COVID-19 in Humanitarian and Fragile Contexts:

Disease surveillance, program monitoring, social interaction, and policy analysis during the first year of the COVID-19 pandemic

Cox's Bazar, Bangladesh

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Shaping practices
Influencing policies
Impacting lives

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Disclaimer

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Acronyms

ACF	Action Contre la Faim
ANC	Antenatal Care
ANC1	First Antenatal Care Visit
ARI	Acute Respiratory Infection
CAR	Central African Republic
CFR	Case Fatality Rate
CXB	Cox's Bazar
DHIS2	District Health Information Software 2
DRC	Democratic Republic of Congo
FGD	Focus Group Discussions
HCWs	Health Care Workers
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Units
IPC	Infection Prevention and Control
IR	Incidence Rate
IRB	Institutional Review Board
KII	Key Informant Interview
LMICs	Low- and Middle Income Countries
NCD	Non-Communicable Disease
NGOs	Non-Governmental Organizations
PCR	Polymerase chain reaction
PNC	Postnatal Care
PPE	Personal Protective Equipment
TB	Tuberculosis
TR	Testing Rate
UHC	Upazila Health Complex
UH&FWC	Union Health and Family Welfare Center
UNHCR	United Nations High Commissioner for Refugees
WHO	World Health Organization

Executive Summary

Background and Objectives

The COVID-19 pandemic declared by the World Health Organization on March 20, 2020 has affected almost all countries in the world and all aspects of our societies. With more than 649 million cases and 6.6 million deaths by December 1, 2022, [1] the COVID-19 pandemic has challenged every health system in the world. It has led to a variety of governmental responses that aimed to both contain the spread of the disease, maintain essential services, and overall trying to minimize disruptions while protecting their populations. Health systems in low- and middle-income countries (LMICs) and in humanitarian settings were considered at highest risk at the beginning of the pandemic due to pre-existing vulnerabilities ranging from already fragile, understaffed, and underfunded health systems, limited available emergency care capacity, poor living conditions, limited access to water and sanitation, potentially vulnerable population with precarious health status. [2]

The objective of this study was to improve the understanding of the epidemiology of COVID-19 in Bangladesh with a focus on Cox's Bazar (CXB) region and the broader impacts on essential health services. It aimed to document how programs adapted, and how population behaviors related to health care seeking and social interactions were affected and changed over time. This study was part of a larger study implemented in three countries focusing on humanitarian settings: Bangladesh, Central African Republic and Democratic Republic of the Congo. It was led by the Center for Humanitarian Health at Johns Hopkins Bloomberg School of Public Health in collaboration the humanitarian organizations Action Contre la Faim and IMPACT.

Bangladesh is a LMIC with a fragile health care system prior to COVID-19 The country had one of the highest burdens of reported COVID-19 infections within South Asia. [3] As of December 1, 2022, a total of 2.04 million confirmed cases have been reported. [3] While contributing factors include the country's high population density of 1,265 people per km^2 and 31.5% of the country's population living below the poverty line, the Government of Bangladesh has also been criticized for their management of the pandemic. [4] The key concerns that have been raised center around the country's low testing rates, the delay and poor implementation of COVID-19 measures, and the overall lack of coordination between governmental bodies and district levels. [4]

Methods

This was a mixed-methods study that brought together primary and secondary, qualitative and quantitative data from a variety of sources. We aimed to complement health facility data with perspectives from both affected communities and health care providers, to provide a more comprehensive understanding of the situation in the research site.

This case study includes four components:

1. COVID-19 Epidemiology using secondary anonymized data to collect information for the COVID-19 epidemiology section including individual-level case and testing data, case management data, national testing data, national morbidity and mortality data and population data.

2. An interrupted time series analysis assessing how health care utilization for a variety of services on the continuum of care has changed.
3. Perceptions of health service delivery adaptations through in-depth interviews with health care workers followed by qualitative analysis using thematic and framework analysis.
4. Health seeking behavior and social interactions following a mixed-methods approach of key informant interviews and a household survey. Qualitative data was analyzed using a saturation grid matrix. Quantitative data was analyzed using a weighted analysis of survey responses.

Key Findings

1. COVID-19 epidemiology

- Results align with global epidemiology.
- CXB district's epidemic curves correspond closely with sociological factors including intranational movement, large religious celebrations and changes in testing.
- Incidence and case-fatality rates in CXB district are comparable if not lower than national rates, likely due to high rates of isolation and limited testing capacity.
- Testing and incidence rates were higher in women than in men.
- Odds of death increased with age, as we see globally.

2. Routine Health Services

- Outpatient consultations showed different behavior for facilities at different levels**.** Most higher-level facilities had a cumulative decrease, and most lower-level facilities showed a cumulative increase. Trends were more erratic with high level facilities with less variability at the lower-level health facilities.
- Maternal and reproductive health services reported a cumulative decrease in first antenatal care visits services and an inconsistent trend for family planning services. Visits for antenatal care showed opposite trend of outpatient consultations, with higher level facilities mostly reporting an increase and lower-level health facilities a decrease. The high variability in family planning before COVID-19 made it difficult to identify changes during COVID-19 period.
- Both higher and lower-level facilities reported a drop at the beginning of the pandemic for respiratory tract infections, with lower-level facilities seeing a much smaller decrease. Fifty percent of the upazilas reported an overall positive balance in cumulative consultations for respiratory infections.
- Uptake of 3rd dose of pentavalent vaccine showed a sharp drop at the beginning of the pandemic in all upazilas, followed by an increase. Fifty percent of upazilas reported a cumulative increase.
- A lower rates of cholera inpatient admissions were reported in all but two upazilas (Teknaf and Ukhiya) during the COVID-19 period compared to pre-COVID-19 period.
- Most of the upazilas reported a cumulative decrease in outpatient consultations for diarrhea (children under 5) over the COVID-19 period, yet the biggest difference was recorded in Chakaria that corresponded to +2000 cases.

- Higher level health facilities seemed to show a drop in emergency referrals at the beginning of the pandemic followed by increasing trends a few months later. Lower-level health facilities showed less variation during COVID-19 compared to pre-COVID-19.

3. Health care workers perceptions

- The perceptions of service changes by health care workers varied greatly, and few consistent patterns could be identified.
- Those reporting increase in services cite:
  - Fear of COVID-19, seasonal changes for certain diseases.
  - An increased awareness of COVID-19.
  - An increase in the complexity of cases.
  - Close proximity of their health facility to the community.
  - An increase in recruitment of nurses and doctors.
- Those reporting a decrease in services cite:
  - Fear of COVID-19.
  - School closures.
  - Lockdowns that were imposed.
  - Supply scarcity.
  - Infection rates among staff.
- Most health care professionals reported that changes to services and activities were difficult to implement because of several factors:
  - Lack of awareness and understanding of COVID-19.
  - Resistance to barrier measures.
  - Supply shortages, fear of COVID-19.
  - Lack of government support.
    Transportation issues caused by lockdown.

4. COVID-19 Knowledge, Health Seeking Behavior and Social Interactions

Knowledge about COVID-19:

- Two thirds were classified as “little informed” and another third as “informed”.
- The majority of respondents were not aware that cases could be asymptomatic.

Preventive measures: related knowledge and reported practice:

- Most people were aware of COVID-19 prevention measures in some form, though only 10 out of 23 key informants believed others were aware of these preventive measures.
- Adherence to preventive measures decreased over time, both because risk perception decreased among people and police/army enforcement declined.
- Mask wearing, social distancing and hand washing were the most frequently identified preventive measures used in the community.

- There were differences in uptake of preventive measures by gender, geographic location, and income:
    - More women than men reported always wearing masks and always handwashing.
    - Less rural -than urban respondents reported wearing a mask.
    - Economic and financial barriers to practice protective measures.
    - Increasing age and education were associated with higher odds of wearing a mask.
    - Higher level of education and of COVID-19 related knowledge, as well as female sex, were associated with higher odds of practicing physical distancing and hand washing.

Vaccination:

- Almost all (99%) survey respondents reported willingness to get vaccinated.
- Varying degrees of trust and confidence in vaccines from qualitative responses, as well as issues related to equitable access.
- Possible reasons for not getting the vaccine include:
    - Lack of understanding / lack of information on the effectiveness of the vaccines.
    - Fear of side effects.
    - Problems with vaccine given current health status including pregnancy.

Information sources:

- In quantitative data, radio and TV were most commonly reported by respondents over the age of 30 while those 18-30 most commonly used social messaging apps as their main form of information.
- The vast majority trusted the news they got from whatever source they used.

Health care seeking behavior:

- Proximity, cost, and trust were the three main factors guiding choice of provider.
- Respondents mainly sought care at pharmacies, followed by public hospitals and unlicensed doctors.
- Almost half of the respondents considered the services accessibility to have remained the same since the beginning of COVID-19. One third thought they had decreased and almost one fifth thought they had increased.
- Fear of COVID-19, lack of health care providers, human resources diverted to COVID-19 patients and costs were the three main reasons why respondents perceived accessibility had decreased.
- Most of the household's members with chronic diseases were able to access they care they need.
- Those who did not seek care did not consider their condition serious enough; cost was the second reason for not seeking care.

Social interactions:

- Characteristics of interactions the day before the survey:
    - Almost all respondents had interactions with people outside of their household.
    - Average of 2 contacts/ day/ respondent.
    - Assortative by sex and by age (for adult and young adults).

- Mainly in the home, or another house, or the street; and mainly outdoors and without physical contact.
- Majority of the interactions were short (less than 15 min).
- Masks were not worn in 25% of the interactions.

- Changes since the beginning of the COVID-19 pandemic:
  - The majority reported reducing the frequency and the duration of meetings.
  - Financial challenges and education disruptions were mentioned as major themes when asked about the impact of the pandemic on daily life.

Conclusions and Recommendations

1. Policies and their implementation

The Government of Bangladesh implemented some policies that attempted to reduce SARS-COV-2 infections such as lockdowns and the building of isolation centers. However, several events and policies, such as the return of factory workers from Dhaka to their home communities at the start of the lockdown, the end of the national lockdown at the end of May that allowed factories and mass transportation to renew operations, and the Eid al-Fitr celebrations (May 23-24, 2020), likely contributed to widespread travel and large gatherings, with consequent increases in COVID-19 infections. There was also an overall lack of coordination between governmental bodies and district levels. In the future, consistent policies and strong coordination from central level with the districts are needed to ensure a coherent response to large-scale epidemics.

Insecurity in CXB district did not appear to be a factor in accessing health services nor in population movement, unlike in other countries like the DRC. However, government quarantine policies and their level of enforcement, shortened outpatient visiting hours, task shifting of frontline HCWs, prior levels of trust in health care system, accessibility, difference in socio-economic status of population (affordability of services was one key factor in guiding decisions as to where to seek care) and how adaptations to clinical services were implemented did affect how communities accessed health services and at which levels (more on this in the health care access and utilization section below). Therefore, government policies and their implementation have immediate effects, such as where people go to access health services and why, as well as longer term effects such as trust in government and its services.

Shortage of materials and supplies, including PPE, masks, hand sanitizer, water (for handwashing) and soap at health facilities challenged the implementation of preventative measures, and prompted HCWs to improvise, or purchase these items themselves if feasible to do so. Many HCWs were infected during the first wave of COVID-19 in Bangladesh, also contributing to difficulty in providing services. This may have been particularly important as there was already a shortage of HCWs in Bangladesh, particularly in the rural and remote areas, despite numerous government policies to retain HCWs in remote areas in Bangladesh. The shortage of high-quality PPE and lack of training on how to effectively use it likely contributed to the high morbidity and mortality rate among medical personnel. In the future, the government needs to concentrate on the implementation of an effective supply chain of materials and supplies to ensure HCWs are protected, and communities have the confidence that there will be adequate

supplies when they access health care services. Finally, health work force issues have been a problem in Bangladesh for a long period.

2. Diseases testing capacity and strategies

Ensure testing capacity for COVID-19 and future diseases of epidemic potential is quickly scaled-up at the beginning of an epidemic in Bangladesh is necessary to better understand the epidemiology of the disease. In our study, different upazilas in CXB had different levels of testing available. Higher testing in CXB Sadar may have related to the location of larger health facilities for the district, while in other upazilas, it may have been related to international assistance for refugees with mobile PCR machines. Regardless of the reasons, availability of tests, as well as a change in policy where people had to pay for tests, made it difficult to interpret the incidence rates in and among the various upazilas in CXB district. Furthermore, testing amongst females was lower than amongst males. A testing strategy in the future should include a concerted effort to have equal access for females.

If rapid scale-up of testing is not possible across a district or country, the use a limited number of tests to undertake representative sample of tests to improve initial understanding of disease epidemiology and CFRs should be undertaken. For the latter, this may allay anxiety and encourage positive health seeking behavior if the population has a more realistic understanding of the mortality of the specific disease. It could also help build trust amongst the community and government authorities, which was noted as a barrier regarding understanding and positive health seeking behaviors.

While some population-based antibody serosurveys were undertaken in Bangladesh, none took place in CXB to improve the understanding of the epidemic and to allow for more informed policies and programs. Furthermore, serosurveys amongst specific groups, such as the refugees, should also include nationals, with significant power to disaggregate, to ensure that a more complete picture of the epidemiologic situation occurs as early on in an epidemic as possible.

3. Health systems data management

The COVID-19 line list was introduced at the beginning of the pandemic, and included a set of individual level variable encompassing case demographic characteristics, residence, test data, contact tracing, disease outcome. Unfortunately, due to the high number of reported cases the level of completeness decreased quickly, drastically limiting the capacity to analyze such data.

COVID-19 data were then integrated into DHIS2, yet initially with few aggregated and incomplete variables. For sustainability purposes, the district should sustain the integration of COVID-19 data into DHIS2 and ensure individual level data about co-morbidities, disease management and outcomes are aggregated and available as well, to improve understanding of the COVID-19 epidemiology.

4. Data from the community, and risk communication and community engagement

This study included a great deal of data from community members, including knowledge, attitudes and practices, and social interactions. Compliance with practices was quite high (especially wearing a mask) and decreased over time; this can be linked to lifting of requirements, reduced risk perception and fatigue. Interestingly, no rural-urban divide was identified in reported practices, however increased challenges faced by poorer community members were raised by respondents. Knowledge that the virus could be

spread by persons who were asymptomatic was low, as in many other countries. There is a need to develop messages to address the concept of spread via asymptomatic cases.

Unlike many other countries, COVID-19 vaccine acceptance was rather high amongst people surveyed in CXB district. After a slow vaccine rollout in Bangladesh, COVID-19 vaccination campaign was on target to achieve 70% of fully vaccinated people by midyear. The accepting attitude of COVID-19 vaccine by this population should be studied further, and perhaps other changes could be built upon such positive attitudes related to other behavioral aspects for COVID-19 and other diseases of epidemic potential.

Little is known about social interactions during the COVID-19 pandemic amongst Bangladeshi communities. Our population-based social interaction study amongst people in CXB found that contacts with people outside of the households were common and occurred daily, yet the number of interactions was relatively low. Physical contact was quite rare, masks were worn in 25% of interactions (more men than women), and most encounters were short and occurred outside. Gender differences were also observed. Behaviors seemed to have changed during periods of COVID-19 restrictions, with fewer and shorter interactions which tended to avoid groups at higher risk, especially the elderly. While this was helpful to reduce the risk of infections, mental health and psychological consequences cannot be underestimated. These factors are relevant for the development of future policies to contain the spread of diseases.

As always, RCCE programs need to be adapted according to data and evidence collected. While the concept of asymptomatic cases requires particular attention, there are many positive aspects of behavior, including social interactions, and COVID-19 vaccine acceptance, that can be built upon amongst the population in CXB district.

5. Health care access and utilization

While the reported data suggests that morbidity and mortality were not as severe as expected, it is important to highlight that with such limited testing capacity, the reported case counts are likely significantly underreported. The true incidence and mortality rates in CXB district are likely much higher than what is reported in this paper. In the future, testing strategies and improved data management systems are needed in CXB district to better understand the overall morbidity and mortality from widespread epidemics, such as occurred with the COVID-19 pandemic.

There was a need to improve the understanding of health care access and utilization during the COVID-19 epidemic in CXB district. The ITS data showed a reduction in overall outpatient health consultations, and consultations for respiratory infection in children under 5, vaccinations, and ANC. As in other studies, a reduction in respiratory tract infections could be due to people's fears of going to the health facilities and either being diagnosed with COVID-19 or catching COVID-19 at the clinics, or it could be due to a reduction in such infections due to improved IPC measures. Clearly, people adapted their health seeking behavior according to a variety of factors from quarantine that limited population mobility to socioeconomic factors. Households and HCWs interviewed stressed proximity to health services as an important factor in choosing where to go. Some people chose to use primary health care services for certain diseases while deciding to go to hospitals for other services. As in many other countries, there was a reduction in many people utilizing health care services at the beginning of the epidemic that coincided with lockdowns. Further investigation into the differential decision-making for services sought at health care facilities of

different levels is needed to better understand which factors shaped communities' decisions. This information could help the government and its partners improve the effectiveness of health service provision, including supply chain and health care workforce. Furthermore, there appeared to be a need to expand the availability of trained HCWs in rural and remote areas.

6. Data triangulation

Our study shows the need to triangulate disease specific data, health systems data, and community-based data is essential for analysis and interpretation to inform strategies and programs.

1 Introduction

The COVID-19 pandemic declared by the World Health Organization (WHO) on March 20, 2020 has affected almost all countries in the world and all aspects of our societies. With more than 643 million cases and 6.6 million deaths by December 1, 2022, [1] the COVID-19 pandemic has challenged every health system in the world, and led to a variety of governmental responses that aimed to both contain the spread of the disease, maintain essential services, and tried to minimize disruptions while protecting their populations.

Since the identification of the novel SARS-CoV-2 virus in December 2019, extraordinary progress has been made in terms of understanding how the virus operates in the human body, transmission chains, risk factors for negative outcomes up to the development, treatment strategies, and production at scale of multiple effective vaccines. Effects on countries, economies and communities varied across regions and over time, as multiple waves of cases were recorded at different times in different parts of the world.

Health systems in low- and middle-income countries (LMICs) and in humanitarian settings were considered at highest risk at the beginning of the pandemic due to both very low capacity to prepare and respond to epidemics and pandemics [2] and pre-existing vulnerabilities ranging from already fragile, understaffed, and underfunded health systems, limited available emergency care capacity, poor living conditions, limited access to water and sanitation, potentially vulnerable population with precarious health status. [5, 6] Several modeling studies attempted to estimate the burden of infections in various LMICs and forced displacement settings in Africa and worldwide, depicting quite gloomy scenarios. [7, 8] Fortunately, these dire forecasts did not occur, although several waves have been reported in all countries. 20 million cases and 389,000 deaths were reported in LMICs hosting humanitarian settings by December 1, 2022, [9] with the majority of cases being asymptomatic and a low proportion of patients experiencing severe outcomes and death. [10, 11] The underlying causes for the heterogeneity in the disease spread in different countries remain unclear. Several factors have likely contributed to such different scenarios including early introduction of response measures, previous experience with epidemics and emergencies, demographic factors, host genetics and cross reactivity with other pathogens, climate and environmental factors. [11, 12]

Besides the direct effects of the spreading of the SARS-CoV-2 virus, particularly concerning was the capacity to maintain essential health services when resources and attention were focused on a single disease and diverted from routine health services. In previous large-scale epidemics (e.g., Ebola in West Africa and cholera in Yemen), there was excess morbidity and mortality from communicable and non-communicable diseases (NCDs). [13] National governments and humanitarian organizations implementing health programs quickly recognized the need to adapt service provision in order to minimize infections while ensuring the service could be continued. [14] Without existing guidance, program adaptations were introduced, piloted and adapted, which in turn informed the development of guidance. [15]

Despite the increasing evidence, less is known about COVID-19 in humanitarian settings, both in terms of epidemiology, broader impacts on essential health services, how programs were adapted and how population behaviors related to health care seeking and social interactions were affected and have changed over time. Therefore, we designed a multi-country study with the following objectives:

1. Improve the understanding COVID-19 epidemiology in humanitarian settings.
2. Assess the broader impact of the pandemic on non-COVID-19 morbidity and mortality, as well as on health services utilization by vulnerable groups.
3. Investigate how social interaction and health seeking behaviors have been affected and evolved during the pandemic.
4. Document policies and interventions and investigate their impact on the epidemiology of COVID-19 and non-COVID-19 diseases.

The study was implemented in three countries focusing on humanitarian settings: Bangladesh, Central African Republic (CAR) and the Democratic Republic of Congo (DRC). The study covered the first year of the COVID-19 pandemic from March 2020 to April 2021. More than 126.4 million cases and 2.8 million deaths were recorded globally by the end of the study period. [16]

This report focuses on Bangladesh, in particular the Cox's Bazar (CXB) region, and presents the methodology, findings, and discussion of the study. The study was led by the Center for Humanitarian Health at Johns Hopkins Bloomberg School of Public Health in collaboration with Action Contre la Faim (ACF) and IMPACT, two humanitarian organizations that have been present in the three countries for many years. ACF facilitated processes to obtain secondary data from the Ministry of Health (MoH) and WHO, including COVID-19 line list, testing data and routine health services. ACF also conducted key informant interviews with health care workers. IMPACT led the primary qualitative and quantitative data collection, by conducting key informant interviews and a household survey in the communities living in CXB district.

2 Case study profile

Bangladesh is a lower-middle income country with a unitary form of government. There are 64 districts in the country, with each district divided into several sub districts, also called upazilas. [17] The Institute of Epidemiology, Disease Control and Research is considered the focal institute for conducting public health surveillance and outbreak responses, while the Ministry of Health and Family Welfare, which houses the Directorate General of Health Services, is responsible for the preparation and management of curative, preventive, and pro-active health services for the population of the country. [17] As part of its COVID-19 response, the Government of Bangladesh established several committees at all levels comprised of decision-makers, administration, law and order, information, local and international organizations, and various components of the health system. A technical committee was formed at central level comprising health care stakeholders for the purpose of evaluating activities in the plan through a review process and for recommending resource mobilization. [18] Bangladesh had an already fragile health care system prior to COVID-19. The health system is made up of over 600 hospitals, including 482 primary care hospitals at the sub-district level and below, 65 secondary hospitals at the district level, 15 medical and dental college hospitals and specialist facilities. There are 16,438 community clinics and health centers, and only 399 Intensive Care Units (ICUs) in the government hospitals in Bangladesh, of which 218 are in Dhaka. [19]

The country had one of the highest burdens of reported COVID-19 infections within South Asia. [3] As of December 1, 2022, a total of 2.04 million confirmed cases have been reported. [3] While contributing factors include the country's high population density of 1,265 people per km^2 and 31.5% of the country's population living below the poverty line, the Government of Bangladesh has also been criticized for their management of the pandemic. [4] The key concerns that have been raised center around the country's low testing rates, the delay and poor implementation of COVID-19 measures, and the overall lack of coordination between governmental bodies and district levels. [4]

CXB, a district within the Chattogram Division of Bangladesh, is one of the country's poorest and most vulnerable districts. CXB has long faced environmental, social, and economic vulnerabilities. [20] Of the almost 3 million people in the district, approximately 33% live below the poverty line. [20] Fifty-three percent of the host population is age 19 years and under. Only 5.1% of the population is over the age 60 years. The male-to-female sex ratio is 1.04. [21] CXB is broken up into eight *upazilas*, or sub-districts: CXB Sadar (the economic hub of the district), Chakaria, Kutubdia, Moheshkhali, Pekua, Ramu, Teknaf, and Ukhia.

These vulnerabilities have only been exacerbated by the current refugee crisis. Since 2017, over 900,000 Federally Displaced Myanmar Nationals fleeing persecution and genocide in Myanmar have crossed the border into CXB. [22] In response, the local government and aid organizations created 34 refugee camps in Teknaf and Ukhia, two sub-districts in CXB. One of these 34, Kutupalong-Balukhali, is one of the largest refugee settlements in the world, housing over 626,500 refugees. [23,24] Prior to the COVID-19 pandemic, the refugee camps have been served by one district hospital with a 250-bed capacity which has long suffered from overcrowding with a bed occupancy rate over 200%, poor infection control, inadequate hygiene protocol and waste management. [8] The camps are also served by 5 hospitals run by nongovernmental 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). Outside of the camps, there is an estimated number of 910 hospital beds within CXB.

This analysis only focuses on the out-of-camp host population within the district.

2.1 COVID-19 situation and response measures

Faced with an increasingly fragile system, the host community of CXB was not well-positioned for the spread of COVID-19. Bangladesh reported its first three cases of COVID-19 on March 8, 2020. [17] Local transmission took hold within a week, and by March 23, 2020, CXB reported its first case. From the first cases, alarm bells rang within the humanitarian community, [8, 25] as in fragile contexts like CXB, morbidity and mortality could become significant. Researchers began modeling SARS-COV-2 to predict epidemic progression. A modeling analysis conducted by Johns Hopkins Bloomberg School of Public Health in the beginning of the pandemic illustrated how a single case in the Kutupalong-Balukhali settlement could lead up to 370 cases within 30 days and 589,800 within a year, depending on the transmission level. [8] These impacts would reverberate outside the camps. Local hospitals would be overwhelmed within 55-136 days, even in a low- transmission scenario. [8] Early models of Chattogram Division similarly warned that the division could experience higher death rates than even Dhaka. [26]

From the start, the CXB health system was restricted in its response to COVID-19. The entire district had only one laboratory that could run polymerase chain reaction (PCR) tests on SARS-CoV2 samples, significantly limiting testing capacity. [27] By June 2020, the laboratory's maximum capacity was around 200 tests per day. [27] The United Nations High Commissioner for Refugees (UNHCR), WHO, and other aid groups provided assistance to improve capacity, including a second PCR machine. [27] By August 2020, capacity had increased to 1,000 tests per day, but this was still low for a population of almost 3 million people. [28] Clinical management of severe cases in CXB was additionally limited. The only ICU ward in the district, located at the CXB 250 bed District Sadar Hospital, started with only 10 beds and increased to 38 beds in June 2020. [29, 30]

Following the first cases in March, the Government of Bangladesh implemented a nationwide lockdown. [31] While this lockdown may have helped general community transmission, it was not strictly enforced, with sidelined garment workers traveling back and forth from Dhaka to their home villages during the lockdown. [32] SARS-CoV-2 soon spread from Dhaka into surrounding cities and villages. [32] Within several months, Chattogram Division became a hotspot, with the second highest case count after Dhaka. [33, 34] In August 2020, CXB ranked 10th of 64 districts for number of cases and 12th for number of deaths. [34] Nationally, men were found to make up 72% of incident cases and of 79% of deaths. [17, 32, 34] Cases were highest among those aged 21-40 and lowest among children and the elderly. [32] The national case-fatality rate ranged from 1.3% to 2.4%, with mortality being greatest among those 60+. [31, 32, 34] Compared to six neighboring countries – Bhutan, Sri Lanka, India, Pakistan, Myanmar, and Nepal – Bangladesh had the lowest testing rate. [35] Despite having lower testing rates, by August 2020, Bangladesh ranked among the top 15 countries with highest COVID-19 morbidity. [28, 34]

3 Case study methodology

3.1 Overview of study components

This was a mixed-methods study that brings together primary and secondary, qualitative and quantitative data from a variety of sources. We aimed to complement health facility data with perspectives from both affected communities and health care providers, to provide a more comprehensive understanding of the situation in the research site.

Each case study includes four components:

1. COVID-19 Epidemiology.
2. Changes in health care utilization.
3. Perceptions of health care workers (HCWs) on health service delivery adaptations.
4. Health seeking behavior and social interactions.

While the approach is consistent across case studies, adaptations were necessary to reflect data availability and contextual and cultural differences.

3.2 Ethical approval and national authorizations

Ethical approval was obtained from the Johns Hopkins Bloomberg School of Public Health's Institutional Review Board (IRB). Components 1 to 3 were deemed non-human subject research (IRB determination notice 14719) as they used only secondary, aggregated, or anonymized quantitative data; and qualitative interviews with HCWs were conducted in their professional capacity. Authorization to access and analyze data was obtained from Bangladesh's Medical Research Council (Ref: BMRC/NREC/2019-2022/125, dated March 4, 2021). Component 4 was deemed human subject research (JHSPH's IRB determination note 15447) as personal information was collected. Ethical approval from in-country IRB was obtained from the Institute of Health Economics of the University of Dhaka (IRB letter dated March 28, 2021). Participation in the surveys and focus group discussions was voluntary and only consenting adult respondents were included.

3.3 COVID-19 epidemiology

3.3.1 Objectives

This component aimed to investigate the epidemiology of COVID-19 in CXB district, Bangladesh.

3.3.2 Data sources

Secondary anonymized data was compiled from several sources:

1) *Individual-Level Case Data* – A line list of confirmed COVID-19 cases from the host community was obtained from WHO. These data included testing date, upazila name, and outcome for each reported confirmed case in CXB. There were additional variables included in the line list template (e.g., severity), but completeness was too low, and they could not be analyzed.

2) *Individual-Level Testing Data* – A line list of COVID-19 tests conducted in CXB was obtained from WHO. These data included testing data and location, patient's address, and test result. Patient addresses were not consistently at the household level, rather they were provided at a variety of unspecified levels including ward, village, and upazila and had to be aggregated at the upazila level for consistency of analysis. Addresses were first categorized by upazila using the 2011 Census and Google Maps. If a patient address was unable to be categorized using those two resources, facility location was used as a secondary form of categorization. Facility location was not used as a primary measure of categorization as this could lead to imprecise categorization. In numerous cases across the testing data, patient address and facility location did not share the same upazila, indicating patients traveling across upazila borders for care. As such, facility location was only used as the secondary measure of categorization for tests that could not otherwise be categorized. Any remaining addresses that still could not be categorized at the upazila level were excluded from upazila-level analyses but included in district-level analyses. Addresses that were outside CXB were excluded from analysis. Throughout the cleaning process, common variations in spelling (e.g., Chakaria vs. Chakoria vs. Chokoria; Toytong vs Toitong) were identified and allowed.

3) *Case Management Data* – Hospitalization data was obtained from the District Health Information Software 2 (DHIS2). Data was organized as the number of new cases, number of hospitalized patients, number of recovered patients, and number of deaths per day, at the district-level. Further clinical management data was obtained from DHIS2. These data were disaggregated by hospital and included data points like daily number of COVID-19 patients hospitalized, on oxygen support, on ventilator support, with comorbidities, and in ICUs. The data were used to calculate proportion of COVID-19 cases needing advanced support such as oxygen, ventilator or ICU support. Because the data were daily at a facility-level, we could only calculate proportion of cases each day or the average weekly proportion.

4) *National Morbidity and Mortality Data* – Data on cases and deaths for all of Bangladesh was obtained from the Johns Hopkins COVID-19 Dashboard. [36]

5) *National Testing Data* – National-level data on COVID-19 testing in Bangladesh was obtained from Our World in Data. [3, 37]

6) *Population Data* – Population data for CXB and its upazilas were obtained from the 2011 Population and Housing Census conducted by the Bangladesh Bureau of Statistics within the Ministry of Planning. [21] To acquire 2020 population estimates, the 2011 growth rate was applied to the adjusted 2011 population sizes by upazila. The same was done for age-distributed populations and sex ratios. National population data was obtained from the Johns Hopkins COVID-19 dashboard. [36]

3.3.3 Analysis

Incidence rates and testing rates are expressed per 100,000 people, and positivity rate is in percent. Incidence rates were calculated from the WHO Case Line List, while testing rates and positivity rates were calculated from the WHO Testing Line List. In March and April 2020, patient addresses in the testing line list were incomplete so tests could not be sorted by upazila. Age-specific incidence rates per 100,000 people were calculated using case counts from the WHO Case Line List and age- specific population data projected from the 2011 census.

Descriptive statistics were conducted to analyze the epidemiology of COVID-19 within CXB. Chi square tests were used to compare observed versus expected counts of cases and deaths between different binary characteristics. Expected counts were calculated by applying a select incidence rate to the applicable population data. Two-sample t-tests were conducted to compare average ages of cases from the confirmed case line list. Lastly, logistic regressions were run to identify demographic characteristics associated with higher odds of death from COVID-19.

3.4 Routine health services

3.4.1 Objectives

This component aimed to estimate how health care utilization changed at the beginning of the COVID-19 pandemic and over time during the first year of the COVID-19 pandemic.

3.4.2 Indicator definitions

The following indicators were explored. Denominators were used to calculate per-capita change in observed value of each indicator compared to the counterfactual over the course of COVID-19 period.

The COVID-19 period was defined as April 1, 2020 to March 31, 2021; while the pre-COVID-19 period spanned from Jan 1, 2017 to March 31, 2020.

Table 1: Definition of indicators used in the analysis (April 1, 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

Indicator	Numerator	Denominator
Outpatient consultations	Number of outpatient consultations (sum of outpatient consultations for males <5, males >=5, females <5, and females >=5)	Estimated population in upazila during COVID-19 period
Antenatal Care (first visit) (ANC1)	Number of first antenatal care consultations (within 16 weeks of delivery)	Estimated population of pregnant people in upazila during COVID-19 period
Respiratory tract infections, Under 5	Total number of outpatient consultations for respiratory tract infections <5 years (acute lower and upper respiratory tract infections combined)	Estimated number of children <5 years of age in upazila during COVID-19 period
Outpatient consultations for diarrhea, Under 5	Total number of outpatient consultations for diarrhea for children <5 years	Estimated number of children <5 years of age in upazila during COVID-19 period
Malaria consultations	Number of consultations for malaria	Estimated population in upazila during COVID-19 period
Deaths	Number of all-age, all-cause deaths captured in institutional records	Estimated population in upazila during COVID-19 period

Indicator	Numerator	Denominator
Penta3 vaccination	Total number of vaccination doses provided to children <12 months for PENTA3 (diphtheria, tetanus, whooping cough, hepatitis B and haemophilius influenzae type B)	Estimated number of children <12 months in upazila during COVID-19 period
New family planning consultations	Total number of new consultations for family planning	Estimated population in upazila during COVID-19 period
Emergency referrals	Number of emergency referrals from a lower level health facility to higher level (from community health facilities to upazila Health complex (UHC); from UHC to District hospitals; from district hospitals to specialty or medical college hospitals)	Estimated population in upazila during COVID-19 period
Consultations for diabetes, >5 years old	Number of outpatient consultations for diabetes, >5 years old	Estimated population of individuals 5 years or older in upazila during COVID-19 period (estimated as difference between total population and estimated number of children under 5 years old)
Cholera rate, inpatient	Number of inpatient cholera cases of all ages	Estimated population of individuals living in the upazila (at two points in time: i) one year prior to beginning of COVID-19 period and ii) during COVID-19 period)

The quantities used in the denominators as described in table 1 were calculated as follows:

- *Estimated population in upazila during COVID-19 period:* Weighted average of upazila population in 2020 and 2021, as projected from the census (population in 2020*9/12 + population in 2021*3/12). [21]
- *Estimated population of pregnant women in upazila during COVID-19 period*: 4% of estimated population in upazila during COVID-19 period (calculated as above).
- *Estimated number of children <5 years of age in upazila during COVID-19 period*: 8.8% of estimated population in upazila during COVID-19 period. [38]
- *Estimated number of children <12 months in upazila during COVID-19 period*: 1.76% of estimated population in upazila during COVID-19 period. Note that we estimated this to be 20% of population of children 0 – 4 years age (calculated as above).

- *Estimated population in upazila one year prior to beginning of COVID*-period (i.e., April 1, 2019 to March 31, 2020): Weighted average of upazila population in 2019 and 2020, as projected from the census (population in 2019*9/12 + population in 2020*3/12). [21]

3.4.3 Inclusion and exclusion criteria

We excluded any facility that had one or more months with missing data during the COVID-19 period, as it was not possible to estimate/ impute the value for the given month. We also excluded facilities with less than 80% of data in the pre-COVID-19 period (corresponding to 31 out of 39 months included in the study period). All 0 values were treated as missing values.

3.4.4 Model

For each indicator, for each health facility, we independently fit a generalized linear model with log-link and negative binomial distribution, with the following structure:

$$\log(E[Y|month, t] = \beta_0 + \beta_1 month + \beta_2 \cos\left(\frac{2\pi t}{12}\right) + \beta_3 \cos\left(\frac{4\pi t}{12}\right) + \beta_4 \cos\left(\frac{6\pi t}{12}\right) + \beta_5 \sin\left(\frac{2\pi t}{12}\right) + \beta_6 \sin\left(\frac{4\pi t}{12}\right) + \beta_7 \sin\left(\frac{6\pi t}{12}\right)$$

where *Y* is the count variable of interest (e.g., number of consultations), $month$ is the chronological number of months since the beginning of study period, t is the calendar month (ranging from 1 to 12), used to capture long-term trend. To model seasonality, we used three harmonic functions, and assumed period was 12 months. For indicators where seasonality was not expected to play a role (e.g., ANC1), we excluded the harmonic functions from the model definition.

3.4.5 Difference from expected values

To estimate cumulative difference from observed and expected values during COVID-19 period for each health facility, we generate counterfactual, or expected values during COVID-19 period by calculating 95% prediction intervals for each facility for each month of the COVID-19 period. This was done using a parametric bootstrap procedure, as described in Fulcher et al.[39] For each month in the COVID-19 period, we calculated the difference between the expected value of the indicator and the observed value, and aggregated these differences across all facilities of similar level (Higher level vs Lower level) in each upazila. We converted this value to difference in per capita number of counts by dividing the cumulative difference by a population estimate for the COVID-19 period, calculated as (population in 2020 * 9/12 + population in 2021 * 3/12).

We calculated percent difference from expected values by dividing the aggregated difference between expected and observed values at each month of COVID-19 period by the aggregated expected number of consultations. Models were fit using *MASS* package. [40] This was done separately for lower-level facilities, higher level facilities, and all facilities in an upazila, unless services were only provided at one

level of facilities. Table 2 summarizes the type of facilities and data used for each indicator. Upazila-level data were only used when data from neither lower nor upper facilities were available.

3.4.6 Level of analysis

We characterized the facilities as follows:

- Higher level: Upazila Health Complex (UHC) or District Hospital.
- Lower level: Community Clinic or Union Health and Family Welfare Centre.

The analysis was conducted per level of health facilities as indicated in table 2.

Table 2: Types of health facilities included in the analysis by indicator (April 1, 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

Indicator	Lower facilities	Upper facilities	Upazila-level
Outpatient consultations	Community clinics	Upazila Health Complex District Hospital	
ANC1	Community clinics	Upazila Health Complex District Hospital	
Respiratory infections, Under 5	Community clinics	Upazila Health Complex District Hospital	
Consultations for diarrhea, Under 5	Community clinics	Upazila Health Complex District Hospital	
Deaths			upazila-wide reports + hospitals
Penta3 vaccination			upazila-wide reports
New family planning consultations	UH&FWC		
Emergency referrals	Community clinics	Upazila Health Complex District Hospital	
Consultations for diabetes, >5 years old	Community clinics		
Cholera cases, inpatient		Upazila Health Complex District Hospital	

Because cases of cholera were sporadic and relatively sparse, we did not fit the model as above. We included all facilities that reported inpatient cholera cases and compared the rate of cases per 10,000 people in the year preceding the COVID-19 period and during the COVID-19 period. The year preceding the COVID-19 period was defined as period from April 1, 2019 to March 31, 2020.

3.5 Health care workers' perceptions

3.5.1 Objectives

This component aimed to understand how health service provision was modified since the beginning of the COVID-19 pandemic; to gather perceptions and opinions of HCWs about adaptations, measures, changes in consultations, as well as their understanding of population's perceptions.

3.5.2 Data sources

In-depth interviews with HCWs were conducted between March and June 2021 in ACF-supported health facilities in five of the eight upazilas in CXB District.

Thirty-five health facilities were visited (22 community clinics, 5 upazila health complexes, 4 union health and family welfare centers, 3 union health sub centers, and 1 district hospital) in CXB. Different types of HCWs were interviewed to capture a variety of perspectives, though the final sample ultimately depended on the availability of specific health care professional profiles at a given health facility the day that health facility was visited. The interview guide is available in annex 1.

3.5.3 Analysis

Transcripts or notes for each interview were drafted in English and thematic analysis was conducted. Framework analysis was used to explore qualitative data. A matrix output with cases as row and codes as columns) was developed to summarize data and facilitate comparisons between respondents and topics. [41]

3.6 Health care seeking behavior and social interactions

3.6.1 Objectives

This component aimed to characterize social interactions; to explore knowledge, attitude and practices related to COVID-19, and to improve understanding of health-seeking behavior and how they evolved over time. More specifically, the study aimed to answer following research questions:

1. How can social interactions be characterized in terms of:
    a. Key features – among whom, where do they occur and at which frequency?
    b. Conditions – length of interactions and the use of social distancing?
    c. Drivers – why do people meet face- to-face and are there alternatives to these meetings?
2. What are the most common health-seeking behaviors in the assessed communities?
    a. What is the extent of knowledge and attitudes around use of these behaviors?
    b. Do these behaviors include COVID-19 preventive measures?
    c. What is the extent of knowledge and attitudes around vaccinations by those in assessed communities?

3. How did social interaction and health- seeking behaviors evolve?
    a. During the month before COVID-19?
    b. In the first months after COVID-19, when physical distancing measures were introduced?
    c. At the time of data collection?

A mixed method approach was utilized, using key informant interviews (KII) as the qualitative piece and household surveys as the quantitively piece.

3.6.2 Data sources

3.6.2.1 Qualitative data collection

Qualitative data were collected via telephonic KII instead of focus group discussions (as done in the other case studies) due to concerns over the COVID-19 situation and potential risk of spreading the virus through in person gatherings. Furthermore, lockdown and movement restrictions were in place the majority of the study period, making it impossible to conduct group activities. 23 structured KIIs took place over the phone, slightly overachieving the target of 20 (Table 3). Key Informant Interviews were conducted between June 1 and October 5, 2021. Interview guide is available in annex 3.

The KIIs were primarily identified by ACF, with additional support from REACH in areas where the initial KIs could not be reached after multiple attempts. The qualitative data collection was conducted in seven upazilas of CXB; one more than originally planned, as the remote data collection facilitated the access to KIs in more distant locations. Ramu Upazila was not included as it remains outside of ACF's implementation area.

KII participants were purposively sampled to ensure they had an understanding of their communities and could represent the population, as well as aiming to capture a range of voices. The profile of participants included community and religious leaders, elders, various occupations, like electricians, pharmacists, teachers as well as students, caregivers, and housewives. While aiming for inclusivity, it was not possible to identify and reach people with disabilities to participate in this part of the data collection. KIIs were split across the upazilas to capture differing local characteristics, distributed between adults aged 18-29 years, 30-59 years and over 60 years, and with an overall balance of male and female. It was challenging to reach the age group of over 60 year-olds to participate in the KIIs over the phone. Thus, one KI less than originally planned with this age group was conducted (CXB Sadar). To ensure the saturation of all discussion topics, two more KIIs than planned were conducted in Maheshkhali. Efforts were also made to include respondents from urban and rural areas; however, they were not formally factored into a qualitative stratification plan.

Interviewees' responses were recorded in a paper-based format and then transcribed.

Table 3: Characteristics of key informants (June - October 2021, Cox's Bazar, Bangladesh)

KII ID	Age	Gender	Location	Location Type	Profession
101	20-29	F	Kutubdia	Rural	Housewife
102	20-29	M	Moheshkali	Rural	Pharmacist
103	40-49	M	Moheshkali	Rural	Imam and Teacher
104	40-49	F	Pekua	Rural	Caregiver
105	40-49	F	Ukhiya	Rural	Caregiver
106	20-29	M	Ukhiya	Rural	Caregiver
107	30-39	M	Teknaf	Rural	Teacher
108	60-69	M	Moheshkali	Rural	Teacher
109	60-69	M	Pekua	Rural	Retired NGO staff
110	30-39	M	Moheshkali	Rural	Imam
111	30-39	F	Moheshkali	Rural	Caregiver
112	60-69	F	Kutubdia	Rural	Caregiver
113	20-29	F	Teknaf	Rural	Teacher
114	60-69	F	Teknaf	Rural	Caregiver
115	20-29	M	Pekua	Rural	Teacher
116	60-69	M	Ukhiya	Rural	Pensioner
117	30-39	M	CXB Sadar	Rural	Electrician
201	20-29	F	CXB Sadar	Urban	Student
202	50-59	F	CXB Sadar	Urban	Housewife
203	40-49	M	Kutubdia	Urban	Teacher
204	20-29	F	Chakaria	Rural	Housewife
205	40-49	F	Chakaria	Rural	Housewife
206	40-49	M	Chakaria	Rural	Landlord

3.6.2.2 Quantitative data collection

Data was collected between the 13th and 16th of January 2022, with data collected in all upazilas within the CXB District (Chakaria, Maheshkhali, Kutubdia, CXB Sadar, Ramu, Pekua, Ukhia, Teknaf). The questionnaire was designed collaboratively with the partner organization, REACH, and Johns Hopkins University, with the intent to generate a representative understanding of the prevalence of social interactions and health-seeking behaviors identified through the qualitative data, and how these phenomena differ over time in response to COVID-19. A total of 842 respondents were polled through these surveys. Interview guide is available in annex 2.

The sample size was proportionally allocated to each upazila, and its unions based on their population count in the 2011 nationwide census. An exception was made for the two island upazilas (i.e., Kutubdia and Maheshkhali), where the sample was scaled up relative to the upazila population to reach a 95%

confidence level and 10% margin of error. Furthermore, the sample was increased in Teknaf and Ukhia upazilas, where there are refugee populations, in order to allow for representative disaggregation by distance to a refugee camp (i.e., near to/far from camp). The distance was calculated from each sample point to the nearest camp boundary. The boundary between 'near' and 'far' was then set to have equal samples (i.e., 50%) in each category across the two upazilas.

The sample frame set out for a disaggregation between rural and urban areas. The 2011 census includes the classification of the population as 'rural', 'urban' and 'other' at the upazila level; however, the settlement classification is not provided at a lower administrative tier to indicate where within the upazila the respective population groups are located. Since the 'urban' classification is missing in the census data for half of the upazilas, it was merged with the 'other' classification at design stage (Table 4). To identify the urban areas within each upazila and inform the rural/urban sampling frame at data collection stage, the REACH GIS unit reviewed structure footprints using OSM imagery and overlaid this data with the established district boundaries to evaluate the population density of each union. The population was also measured, according to the household count in the 2011 census, divided by the square kilometers of each union to determine population density. Per upazila, the union with the highest density was classified as 'urban'. The share of the upazila population residing in those unions matched the proportions that were officially classified as 'urban' in the 2011 census (Table 4, marked in bold). Since there is no definition to what constitutes 'other' at the upazila level, the sample frame finally relied on the GIS-informed classification (given its match with the census designation of 'urban').

Table 4: Urban sample allocation (January 2022, Cox's Bazar, Bangladesh)

Upazila	% of population classified as 'Urban', census	% of population classified as 'Other', census	% of total sample classified as 'Urban', TORs	% of total sample classified as 'Urban', GIS
Chakaria	**15%**	0%	15%	**15%**
CXB Sadar	**38%**	12%	50%	**38%**
Kutubdia	0%	21%	21%	21%
Maheshkhali	**9%**	0%	9%	**9%**
Pekua	0%	17%	17%	9%
Ramu	0%	16%	16%	12%
Teknaf	**10%**	10%	20%	**10%**
Ukhia	0%	14%	14%	22%
Total	**13%**	**9%**	**22%**	**18%**

Individual households within each locality were selected via random allocation of a GPS point per union. During data collection, sample GPS points and shelter footprints were uploaded to enumerator phones using the Maps.Me application. If the sample shelter was not occupied or did not contain an eligible household member, enumerators moved to the next assigned shelter. Enumerators worked in pairs of one man and one woman to ensure respondents could be interviewed by the same sex. One adult per household was interviewed. The minimum sample sizes by upazilla as set out in the strudy protocol were all achieved (table 5). To ensure that the samples were met at the union level, some harder-to-reach areas were visited with a higher number of enumerator teams. The minimun sample size for urban (161) was

not achieved (a slight under-sampling of urban areas by 6 households), which could not be corrected due to time constraints.

Table 5: Achieved sample size per upazila and residence setting (January 2022, Cox's Bazar, Bangladesh)

Upazila	Rural	Urban	Total	Minimum ss from ToR
Chakaria	141	25	166	140
CXB Sadar	107	63	170	143
Kutubdia	30	7	37	26
Maheshkhali	89	12	101	88
Pekua	56	6	62	42
Ramu	79	10	89	70
Teknaf	105	9	114	116
Ukhia	80	23	103	95
Total	**687**	**155**	**842**	**720**

3.6.3 Analysis

3.6.3.1 Qualitative analysis

Qualitative data was first analyzed using a saturation matrix, whereby all discussion points raised for each research question during all focus group discussions (FGDs) were listed. The number of mentions of each discussion point is counted to identify the most common opinions expressed and information provided by group members. The KIIs were also coded using Nvivo software to further identify themes and synthesize information and data.

3.6.3.2 Quantitative analysis

A weighted analysis of survey responses was conducted. Weights were added to ensure that samples were proportional to the upazila populations. Results were analyzed both at the aggregate and disaggregate level, with respondents separated by the following categories: Age (categories 18-30, 31-45, 46-59, 60+), gender, settlement type (urban/rural), upazila, landform type (island or mainland), and distance from a refugee camp (Ukhia and Teknaf upazilas only). Additional demographic information was collected as well and is reported in the respondent characteristics section of the results, including education level of respondents, head of household status, occupation, and income. Logistic regressions were used to estimate factors associated with selected outcomes.

We also investigated level of knowledge about COVID-19 at the time of data collection, using three multiple choice questions (table 6). An aggregated score was calculated as the average of the question specific scores and respondents classified as not / partially / informed or well informed.

Table 6: Classification of respondents by knowledge related to key features of COVID-19 (January 2022, Cox's Bazar, Bangladesh)

Question	Score system	Answer options
Who is most susceptible to falling seriously ill to coronavirus? (SI)	"Well informed" corresponds with choosing 3 of these 3 options	Elderly, People with preexisting conditions, Adults
	"Informed" corresponds with choosing Everyone (cannot be chosen with other options) OR 2 of the 3 options here.	Everyone OR Elderly, People with preexisting conditions, Adults
	"A little informed" corresponds with choosing 1 or more out of 5 of these options.	Elderly, people with preexisting conditions, adults, children, health workers.
	"Not informed" corresponds with choosing any of the following options.	Do not want to respond/Don't remember Pregnant / lactating women Other
How can a person contract COVID-19? (PC)	"Well informed" corresponds with those who chose 3 out of 3 options.	-Airborne (other people coughing /sneezing) -Physical contact with infected people -Physical contact with contaminated object/ surface
	"Informed" corresponds with those who chose 2 out of 3 options.	
	"A Little Informed" corresponds with those who chose 1 out of 3 options.	
	"Not informed" corresponds with choosing any of these options.	-Drinking/washing in infected water -Eating certain foods -Breastfeeding / breastmilk -Do not want to respond/Don't remember -Other
How could you reduce the chance of getting COVID-19? (RC)	"Well informed" corresponds with those who chose 8 out of 8 options.	-Wearing a face mask -Getting the COVID-19 vaccine -Keep social distance of 1 m -Washing hands -Avoid physical contact with other people -Avoid mass gatherings (religious gatherings, community celebrations) -Reduce frequency and duration of contact with other people -Disinfecting/cleaning objects
	"Informed" corresponds with those who chose 7 out of 8 options.	
	"A little informed" corresponds with those who chose at least 5 out of the 9 options	-Wearing a face mask -Getting the COVID-19 vaccine -Keep social distance of 1 m -Washing hands -Avoid physical contact with other people -Avoid mass gatherings (religious gatherings, community celebrations) -Reduce frequency and duration of contact with other people -Disinfecting/cleaning objects -Wearing gloves

"Not at all informed" corresponds with choosing any of these options OR less than 5 of the previous options	-Praying -Other -Do not want to respond/Don't remember

4 Case study findings

4.1 COVID-19 epidemiology

4.1.1 Key results

- Results align with global COVID-19 epidemiology.
- The district's epidemic curve appears to align with sociological factors including intranational movement, large religious celebrations, and changes in testing.
- Incidence and case-fatality rates in CXB district were comparable if not lower than national rates, likely influenced by high rates of isolation and limited testing capacity.
- Testing and incidence rates were higher among men than women, although there was no significant difference in mortality.
- Odds of death increased with age.
- Incomplete data reduced the ability to identify disparities, gaps, and barriers, which limits strategic interventions and advocacy efforts.

4.1.2 Description of the data

COVID-19 Line list

There were 6,075 observations in the dataset. Of these, 100% contained date of case detection and name of upazila and almost all entries contained information about age and sex (98.98% and 99.97%). Nationality was identified in 58.75% of cases. Only 21% contained the specific name of camp of residence and there was no information on district. No information was collected regarding number of contacts identified, number of contacts traced or number of contacts in home quarantine. Completeness by variable is presented in table 7.

Table 7: Completeness by variable, COVID-19 line list data (March 1 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

Data Available (N by variable)	N=6,075	%
Detection method	3622	59.62%
Date of case detection	6075	100.00%
Location of testing	5567	91.64%
Case or contact	3406	56.07%
Age	6013	98.98%
Sex	6073	99.97%
Nationality	3569	58.75%
Camp of Residence	1250	20.58%
Upazilla	6075	100.00%
District	0	0.00%
Travel history	1881	30.96%
Last status of patient	3652	60.12%
Isolation location	484	7.97%
Severity of disease	484	7.97%
No. contacts identified	0	0.00%
No. contacts traced	0	0.00%
No. contacts in home quarantine	0	0.00%
Location of facility of quarantine	0	0.00%
Date of specimen collection	5399	88.87%
Date of lab result received	290	4.77%
30-day outcome	3652	60.12%
Date of death	76	1.25%
Discharge date	32	0.53%

COVID-19 testing data

Completeness of testing data improved over time (table 8).

Table 8: Completeness of variables in COVID-19 testing data (March 1, 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

Data availability (N by variable)		Referred by (Facility)	Age	Sex	Date specimen collected	PCR Date	Category	Address
March 2020	N=2	0	2	0	2	0	2	0
	%	0	100	0	100	0	100	0
April 2020	N=1447	1	1430	3	1447	0	1447	0
	%	0.1	98.8	0.2	100	0	100	0
May 2020	N=6673	3293	6567	3277	6673	0	6673	1041
	%	49.3	98.4	49.1	100	0	100	15.6
June 2020	N=10619	10615	10421	10572	10619	0	10619	10269
	%	100.0	98.1	99.6	100	0	100	96.7
July 2020	N=7683	7683	7509	7639	7683	341	7683	7682
	%	100	97.7	99.4	100	4.44	100	99.99
August 2020	N=8824	8824	8707	8751	8824	8824	8824	8824
	%	100	98.7	99.2	100	100	100	100
September 2020	N=14349	14349	14177	14241	14349	14349	14349	14349
	%	100	98.8	99.2	100	100	100	100
October 2020	N=8884	8884	8712	8776	8884	8884	8884	8884
	%	100	98.1	98.8	100	100	100	100
November 2020	N=13085	13085	12960	12968	13085	13085	13085	13084
	%	100	99.0	99.1	100	100	100	99.99
December 2020	N=11909	11909	11830	11885	11909	11909	11909	11909
	%	100	99.3	99.8	100	100	100	100
January 2021	N=6478	6478	6439	6478	6478	6478	6478	6477
	%	100	99.4	100	100	100	100	99.98
February 2021	N=6240	6240	6193	6240	6240	6240	6240	6234
	%	100	99.2	100	100	100	100	99.9
March 2021	N=8411	8411	8350	8411	8411	8411	8411	8410
	%	100	99.3	100	100	100	100	99.99

4.1.3 Epi curve

While CXB identified its first case of COVID-19 on March 23, 2020, the epidemic did not truly start for another month. On April 19, 2020 the district reported its second case and proceeded to report 37 additional cases in the following two weeks. At the district level, the incidence rate began rising in April and peaked in June 2020. This peak was short-lived, as the incidence rate began to quickly decline in July 2020. A smaller wave occurred in August and September, but overall, the incidence rate declined gradually over time before starting to increase again in March 2021.

Within upazilas, epidemic curves followed similar patterns, with one main peak in June 2020 and a smaller second wave in August 2020. Chakaria had a longer peak, with sustained higher incidence rates in both May and June 2020. All upazilas experienced an increase in incidence rate in March 2021, with CXB Sadar and Teknaf experiencing the greatest increase. Figure 1 below shows the rolling two-week average incidence rates and their respective confidence intervals throughout the time period, comparing CXB and the eight upazilas.

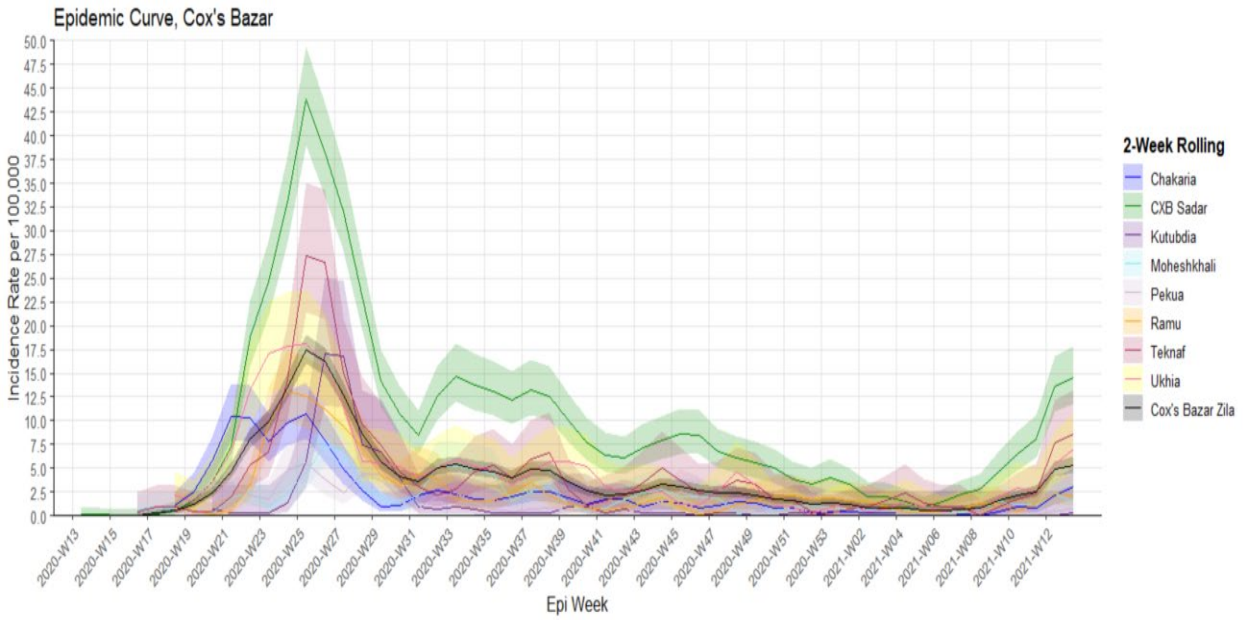

Figure 1: Epidemic curve, incidence rates by upazila, (March 23, 2020 to March 31, 2021, CXB, Bangladesh)

4.1.4 Incidence rates

CXB Zila recorded 6,072 confirmed cases of COVID-19 from March 2020 to March 2021.

Table 9 shows incidence rates (IR) over the study period at national, district and upazila levels. IRs ranged from 63.45/100,000 people in Pekua to 517.74/100,000 people in CXB Sadar, where the IR was approximately 2.5 times higher than that of the entire district. Incidence rates fluctuated importantly over time as reflected in the epi curve.

4.1.5 Testing capacity

Testing rate at CXB district level was similar to testing rate at national level (2,867/100,000 people and 2,836/100,000 people respectively). Testing rates varied importantly across upazilas, ranging from 754/100,000 in Kutubdia to 6,065 in Tefnaf (table 9). The two-week rolling average testing rate varied considerably throughout the period; four main peaks occurred in June 2020, September 2020, November 2020, and March 2021. These peaks in testing rate correlated with peaks in incidence rate (see Figure 2). It is unknown whether the testing rate increased (e.g., due to increased capacity) causing incidence rate to increase, or whether an increase in cases spurred an increase in testing. CXB Sadar and Teknaf upazilas had the greatest proportion of their populations tested, while Ramu, Pekua, and Kutubdia had the lowest testing rates. People who were tested for SARS-CoV-2 ranged from 7-days-old to 99-years-old. Despite being approximately 51% of the population, males were more likely to get tested, making up 68% of the tests (p-value <0.001).

4.1.6 Positivity Rates

The cumulative positivity rate for CXB district was 9% compared to 13% at national level. Psotivity rates ranged from 4% in Moheshkhali to 14% in CXB Sadar. Kutubdia, which had the lowest testing rate, had the third highest cumulative positivity rate; its highest monthly positivity rate was 27.27% in October 2020. Positivity rates – both at the district and upazila levels – spiked in May and June 2020 and trended downward the rest of the time period before rising again in March 2021 (table 10).

Table 9: Incidence, testing and positivity rates by upazila, (March 1 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

	No. Cases	Incidence Rate (per 100,000)	Testing Rate (per 100,000)	Positivity Rate (%)
Bangladesh	611,295	371.18	2,835.73	13.09
CXB District	6,072	202.65	2,867.1	9.31
Chakaria	564	120.4	1,564.99	7.87
CXB Sadar	3,180	517.74	4,894.64	14.06
Kutubdia	106	70.93	754.76	11.81
Moheshkhali	394	96.48	2,861.43	4.14
Pekua	221	63.45	1,074.45	7.56
Ramu	458	130.21	1,322.44	12.27
Teknaf	512	224.2	6,065.06	5.03
Ukhia	637	227.87	3,316.72	8.49

Table 10: Incidence, testing and positivity rate by upazila and by month (March 1, 2020 to March 2021, Cox's Bazar, Bangladesh)

Admin. Unit	Rate	Mar. 2020	April 2020	May 2020	June 2020	July 2020	Aug. 2020	Sept. 2020	Oct. 2020	Nov. 2020	Dec. 2020	Jan. 2021	Feb. 2021	Mar. 2021
CXB District	IR	0.03	1.17	21.09	63.35	24.76	21.16	17.09	12.22	10.78	6.47	3.94	2.84	17.76
	TR	0.07	48.29	181.39	281.85	160.13	157.8	228.22	134.53	209.03	200.05	209.76	200.02	267.3
	PR	0	3.25	19.54	19.08	15.65	13.96	8.19	9.77	5.29	3.37	1.86	1.47	6.66
Chakaria	IR	0	1.07	32.23	36.5	8.97	7.9	9.18	7.04	4.91	2.56	1.07	0.43	8.54
	TR	0	0	197.67	160.1	81.33	72.15	102.25	86.88	131.07	134.27	231.62	208.13	244
	PR	0	0	27.65	14.67	11.02	12.43	8.77	8.12	4.07	1.75	0.46	0.21	3.5
CXB Sadar	IR	0.16	0.81	44.94	153.86	64.64	57.63	46.73	32.07	30.61	17.58	9.12	8.47	51.12
	TR	0	0	309.99	647.82	371.37	319.43	423.63	242.1	324.48	276.45	290.62	299.07	380.81
	PR	0	0	24.95	19.93	17.32	19.01	11.95	15	9.68	6.3	3.31	3.62	13.51
Kutubdia	IR	0	0	1.34	43.49	16.73	2.68	2.68	2.01	0.67	0.67	0	0	0.67
	TR	0	0	143.86	288.39	80.29	16.06	18.07	7.36	7.36	18.74	28.77	18.74	29.44
	PR	0	0	1.4	16.47	22.5	25	3.7	27.27	9.09	10.71	0	0	2.27
Moheshkhali	IR	0	2.45	5.39	20.32	11.26	19.1	8.08	8.82	4.9	3.92	2.94	1.96	7.35
	TR	0	0	58.28	72.24	116.56	269.36	185.61	162.35	262.5	286.01	282.33	295.07	349.18
	PR	0	0	11.34	26.78	10.92	7.36	5.01	4.98	1.49	1.71	1.04	0.83	1.96
Pekua	IR	0	0.57	10.62	18.37	11.2	6.32	2.87	3.73	4.88	2.3	0.57	0.57	1.44
	TR	0	0	200.68	115.7	64.88	28.42	38.47	36.75	151.3	63.45	59.43	49.95	45.07
	PR	0	0	8.44	10.67	17.7	24.24	13.43	10.16	3.04	1.36	0.97	1.15	3.18
Ramu	IR	0	0.85	6.54	51.17	19.62	11.37	8.81	5.4	3.13	8.53	4.26	3.41	7.11
	TR	0	0	101.78	197.3	95.81	57.14	110.59	53.73	58.57	89.27	76.76	86.14	106.33
	PR	0	0	22.91	17.58	21.07	13.93	8.74	11.11	5.34	7.96	5.56	3.96	6.68
Teknaf	IR	0	1.75	11.82	84.95	27.15	16.64	17.95	14.45	13.57	3.94	6.57	1.75	23.65
	TR	0	0.44	216.32	389.29	171.66	196.62	491.76	283.32	560.51	576.27	571.45	598.6	675.23
	PR	0	0	7.89	20.7	16.33	9.13	4.19	5.41	2.73	1.75	1.07	0.44	3.57
Ukhia	IR	0	2.15	33.63	70.11	22.18	21.82	22.54	11.45	11.45	3.58	4.65	1.79	22.54
	TR	0	0	140.22	294.4	177.07	186.73	461.09	177.43	198.17	221.78	156.32	191.02	351.99
	PR	0	0	19.39	22.48	11.72	12.07	5.35	6.65	6.14	1.61	2.29	0.94	6.4

Note: IR = Incidence rate; TR= Testing rate; PR= Positivity rate

Incidence, testing, and positivity rates over time are depicted at district level in figure 2 and at upazila level in figure 3. The same rates as well as case fatality rates are mapped in figure 4.

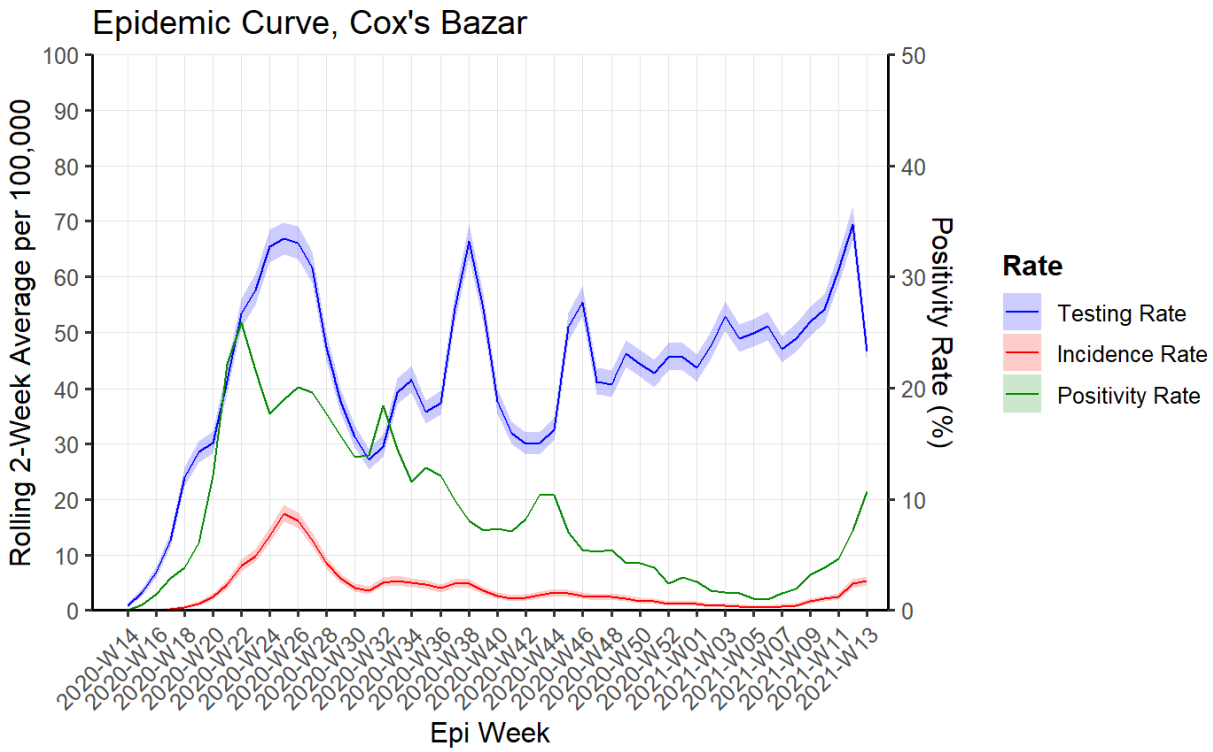

Figure 2: Incidence, testing and positivity rates (Cox's Bazar, Bangladesh, March 2020 to March 31, 2021)

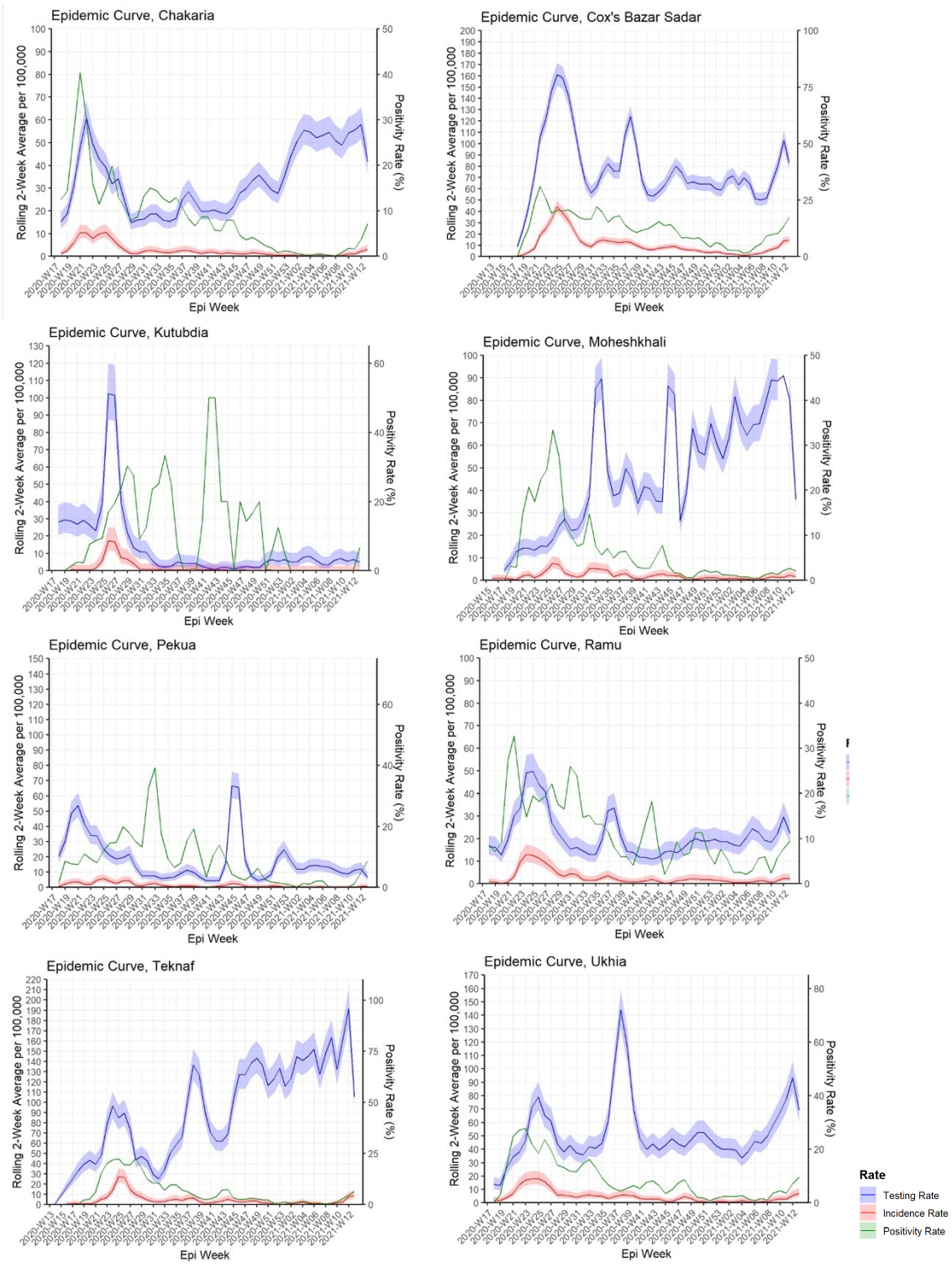

Figure 3: Incidence, testing, positivity rates by upazila, (March 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

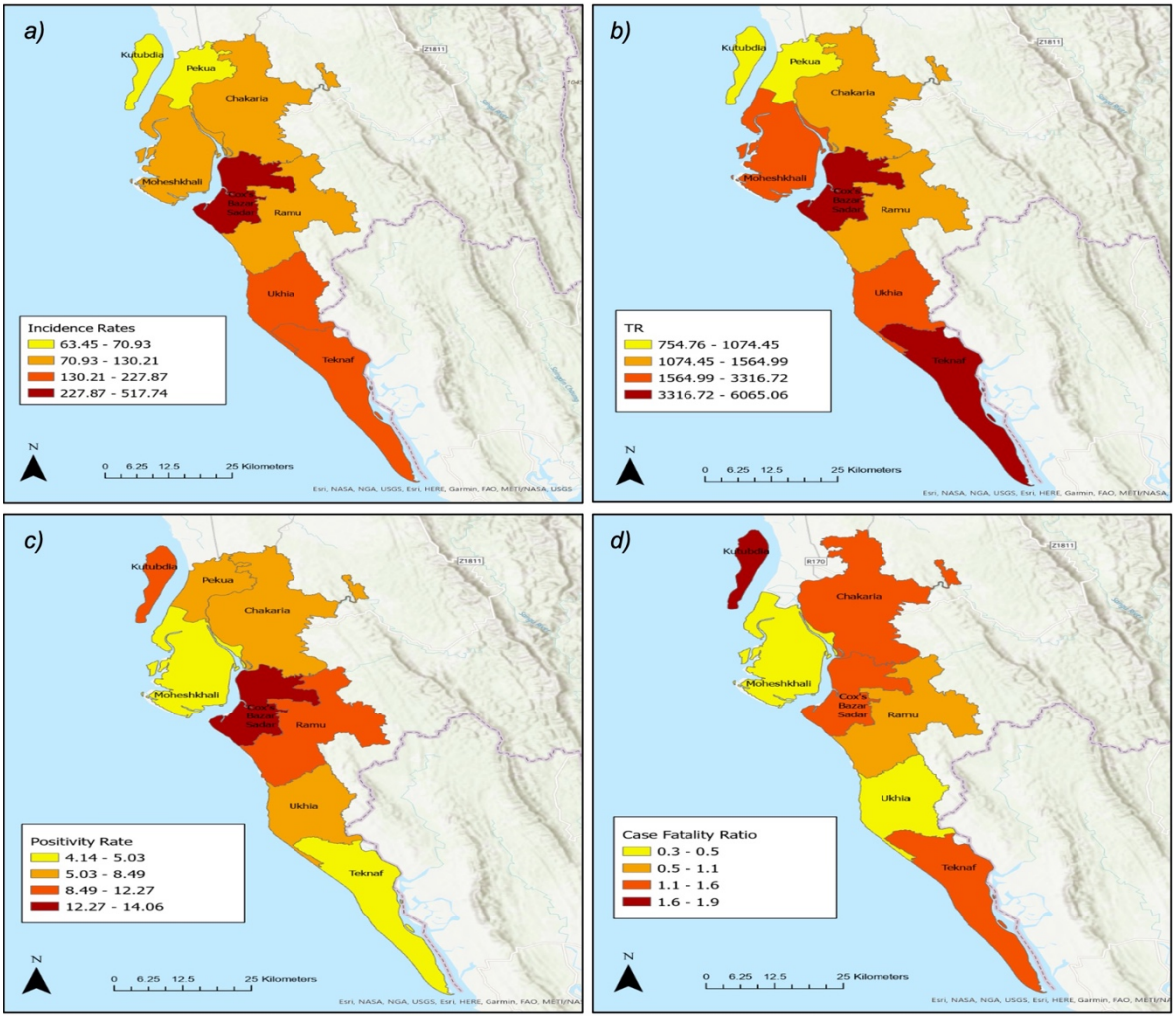

Figure 4: Maps of Cox's Bazar district: a) incidence rates; b) testing rates; c) positivity rates; d) case fatality rate. (March 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

4.1.7 Distribution by sex, age, residence/origin

Incidence rates differed by age and sex. Across all upazilas, incident cases were much higher among males compared to females. At the district level, the incidence rate among men was twice as high as that among women ($p<0.001$). Within upazilas, the incidence rate for men ranged from 1.5 times higher in Ukhia to 6.6 times higher in Moheshkhali.

The median age of cases across upazilas ranged from 29-36 years, with an overall median age of 32 for the district. Overall, the highest incidence rates occurred among people aged 50-59. Age groups with the highest incidence rate were 50-59 in CXB Sadar, Chakaria, and Ramu; 30-49 in Moheshkhali, Pekua, and Teknaf; and 20-29 in Ukhia and Kutubdia (table 11).

Table 11: Age-specific incidence rates by upazila (March 1 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

	CXB District	Chakaria	CXB Sadar	Kutubdia	Moheshkhali	Pekua	Ramu	Teknaf	Ukhia
Under 10	21.91	11.31	55.93	17.84	3.34	10.15	7.74	44.46	25.97
10-19	53.46	25.27	127.97	25.2	28.81	29.07	39.78	74.22	46.2
20-29	328.62	160.4	697.75	137.25	172.21	108.54	190.07	450.0	536.56
30-49	440.02	281.29	1068.73	129.72	232.96	140.46	293.42	450.47	478.87
50-59	452.74	306.86	1363.97	118.08	159.69	118.58	319.83	415.98	222.58
60+	304.95	251.14	947.24	71.68	89.04	67.86	155.55	295.32	233.59

4.1.8 Mortality Risk Factors

CXB recorded 76 total deaths from March 1, 2020 to March 31, 2021. Kutubdia had the highest case-fatality rate (0.019, or 1.9%), while Ukhia had the lowest case-fatality rate (0.003, or 0.3%) (table 12). Ramu was the only upazila with a statistically significant difference in deaths between males and females (p-value <0.01); in Ramu, females had a significantly higher case-fatality rate compared to males.

Case-fatality rates were higher among cases aged 60 years and above (table 12). Excluding Ukhia, which had only two recorded deaths, neither of which was above age 60, case-fatality rates among those 60 and above ranged from 10-16.7%.

Table 12: Case fatality rates (overall and by sub-groups) by upazila (March 1 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

	CXB District	Chakaria	CXB Sadar	Kutubdia	Moheshkhali	Pekua	Ramu	Teknaf	Ukhia
Deaths	76	8	47	2	2	2	5	8	2
CFR	1.3	1.4	1.5	1.9	0.5	0.9	1.1	1.6	0.3
CFR Male	1.2	1.4	1.7	1.3	0	1.1	0.3	1.4	0.2
CFR 60+	10.1	10	10.9	16.7	10	15.4	13.8	13.8	0

In line with the CFRs, results from a logistic regression (table 13) show that older age is associated with higher odds of mortality (p<0.001). Sex was not significantly associated with increased mortality and did not appear to confound the relationship between mortality and age. The probability of death among individuals under age 18 was zero, as no deaths occurred in this age group. The lowest age group included in the regression was adjusted to include at least one death.

Table 13: Factors associated with mortality (March 1 2020 to March 31, 2021, Cox's Bazar, Bangladesh)

Factor	Univariate Analyses	Multivariate Analysis
	Odds ratio	Odds ratio
Age		
<=25 years	reference	reference
26-39 years	2.57	2.62
40-59 years	9.2**	9.42**
60+ years	85.42***	87.03***
Sex		
Male	reference	reference
Female	1.13	1.2
p-values: * <0.05, ** <0.01, *** <0.001		

4.1.9 Case Management

In April 2020, 86.1% of cases were isolated, either at home, in hospitals, or in specialized isolation facilities. By June 2020, 100% of cases were reportedly isolated. In total, 63.81% of recorded cases were reported as hospitalized, representing approximately 0.14% of the entire population. From March to August 2020, 100% of cases were hospitalized. Reported hospitalization rates rapidly dropped to 18.97% in September 2020 and remained 0% for the rest of the time period. However, data from hospitals indicate that they were still admitting COVID-19 patients throughout the time period, suggesting hospitalizations continued.

Clinical management indicators from hospital-level data were extremely limited (table 7). Of the 10 hospitals in the district, data on the number of COVID-19 patients per day was more than 65% complete for only six facilities. CXB 250 Bed District Sadar Hospital, the only ICU facility in the district and thus where many patients were sent, had very incomplete data. Number of COVID-19 patients, proportion of patients in ICU, and proportion of patients on ventilator were only 59%, 71%, and 66% complete, respectively. Proportion of patients with comorbidities was 5% complete, and proportion on oxygen support was only 1% complete. Based on available data, the weekly ICU bed occupancy averaged 37.2% with a maximum of 65.7%.

Only one facility – Ukhia Upazila Health Complex – had non-zero data on comorbidities among hospitalized patients, although data was still only 65% complete. The average weekly proportion of hospitalized patients with recorded comorbidities ranged from 0-39.5%, with an average of 13.6%. No information on the specific comorbidities was available.

4.1.10 Comparison with National Data

Compared to Bangladesh nationally, CXB as a district had a 45% lower incidence rate (IRR 0.55). All upazilas had an incidence rate lower than the national, except for CXB Sadar, which had a 39% higher incidence rate. The differences in incidence rates are further supported by comparing testing and positivity rates. CXB as a district had a testing rate comparable to the national rate (testing rate ratio 1.01). However, the district's positivity rate was 28.9% lower; within upazilas, all but CXB Sadar had a lower positivity rate. This

suggests that CXB's lower incidence rate compared to the country as a whole may not have been due to worse access to testing. COVID-19 cases also seemed to have better clinical outcomes compared to cases nationally. CXB District had a 12% lower case-fatality rate compared to that of Bangladesh nationally.

4.2 Routine health services

4.2.1 Key results

Outpatient consultations

- Different behavior for facilities at different levels:
    - At the beginning of the pandemic, a drop in consultations can be seen at higher level health facilities while minor drops or increases can be seen at lower level health facilities.
    - During the COVID-19 period, trends seem more erratic at higher level health facilities, although all seem reporting an increase in consultations towards the end of 2020 followed by a decrease; less variability at lower-level health facilities.
- Cumulative differences in consultations over the COVID-19 period:
    - 50% of the upazilas reported an overall positive balance.
    - Most higher-level facilities reported a decrease.
    - Most lower-level facilities reported an increase.
    - In only one upazila facilities at both levels reported a cumulative decrease, otherwise in the majority of the upazilas a decrease at hospital level was compensated by increases in lower-level health facilities.

Respiratory tract infections

- Different behavior according to different health facility level less pronounced than for OPT consultations. Yet,
    - Higher level health facilities reported a drop at the beginning of the pandemic, followed by a surge end of 2020 leading to the majority of the hospitals reporting much higher monthly consultations than expected.
    - Lower-level health facilities also reported a drop but smaller than higher level facilities.
- Cumulative differences in consultations over the COVID-19 period.
    - 50% of the upazilas reported an overall positive balance.
    - Differences between lower and higher level health facilities were less evident than for outpatient consultations.
    - Only two upazilas reported discordant trends; all others either showed an increase or a decrease at both higher and lower health facilities.

Outpatient consultations for diarrhea (children under 5)

- Drop at the beginning of the pandemic followed by an increase towards the end of 2020 can be seen both at higher and lower level facilities, although variability is higher at higher level facilities.
- Most of the upazilas report a cumulative decrease over the COVID-19 period, yet the biggest difference was recorded in Chakaria and corresponded to +2000 cases.

Cholera inpatient admissions

- Lower rates of cholera inpatient admissions were reported in all but two upazilas (Teknaf and Ukhiya) during the COVID-19 period compared to pre-COVID-19 period.

Emergency referrals

- Higher level health facilities seem to show a drop in referrals at the beginning of the pandemic followed by increasing trends a few months later.
- Lower level health facilities showed less variation during COVID-19 compared to pre-COVID-19.
- In three upazilas lower level health facilities reported a decrease at the beginning of the pandemic and fewer than expected referrals during the entire COVID-19 period.
- Five upazilas reported a cumulative decrease in number of referral and two an increase. In both cases, changes were driven by higher level health facilities.

Third dose of pentavalent vaccine

- All upazilas reported a sharp drop at the beginning of the pandemic followed by an increase
- 50% of the upazilas reported a cumulative increase in consultations.

New consultations for Family Planning

- Apparent drop at the beginning of the pandemic but decreasing trends can be observed starting before COVID-19.
- The high variability before COVID-19 makes it difficult to identify changes during COVID-19 period.
- Two upazilas reported a cumulative (but small) increase, and two a bigger cumulative decrease.

First visit to antenatal care

- Higher level health facilities seem to show a drop at the beginning of the pandemic, followed by a spike and higher than expected number of antenatal care (ANC) visits during the COVID-19 period.
- Lower level facilities showed less variability, with smaller drops at the beginning of the pandemic, followed by positive trends.
- Most upazilas reported a cumulative decrease, with higher level facilities mostly reporting an increase and lower level health facilities a decrease.

All cause institutional mortality

- Low numbers and high variability make it difficult to identify changes during COVID-19
- Most upazilas reported a decrease in institutional mortality, although absolute differences were small.

4.2.2 Facilities included in the analysis

Table 14 shows the number of health facilities finally included in the analysis, by type.

Table 14: Number of health facilities included in the analysis by type (January 1, 2017 to March 31, 2021, Cox's Bazar, Bangladesh)

Upazila	Community Clinic	UH&FWC	Upazila Health Complex	Upazila wide report	District Hospital
Chakaria	44	20	1	1	
Coxs Bazar Sadar	29	13		1	1
Kutubdia	12	10	1	1	
Moheshkhali	30	20	1	1	
Pekua	14	15	1	1	
Ramu	27	21	1	1	
Teknaf	15	9	1	1	
Ukhiya	17	13	1	1	

Note: UH&FWC: Union Health and Family Welfare centre

4.2.3 Outpatient consultations

Figure 5 shows the number of monthly outpatient consultations over the entire study period (January 1, 2017 to March 31, 2021). The upper panel depicts aggregated values (all levels), while trends disaggregated by health facility level are reported in the lower panels. Different behaviors can be observed according to the health facility level, both in the pre-COVID-19 and in the COVID-19 periods. Consultations at higher level facilities seem to experience more fluctuations than those at lower-level health facilities, especially during the COVID-19 period. All higher-level health facilities reported a sharp drop at the beginning of the COVID-19 pandemic, while lower-level health facilities showed either minor drops or increases in outpatient consultations. This can be seen also in figure 6, showing the monthly percent difference between expected and observed values. All higher-level facilities started the COVID-19 period at levels 50% to 100% lower than expected, while the lower-level facilities were at similar or higher levels. Trend during the COVID-19 period is more erratic in higher level health facilities, although all seem reporting a spike in consultations towards the end of 2020, followed by a decrease. Trend during the COVID-19 period at lower-level health facilities showed less variability (except for a major drop in Chakaria early 2021).

Table 15 shows the cumulative difference in absolute number of outpatient consultations over the COVID-19 period. At upazila level, 50% of the upazilas reported a cumulative increase in consultations (ranging from +2,114 in Pekua to +176,534 in CXB Sadar), and 50% reported a decrease (ranging from -710 consultations in Kutubdia to -86,927 in Ramu). However, when looking at health facility levels, we see that most of higher-level facilities (6/8) reported a decrease in consultations (ranging from -13,706 in Pekua to -135,412 in CXB Sadar). On the contrary, lower-level facilities reported an increase in 5 out of 8 upazilas (ranging from +7,563 in Teknaf to +311,946 in CXB Sadar).

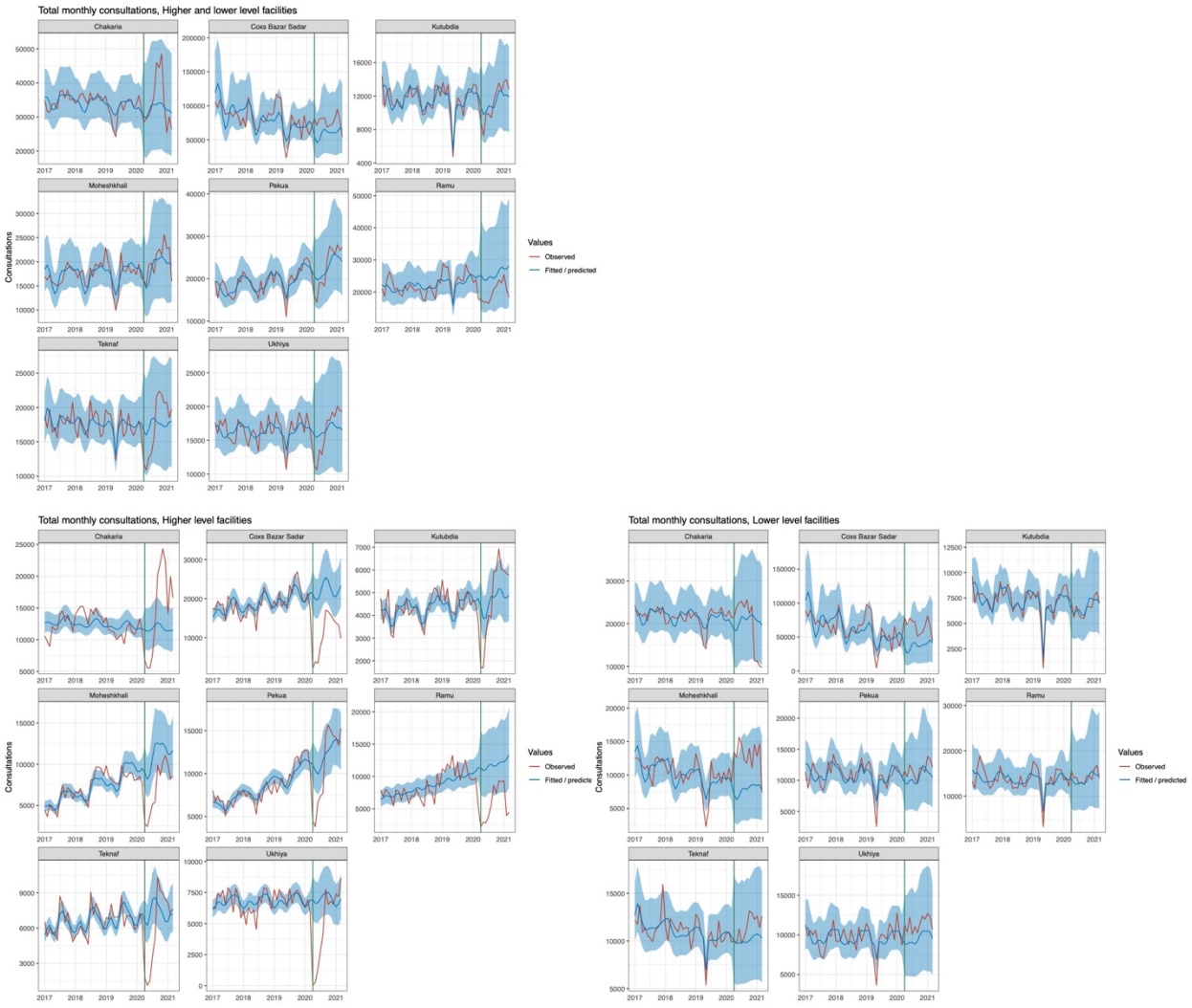

Figure 5: Number of monthly outpatient consultations in Cox's Bazar district, Bangladesh, January 1, 2017 to March 31, 2021, by upazila: total (all health facilities, upper left); higher level health facilities (bottom left); lower level health facilities (bottom right)

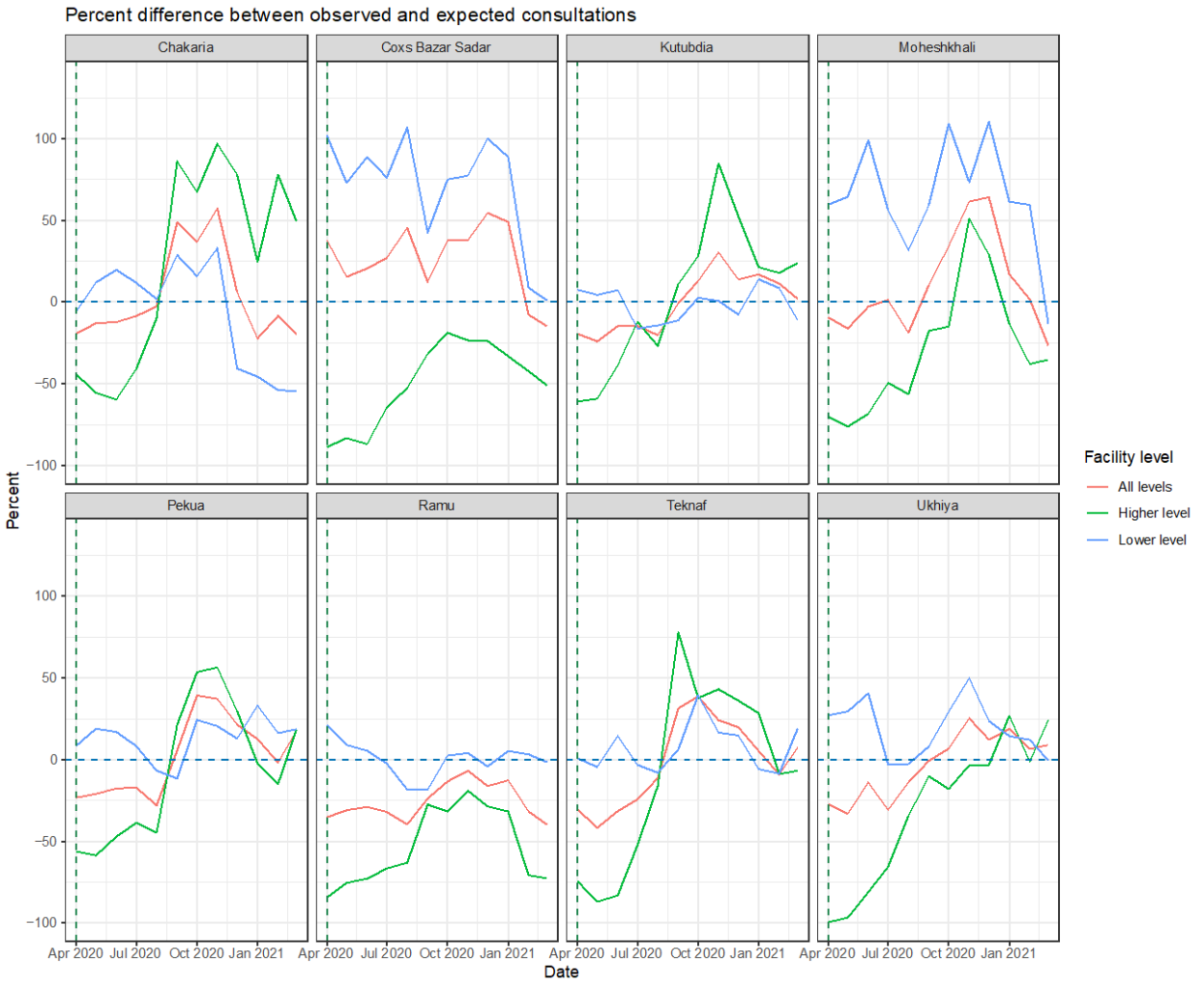

Figure 6: Percent difference between observed and expected outpatient consultations in Cox's Bazar district during the COVID-19 period, April 1 2020 to March 31, 2021, by upazila and health facility level

Table 15: Cumulative and per capita difference between observed and expected number of outpatient consultations during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), Cox's Bazar district, by facility level and upazila

Upazila	Facility level	N	Difference	Per capita difference
Chakaria	All levels		9,187 [-1517; 19891]	0.019 [-0.003; 0.042]
	Higher level	1	27,346 [22151; 32542]	0.058 [0.047; 0.069]
	Lower level	43	-18,160 [-23668; -12651]	-0.038 [-0.05; -0.027]
CXB Sadar	All levels		176,534 [159007; 194062]	0.304 [0.274; 0.334]
	Higher level	1	-135,412 [-147526; -123298]	-0.233 [-0.254; -0.212]
	Lower level	29	311,946 [306533; 317360]	0.537 [0.528; 0.547]
Kutubdia	All levels		-710 [-2542; 1121]	-0.005 [-0.018; 0.008]
	Higher level	1	692 [-576; 1960]	0.005 [-0.004; 0.014]
	Lower level	11	-1,402 [-1965; -840]	-0.01 [-0.014; -0.006]
Moheshkhali	All levels		14,929 [6024; 23834]	0.038 [0.015; 0.061]
	Higher level	1	-43,820 [-53710; -33930]	-0.112 [-0.138; -0.087]
	Lower level	27	58,749 [57765; 59733]	0.151 [0.148; 0.153]
Pekua	All levels		2,114 [-5934; 10162]	0.01 [-0.028; 0.048]
	Higher level	1	-13,706 [-24014; -3399]	-0.064 [-0.113; -0.016]
	Lower level	14	15,820 [13562; 18079]	0.074 [0.064; 0.085]
Ramu	All levels		-86,927 [-91119; -82735]	-0.259 [-0.272; -0.247]
	Higher level	1	-86,406 [-86740; -86073]	-0.258 [-0.259; -0.257]
	Lower level	23	-520 [-5047; 4006]	-0.002 [-0.015; 0.012]
Teknaf	All levels		-5,994 [-17947; 5958]	-0.018 [-0.054; 0.018]
	Higher level	1	-13,558 [-21340; -5775]	-0.041 [-0.064; -0.017]
	Lower level	12	7,563 [3393; 11733]	0.023 [0.01; 0.035]
Ukhiya	All levels		-7,315 [-10208; -4422]	-0.028 [-0.039; -0.017]
	Higher level	1	-27,245 [-28466; -26024]	-0.103 [-0.108; -0.099]
	Lower level	15	19,930 [18258; 21602]	0.076 [0.069; 0.082]

4.2.4 Respiratory tract infections (children under the age of 5)

Figure 7 shows the number of monthly consultations for respiratory tract infections over the entire study periods (January 1, 2017 to March 31, 2021). The upper panel depicts aggregated values (all levels), while trends disaggregated by health facility level are reported in the lower panels. Trends vary both across upazilas and across health facility levels.

Higher level health facilities reported a drop in respiratory consultations at the beginning of the pandemic followed by an increase towards the end of 2020. Hospitals from 5/8 upazilas report much higher monthly consultations for respiratory infections than previous years, while the increase was minor in CXB Sadar. Kutubdia reported fewer number of consultations than expected. Lower level health facilities also reported a drop in consultations, but smaller than what was seen at higher level facilities. This can be seen in figure 8 which shows the percent monthly difference between observed and expected values: higher level health facilities started the COVID-19 period between 50 and 100% lower than expected, while lower level health facilities ranged between +10% and -60%.

Table 16 shows the cumulative difference in number of consultations for respiratory tract infections over the COVID-19 period. At upazila level, 50% of the upazilas reported a cumulative increase in respiratory consultations (ranging from +382 in Pekua to +3,707 in Teknaf), and 50% reported a decrease (ranging from -1,838 consultations in Ukhiya to -10,153 in Kutubdia). Differences between lower and higher-level health facilities were less evident than for outpatient consultations. Only two upazilas (Moheshkhali and Pekua) reported discordant trends; all others either showed an increase or a decrease at both higher and lower health facilities.

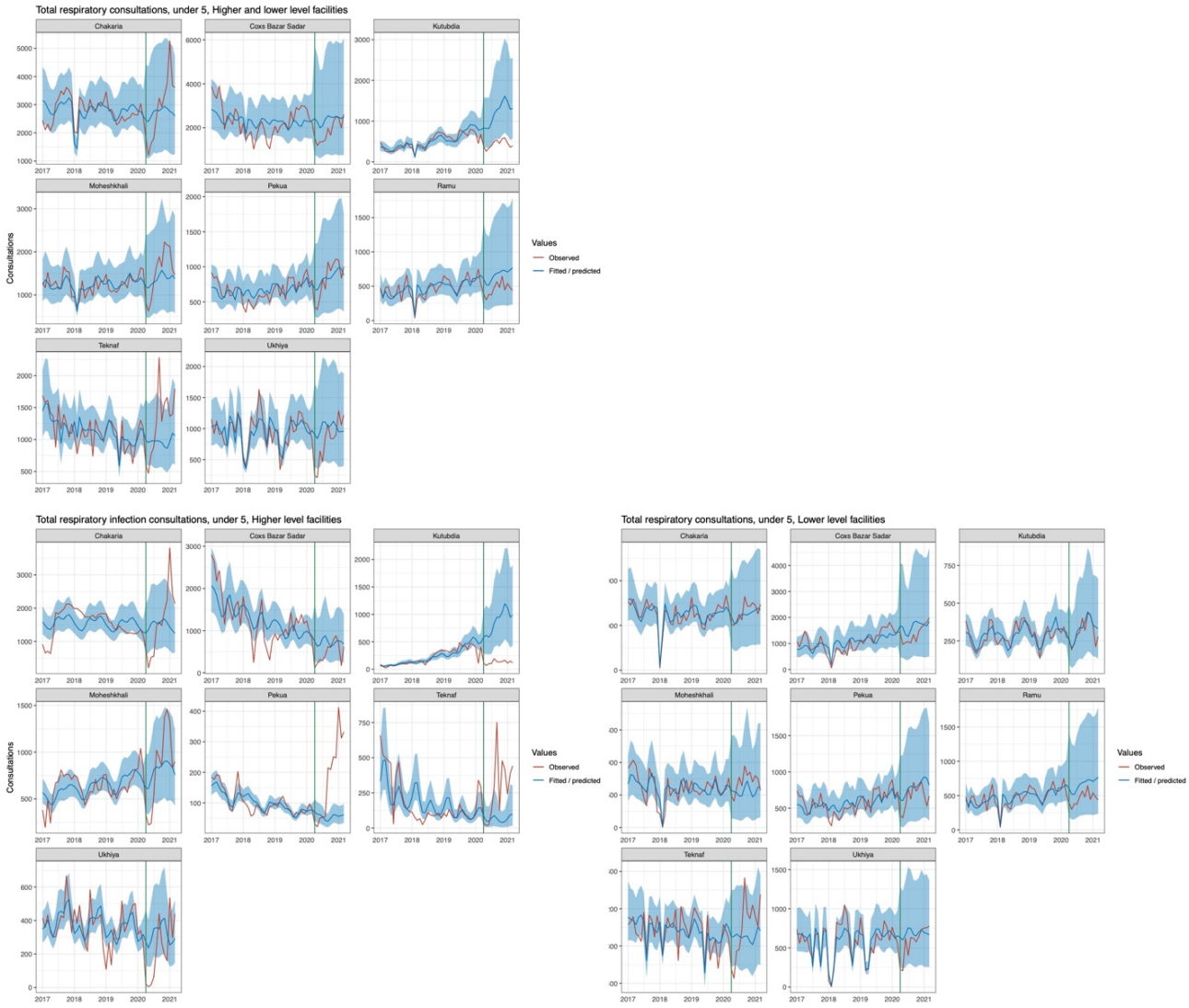

Figure 7: Number of monthly consultations for respiratory tract infections in Cox's Bazar district, Bangladesh, January 1 2017 to March 31, 2021, by upazila: total (all health facilities, upper left); higher level health facilities (bottom left); lower level health facilities (bottom right)

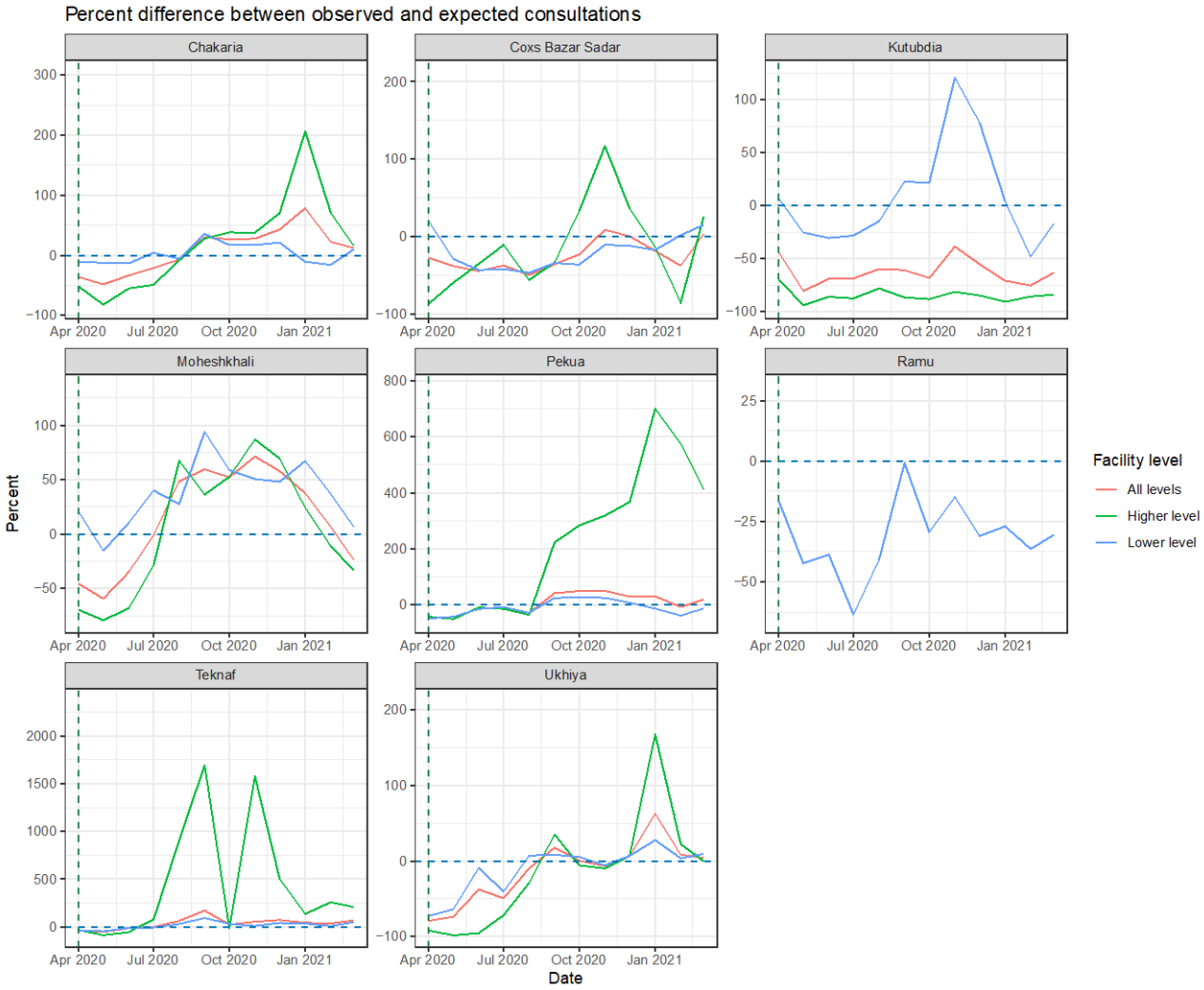

Figure 8: Percent difference between observed and expected consultations for respiratory tract infections in Cox's Bazar district during the first year of the COVID-19 pandemic (April 1 2020 to March 31, 2021), by upazila and level of facilities

Table 16. Cumulative and per capita difference between observed and expected number of consultations for respiratory tract infections among children under 5 years old during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), Cox's Bazar district, by facility level and upazila

Upazila	Facility level	N	Difference	Per capita difference
Chakaria	All levels		2,542 [2170; 2913]	0.061 [0.052; 0.07]
	Higher level	1	2,158 [1842; 2473]	0.052 [0.044; 0.059]
	Lower level	34	384 [328; 440]	0.009 [0.008; 0.011]
Coxs Bazar Sadar	All levels		-8,279 [-9358; -7200]	-0.162 [-0.183; -0.141]
	Higher level	1	-3,758 [-5191; -2325]	-0.074 [-0.102; -0.046]
	Lower level	22	-4,521 [-4874; -4168]	-0.089 [-0.095; -0.082]
Kutubdia	All levels		-10,153 [-10391; -9915]	-0.797 [-0.816; -0.778]
	Higher level	1	-10,135 [-10471; -9799]	-0.796 [-0.822; -0.769]
	Lower level	10	-18 [-116; 80]	-0.001 [-0.009; 0.006]
Moheshkhali	All levels		1,272 [22; 2522]	0.037 [0.001; 0.073]
	Higher level	1	-918 [-1982; 146]	-0.027 [-0.058; 0.004]
	Lower level	22	2,190 [2004; 2376]	0.064 [0.058; 0.069]
Pekua	All levels		382 [-29; 792]	0.02 [-0.002; 0.042]
	Higher level	1	1,479 [1438; 1520]	0.079 [0.077; 0.081]
	Lower level	13	-1,098 [-1549; -646]	-0.059 [-0.083; -0.035]
Ramu	All levels		-2,887 [-2988; -2786]	-0.098 [-0.101; -0.095]
	Lower level	13	-2,887 [-2988; -2786]	-0.098 [-0.101; -0.095]
Teknaf	All levels		3,707 [3561; 3853]	0.126 [0.122; 0.131]
	Higher level	1	2,242 [2240; 2244]	0.077 [0.076; 0.077]
	Lower level	10	1,465 [1321; 1609]	0.05 [0.045; 0.055]
Ukhiya	All levels		-1,838 [-1970; -1705]	-0.079 [-0.085; -0.074]
	Higher level	1	-722 [-897; -548]	-0.031 [-0.039; -0.024]
	Lower level	11	-1,115 [-1157; -1073]	-0.048 [-0.05; -0.046]

4.2.5 Outpatient consultations for diarrhea (children under the age of 5 years)

Figure 9 shows the number of monthly consultations for diarrhea cases among children under the age of 5 years. There was high variability both across upazilas and between health facility levels in the pre-COVID-19 period. A clear drop at the beginning of the pandemic can be seen in 3 of the 4 higher level facilities included in the analysis, all followed by an increase late 2020 – early 2021. In Chakaria, number of consultations for diarrhea at higher level hospitals were decreasing since 2017 and while this trend did not seem interrupted at the beginning of the pandemic, consultations increased much more than expected towards the end of 2020. Lower-level facilities show more stable trends both before and during the COVID-19 period. Yet, drops at the beginning of the pandemic can be observed in 5 out of the 7 upazilas included in the analysis, followed by an increase. In Chakaria, CXB and Ramu, observed values during COVID-19 did not seem to differ from expected values. This is reflected in figure 10 showing the monthly percent difference between expected and observed values. In the upazilas for which data are available at both levels, higher level health facilities started the COVID-19 period with higher differences from expected values than lower-level health facilities.

Three of the eight upazilas reported a cumulative positive difference ranging from +92 in Kutubdia to +2,138 in Chakaria. Increases within these three upazilas were consistent at both higher and lower-level facilities (table 17). The remaining 5 upazilas reported a cumulative decrease in outpatient consultations for diarrhea for children under the age of 5 years, of which two reported a decrease at higher levels, but an increase at lower levels (table 17).

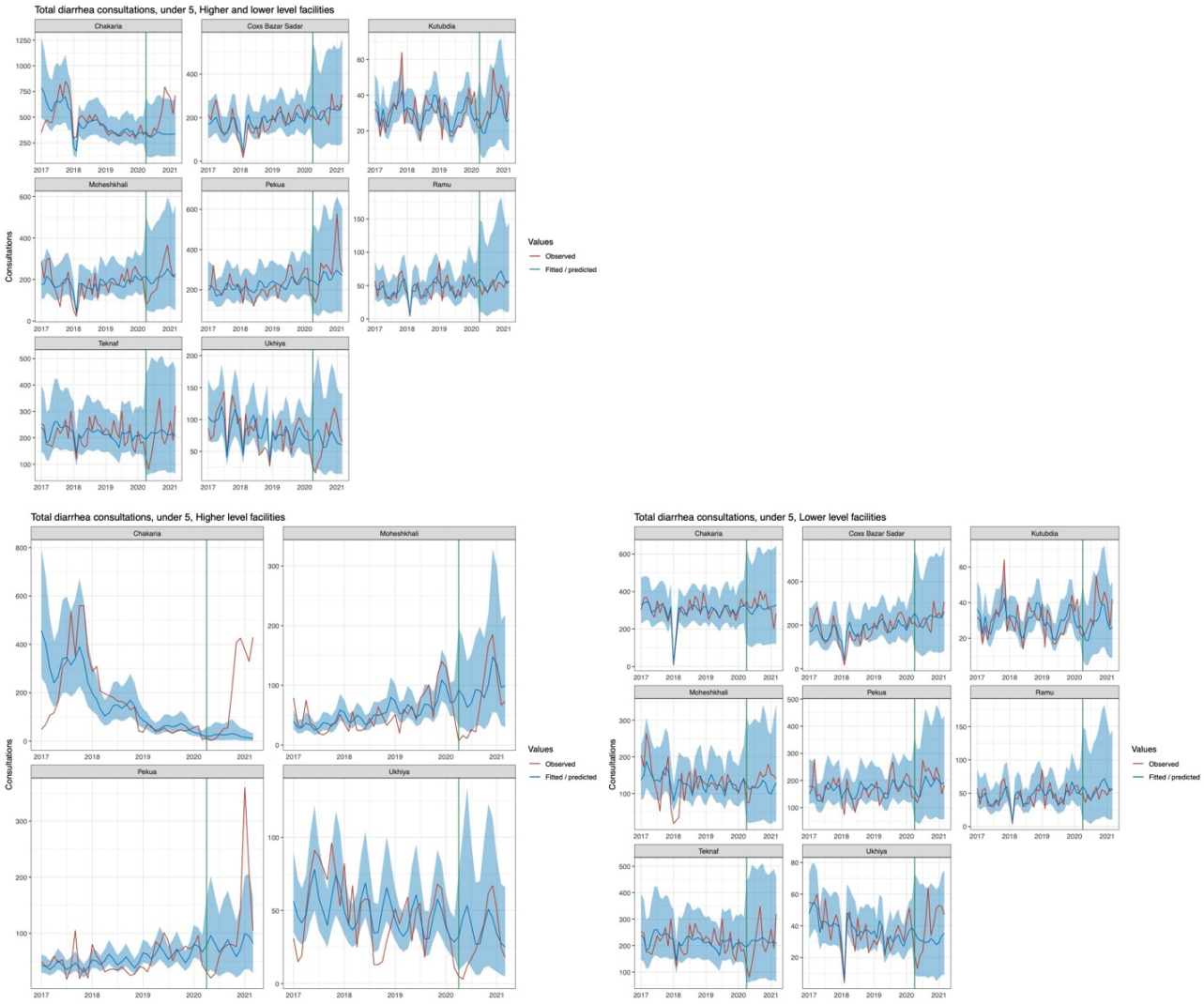

Figure 9: Number of monthly consultations for diarrhea (children <5 years) in Cox's Bazar district, Bangladesh, January 1, 2017 to March 31, 2021, by upazila: total (all health facilities, upper left); higher level health facilities (bottom left); lower level health facilities (bottom right)

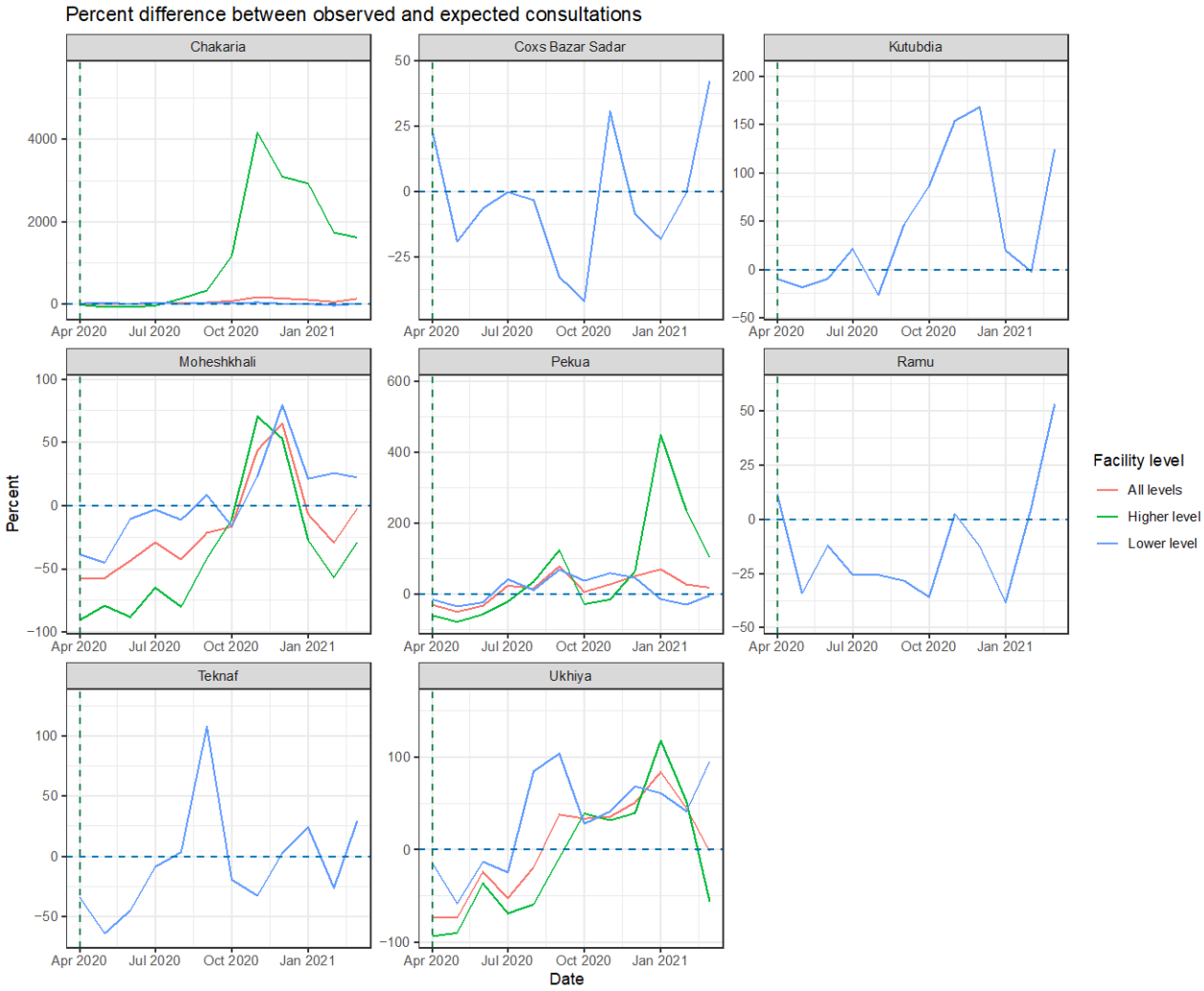

Figure 10: Percent difference between observed and expected consultations for diarrhea (children under 5) during the first year of the COVID-19 pandemic (April 1 2020 to March 31, 2021), Cox's Bazar district, Bangladesh, by upazila

Table 17: Cumulative and per capita difference in outpatient consultations for diarrhea (under 5) during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), Cox's Bazar district, Bangladesh, by facility level and upazila

Upazila	Facility level	N	Difference	Per capita difference
Chakaria	All levels		2,138 [2044; 2231]	0.051 [0.049; 0.053]
	Higher level	1	2,025 [2000; 2050]	0.049 [0.048; 0.049]
	Lower level	19	112 [-6; 231]	0.003 [0; 0.006]
CXB Sadar	All levels		-158 [-228; -88]	-0.003 [-0.004; -0.002]
	Lower level	17	-158 [-228; -88]	-0.003 [-0.004; -0.002]
Kutubdia	All levels	3	92 [65; 119]	0.007 [0.005; 0.009]
	Lower level	3	92 [65; 119]	0.007 [0.005; 0.009]
Moheshkhali	All levels		-646 [-860; -432]	-0.019 [-0.025; -0.013]
	Higher level	1	-648 [-878; -418]	-0.019 [-0.026; -0.012]
	Lower level	11	2 [-14; 18]	0 [0; 0.001]
Pekua	All levels		450 [439; 460]	0.024 [0.023; 0.025]
	Higher level	1	358 [333; 384]	0.019 [0.018; 0.021]
	Lower level	10	91 [55; 127]	0.005 [0.003; 0.007]
Ramu	All levels	6	-128 [-183; -73]	-0.004 [-0.006; -0.002]
	Lower level	6	-128 [-183; -73]	-0.004 [-0.006; -0.002]
Teknaf	All levels	7	-299 [-354; -244]	-0.01 [-0.012; -0.008]
	Lower level	7	-299 [-354; -244]	-0.01 [-0.012; -0.008]
Ukhiya	All levels		-26 [-36; -15]	-0.001 [-0.002; -0.001]
	Higher level	1	-134 [-146; -123]	-0.006 [-0.006; -0.005]
	Lower level	5	109 [108; 110]	0.005 [0.005; 0.005]

4.2.6 Cholera cases (inpatient admissions)

There was high variability in the number of inpatients due to cholera in the pre-COVID-19 period as shown in figure 11. Cholera inpatient admissions during the COVID-19 period seem to be lower than in the COVID-19 period in all but two upazilas (Teknaf and Ukhiya). Table 18 shows that average monthly cholera inpatient rates during the pre-COVID-19 and the COVID-19 periods. In Teknaf and Ukhiya, monthly rates during the COVID-19 period is clearly higher than during the COVID-19 period, while in CXB Sadar the difference is small.

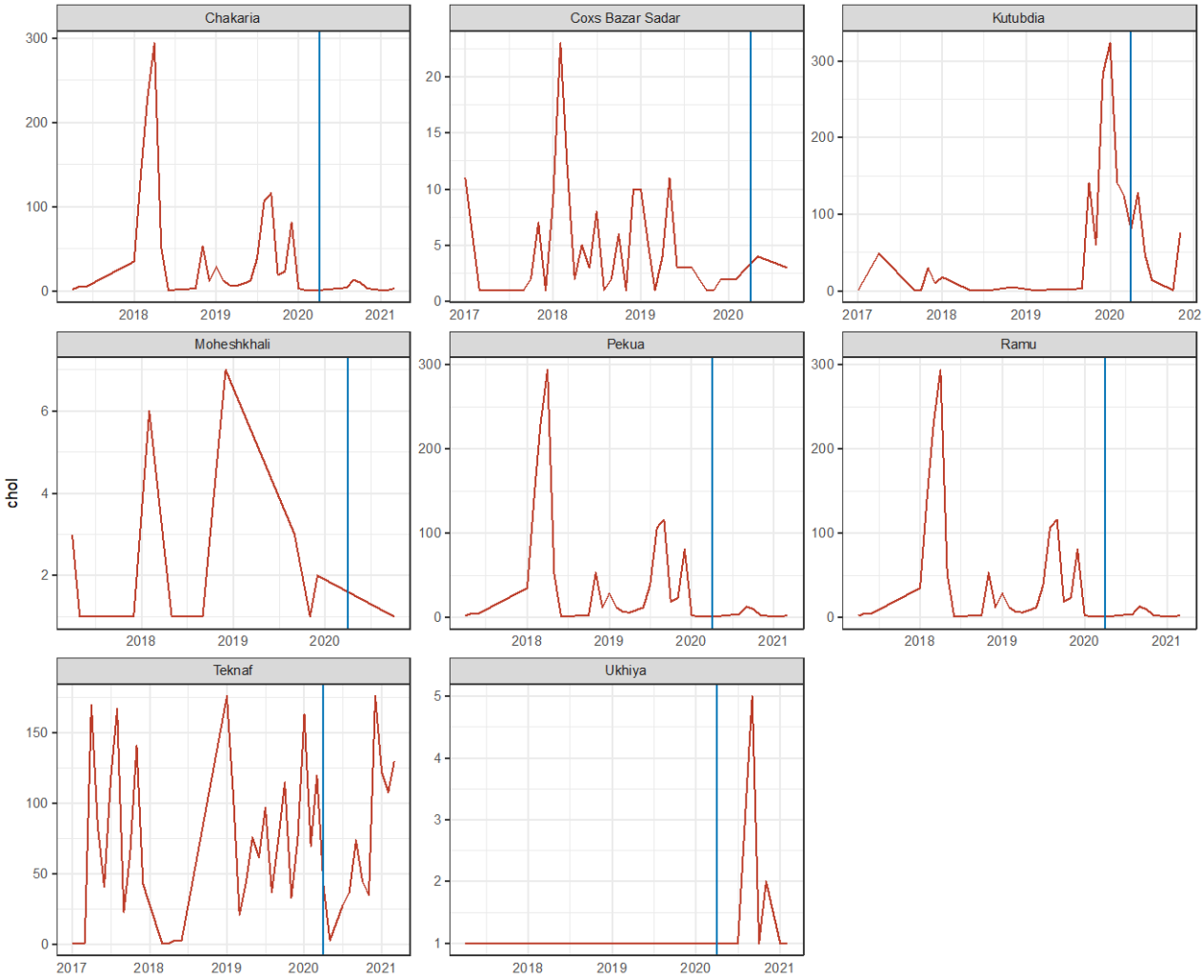

Figure 11: Number of inpatient cholera cases in higher level health facilities in Cox's Bazar district, Bangladesh, Jan 1, 2017 to March 31, 2021, by upazila

Table 18: Average cholera rate, per 10,000 people per month, in the year preceding beginning of COVID-19 period (April 1, 2019 – March 31, 2020), and during COVID-19 period (April 1, 2020 to March 31, 2021), Cox's Bazar, Bangladesh, by upazila

Upazila	pre-COVID-19 period rate	COVID-19 period rate
Chakaria	0.865	0.095
Coxs Bazar Sadar	0.056	0.060
Kutubdia	10.405	3.984
Moheshkhali	0.050	0.026
Pekua	1.856	0.212
Ramu	1.176	0.134
Teknaf	2.339	2.184
Ukhiya	0.037	0.076

4.2.7 Emergency referrals

Figure 12 shows the number of monthly emergency referrals (from lower to higher level or speciality hospitals) over the study period (January 1, 2017 to March 31, 2021). Higher variability across upazilas can be seen at higher level facilities compared to lower level. Higher level hospitals seem to show a drop at the beginning of the pandemic, followed by increasing trends a few months later. Except for Kutubdia, lower level health facilities across upazilas showed less variation during COVID-19 compared to pre-COVID-19. Three upazilas (Kutubdia, Moheshkhali, Ukhiya) not only reported a decrease at the beginning of the pandemic, but remained below expected values for the entire COVID-19 period (figure 13).

Five upazilas reported a cumulative decrease in referrals over the COVID-19 period, ranging from -2,066 in Teknaf to -34,906 in CXB Sadar (table 19). Decreases in these five upazilas were driven by decreases in higher level hospitals. Pekua and Chakaria reported a cumulative increase in emergency referral over the COVID-19 period, which were also driven by higher level health facilities.

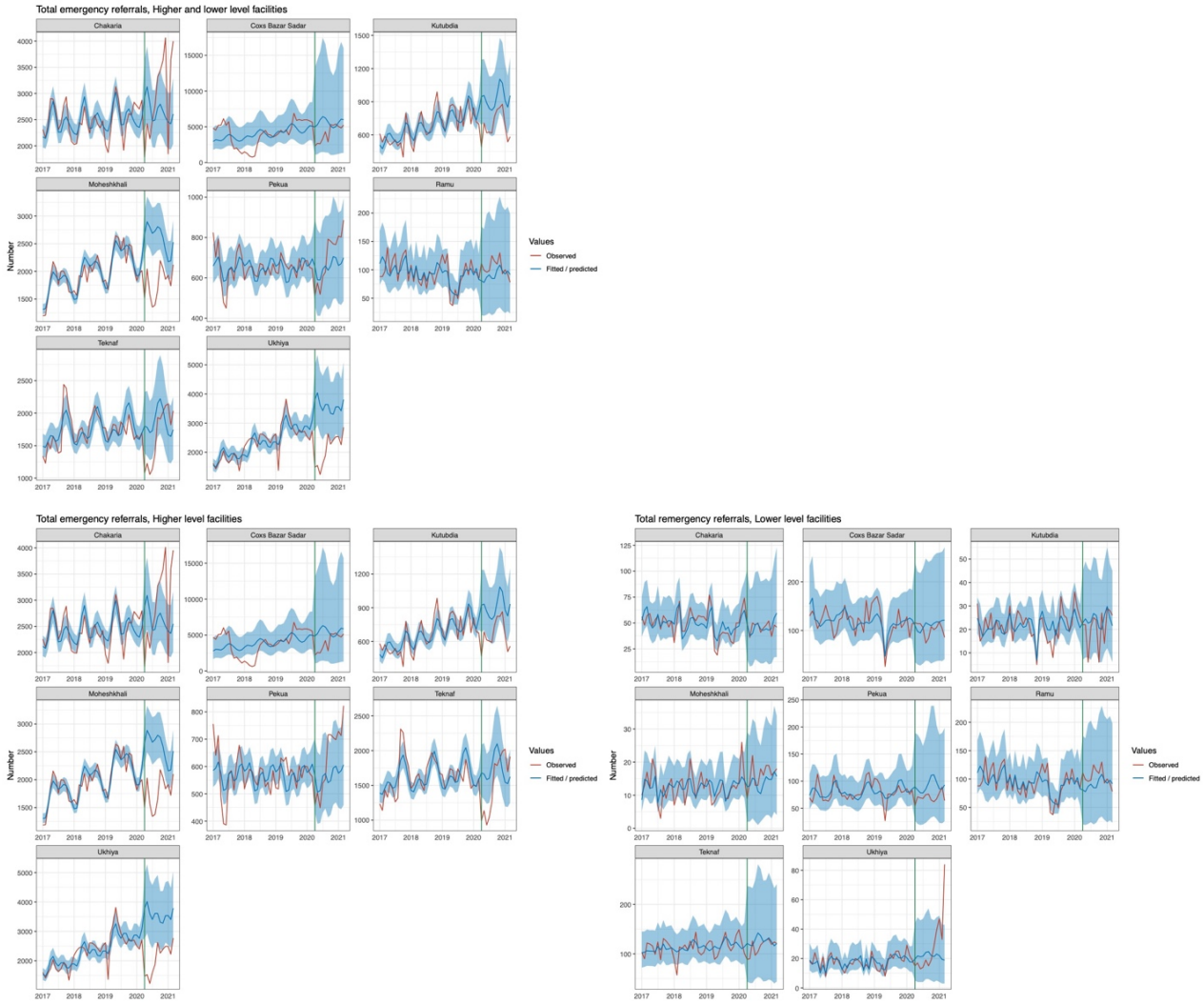

Figure 12: Number of monthly emergency referrals in Cox's Bazar district from lower to higher level facilities, Bangladesh, January 1, 2017 to March 31, 2021, by upazila: total (all level, upper left); higher level health facilities (bottom left); lower level health facilities (bottom right)

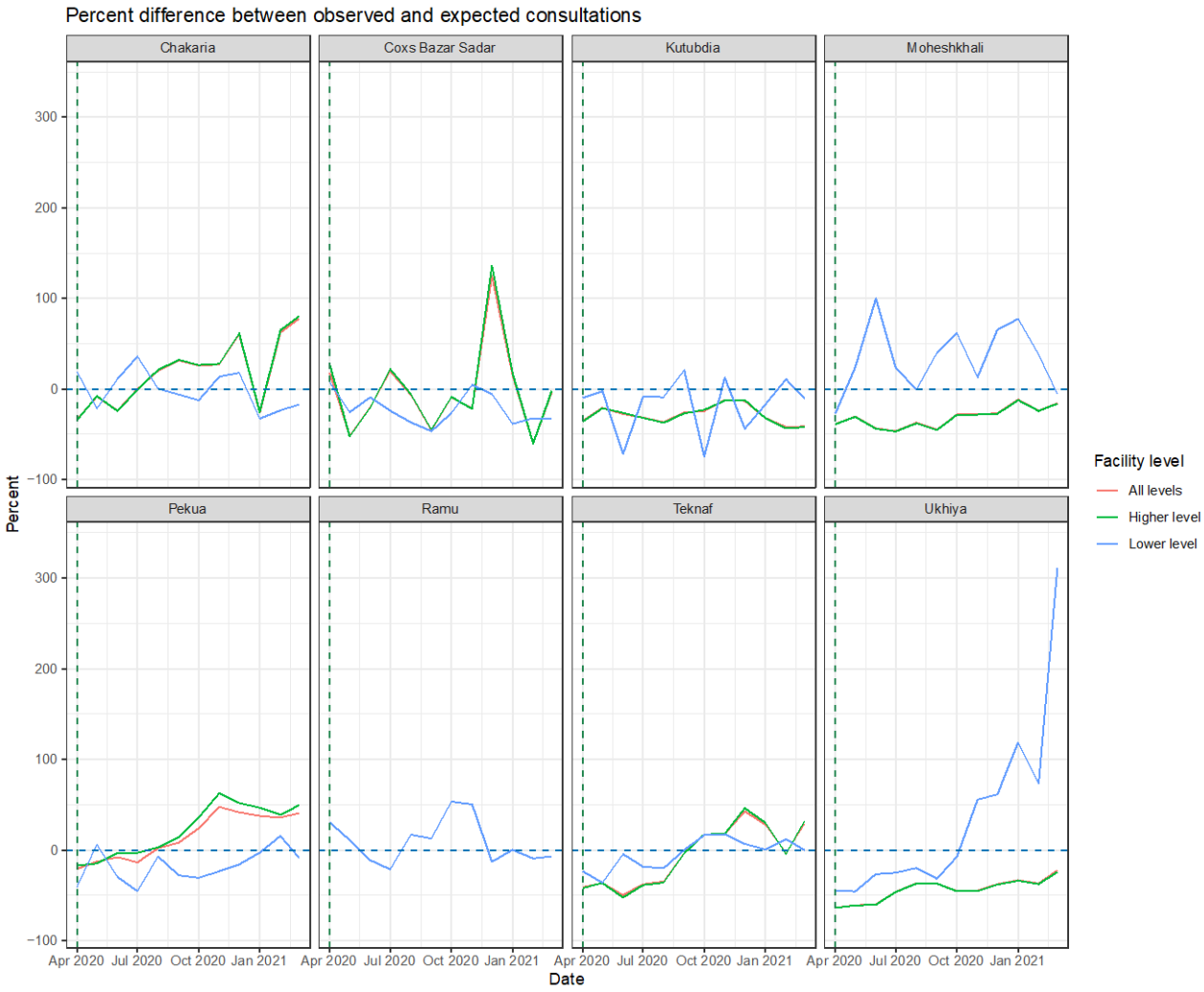

Figure 13: Percentage difference between observed and expected emergency referrals during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), Cox's Bazar district, Bangladesh, by upazila and facility level

Table 19: Cumulative and per capita difference between observed and expected number of emergency referrals during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), Cox's Bazar district, Bangladesh, by facility level and upazila

Upazila	Facility level	N	Difference	Per capita difference
Chakaria	All levels		4,805 [3456; 6154]	0.01 [0.007; 0.013]
	Higher level	1	4,838 [3528; 6149]	0.01 [0.007; 0.013]
	Lower level	7	-34 [-72; 5]	0 [0; 0]
CXB Sadar	All levels		-34,906 [-58335; -11476]	-0.06 [-0.1; -0.02]
	Higher level	1	-34,471 [-58004; -10938]	-0.059 [-0.1; -0.019]
	Lower level	8	-434 [-539; -330]	-0.001 [-0.001; -0.001]
Kutubdia	All levels		-3,333 [-3440; -3226]	-0.023 [-0.024; -0.022]
	Higher level	1	-3,272 [-3371; -3172]	-0.023 [-0.023; -0.022]
	Lower level	3	-62 [-70; -53]	0 [0; 0]
Moheshkhali	All levels		-10,119 [-10312; -9926]	-0.026 [-0.026; -0.025]
	Higher level	1	-10,156 [-10333; -9980]	-0.026 [-0.026; -0.026]
	Lower level	3	38 [21; 54]	0 [0; 0]
Pekua	All levels		982 [802; 1162]	0.005 [0.004; 0.005]
	Higher level	1	1252 [1198; 1307]	0.006 [0.006; 0.006]
	Lower level	10	-270 [-396; -145]	-0.001 [-0.002; -0.001]
Ramu	All levels		64 [36; 93]	0 [0; 0]
	Lower level	11	64 [36; 93]	0 [0; 0]
Teknaf	All levels		-2,066 [-3023; -1109]	-0.006 [-0.009; -0.003]
	Higher level	1	-1,980 [-2880; -1079]	-0.006 [-0.009; -0.003]
	Lower level	9	-86 [-143; -30]	0 [0; 0]
Ukhiya	All levels		-20,793 [-24966; -16620]	-0.079 [-0.095; -0.063]
	Higher level	1	-20,866 [-25023; -16710]	-0.079 [-0.095; -0.063]
	Lower level	4	74 [57; 90]	0 [0; 0]

4.2.8 Third dose of pentavalent vaccine

All upazilas showed a sharp drop in administration of the 3rd dose of Pentavalent vaccine at the beginning of the pandemic, followed by a sharp increase a few months later (figure 14). They all showed unstable patterns thereafter (figure 15). Four upazilas reported a cumulative decrease in delivered doses, ranging from -110 in Pekua to -1,130 in Chakaria. The other four upazilas reported a cumulative increase in vaccine doses delivered ranging from +366 in Ramu to +880 in Ukhiya (table 20).

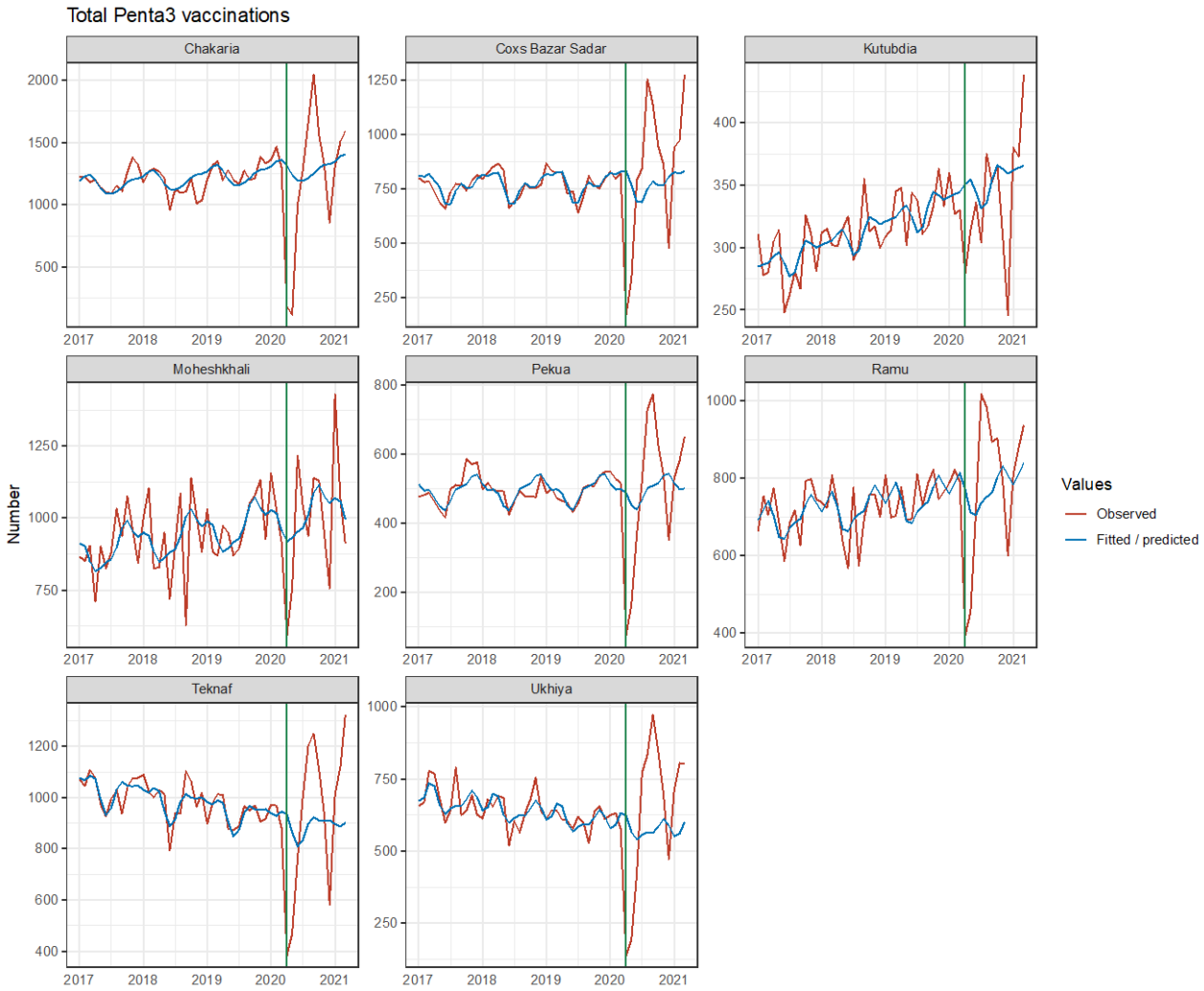

Figure 14: Aggregated number of monthly 3rd pentavalent vaccine doses delivered in Cox's Bazar district, Bangladesh, January 1, 2017 to March 31, 2021, by upazila

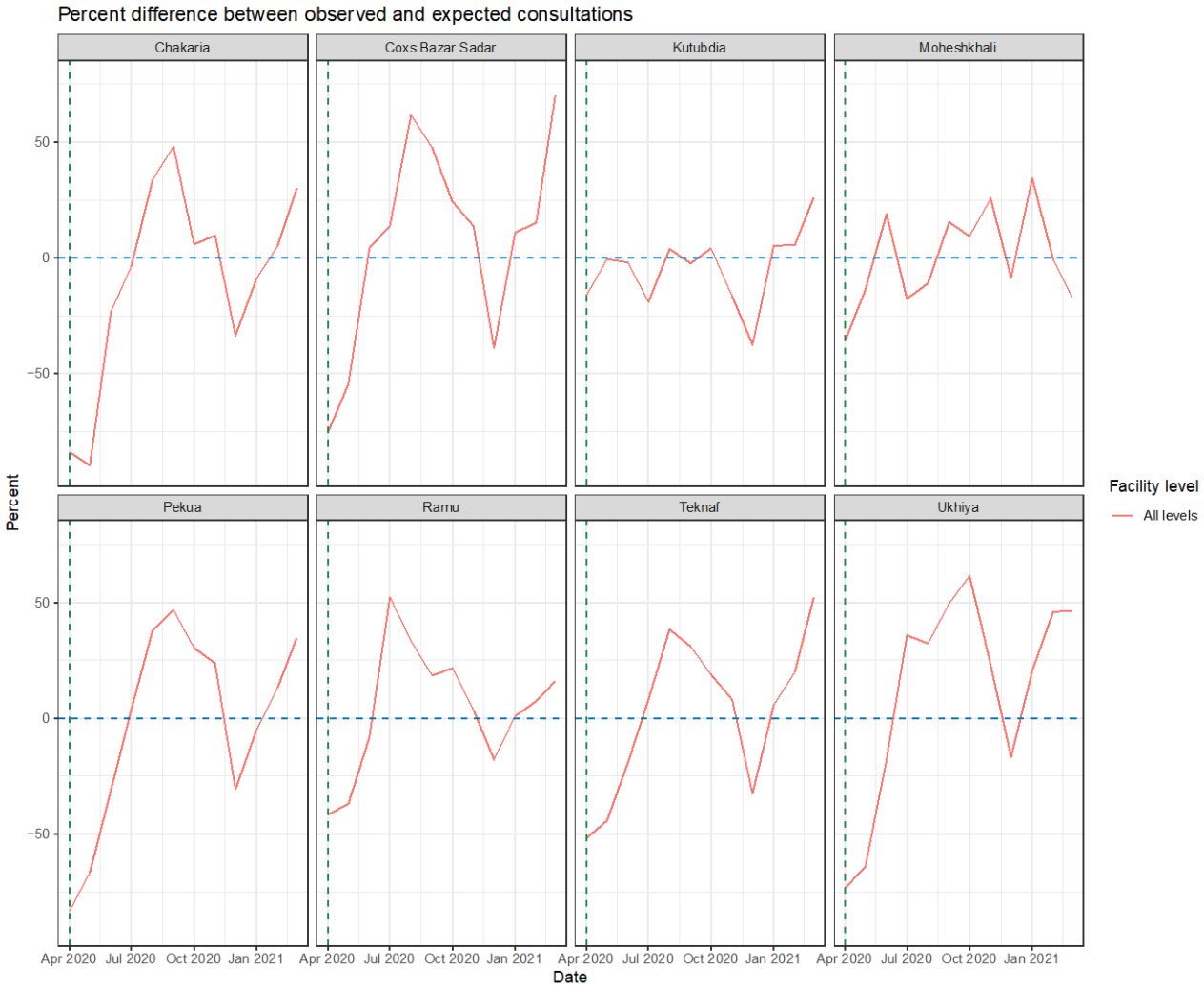

Figure 15: Percent difference between observed and expected delivered doses of Penta 3 in Cox's Bazar district during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), by upazila

Table 20. Cumulative and per capita difference in administered doses of Penta3 vaccine during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), Cox's Bazar district, Bangladesh, by facility level and upazila

Upazila	Facility level	N	Difference	Per capita difference
Chakaria	All levels	1	-1,130 [-1348; -912]	-0.135 [-0.161; -0.109]
Coxs Bazar Sadar	All levels	1	782 [757; 807]	0.077 [0.074; 0.079]
Kutubdia	All levels	1	-198 [-250; -145]	-0.078 [-0.098; -0.057]
Moheshkhali	All levels	1	-120 [-704; 463]	-0.018 [-0.103; 0.068]
Pekua	All levels	1	-110 [-152; -67]	-0.029 [-0.041; -0.018]
Ramu	All levels	1	366 [177; 556]	0.062 [0.03; 0.094]
Teknaf	All levels	1	401 [274; 528]	0.068 [0.047; 0.09]
Ukhiya	All levels	1	880 [855; 905]	0.19 [0.184; 0.195]

4.2.9 Family planning (new consultations)

New consultations for family planning showed high variability over the entire study period (figure 16). There was an apparent drop at the beginning of the pandemic, although decreasing trends that started before the beginning of the pandemic can be seen in Chakaria, CXB Sadar and Teknaf. In these three upazilas, the difference from expected values during COVID-19 period were somewhat limited, while Kutubdia reported a very high spike summer 2020 (figure 17). CXB Sadar and Teknaf reported each about 2,000 consultations less than expected; while Chakaria and Kutubdia reported a small but positive balance over the COVID-19 period (table 21).

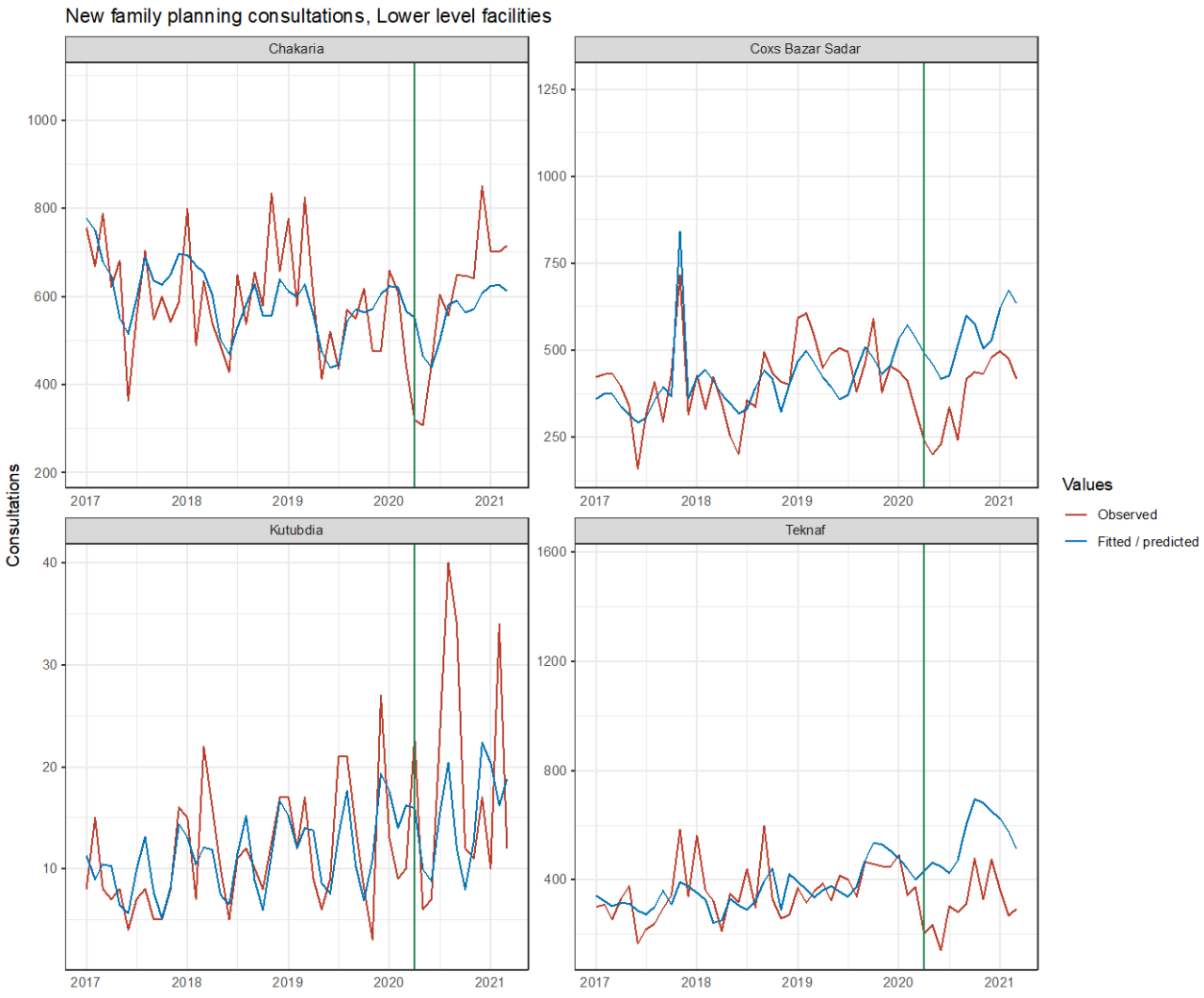

Figure 16: Aggregated number of monthly new consultations for family planning in Cox's Bazar district, Bangladesh, January 1, 2017 to March 31, 2021, by upazila

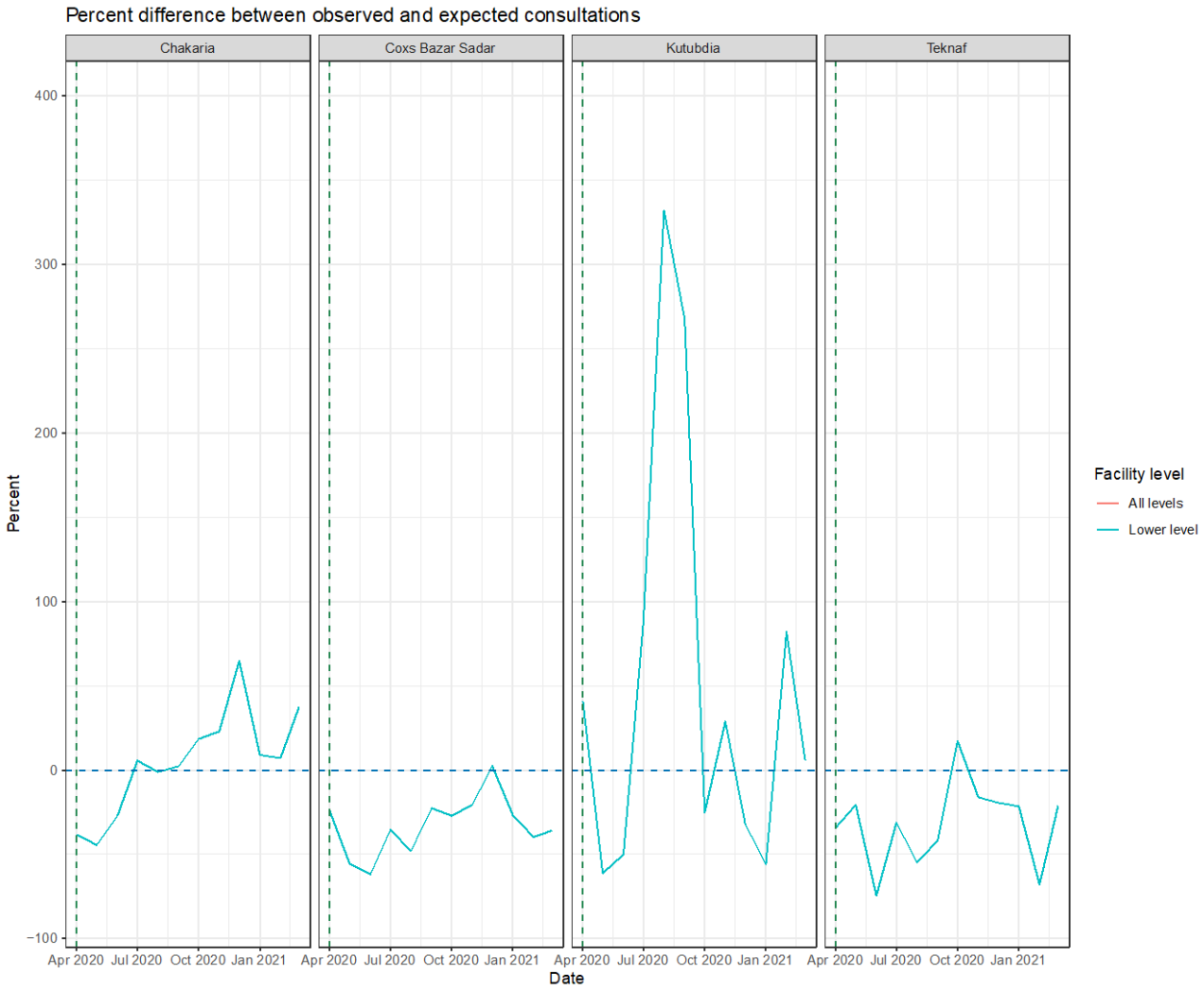

Figure 17: Percent difference between observed and expected number of new family planning consultations during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), in Cox's Bazar district, Bangladesh, by upazila

Table 21: Cumulative and per capita difference between expected and observed new consultations for family planning during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), Cox's Bazar district, Bangladesh, by facility level and upazila

Upazila	Facility level	N	Difference	Per capita difference
Chakaria	Lower level	15	216 [-40; 473]	0 [0; 0.001]
CXB Sadar	Lower level	8	-2,338 [-2973; -1703]	-0.004 [-0.005; -0.003]
Kutubdia	Lower level	1	43 [40; 46]	0 [0; 0]
Teknaf	Lower level	3	-2,702 [-3460; -1943]	-0.008 [-0.01; -0.006]

4.2.11 First visit of antenatal care

Figure 18 shows absolute numbers of first antenatal care visits during the entire study period (January 1, 2017 to March 31, 2021). High variability can be seen in the pre-COVID-19 study period especially at higher level health facilities. They seem to show a drop at the beginning of the pandemic followed by a spike (figure 18), leading to higher than expected levels during the COVID-19 period (figure 19). Trends before COVID-19 were more stable in lower level health facilities (except for a drop in 2018 in four upazilas). Smaller decreases can be seen at the beginning of the pandemic followed by positive trends and more stable patterns during COVID-19 (figure 19). The majority of upazilas reported a cumulative decrease in ANC1 visits (table 22). The higher-level facilities tended to report an increase in consultations and the lower level facilities tended to report a decrease. However, the biggest difference was recorded in Moheshkhali, where higher level health facilities recorded 4,964 less consultations during the COVID-19 period.

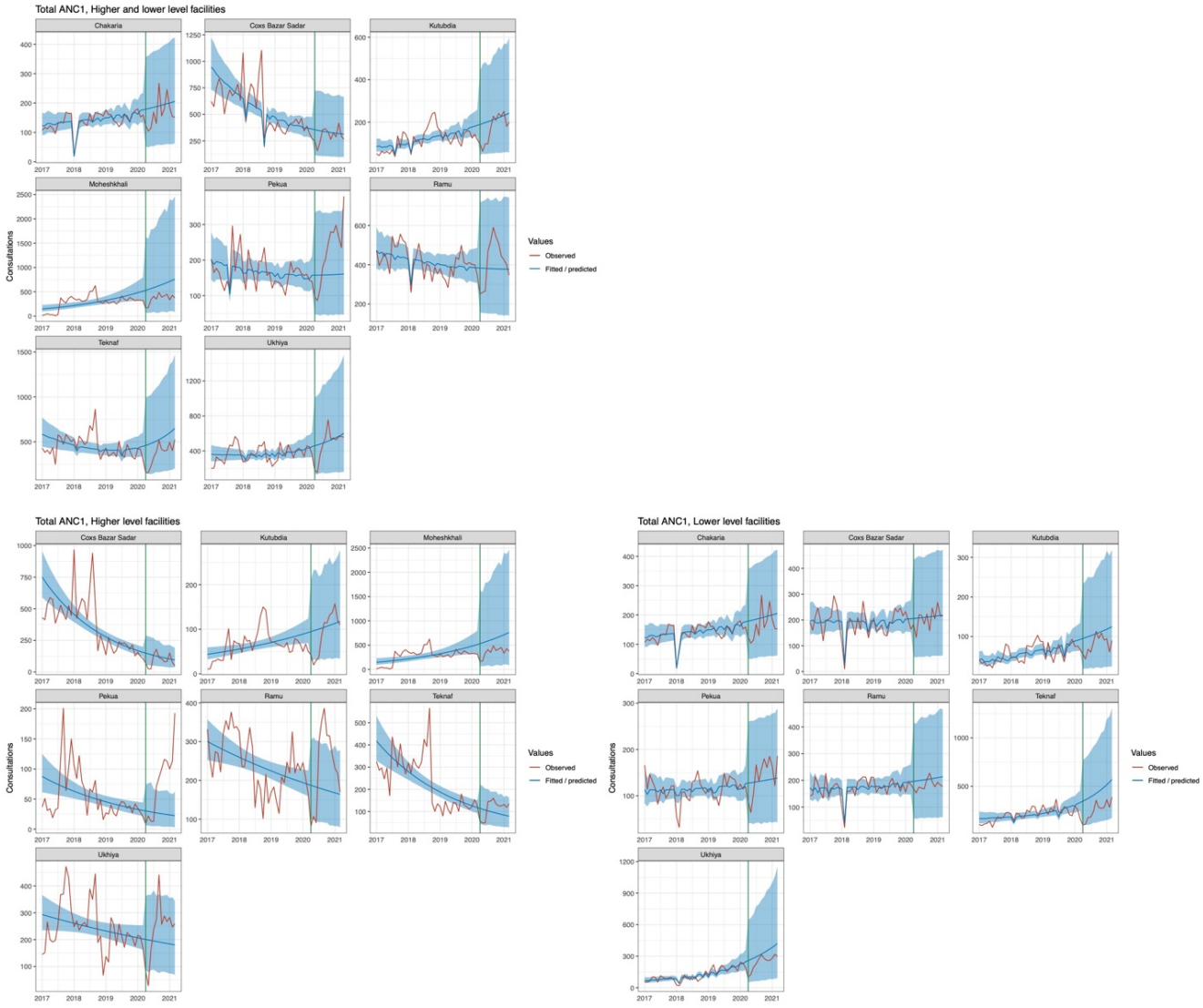

Figure 18: Aggregated (all facilities) monthly number of first antenatal care (ANC1) consultations in Cox's Bazar, Bangladesh (January 1, 2017 to March 31, 2021), by upazila

Figure 19: Percent monthly difference between observed and expected number of first antenatal care consultations during the first year of the COVID-19 pandemic, (April 1, 2020 to March 31, 2022), Cox's Bazar district, Bangladesh

Table 22: Cumulative and per capita difference in number of first antenatal care visits during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2022), Cox's Bazar district, Bangladesh, by facility level and upazila

Upazila	Facility level	N	Difference	Per capita difference
Chakaria	All levels		-388 [-420; -357]	-0.02 [-0.022; -0.019]
	Lower level	24	-388 [-420; -357]	-0.02 [-0.022; -0.019]
CXB Sadar	All levels		-456 [-533; -380]	-0.02 [-0.023; -0.016]
	Higher level	1	-316 [-377; -256]	-0.014 [-0.016; -0.011]
	Lower level	23	-140 [-156; -124]	-0.006 [-0.007; -0.005]
Kutubdia	All levels		-338 [-544; -133]	-0.058 [-0.094; -0.023]
	Higher level	1	111 [-81; 303]	0.019 [-0.014; 0.052]
	Lower level	9	-450 [-463; -436]	-0.078 [-0.08; -0.075]
Moheshkhali	All levels		-4,964 [-7538; -2391]	-0.318 [-0.483; -0.153]
	Higher level	1	-4,964 [-7538; -2391]	-0.318 [-0.483; -0.153]
Pekua	All levels		778 [691; 865]	0.091 [0.081; 0.102]
	Higher level	1	684 [674; 693]	0.08 [0.079; 0.081]
	Lower level	14	94 [16; 173]	0.011 [0.002; 0.02]
Ramu	All levels		72 [-85; 230]	0.005 [-0.006; 0.017]
	Higher level	1	386 [303; 470]	0.029 [0.023; 0.035]
	Lower level	16	-314 [-388; -240]	-0.023 [-0.029; -0.018]
Teknaf	All levels		-1,798 [-2327; -1270]	-0.135 [-0.175; -0.095]
	Higher level	1	347 [190; 504]	0.026 [0.014; 0.038]
	Lower level	9	-2,146 [-2831; -1460]	-0.161 [-0.213; -0.11]
Ukhiya	All levels		-930 [-1079; -782]	-0.088 [-0.102; -0.074]
	Higher level	1	688 [392; 984]	0.065 [0.037; 0.093]
	Lower level	10	-1,618 [-2064; -1173]	-0.154 [-0.196; -0.111]

4.2.12 All-cause mortality

We aggregated results from upazila-wide reports and upper-level facilities (District Hospital and Upazila Health Complexes) for each upazila. For this indicator, number of facility deaths reported in Upazila Health Complexes was generally low and included many months with 0 reported cases. While for other indicators, we treated 0s as missing values and excluded facilities that had high level of missingness, for this indicator, we kept all data from Upazila Health Complexes, as it is likely that months with 0 reported institutional deaths were true 0s.

We found low absolute numbers and high variability over the entire period (figure 20), making it difficult to see changes at the beginning or during the pandemic. The majority of upazilas reported a decrease in the number of institutional deaths over the COVID-19 period (table 23). Cumulative differences (either increases or decreases) were small in all upazilas, as shown in table 23 (ranging from -236 deaths in CXB Sadar to +62 in Moheshkhali.

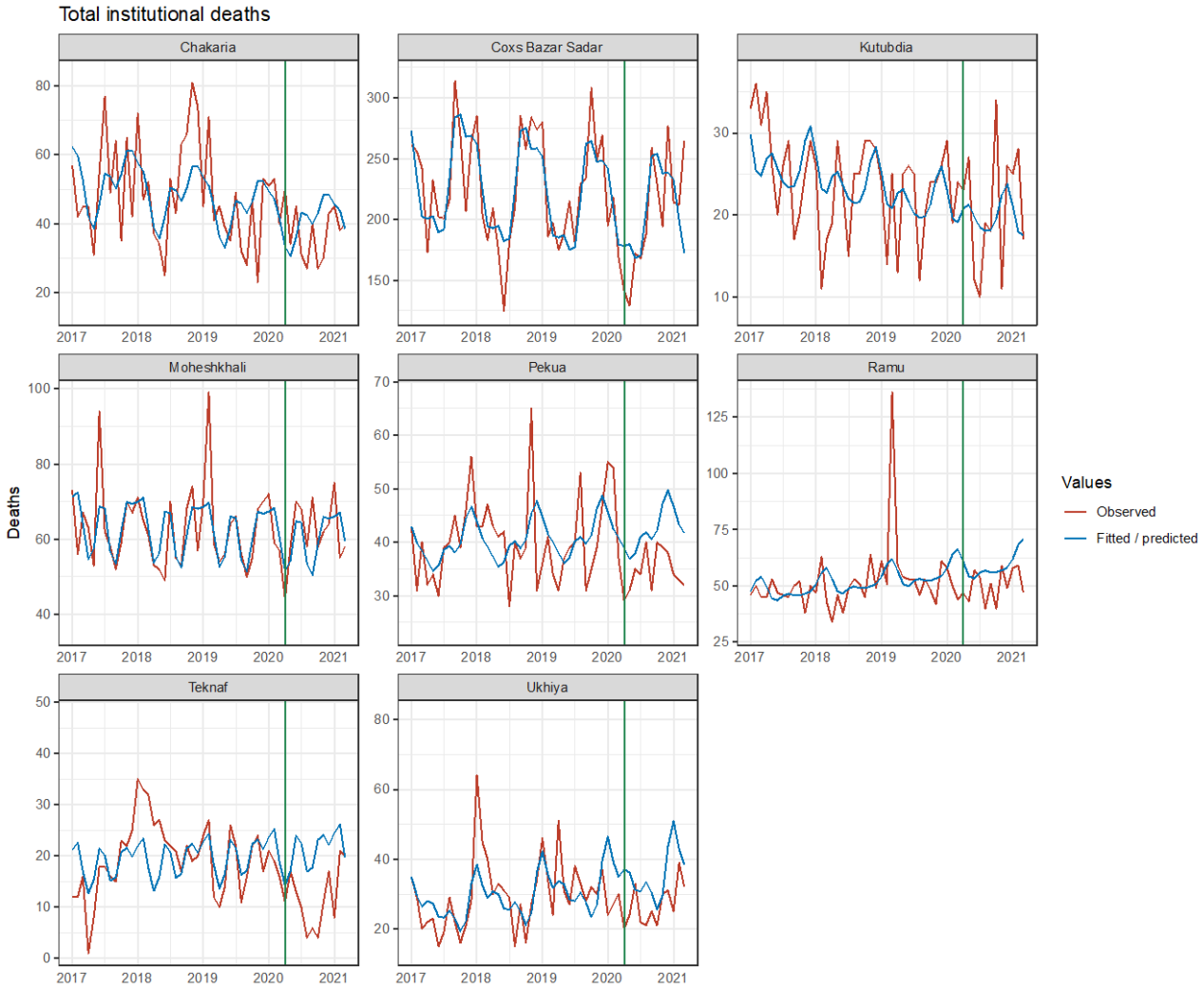

Figure 20: Aggregated number of institutional deaths reported in Cox's Bazar, Bangladesh, January 1, 2017 to March 31, 2021, from upazila-wide reports, district hospitals and upazila health complexes, by upazila

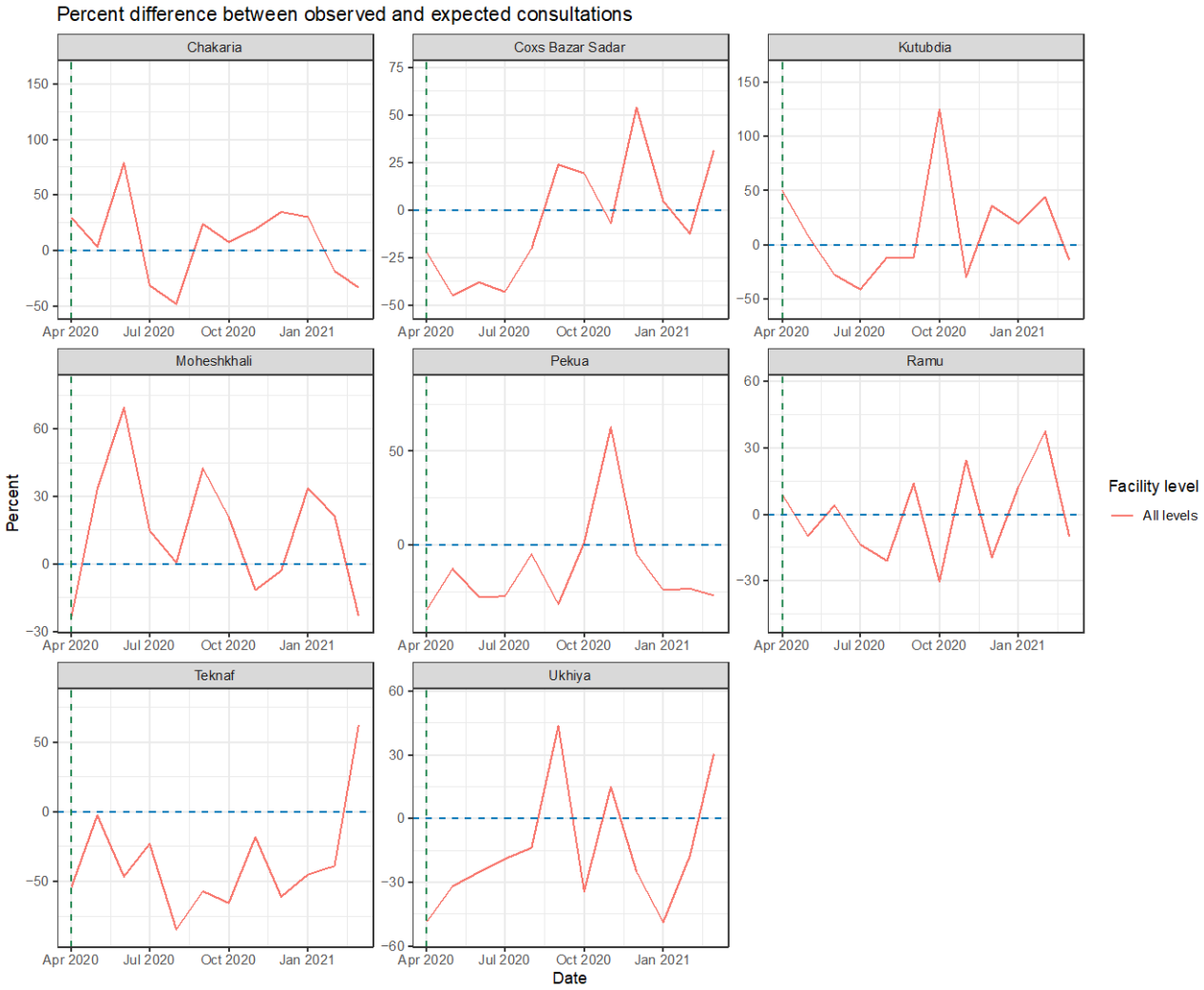

Figure 21: Percent difference between observed and expected institutional deaths in Cox's Bazar district during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), by upazila

Table 23: Cumulative and per capita difference between expected and observed number of institutional deaths during the first year of the COVID-19 pandemic (April 1, 2020 to March 31, 2021), Cox's Bazar district, Bangladesh, by facility level and upazila

Upazila	Facility level	N	Difference	Per capita difference
Chakaria	All levels	1	-34 [-100; 33]	0 [0; 0]
CXB Sadar	All levels	1	-236 [-358; -113]	0 [-0.001; 0]
Kutubdia	All levels	1	16 [5; 27]	0 [0; 0]
Moheshkhali	All levels	1	62 [54; 70]	0 [0; 0]
Pekua	All levels	1	-88 [-94; -82]	0 [0; 0]
Ramu	All levels	1	-35 [-42; -28]	0 [0; 0]
Teknaf	All levels	1	-114 [-126; -103]	0 [0; 0]
Ukhiya	All levels	1	-98 [-114; -83]	0 [0; 0]

4.3 Health care workers' perceptions

4.3.1 Key results

- **Preventive measures** put into place:
    - Closing of schools, partial closing of the market/bazar.
    - Restricting people's movement.
    - Social distancing, limiting the number of people at gatherings.
    - Use of megaphone to project information about COVID-19.
    - Disinfecting health facilities, wearing masks, handwashing, using hand sanitizer.
- Most HCWs reported that changes to activities and services because of COVID-19 were difficult to implement and did not work as planned for various reasons, including:
    - Lack of awareness and understanding of COVID-19 and of preventive measures among community members.
    - Community's resistance to preventive measures.
    - Shortages of materials and staff (cases of COVID-19 among staff).
    - Fear of COVID-19 infections.
    - Lack of government support.
    - Transportation issues caused by lockdown.
- HCWs mainly depicted changes in terms of increases or decreases in consultations and service availability. Perceptions varied importantly, so that the same service was reported as increased or decreased by different health care providers. Size/level of health facility often was associated with different perceptions.
- Most common **reasons for decrease in services** at health facilities and in the communities
    - Fear of COVID-19 infections in health facilities.
    - Lockdowns/Mobility restrictions.
    - Supply scarcity of medicines and material.
    - COVID-19 infections among staff members.
- Most common **reasons for increase in services**
    - Only health facility available.
    - Mobility restrictions, forcing patients to seek care at nearby clinics.
    - Fear of COVID-19 (motivating care seeking behavior for other symptoms/diseases).
- **Preventive supplies**
    - Most health care professionals reported that there was a shortage of personal protective equipment (PPE), masks, hand sanitizer, water (for handwashing), and soap at their health facilities which prompted them to purchase these items themselves.
    - In many cases, the government and other organizations failed to provide these infection, prevention, and control (IPC) materials though some NGOs were able to assist.
- **Perception by service according to most respondents**:
    - Maternal and Newborn health services: no change or decrease.
    - Non-communicable diseases: no change.
    - Vaccination Services and growth monitoring: decrease.
    - Family Planning: no change or decreased.

- Laboratory Capacity: no change or temporary suspension.

- **Perception of the population to the IPC measures:**
  - These changed over time. Initially communities were reluctant while counseling and communication help increasing their acceptance.

4.3.2 Participants' profile

Out of the 54 HCWs who were interviewed, 28 were male, and 26 were female. Interviews were conducted and recorded in Bangla and translated to English. In total, the following health care professionals were interviewed: 18 community HCWs, 10 health assistants, 7 residential medical officers, 5 senior staff nurses, 4 sub assistant community medical officers, 3 family welfare assistants, 2 assistant health inspectors, 2 Family Welfare Visitors, 1 health inspector, and 1 family planning inspector, and 1 nursing supervisor. Thirty-three respondents worked in a community clinic, 9 in an upazila health complex, and 4 each in a district hospital, union health and family welfare complex and union health sub center. Table 24 outlines characteristics of KII participants.

Table 24: List and details of key informants (2021, Cox's Bazar, Bangladesh)

Interview ID	Facility name where participant works	Type of Facility	Respondent Position	Sex
001-01	250 bed Sadar hospital	District Hospital	Residential Medical Officer	Male
001-02	200 bed Sadar hospital	District Hospital	Residential Medical Officer	Male
001-03	200 bed Sadar hospital	District Hospital	Senior Staff Nurse	Female
001-04	200 bed Sadar hospital	District Hospital	Senior Staff Nurse	Female
145-01	Ukhiya Upazila Health Complex	Upazila Health Complex	Residential Medical Officer	Male
145-02	Ukhiya Upazila Health Complex	Upazila Health Complex	Senior Staff Nurse	Female
148-01	Balukhali Union Health sub center	Union Health sub center	Sub Assistant Community Medical Officer	Female
148-02	Balukhali Union Health sub center	Union Health sub center	Health Assistant	Male
155-01	Kutupalong Community clinic	Community Clinic	Community Health Care Provider	Male
155-02	Kutupalong Community clinic	Community Clinic	Assistant Health Inspector	Male
158-02	Matbopara Community clinic	Community Clinic	Assistant Health Inspector	Male
160-01	Paglirbil Community Clinic	Community Clinic	Community Health Care Provider	Female
160-02	Paglirbil Community Clinic	Community Clinic	Health Assistant	Male
161-01	Painnasia Community clinic	Community Clinic	Health Assistant	Male
164-01	Ruhullar Deba community Clinic	Community Clinic	Community Health Care Provider	Female
166-01	South Haludiya Community clinic	Community Clinic	Community Health Care Provider	Female
166-02	South Haludiya Community clinic	Community Clinic	Family Welfare Assistant	Female
168-01	Teknaf Upazila Health Complex	Upazila Health Complex	Residential Medical Officer	Male
168-02	Teknaf Upazila Health Complex	Upazila Health Complex	Nursing Supervisor	Female
170-01	Amtoli Community Clinic	Community Clinic	Community Health Care Provider	Male
171-01	Baharchara Health & Family Welfare Center	Union Health & Family Welfare Center	Sub Assistant Community Medical Officer	Male

173-01	Hnila Union Health Sub Center	Union Health Sub Center	Sub Assistant Community Medical Officer	Male
175-01	Jabbaria Lalu Sharif Community Clinic	Community Clinic	Community Health Care Provider	Male
178-02	Kochubonia Community Clinic	Community Clinic	Health Assistant	Male
179-01	Koinchoripara Community Clinic	Community Clinic	Community Health Care Provider	Male
179-02	Koyainchori Para Community Clinic	Community Clinic	Health Assistant	Male
180-01	Leda Community Clinic	Community Clinic	Community Health Care Provider	Male
184-01	Nazirpara community Clinic	Community Clinic	Community Health Care Provider	Female
184-02	Nazirpara community Clinic	Community Clinic	Health Assistant	Male
185-01	Rangikhali community Clinic	Community Clinic	Community Health Care Provider	Female
185-02	Rangikhali community Clinic	Community Clinic	Health Assistant	Female
193-01	Pekua Upazila Health complex	Upazila Health Complex	Senior Staff Nurse	Female
193-02	Pekua Upazila Health complex	Upazila Health Complex	Residential Medical Officer	Male
194	Barbakia Union Sub- Center	Union Health Sub Center	Sub Assistant Community Medical Officer	Male
200-01	Gudikata Community Clinic	Community Clinic	Community Health Care Provider	Female
200-02	Gudikata Community Clinic	Community Clinic	Health Assistant	Male
204-01	Matborpara Community Clinic	Community Clinic	Community Health Care Provider	Female
204-02	Matborpara Community Clinic	Community Clinic	Health Inspector	Male
205-02	Magnama Union Center	Union Health & Family welfare center	Family Welfare Visitor	Female
209-01	Sabujpara Community Clinic	Community Clinic	Community Health Care Provider	Female
209-02	Sabujpara Community Clinic	Community Clinic	Family Welfare Assistant	Female
212-02	Janatabazar Community Clinic	Community Clinic	Community Health Care Provider	Female
214-02	Moheshkhali Upazila Health Complex	Upazila Health Complex	Residential Medical Officer	Male
216-01	Bara Deil Community Clinic	Community Clinic	Community Health Care Provider	Female
216-02	Bara Deil Community Clinic	Community Clinic	Health Assistant	Female
221-01	Charpara Community Clinic	Community Clinic	Community Health Care Provider	Male
221-02	Charpara community Clinic	Community Clinic	Health Assistant	Female
226-01	GM Ghat community Clinic	Community Clinic	Community Health Care Provider	Female
226-02	JM Ghat community Clinic	Community Clinic	Family Welfare Assistant	Female
252-01	Kutubdia Upazilla Health Complex	Upazila Health Complex	Residential Medical Officer	Male
252-02	Kutubdia Upazilla Health Complex	Upazila Health Complex	Senior Staff Nurse	Female
254-01	Ali Fakir Dail Community Clinic	Community Clinic	Community Health Care Provider	Male
257	Boroghop Union Health & Family welfare center	Union Health & Family welfare center	Family Welfare Visitor	Female
270	Utter Dhurang Union Health & Family welfare center	Union Health & Family welfare center	Family Planning Inspector	Male

4.3.3 Context and introduced measures

The majority of HCWs reported that the following public health and social measures were put in place in March 2020 in response to the COVID-19 pandemic: closing of schools, restricting people's movement (including at the market/bazar), limiting the number of people at gatherings, miking (use of megaphone with a loud sound system to project information about COVID-19) or improving the public's awareness of COVID-19, disinfecting health facilities, wearing masks, handwashing, social distancing, partial closing of the market/bazar, and using hand sanitizer.

Many providers reported their health facilities have been operating as usual. With regard to COVID-19 related services, testing, specimen collection, and isolation services were not provided in the majority of the health facilities. Two providers at Upazila Health Complexes in Ukhiya and Kutubdia reported that COVID-19 vaccinations are being offered at their health facilities, and a health assistant at a Community Clinic reported that their facility is referring patients elsewhere for the COVID-19 vaccine.

Other events that occurred during this time include a fire in a camp served by the Kutupalong Community Clinic and a chickenpox outbreak in the community served by the Baharchara Health & Family Welfare Center from December 2020-January 2021. A few providers reported that various health care workers tested positive for COVID-19 which affected facility operations.

4.3.4 Changes and adaptations by health service

Most HCWs reported that changes to activities and services because of COVID-19 were difficult to implement and did not work as planned for various reasons, including lack of awareness and/or understanding of COVID-19 and preventive measures among community members, resistance to PHSM, shortages of materials and staff, fear of COVID-19, lack of government support, transportation issues caused by lockdown, and cases of COVID-19 among staff.

Some HCWs reported that fewer patients came to their health facilities from fear of COVID-19 or distance to the facility. A residential medical officer at a district hospital and a health assistant at a community clinic reported that there was insufficient space at their health facility to meet the demands caused by COVID-19. A few HCWs reported that the changes put in place during the pandemic should continue after the pandemic ends. The remaining health care professionals reported no significant changes to activities and services or difficulties implementing these changes and that services were provided as expected due in part to NGO support.

Table 25 summarizes the main changes highlighted during the interviews by health service type. Respondents mainly perceived changes in terms of increase or decrease of consultations for a given service and highlighted possible causes. Causes for a change are listed according to how frequently they were reported (from most to least frequent). More details by health service are provided in the sections below.

Table 25: Summary results: reported changes in health service provision and possible causes (2021, Cox's Bazar, Bangladesh)

Health care services	Reasons for decrease	Reasons for increase
Sexual and Reproductive health	• Fear of COVID-19 • Lockdown • COVID-19 infections among staff members • Supply scarcity • Efforts to reduce COVID-19 transmission	• Only health facility available • Increased interest in injectable contraception
Child health	• Efforts to reduce COVID-19 transmission • Health care worker strikes • Government rules and restrictions • Lockdown • Fear of COVID-19 • COVID-19 cases • COVID-19 infections among staff members	• Seasonal changes • Proximity to clinic • Fear of COVID-19 (motivating care seeking behavior for other diseases)
Communicable diseases	• Fear of COVID-19 • Mobility restrictions • Spread of COVID-19 • COVID-19 infections among staff members • Lockdown	•
Non-Communicable diseases	• Fear of COVID-19 • COVID-19 infections among staff members • Lockdown	• Increased awareness of COVID-19 • Only health facility in the community • Fear of COVID-19 (motivating care seeking behavior for other diseases)
Maternal and newborn health	• Fear of COVID-19 • Spread of COVID-19 • COVID-19 infections among staff members • Lockdown • Interruption of postnatal care services • Decreased service time • COVID-19 infections among staff members	• Patient sought care in facilities close to community • Emergency cases went directly to referral hospitals • Augmentation of pregnancies due to lockdown
Laboratory capacity	• COVID-19 infections among staff members • Fear of COVID-19 • Mobility restrictions • Home testing • Supply scarcity • Machine malfunctioning • Only COVID-19 specific laboratory services offered	• Fear of COVID-19 (motivating care seeking behavior for other diseases) • Mobility restrictions forcing patients to seek care at nearby clinics
Pharmacy	• Supply scarcity • Fear-of COVID-19 • Mobility restrictions • Lockdown • COVID-19 infections among staff members	• Reduce the flow of patients to the facility • Increased interest in vaccinating children following routing vaccination disruption
Referrals	• Fear of COVID-19 • Mobility restrictions / lockdown • Transportation limitations • Economic problems • Gathering restrictions	• Increase in common-cold patients • Complexity of cases • Mobility restrictions forcing patients to seek care at nearby clinics

	• Efforts to reduce COVID-19 transmission • More awareness of COVID-19 • Health care worker strikes	
Community activities	• Fear of COVID-19 • Mobility restrictions / lockdown • Gathering restrictions	

Sexual and reproductive health

Forty-four percent of HCWs reported that family planning services did not change. Other HCWs reported that family planning services and patients (new and old), decreased in March 2020 in response to the COVID-19 pandemic mainly due to fewer patients coming to the health facility out of fear of COVID-19 transmission. Several professionals reported a decreased rate of use of services for oral pills and injectables. Less common reasons for this reduction in family planning services include lockdown, COVID-19 infections among staff members, supply scarcity, and as an effort to prevent or reduce the spread of COVID-19. Interruption of services, reduction in home visits as well as reduction in the service duration were also reported. Another respondent reported that home visits increased to reduce the number of people coming to the health facility. Two HCWs (a Community Health Care Provider and family welfare assistant) at community clinics reported an increase in family planning services, especially injectable services, in March 2020 in response to the COVID-19 pandemic as a result of being the only facility available to the community at this time and women's interest in the injectable method during the pandemic. Changes in how services were provided also included spacing out clients ensuring distance while in the line.

Child health services

Most HCWs reported that growth monitoring and vaccination services decreased or were interrupted in March 2020 in response to the COVID-19 pandemic. This was mainly due to efforts to prevent the spread of COVID-19, strikes of HCWs (in March 2020 and then November and December 2020 – two facilities), government rules and movement restrictions (including lockdown), fear of COVID-19 infection and transmission, and cases of COVID-19. Cases of COVID-19 among staff led to a suspension of services at those health facilities. Few reported caregivers going to the pharmacy instead due to fear of infections at health facilities, and due to movement restrictions.

Some HCWs reported an increase in cases of diseases such as acute respiratory infection (ARI), diarrhea, and pneumonia as well as increased frequency of consultations in March 2020 as a result of seasonal changes. Less common reasons for the increase in consultations include fear of COVID-19 infection (driven by a lack of knowledge of the signs and symptoms of COVID-19 which motivated people to seek care for other diseases) and proximity to the clinic. Health professionals reported that people from the communities would seek care at the local health facilities (instead of the hospital or other clinics farther away).

Other HCWs (15 of 54) reported that there was no change in prevention and treatment of diseases, growth monitoring or vaccination services. Others mentioned changes in the way anthropometric measurements were conducted. In order to reduce proximity and touching of children, it was not allowed to measure height and weights, but only Mid-Upper Arm Circumference.

Communicable diseases

Most HCWs (35 of 54) reported that treatment and screening of communicable diseases such as malaria, human immunodeficiency virus (HIV), and tuberculosis (TB) among adults was not impacted by the COVID-19 pandemic at their health facilities.

Some HCWs reported that fewer patients (especially malaria patients) came to their health facilities and services were temporarily stopped or their frequency was reduced in March 2020 in response to the COVID-19 pandemic mainly as a result of fear of COVID-19, movement restrictions, the spread of COVID-19, COVID-19 infections among staff members, and lockdown. Cases of COVID-19 among staff led to a suspension of services at those health facilities. Three respondents mentioned a reduced rate/frequency of malaria screening during March of 2020. Others reported that TB and other patients received counselling at home so that they did not need to visit the health facility.

One HCW (health assistant) at a community clinic reported an increase in service frequency in March 2020 in response to the COVID-19 pandemic due to fear of COVID-19 infection which was driven by more awareness of COVID-19 leading to more care seeking behaviors. One professional cited construction at the health facility as a factor in a decrease in services, unrelated to COVID-19.

Non-communicable diseases

Most HCWs reported that treatment and screening of diabetes, cardiovascular diseases, and other non-transmissible diseases was not impacted by the COVID-19 pandemic at their health facilities.

Many other HCWs reported a decrease in the number of patients and interruption of services at their facilities in March 2020 mainly as a result of fear of COVID-19, lockdown, and COVID-19 infections among staff members. Cases of COVID-19 among staff led to a suspension of services at those health facilities. Less common reasons for this decrease in services and service time included the absence of doctors and as an effort to reduce COVID-19 transmission. Also, it was reported that only severe patients would come for treatment due to fear of COVID-19 infection.

Some HCWs reported an increase in the frequency of services at their facilities in January 2021 due to more awareness of COVID-19, higher likelihood of seeking services out of fear of COVID-19 and being the only health facility in the community.

Maternal and newborn health

Most HCWs reported that maternal and newborn patients and services, including deliveries (routine and emergency) and ante-natal/post-natal consultations (ANC and PNC), either did not change or decreased in March 2020 in response to the COVID-19 pandemic. This was mainly due to fewer patients coming to the health facility out of fear of COVID-19 transmission. Less common reasons for this reduction include the spread of COVID-19, COVID-19 infections among staff members, lockdown, interruption of PNC services and decreased service time. Cases of COVID-19 among staff led to a suspension of services at those health facilities.

Other HCWs referred to an increase in consultations due to mobility restrictions. This played out in two ways: HCWs from Upazila Health Complexes reported an increase in maternal and newborn patients in March 2020 as, they argue, patients sought care only in case of emergency and went directly to the

referral hospitals, instead of going to the local health center. Other HCWs from health centers however argued that more patients sought care in facilities more closed to the community to avoid movement to referral hospitals.

Finally, some HCWs perceived an augmentation in pregnancies due to the lockdown.

Laboratory Capacity

Most HCWs (39 of 54) reported that laboratory capacity for COVID-19 and other diseases (e.g., malaria, HIV/AIDS, etc.) was not impacted by the COVID-19 pandemic at their health facilities. Yet, many HCWs reported reduced or temporary suspension of pregnancy, diabetes and malaria testing, temporary or long-term lab closures, and reduced services, service times, and service recipients in March 2020 due to COVID-19 infections among staff members, fear of COVID-19 and COVID-19 transmission, and mobility restrictions. Cases of COVID-19 among staff led to a suspension of services at those health facilities. Less common reasons for these decreases in laboratory services include urine testing at home, supply shortage of pregnancy kits, sugar test machine malfunctioning, and as an effort to reduce COVID-19 transmission. One health care professional at a community clinic reported that the frequency of services at their health facility was reduced in June 2020 due to the laboratory services changing to special COVID-19 duty.

One community health care provider at a community clinic reported that the number of tests increased at their health facility in March 2020 due to fear of COVID-19 and mobility restrictions motivating people to go to this facility to seek care.

Pharmacy

A little over half (28 of 54) of HCWs reported that drug availability and pharmacy services were not impacted by the COVID-19 pandemic at their health facilities.

Many HCWs reported that drug availability and pharmacy service frequency, duration, and time decreased or stopped altogether in March 2020 for a variety of reasons. Drug availability decreased mainly as a result of increased demand for medications from more patients seeking care; health care professionals also reported a decrease in patients/clients due to fear of COVID-19, mobility restrictions, and lockdown preventing patients from seeking care. Cases of COVID-19 among staff led to a suspension of services at those health facilities.

Others reported that higher quantity of medicine were taken or provided in March 2020 from fear of COVID-19 and to reduce the flow of patients to the facility. One health assistant at a community clinic reported that vaccination services at their facility increased in January 2021 due to increased interest in vaccinating children who missed vaccination because the EPI campaigns were interrupted.

Some HCWs reported that community members chose to purchase medicine from outside the health facility pharmacy in March 2020 due to fear of COVID-19. A family welfare visitor at a union health and family welfare center reported that the medication distribution modality and the amount changed due to interrupted supply chain but no details about this change were provided.

Referrals

Most HCWs reported a decrease in the number, frequency and rate of referrals at their health facilities in March 2020 in response to the COVID-19 pandemic due to fear of COVID-19 infection and transmission,

mobility restrictions, and lockdown. Less common reasons for this decrease in referrals include transportation limitations and economic problems.

Many health care professionals (19 of 54) reported no changes to the frequency of and reason for referrals at their health facilities in response to the COVID-19 pandemic.

Some HCWs reported an increase in the number and frequency of referrals (especially for COVID-19 patients and patients with fever or cough-like symptoms) in March 2020 in response to the COVID-19 pandemic for a variety of reasons, including an increase in common-cold patients, complexity of cases, and mobility restrictions causing people to seek care at their facilities.

Community outreach

Most HCWs reported that the number of participants at community activities and the activities themselves (including meetings, services, and mother gatherings) decreased, were restricted, or stopped altogether (temporarily or otherwise) in March 2020 in response to the COVID-19 pandemic. This was due to government rules like lockdown, mobility restrictions, and gathering restrictions, fear of COVID-19, and efforts to reduce COVID-19 transmission and avoid mass gatherings. Other reasons for this decrease in community activities include increased awareness of COVID-19 and strikes by health care workers. Several reported no changes.

4.3.5 Infection Prevention and Control Measures

Infection prevention and control measures implemented in the health facility: Most HCWs reported following measures: mask wearing and mask distribution, handwashing, maintaining social distancing (including one-by-one patient service and controlling patient flow), temperature screening, disinfecting the health facility, using hand sanitizer, counselling and other awareness messaging. Other prevention and control measures include wearing PPE, leg disinfection, triage, installing a flu corner, installing an isolation center, and using gloves.

Challenges related to the implementation of IPC measures: Most HCWs reported a shortage of PPE, masks, hand sanitizer, water (for handwashing), and soap at their health facilities which prompted them to purchase these items themselves. In many cases, the government and other organizations failed to provide these IPC materials though some NGOs were able to assist. Workforce was also in low supply at several facilities. Other challenges that affected the implementation of IPC measures at health facilities include that people did not want to obey IPC measures, were not aware of IPC measures, and did not understand IPC measures.

Perception of the population to the IPC measures: Most HCWs reported that their communities did not want to accept the infection prevention and control measures implemented at the beginning of the COVID-19 pandemic response due to a lack of knowledge, lack of understanding, or a desire not to adhere to the IPC measures, but later they understood the importance of these measures due, in part, to counseling. Similarly, awareness of IPC measures was initially low at several health facilities but has been growing over time, partially due to counseling and social media.

Some HCWs reported that people responded positively to the IPC measures while others reported that people initially felt afraid of, angry towards, annoyed with, dissatisfied with, or reacted in a 'bad manner' to the IPC measures (or felt obligated to adhere to these measures) before eventually growing accustomed to them. Several health care professionals reported that people in their communities could not accept the IPC measures at all, refused to adhere to them, did not give them any importance, or were generally apathetic towards them.

Several HCWs reported that their communities understood the importance of COVID-19 and IPC measures and took these measures seriously. Others reported that their communities tried to adhere to IPC measures. A sub-assistant community medical officer at a union health and family welfare center and a health assistant at a community clinic reported that their communities partially realized the importance of the IPC measures and partially accepted these measures.

A health assistant at a community clinic and a family welfare assistant at a community clinic reported that at the beginning of the COVID-19 pandemic, their communities were more likely to adhere to the IPC measures. Similarly, two family welfare visitors at union health and family welfare centers reported that their communities are not currently adhering to the IPC measures though they were for a period of time.

Two community health care providers at community clinics reported that their communities do not believe that COVID-19 exists.

4.3.6 Summary of health care workers' perceptions

Answers varied greatly and few consistent patterns could be identified. Many professionals report that services did not change or were not impacted by COVID-19 in March of 2020, but others in the same field reported increases or decreases in services. Those reporting increase in services cite fear of COVID-19, seasonal changes for certain diseases, an increased awareness of COVID-19 and an increase in the complexity of cases, close proximity of their health facility to the community, an increase in recruitment of nurses and doctors. Affected service included MNCH, child preventive health, adult non-communicable diseases, pharmacy, and referrals. Many respondents said that there was a decrease in number of patients seeking services in March of 2020 due to a fear of COVID-19, school closures, lockdowns that were imposed, supply scarcity, and infection rates among staff. All services were affected by some degree of reduction in services. One can see overlap between services reporting decreases and increases depending on reporting source.

Most HCWs reported that changes to services and activities were difficult to implement because of several factors: lack of awareness and understanding of COVID-19, resistance to barrier measures, supply shortages, fear of COVID-19, lack of government support and transportation issues caused by lockdown.

Most HCWs also reported challenges to IPC measures - shortage of PPE, masks, hand sanitizer, water (for handwashing), and soap at their health facilities which prompted them to purchase these items themselves. In many cases, the government and other organizations failed to provide these IPC materials though some NGOs were able to assist. Workforce was also in low supply at several facilities, although in many facilities, they reported an increase in staffing.

There was some variation depending on level of care among HCWs. At the District Hospital level, there was a perception that the flow of COVID-19 patients increased, but other patient visits decreased initially. There was an increase in staffing at the district level as well. IPC measures were initially challenging, citing a shortage of PPE, but that the population participated without an issue when the importance was explained. At the Upazila Health Complex level, some sites were more impacted than others. For example, Teknaf Upazila Health Complex and Ukhiya Health Complex were significantly impacted across all areas of practice, while Pekua Health Complex respondents reported that health services never stopped and were not significantly impacted by COVID-19.

4.4 Health care seeking behavior and social interactions

4.4.1 Key results

Attitude and knowledge about COVID-19

- Most respondents:
    - Did not know of COVID-19 cases in their community.
    - Were not aware that cases could be asymptomatic.
    - Were classified as “little informed” and another third as “informed”.

Preventive measures: related knowledge and reported practice

- Most people were aware of COVID-19 prevention measures in some form, though only 10 out of 23 KIs believed others were aware of these preventive measures.
- Adherence to preventive measures decreased over time, both because risk perception decreased among people and police/army enforcement declined.
- Across both qualitative and quantitative results mask wearing, social distancing and hand washing were the most frequently identified preventive measures used in the community.
- More than half of the respondents reported wearing a mask, washing hands, and practicing physical distance. There were differences in uptake of preventive measures by gender, geographic location, and income:
    - More women than men reported always wearing masks and always handwashing.
    - Less rural than urban respondents reported wearing a mask.
    - Economic and financial barriers to practice protective measures: need to work, take public transit, could not afford to buy extra seat for more space.
- Increasing age and education are associated with higher odds of wearing a mask; higher level of educations and of COVID-19 related knowledge, as well as female sex, were associated with higher odds of practicing physical distancing and hand washing.

Vaccination

- Almost all (99%) survey respondents reported willingness to get vaccinated.

- Varying degrees of trust and confidence in vaccines from qualitative responses, as well as issues related to equitable access.
- Possible reasons for not getting the vaccine included lack of understanding / lack of information on the effectiveness of the vaccines, fear of side effects and problems with vaccine given current health status including pregnancy.

Information sources

- In quantitative data, radio and TV were most commonly reported by respondents over the age of 30 while those 18-30 most commonly used social messaging apps as their main form of information.
- The vast majority trusted the news they got from whatever source they used.

Health care seeking behavior

- Respondents mainly seek care at pharmacies, followed by public hospitals and unlicensed doctors
- Proximity, cost, and trust are the three main factor guiding choice of provider.
- Most of the household's members with chronic diseases are able to access they care they need.
- Three quarters of the respondents brought their children to routine vaccination.
- Almost all those who reported an illness event in the past month sought care, mainly in pharmacies, unlicensed doctors and public hospitals.
- Those who did not seek care did not consider their condition serious enough; cost was the second reason for not seeking care.
- The majority of respondents had to pay for the treatment, but not all were able to pay for the entirety of the treatment, especially among the 60+.
- Almost half of the respondents consider the services accessibility to have remained the same since the beginning of COVID-19. One third think it has decreased and almost one fifth thinks it has increased.
- Fear of COVID-19, lack of health care providers, human resources diverted to COVID-19 patients and costs are the three main reasons why respondents perceived accessibility has decreased.

Social interactions

- Characteristics of interactions the day before the survey:
  - Almost all respondents had interactions with people outside of their household.
  - Average of 2 contacts/ day/ respondent.
  - Assortative by sex and by age (for adult and young adults).
  - Mainly in the home, or another house, or the street. Mainly outdoors and without physical contact.
  - Majority of the interactions were short (less than 15 min).
  - Masks were not worn in 25% of the interactions.
- Changes since the beginning of the COVID-19 pandemic.
  - The majority reported reducing the frequency and the duration of meetings.

4.4.2 Respondents profile

Key Informant Interviews

Twenty-three key informant interviews were conducted, with 13 identifying as males and 10 as females. Seven respondents were between the ages of 20-29; 4 between 30-39; 6 between 40-49; 1 between 50-59 and 5 between 60-69 years of age. Most respondents (20 out of 23) were from rural areas, while the remaining 3 were from urban areas (2 from CXB Sadar and 1 from Kutubdia). Five respondents were from Moheshkali, 4 from Ukhiya, three each from Tekhaf, Kutubdia, Chakaria and Pekua and the remaining 2 from CXB Sadar. Six respondents identified as caregivers, 4 as housewives, 5 as teachers, and one each of the following: imam, imam and teacher, pharmacist, retired NGO staff, pensioner, electrician, student, and landlord. Of the 6 caregivers, 5 were female and one was male. The remaining 5 females, 4 identified as housewives and one identified as a teacher.

Respondent Profiles Household Surveys

A total of 842 respondents were polled within the survey. 52% of respondents were female, 48% were male, with all respondents over the age of 18. 83% of respondents surveyed lived in rural census blocks, with 17% in urban areas. The distribution of respondents by upazila is included in table 26. Across each upazila, there was an even distribution of respondents across the age categories. Most common occupation respondents were student (39% of total respondents), housewife (26% of total respondents), and daily wage worker (13% of total respondents). 37% of total respondents had completed secondary school (grades 5-12) at the time of the survey and 36% had completed primary school (grades 1-5) as the total years of education at the time of survey (table 27).

Table 26: Demographics of household survey respondents (January 2022, Cox's Bazar, Bangladesh)

			Respondent sex		Respondent age				Setting	
Variable		**Total**	**Female**	**Male**	**Age 18-30**	**Age 31-45**	**Age 46-59**	**Age 60+**	**Rural**	**Urban**
Upazila	Chakaria	22%	20%	23%	23%	22%	23%	20%	23%	16%
	CXB Sadar	19%	19%	18%	19%	20%	16%	19%	14%	39%
	Maheshkhali	14%	14%	14%	15%	14%	13%	14%	15%	10%
	Teknaf	12%	12%	12%	12%	11%	13%	14%	14%	5%
	Ramu	12%	13%	11%	11%	12%	14%	11%	13%	7%
	Ukhia	10%	10%	9%	10%	9%	8%	15%	9%	13%
	Pekua	7%	6%	7%	5%	8%	9%	10%	7%	4%
	Kutubdia	6%	6%	5%	5%	5%	6%	4%	6%	6%
Type of Settlement	Rural	83%	83%	83%	82%	82%	85%	81%	--	--
	Urban	17%	17%	17%	18%	18%	15%	19%	--	--
Age of the Respondent	Average	37	36	38	--	--	--	--	37	36
Gender of Respondent	Female	52%	--	--	55%	50%	45%	47%	52%	53%
	Male	48%	--	--	45%	50%	55%	53%	48%	47%
HH size	Average	5	5	5	5	5	6	6	5	5
Is the respondent	No	53%	88%	15%	75%	46%	31%	22%	52%	59%
	Yes	47%	12%	85%	25%	54%	69%	78%	48%	41%

head of household?										

Table 27: Household survey respondent occupation and education (January 2022, Cox's Bazar, Bangladesh)

			Respondent sex		Setting	
Question	**Responses**	**Total**	**Female**	**Male**	**Rural**	**Urban**
Respondent Occupation	Student	39%	39%	39%	39%	39%
	Housewife	26%	53%	0%	26%	26%
	Daily Wage Worker	13%	0%	24%	13%	12%
	Business Owner	8%	0%	15%	8%	9%
	Unemployed	6%	5%	7%	7%	4%
	Private sector - permanent employment (e.g., private education, banking, retail, manufacturing)	6%	1%	11%	6%	6%
	Government employee (including officials, police, teachers, health care workers)	1%	0%	2%	1%	2%
	NGO worker	1%	1%	1%	1%	0%
	Other	1%	0%	1%	1%	0%
	Religious Position	0%	0%	1%	1%	0%
Highest Level of Education Obtained by Respondent	Completed secondary school (grade 5-12)	37%	39%	35%	36%	41%
	Completed primary education (grate 1-5)	36%	36%	37%	37%	32%
	No education	14%	15%	13%	14%	11%
	Madrassah only	6%	5%	7%	6%	4%
	Above grade 12/tertiary education	5%	4%	5%	4%	8%
	Other	1%	2%	1%	1%	2%
	University degree	1%	1%	2%	1%	3%

4.4.3 Attitude and knowledge about COVID-19

Qualitative Results

While 11 KIs reported that their communities are aware of COVID-19, a few respondents mentioned that there are community members who do not believe in the coronavirus. A few KIs reported that some people believe that COVID-19 is an act of God and only God will save them from the virus. One of the respondents mentioned that it is propaganda by the government.

Ten of the twenty-three KIs mentioned that there were COVID-19 cases in their communities; only five personally knew someone who had been infected. Seven KIs reported initial panic in their community because of COVID-19; however, many KIs mentioned that the situation in their communities was normal as there are not many COVID-19 cases locally. Two KIs noted that the number of cases in their communities was growing.

One of the KIs, from Kutubdia island, stated that the situation is better than other areas of the country as their community is an island. However, he noted that it can be problematic during the two biggest religious festivals, Eid-ul-Fitr and Eid-ul-Adha, when many people travel to the islands. Three KIs reported that they thought those traveling from abroad were bringing COVID-19 to their area.

Quantitative results

Table 28 and 29 shows results of the questions about COVID-19 related knowledge, by age and sex (table 28) and by upazila and setting (table 29). Most respondents were not aware of COVID-19 cases in their community, with an even distribution between men and women. Fewer respondents from rural areas knew community COVID-19 cases (33% as compared to 41% in urban areas). Variability across responses in the upazilas was seen as well, ranging from 28% of respondents in Teknaf to 45% in Pekua knowing of COVID-19 cases in their communities.

Knowledge about COVID-19 varied, though most respondents (68%) identified elderly populations as most at risk for serious illness. People with pre-existing conditions were identified as a vulnerable population by 36% of respondents, though this differed between female and male respondents (43% of females reporting vs 28% of males). There was strong consensus across all respondents that COVID-19 had airborne spread (89% of total respondents), with physical contact with infected persons (66%) and with contaminated objects (31%) the next most reported transmission routes. This was relatively consistent across respondent profiles, though as age category increased, fewer respondents reported airborne spread as a mode of transmission.

Only 20% of respondents were aware of asymptomatic spread of COVID-19, with 75% of respondents noting that only those with symptoms had COVID-19. This knowledge of asymptomatic spread increased across the age categories, with 17% of respondents in the 18-30 year age group reporting asymptomatic spread as compared to 28% of those in the 60+ years category.

The majority of the respondents (58.5%) fell into the category “Little informed” and another third (36%) in the category “informed”. Very few (3.1% were well informed. Similar results can be seen across age groups, except for more respondents in the 60+ age group being classified as “not informed” compared to other age groups (between 1.6 to 2.6%). More males than females (4.8% vs 1.6%) were classified as Well informed (table 30). Little variation can be seen across upazilas and settings. No factors were statistically associated with increased level of knowledge (table 31).

Table 28: Knowledge about COVID-19 risk by gender and age, household survey results, (January 2022, Cox’s Bazar, Bangladesh)

			Respondent sex		Respondent age			
Question	**Responses**	**Total**	**Female**	**Male**	**18-30**	**31-45**	**46-59**	**60+**
Are you aware of any COVID-19 cases in your community in the last 10 days?	No	64%	63%	65%	64%	63%	64%	67%
	Yes	34%	36%	32%	34%	35%	33%	33%
	Unsure	2%	1%	3%	2%	3%	3%	--
	COVID-19 does not exist	0%	0%	--	0%	--	--	--
Who do you think is most likely to get seriously ill from the coronavirus?	Elderly (60+)	68%	67%	70%	71%	67%	62%	76%
	People with preexisting conditions	36%	43%	28%	37%	38%	31%	32%
	Adults (19-59)	33%	43%	21%	37%	28%	35%	33%
	Everyone (cannot select with other options)	12%	7%	18%	10%	15%	12%	11%
	Children (0-18)	11%	12%	10%	11%	10%	11%	16%
	Health Workers	5%	6%	3%	8%	3%	3%	3%
	Do not want to respond/Don’t remember	3%	6%	1%	3%	4%	3%	4%

	Pregnant/lactating women	3%	6%	0%	5%	3%	1%	2%
	Other	0%	0	0%	0%	0%	0%	0%
How can a person get COVID-19?	Airborne	89%	92%	85%	90%	91%	83%	80%
	Physical contact with infected person	66%	66%	67%	64%	68%	69%	53%
	Physical contact with contaminated object	31%	29%	34%	29%	31%	37%	36%
	Drinking/washing in infected water	22%	27%	17%	22%	24%	21%	17%
	Eating certain foods	12%	17%	7%	12%	12%	13%	14%
	Breastfeeding/breastmilk	4%	8%	1%	4%	6%	1%	0%
	Do not want to respond/Don't remember	1%	1%	1%	1%	1%	2%	2%
	Other	0%	0%	0%	0%	0%	0%	2%
Does everyone who has COVID-19 show signs and symptoms?	Yes	75%	77%	72%	80%	74%	68%	62%
	No	20%	18%	21%	17%	20%	22%	28%
	Don't want to respond/Don't remember	6%	5%	7%	3%	6%	9%	10%

Table 29: Knowledge about COVID-19 risk by setting and upazila, (January 2022, Cox's Bazar, Bangladesh)

			Setting		Upazila							
	Responses	Total	Rural	Urban	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia
Are you aware of any COVID-19 cases in your community in the last 10 days?	No	64%	65%	56%	69%	58%	62%	65%	50%	68%	70%	59%
	Yes	34%	33%	41%	28%	41%	35%	34%	45%	30%	28%	38%
	Unsure	2%	2%	3%	3%	1%	3%	1%	3%	2%	2%	3%
	COVID-19 does not exist	0%	0%	--	--	--	--	--	2%	--	--	--
Who do you think is most likely to get seriously ill from the coronavirus?	Elderly (60+)	68%	68%	67%	69%	62%	78%	72%	61%	71%	70%	66%
	People with preexisting conditions	36%	37%	33%	37%	30%	19%	40%	28%	39%	40%	47%
	Adults (19-59)	33%	33%	30%	33%	35%	46%	33%	39%	32%	29%	16%
	Everyone (cannot select with other options)	12%	12%	13%	14%	13%	0%	12%	13%	9%	15%	17%
	Children (0-18)	11%	11%	11%	9%	9%	19%	10%	20%	11%	9%	10%
	Health Workers	5%	5%	4%	7%	4%	3%	6%	0%	2%	4%	8%
	Do not want to respond/Don't remember	3%	4%	1%	2%	1%	11%	4%	3%	3%	5%	3%
	Pregnant/ lactating women	3%	3%	3%	3%	6%	0%	2%	0%	6%	4%	4%
	Other	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
How can a person get COVID-19?	Airborne	89%	88%	90%	91%	87%	100%	91%	92%	82%	87%	85%
	Physical contact with infected person	66%	65%	72%	68%	73%	59%	62%	64%	71%	55%	66%
	Physical contact with contaminated object	31%	31%	31%	34%	29%	27%	34%	18%	38%	26%	37%
	Drinking/ washing in infected water	22%	22%	26%	20%	25%	8%	26%	10%	31%	21%	28%
	Eating certain foods	12%	11%	17%	14%	8%	14%	13%	7%	17%	13%	12%
	Breastfeeding/ breastmilk	4%	4%	4%	3%	5%	0%	5%	3%	10%	4%	2%
	Do not want to respond/ Don't remember	1%	2%	0%	1%	0%	0%	2%	0%	2%	4%	2%
	Other	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Does everyone who has COVID-19 show signs and symptoms?	Yes	75%	75%	70%	77%	78%	78%	77%	64%	66%	71%	80%
	No	20%	19%	23%	18%	16%	11%	21%	23%	29%	21%	18%
	Don't want to respond/Don't remember	6%	6%	7%	5%	6%	11%	2%	13%	6%	8%	2%

Table 30: Percentage of respondents by level of COVID-19 related knowledge by respondents' sex, age, upazila and setting; (January 2022, Cox's Bazar, Bangladesh)

	Who is most susceptible to falling seriously ill to coronavirus? (SI)				How can a person contract COVID-19? (PC)				How could you reduce the chance of getting COVID-19? (RC)				Summary Knowledge Classification score			
	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1
Total	5.7	50.8	36.5	7.0	12.0	30.9	25.5	31.6	3.9	6.3	25.3	64.6	3.1	36.3	58.5	2.1
Age of Respondent																
18-30	6.6	50.3	34.4	8.6	12.9	28.8	27.5	30.8	2.7	6.1	28.0	63.1	3.0	38.1	57.3	1.6
31-45	5.4	52.6	35.5	6.5	10.2	33.2	23.6	33.0	4.9	6.6	24.3	64.2	3.1	36.9	58.2	1.7
46-59	3.4	48.7	43.6	4.3	14.5	30.8	24.0	30.8	2.7	5.4	20.5	71.4	3.4	31.6	62.4	2.6
60+	8.3	45.8	39.6	6.3	12.5	27.1	31.3	29.2	6.3	6.3	27.1	60.4	4.2	31.2	58.3	6.2
Gender of Respondent																
F	8.5	50.2	29.6	11.7	7.5	27.9	25.1	39.4	3.3	6.9	21.2	62.8	1.6	36.4	59.2	2.8
M	2.8	51.3	44.1	1.8	16.8	33.9	26.0	23.2	4.5	5.5	23.5	66.5	4.8	36.0	57.9	1.3
Settlement Type																
Rur	6.4	51.3	34.9	7.5	11.8	30.7	26.7	30.8	3.2	6.0	25.8	65.0	3.1	36.1	58.4	2.4
Urb	2.7	48.6	43.9	4.7	12.8	31.8	20.3	35.1	6.8	7.5	23.1	62.6	3.4	37.2	58.8	0.7
Upazila																
Chakaria	6.0	55.4	33.1	5.4	15.1	30.7	24.1	30.1	3.0	7.9	31.7	57.3	4.0	32.7	46.2	0.5
CXB Sadar	6.5	43.2	45.8	7.1	12.3	33.5	23.9	30.3	4.6	4.0	25.8	65.6	2.6	38.1	57.4	1.9
Kutubdia	5.4	43.2	40.5	10.8	19.0	29.7	35.1	16.2	0.0	2.9	14.7	82.4	2.7	24.3	70.2	2.7
Maheshkal	7.9	55.4	30.7	5.9	10.9	27.7	25.7	35.6	2.0	9.1	26.3	62.6	1.0	38.6	60.4	0.0
Pekua	6.6	44.3	46.0	3.3	8.2	46.0	27.9	18.0	3.3	1.6	16.4	78.7	1.6	37.7	59.0	1.6
Ramu	5.7	47.1	38.0	9.2	9.2	32.2	16.1	42.5	12.2	6.1	23.2	58.5	8.0	27.6	58.6	5.7
Teknaf	5.3	59.6	31.6	8.8	9.6	25.4	32.5	32.5	0.9	8.0	23.2	67.9	1.7	34.2	60.5	3.5
Ukhia	6.1	50.0	36.7	7.1	12.2	26.5	25.5	35.7	4.2	6.3	26.0	63.5	2.0	39.8	56.1	2.0

Note: categories: Well informed (4)/ Informed (3) / A little informed (2) / Not at all informed (1).

Table 31: Factors associated with knowledge about COVID-19, (January 2022, Cox's Bazar, Bangladesh)

N= 793	Odds Ratio	95% CI	P value
Sex (ref male)			
Female	.7850994	.3601348 - 1.711529	0.543
Age (ref 18-30)			
31-45	1.000995	.7102384 - 1.410782	0.995
46-59	.7931502	.4746642 - 1.325331	0.376
60+	.8812335	.4303138 1.804666	0.730
Setting (ref urban)			
Rural	.9418882	.6401545 1.385843	0.761
Profession (ref none)			
Daily Wage Worker	1.189292	.5299706 2.668858	0.674
Housewife	1.403234	.5581834 3.527632	0.471
Business owner	1.420057	.6349793 3.175789	0.393
Private Sector	1.476708	.6376238 3.419991	0.363
Student	1.800931	.6389873 5.075772	0.266

Other	.5214452	.1663549	1.634488	0.264
Education (ref none)				
Primary	.8708884	.5739552	1.321439	0.516
Secondary	1.1374	.726892	1.77974	0.573
University	1.969585	.6218262	6.238503	0.249
Upaliza (ref chakaria)				
coxs_bazar_sadar	.8451115	.5295704	1.348666	0.480
kutubdia	.5254313	.2356146	1.171736	0.116
maheshkhali	.9218025	.5466816	1.554323	0.760
pekua	.8809938	.4747712	1.634788	0.688
ramu	.8559029	.4901614	1.494548	0.584
teknaf	.744999	.4457992	1.245008	0.261
ukhia	.9087129	.5343628	1.545315	0.724

4.4.4 Preventive measures: related knowledge and reported practice

Qualitative results

Mask wearing was the most frequent protective measure identified, with 21 KIs mentioning the practice was being used in their communities. This was followed by social distancing and handwashing, which were both cited by 19 of the KIs as common protective measures. 14 respondents mentioned that people were avoiding physical contact with others and 13 mentioned the avoidance of face-to-face social interactions. 9 KIs mentioned the use of hand sanitizer as a preventive measure being used in their communities. However, from the interviews it could be seen that the practice of these protective measures varied within the community.

Only 10 KIs believed that people were aware of COVID-19 preventive measures. 12 KIs stated that they believed following preventive measures was useful in curbing COVID-19 transmission, however, 6 mentioned that some people do not believe in the existence of COVID-19 leading to less adherence. Several respondents said that the extent to which people were following the restrictions/taking preventive measures, depended on enforcement (by army or the police). One KI mentioned that adherence to COVID-19 related restrictions has slowly decreased and that the use of preventive measures is mostly performative at this stage. He stated that in the beginning people were following the rules more closely but now people are going out more and do not take the measures seriously.

Around one third (8 of 23) of the KIs mentioned that complying with protective measures might be more challenging for people from low-income background. Additionally, almost a third said that social distancing was difficult to follow in crowded locations, such as markets. One KI described how their husband changed his shopping habits to avoid crowded areas, she stated that he no longer shops for groceries in the main bazaar but instead purchases them from roadside shops.

Majority of the interviewed KIs (16) reported that compliance with precautions decreased over time. Several KIs mentioned that people in the community "have become used to COVID-19", and therefore they were not following the precautions as much as they used to. 4 KIs mentioned that handwashing had increased since the start of the pandemic, however only 1 KI mentioned increased mask wearing.

One KI said that there has been a general reduction in adherence, most notably, social distancing has decreased with time. Another KI speculates that adherence has decreased because over time they observed that the COVID-19 situation was more serious in cities as opposed to villages. He stated that in the beginning 80% of people engaged in preventive measures but that over time that dropped to 20%. One KI stated that when the numbers increased during another wave people started following the rules again. This included social distancing, masking and washing their hands more frequently. However, they noted that as the numbers reduced so did adherence.

Another KI said that people no longer fear the novel coronavirus and are going out daily, and that this was a sharp contrast to behaviors during the first lockdown. Another stated that people can no longer follow the preventive measures because they must meet their basic needs: 'If people want food, people don't care about anything'.

Some of the respondents mentioned that since there were no confirmed cases in their community, people were not following the rules as much as before. Additionally, over a year into the pandemic, some of the communities have become used to the presence of the virus, and therefore prevalence of protective measures has decreased. One KI conceded that some people do not adhere to measures simply because they do not care, but also stated that some people cannot follow the restrictions because the must go out for work in order to live.

Relevant Quotes:

"We have nothing to do. We have to live our life, all the community people have to live as well. For this, we have to follow preventive measures like, wearing masks, maintain social distance, washing our hands etc. But it is seen that, people don't follow these measures seriously. They just tell others what to do, but don't follow themselves. At the early stage of the corona situation, people were more aware. People used to follow the rules and measures but it has slowly been decreasing. People are going out regularly and are not as aware now." -Male Imam, age 30-39, Moheshkali, rural

"My husband says it's impossible to keep a physical distance while buying necessary goods from grocery shops or markets. He doesn't enter the main Bazar/market. He buys the vegetables or fish from the roadside shops." -Female teacher, age 20-29, Teknaf, rural

"I think these measures are not difficult for me to follow. But it seems difficult for poor, unemployed and needy people. They can't afford to buy a mask box and keep changing one after another. For example, a few days ago, while I was going to the hospital for my baby's regular vaccination, I saw the mask of the rickshaw puller was very dirty. He was using it for many days. So, I suggested for him to wear a mask for 4/5 hours only. I also told him that if he couldn't afford the surgical masks daily, he could use a cotton mask first and then wear the surgical mask on it. You know what, those poor people can't buy masks regularly, and this number is high in our country." – Female teacher, age 20-29, Teknaf rural

"Some people don't want to wear masks at all because they can't wear them for a long time. Many people wash masks several times to use further, which is not healthy at all. – Male caregiver, age 20-29, rural

"Other community people are trying to implement the preventive measures of the corona. And those who don't understand the corona situation, we can make them understand these, e.g. use soap after using the toilet for 20 seconds at least, wash hands before cooking and after cooking, wear a mask on face and keep social distances from each other." -Female caregiver, age 40-49, Ukhiya, rural

"These measures are known in our community. This corona situation can be avoided if people follow these prevention measures. Many people in society follow these measures and some people do not. In fact, measures are very simple, everyone can easily follow them." -Female caregiver, age 40-49, Ukhiya, rural

"People's perceptions depend on corona's effect on the community people. If our society was affected by corona, then people would be more aware of it. Coronavirus has spread into the city areas of the country. In our village, there is no such situation. So, people are not following the measures. As a result, the present situation is getting worse. For example, earlier, people used to wash their hands more frequently, but now they have stopped doing that. There is a decrease in the number of people who follow the preventive measures. Now it can be said that 20% people of our community are following these measures, while it was 80% in the previous year." -Male retired NGO staff, age 60-69, Pekua, rural

"These preventive measures changed over time. During the first stage of the lockdown, people did not go out of their houses because of the fear of coronavirus. But recently, it is seen that they don't care about the virus. They are not maintaining social distances either. Earlier, people rarely used to go to shops, but it is normal now. In fact, they go everyday. Because they don't fear corona now. If you look around, you will see similar scenario." -Female teacher, age 20-29, Teknaf rural

Quantitative results

Tables 32 and 33 shows results related to knowledge about preventive measures by age and sex; and by upazila and setting (respectively). Most respondents were aware of some COVID-19 prevention measures (97% of respondents), with the most commonly reported methods being the wearing of face masks (90% of respondents), getting the COVID-19 vaccine (73% of respondents), social distancing (69% of respondents) and washing hands (66% of respondents). The least reported methods for COVID-19 prevention were prayer (9% of respondents), wearing gloves (16%) and disinfecting objects (26%). There was little variation across age, sex, setting and upazilas.

Tables 34 and 35 show results related to reported practice of preventive measures, by age and sex (table 34) and by upazila and setting (table 35). While most respondents did report wearing a mask always (62%) or sometimes (36%), more women than men reported always wearing a mask (72% vs 50% respectively). Additionally, more women than men reported always washing their hands after entering public areas (66% vs 48% respectively). Overall, few respondents in any category reported never engaging in preventive behaviors, though this could be due to reporting bias by the respondents. Additionally, while mask wearing, social distancing and hand washing were reported by most respondents overall, there was variability based on setting and upazila. 59% of rural respondents reported always wearing masks, compared to 76% of urban respondents. Across the upazilas there was variability as well, with the highest percentage of respondents reporting always wearing a mask in CXB Sadar (72%), and the lowest in Pekua (50%). The percentage of those reporting always social distancing was highest in Kutubdia (78%) and

lowest in Ramu (52%). Finally, the percentage of those reporting always washing hands after entering public spaces was highest in Ramu (68%) and lowest in Kutubdia (38%).

Increasing age and higher level of educations are associated with higher odds of wearing a mask (table 36). Increasing levels of education and of COVID-19 related knowledge, as well as female sex, were associated with higher odds of practicing physical distancing (table 37) and hand washing (table 38).

Table 32: Knowledge about COVID-19 preventive measures by sex and age (January 2022, Cox's Bazar, Bangladesh)

			Respondent sex		Respondent age			
	Responses	Total	Female	Male	18-30	31-45	46-59	60+
Do you know about preventive measures you can take to reduce the chance of getting COVID-19?	Yes	97%	98%	97%	97%	98%	96%	100%
	No	2%	1%	3%	3%	2%	3%	--
	Don't want to respond/ Don't remember	0%	0%	0%	0%	0%	1%	--
How could you reduce the chance of getting COVID-19?	Wearing a face mask	90%	90%	90%	92%	90%	85%	93%
	Getting the COVID-19 vaccine	73%	70%	75%	71%	74%	74%	72%
	Keep social distance of 1m	69%	78%	59%	74%	64%	68%	70%
	Washing hands	66%	74%	56%	64%	67%	66%	66%
	Avoid physical contact with other people	47%	44%	50%	48%	47%	44%	50%
	Avoid mass gatherings	41%	38%	45%	42%	44%	36%	27%
	Reduce frequency and duration of contact with other people	30%	33%	26%	26%	31%	36%	28%
	Disinfecting and cleaning objects	26%	34%	17%	25%	28%	25%	21%
	Wearing gloves	16%	23%	8%	20%	16%	10%	11%
	Praying	9%	10%	7%	7%	9%	13%	6%
	Other	0%	0%	0%	0%	0%	0%	0%
	Do not want to respond/don't remember	0%	0%	0%	0%	0%	0%	0%

Table 33: Knowledge about COVID-19 preventive measures by setting and upazila, (January 2022, Cox's Bazar, Bangladesh)

		Setting		Upazila							
	Total	Rural	Urban	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia
Do you know about Preventive measures you can take to reduce the chance of getting COVID-19?											
Yes	97%	97%	99%	99%	97%	92%	98%	100%	94%	98%	98%
No	2%	2%	1%	1%	3%	5%	2%	--	6%	--	1%
Don't want to respond/Don't remember	0%	1%	--	--	--	3%	--	--	--	2%	1%
How could you reduce the chance of getting COVID-19?											
Wearing a face mask	90%	91%	86%	87%	91%	82%	90%	90%	93%	88%	97%
COVID-19 vaccine	73%	73%	70%	79%	72%	71%	79%	52%	72%	72%	70%

Keep physical distance of 1m	69%	69%	68%	70%	77%	56%	72%	61%	76%	55%	69%
Washing hands	66%	67%	60%	60%	69%	53%	68%	59%	68%	69%	76%
Avoid physical contact with other people	47%	46%	51%	52%	44%	59%	37%	38%	61%	46%	42%
Avoid mass gatherings	41%	41%	41%	48%	36%	38%	46%	38%	54%	30%	31%
Reduce frequency and duration of contacts	30%	28%	37%	33%	26%	24%	28%	20%	48%	21%	31%
Disinfecting and cleaning objects	26%	26%	27%	27%	17%	18%	22%	26%	34%	35%	30%
Wearing gloves	16%	16%	17%	18%	18%	9%	14%	3%	20%	19%	22%
Praying	9%	10%	5%	9%	7%	12%	10%	5%	11%	8%	9%
Other	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Do not want to respond/don't remember	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table 34: Reported practice of preventive measures by age and sex, (January 2022, Cox's Bazar, Bangladesh)

			Respondent sex		Respondent age			
	Responses	Total	Female	Male	18-30	31-45	46-59	60+
Do you wear a mask covering your mouth and nose when you go out in public, i.e., inside public buildings, or in shops or markets, or in crowded outdoor locations?	Yes - always	62%	72%	50%	67%	59%	58%	58%
	Yes - sometimes	36%	25%	47%	29%	39%	40%	40%
	No - never	3%	2%	3%	4%	2%	2%	2%
Do you try to maintain a physical distance from other people when in public, i.e., trying to keep 1 meter apart in shops or markets, or in crowded spaces?	Yes - always	59%	56%	64%	59%	62%	55%	54%
	Yes - sometimes	32%	38%	25%	33%	30%	33%	34%
	No - never	9%	7%	11%	8%	8%	12%	2%
	Do not want to respond	0%	--	0%	--	0%	--	--
Do you wash your hands with soap and water for at least 20 seconds after you have been in crowded public areas?	Yes - always	58%	66%	48%	61%	55%	60%	52%
	Yes - sometimes	37%	29%	44%	33%	40%	32%	44%
	No - never	6%	4%	8%	6%	5%	8%	4%

Table 35: Reported practice of preventive measures by setting and upazila, (January 2022, Cox's Bazar, Bangladesh)

			Setting		Upazila							
	Responses	Total	Rural	Urban	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia
Do you wear a mask covering your mouth and nose when you go out in public, i.e., inside public buildings, or in shops or markets, or in crowded outdoor locations?	Yes - Always	62%	59%	76%	63%	72%	62%	57%	50%	68%	50%	61%
	Yes - Sometimes	36%	38%	24%	34%	27%	35%	40%	50%	29%	46%	36%
	No - Never	3%	3%	1%	4%	1%	3%	3%	--	3%	4%	3%
Do you try to maintain a physical distance from other people when in public, i.e., trying to keep 1 meter apart in shops or markets, or in other crowded spaces?	Yes - Always	59%	60%	57%	60%	54%	78%	58%	68%	52%	58%	64%
	Yes - sometimes	32%	31%	38%	31%	41%	16%	28%	26%	43%	27%	31%
	No - never	9%	10%	5%	10%	6%	3%	14%	6%	6%	15%	5%
	Do not want to respond	0%	0%	--	--	--	3%	--	--	--	--	--
Do you wash your hands with soap and water for at least 20 seconds after you have been in crowded public areas?	Yes - always	58%	57%	62%	58%	67%	38%	53%	48%	68%	51%	60%
	Yes - sometimes	37%	37%	36%	37%	31%	57%	38%	42%	26%	42%	33%
	No - never	6%	7%	2%	4%	2%	5%	9%	10%	6%	7%	7%

Table 36: Factors associated with wearing a mask, (January 2022, Cox's Bazar, Bangladesh)

	1= always + sometimes wearing a mask 0= never wearing a mask N=719			1= always wearing a mask 0 = never wearing a mask N = 400		
	Odds Ratio	95% CI	P value	Odds Ratio	95% CI	P value
Sex (ref male)						
Female	1.168413	.4813192 - 2.836347	0.731	2.014359	.7999193 - 5.072567	0.137
Age (ref 18-30)						
31-45	**3.662302**	**1.288035 - 10.41311**	**0.015***	**3.620446**	**1.228561 - 10.66909**	**0.020***
46-59	3.5213	.82651 - 15.0023	0.089	3.375252	.7796584 - 14.61195	0.104
60+	3.76006	.4332566 - 32.63206	0.230	5.013209	0.5393121 - 46.6006	0.156
Setting (ref urban)						
Rural	.2642989	.0336341 - 2.076879	0.206	0.2233215	0.0284376 - 1.753751	0.154
Education (ref none)						
Primary	2.131343	.7378851 - 6.156272	0.162	2.551115	.8701063 - 7.479762	0.088
Secondary	**6.33104**	**1.617059 - 24.78702**	**0.008***	**9.038771**	**2.274277 - 35.92324**	**0.002***
University	-					
Upaliza (ref chakaria)						
coxs_bazar_sadar	6.676822	.7644473 - 58.31657	0.086	7.515959	.8338254 - 67.74757	0.072
kutubdia	1.89174	.2112779 - 16.93825	0.569	1.728247	.186071 - 16.05214	0.630
maheshkhali	1.550826	.3660161 - 6.570918	0.551	1.68316	.3770085 - 7.514494	0.495
pekua	-			-		
ramu	1.491536	.3490089 - 6.374282	0.590	1.911263	.4274587 - 8.545681	0.397
teknaf	1.430769	.3961609 - 5.167341	0.585	1.039801	.2782119 - 3.886194	0.954
ukhia	1.479434	.3399549 - 6.438284	0.602	1.83582	.3980321 - 8.467249	0.436

Table 37: Factors associated with practicing physical distancing, (January 2022, Cox's Bazar, Bangladesh)

	1= always + sometimes 0= never N=752			1= always 0 = never N = 300		
	Odds Ratio	95% CI	P value	Odds Ratio	95% CI	P value
Sex (ref male)						
Female	1.634315	.439816 - 6.07296	0.463	**2.751977**	**1.455256 - 5.204155**	**0.002***
Age (ref 18-30)						
31-45	1.295242	.686231 - 2.44473	0.425	1.365814	.672895 - 2.772274	0.388
46-59	1.19774	.493997 - 2.90403	0.690	1.426247	.5306491 - 3.833379	0.482
60+	1.012022	.317644 - 3.22433	0.984	1.221995	.3455222 - 4.321782	0.756
Setting (ref urban)						
Rural	.608253	.281610 - 1.5507	0.341	.6698074	.2592562 - 1.730497	0.408
Profession (ref none)						
Daily Wage Worker	1.353204	.44906 - 4.07779	0.591			
Housewife	1.850412	.441146 - 7.76165	0.400			
Business owner	2.011484	.616792 - 6.55986	0.247			
Private Sector	3.688068	.933649 - 14.5685	0.063			
Student	1.85514	.293738 - 11.7164	0.511			
Other	1.727406	.2917 - 10.2309	0.547			
Education (ref none)						
Primary	1.72777	.89125 - 3.34944	0.105	**2.394413**	**1.0837 - 5.290405**	**0.031***
Secondary	2.014689	.937081 - 4.33151	0.073	**3.721351**	**1.553824 - 8.912496**	**0.003***
University	-					
Upaliza (ref chakaria)						
coxs_bazar_sadar	2.124102	.829596 - 5.43856	0.116	3.568893	1.220807 - 10.43325	0.020
kutubdia	5.340308	.664693 - 42.9054	0.115	3.128008	.2911196 - 33.60966	0.347
maheshkhali	.7844234	.343937 - 1.789	0.564	.9751935	.3647076 - 2.607574	0.960
pekua	1.616533	.49256 - 5.3053	0.428	1.663393	.4304191 - 6.428334	0.461
ramu	2.448291	.81228 - 7.37941	0.112	3.697997	1.100685 - 12.42425	0.034
teknaf	.9003689	.406861 - 1.99248	0.796	.8338356	.3292676 - 2.111601	0.701
ukhia	2.498734	.842785 - 7.40838	0.099	3.234881	.9239607 - 11.32565	0.066
Knowledge of Covid-19 (ref Not Informed)						
Partially Informed	2.318681	.730665 - 7.35807	0.153	2.051322	.4886192 - 8.611866	0.326
Informed	**8**	**2.2417 - 28.5498**	**0.001***	**6.332208**	**1.321346 - 30.34546**	**0.021***
Well Informed						

Table 38: Factors associated with hand washing, (January 2022, Cox's Bazar, Bangladesh)

	1= always + sometimes hand washing 0= never hand washing N=753			1= always hand washing 0 = never hand washing N = 400		
	Odds Ratio	95% CI	P value	Odds Ratio	95% CI	P value
Sex (ref male)						
Female	**1.992018**	**1.02278 - 3.879755**	**0.043***	**2.605422**	**1.30135 - 5.216293**	**0.007***
Age (ref 18-30)						
31-45	1.369128	.6479355 - 2.893054	0.410	1.319454	.5986913 - 2.907939	0.492
46-59	1.098278	.4113829 - 2.932097	0.852	1.034139	.38003 - 2.814104	0.948
60+	2.596199	.5086564 - 13.25108	0.251	2.919151	.5034103 - 16.92743	0.232
Setting (ref urban)						
Rural	.4520115	.1324857 - 1.542161	0.205	.4385513	.1231575 - 1.561636	0.203
Education (ref none)						
Primary	1.208403	.5471245 - 2.668932	0.640	1.477543	.646663 - 3.375998	0.354
Secondary	2.448724	.9431852 - 6.357445	0.066	**4.060894**	**1.488707 - 11.0773**	**0.006***
University	--	--	--	--	--	--
Upaliza (ref chakaria)						
coxs_bazar_sadar	3.165134	.6250986 - 16.02639	0.164	3.68429	.6871293 - 19.75465	0.128
kutubdia	1.083546	.2083657 - 5.634665	0.924	.6663286	.112116 - 3.960129	0.655
maheshkhali	.6201303	.2028255 - 1.896022	0.402	.5130856	.1558581 - 1.68908	0.272
pekua	.3951543	.1216588 - 1.283482	0.122	**.2308571**	**.0632334 - .84283**	**0.027**
ramu	1.011592	.29402 - 3.480438	0.985	1.172748	.3183123 - 4.320719	0.811
teknaf	.8842229	.2960286 - 2.64113	0.826	.6726453	.2129977 - 2.124209	0.499
ukhia	.5934017	.1931838 - 1.822749	0.362	.6291507	.1933475 - 2.047249	0.441
Knowledge of Covid-19 (ref Not Informed)						
Partially Informed	3.030903	.7531042 - 12.19801	0.119	--	--	--
Informed	**14.12225**	**2.793464 -71.39447**	**0.001***	--	--	--
Well Informed						

4.4.5 Vaccination

Qualitative results: Willingness and Attitude Towards Vaccination

There were varying degrees of trust and confidence in vaccination across respondents. Eight KIs expressed trust in the vaccines. 11 KIs reported that there is a lack of trust in the vaccines, likely linked to lack of understanding / lack of information on the effectiveness of the vaccines, as well as possible side effects and suitability of the vaccines for people with certain health issues or age groups. Some KIs stated that there was initial distrust, but with time and information, the level of trust has increased. One participant stated there needed to be more efforts by the government to educating people on risks and complications that may arise from taking the vaccine.

Six KIs noted that access to vaccinations remained limited as of the time of the interviews; some of them cited preference of certain groups, which according to them included people of higher socioeconomic status. One KI, who is considered high risk because of an underlying medical condition, stated that she tried in-person and online to get registered for the vaccine. The difficulties she faced led her to believe that they do not care about the people with less prestigious positions.

Four KIs expressed their lack of trust in the effectiveness of the vaccine. One respondent said that since the countries that manufactured the vaccine could not control the pandemic, there was a reason to doubt the vaccine effectiveness. One participant stated that some people do not trust the vaccine as it is coming from India, there was a rumor that the Indian vaccine was made with cow urine and so people are skeptical. Two others described hesitancy on vaccinating based on questions of the effectiveness. One participant described gaining confidence in the vaccine after speaking with others who had taken the vaccine and did not experience side effects.

Relevant Quotes:

"*Before taking the vaccine they had fear, but they do not have fear of it now. In the first week of vaccination program, people told that they will not take the vaccine because they thought it will increase allergy in the human body - they will suffer by fever and die. But what people came to know the real information, they become interested to get this vaccine and think I am not in danger now." -Female caregiver, age 40-49, Pekua, rural*

"Previously, some doses were sent by India. But our people did not fully trust India. Because there was a rumor that those vaccines were produced using the urine of the cow as there was news that Indian people were trying to eradicate the corona by taking cow urine." – Male retired NGO staff, age 60-69, Pekua, rural

We discussed with the people who received the vaccines. We wanted to know some information about the side effects of the vaccine. They replied, "we didn't feel any discomfort or face any problem after being vaccinated, rather we are feeling better now". After hearing this, I am confident that if the vaccine is available the next time, I will receive the vaccine." -Male pensioner, age 60-69, Ukhiya, rural

"Today I went to the Sadar hospital to know about the vaccination. I expressed my interest to get the vaccine to the hospital's authority. I told them that I am a diabetic and high-blood pressure patient, I would like to take the vaccine. They did not hear me. They suggested I apply online; they were not totally supportive. They do not care about the general people. Medical college students, pharmacists, and bankers are getting the priorities there." -Female student, age 20-29, CXB Sadar, urban

"It will be better if people get this information from the government as text messages, publicity or posters. Suppose these posters can be hung at mosques or other religious centers. In that case, people will know about vaccine and be able to decide. In the poster, there may be information like, "people who have the following complications will not receive vaccine". Also, this awareness information can be telecast on television. I also want to know about the advantages and disadvantages of the vaccine." -Female teacher, age 20-29, Pekua, rural

"I don't fully believe in this vaccine; It's 50/50. I don't know about others' opinions. I can't tell you in detail about this topic. Different people have different opinions on this vaccine. I heard that people get sick after receiving this. People are in fear of the vaccine as well. There are rumors against the vaccine." -Male teacher, age 20-29, Pekua, rural

Quantitative results

Most respondents responded positively towards getting the COVID-19 vaccine, with 99% of respondents overall reporting their willingness to get vaccinated given the opportunity. Most commonly cited reasons for not getting the vaccine included fear of side effects (68% of respondents) and problems with vaccine given current health status including pregnancy (39% respondents). There was little variability in the willingness to get vaccinated across age, sex, setting and upazila. Given little variability in outcomes, no factors were found to be statistically significant associated with willingness to be vaccinated (table 41).

Table 39: Vaccination attitude by sez and age, (January 2022, Cox's Bazar, Bangladesh)

			Respondent sex		Respondent age			
	Responses	Total	Female	Male	18-30	31-45	46-59	60+
If offered the vaccination against COVID-19, would you be willing to get vaccinated?	Yes - definitely	99%	98%	99%	98%	99%	98%	98%
	Not decided yet – have doubts	1%	2%	1%	2%	1%	2%	2%
What would be the MAIN reasons you would be concerned or unwilling to get vaccinated	Fear of side effects	68%	61%	100%	59%	100%	50%	100%
	Cannot take vaccine due to my health status / pregnant or lactating	39%	47%	0%	54%	0%	50%	0%
	Doubt the quality of vaccines	23%	19%	39%	24%	0%	50%	0%
	Vaccine is not effective	15%	10%	39%	12%	0%	50%	0%
	Vaccine can cause other diseases and conditions (e.g. infertility)	--	--	--	--	--	--	--
	Other	--	--	--	--	--	--	--
	Vaccine is not appropriate for his/her age	--	--	--	--	--	--	--
	Respondent thinks vaccine can cause COVID-19	--	--	--	--	--	--	--

Table 40: Vaccination attitude by setting and upazila, (January 2022, Cox's Bazar, Bangladesh)

			Setting		Upazila							
		Total	Rural	Urban	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia
If offered the vaccine against COVID-19, would you be willing to get vaccinated?	Yes - definitely	99%	99%	98%	99%	97%	100%	99%	98%	99%	97%	98%
	Not decided yet/have doubts	1%	1%	2%	1%	3%	--	1%	2%	1%	3%	2%
What would be the MAIN reasons you would be concerned or unwilling to get vaccinated	Fear of side effects	68%	66%	74%	0%	67%	--	100%	100%	100%	67%	50%
	Cannot take vaccine due to my health status / pregnant or lactating	39%	44%	26%	100%	33%	--	0%	0%	0%	67%	50%
	Doubt the quality of vaccines	23%	30%	0%	0%	33%	--	0%	0%	0%	33%	50%
	Vaccine is not effective	15%	20%	0%	0%	33%	--	0%	0%	0%	0%	50%
	Vaccine can cause other diseases and conditions (e.g. infertility)	---	---	--	--	--	---	--	--	--	--	--
	Other	--	--	--	--	--	--	--	--	--	--	--
	Vaccine is not appropriate for his/ her age	--	--	--	---	--	--	---	--	--	--	--

	Vaccine can cause COVID-19	--	--	--	--	--	--	--	--	--	--	--

Table 41: Factors associated with willingness to be vaccinated, (January 2022, Cox's Bazar, Bangladesh)

	1= willing to be vaccinated 0=no / not sure N=660		
	Odds Ratio	95% CI	P value
Sex (ref male)			
Female	.3963632	.1011165 - 1.553691	0.184
Age (ref 18-30)			
31-45	4.153719	.8289606 - 20.81327	0.083
46-59	1.094431	.191312 - 6.260872	0.919
60+	1.127876	.110939 - 11.46671	0.919
Setting (ref urban)			
Rural	1.350007	.3222733 - 5.655196	0.681
Education (ref none)			
Primary	.8041469	.1802678 - 3.587176	0.775
Secondary	1.78165	.3014565 - 10.5298	0.524
University	--	--	--
Upaliza (ref chakaria)			
coxs_bazar_sadar	.3025645	.0316955 - 2.888272	0.299
kutubdia	--	--	--
maheshkhali	.6348235	.0382348 - 10.54016	0.751
pekua	--	--	--
ramu	.8033167	.0469709 - 13.73867	0.880
teknaf	.2841626	.0272944 - 2.958427	0.293
ukhia	.389544	.0332163 - 4.568375	0.453
Knowledge of COVID-19 (ref Not Informed)			
Partially Informed	2.560323	.2584105 - 25.3676	0.422
Informed	4.123747	.3492976 - 48.68426	0.261
Well Informed	--	--	--

4.4.6 Information sources

Qualitative results

21 of the 23 respondents said that they were getting information about the pandemic by watching the news on TV. However, it is unclear whether this would apply to all the members of the communities, as the poorest parts of the community likely have restricted access to technological sources, including TVs, mobile phones and radios. Some of the KIs identified unequal access to information leading to differing level of awareness among community members.

Seven KI reported that social media, including Facebook, YouTube and WhatsApp, are widely used as sources for information. Eight KIs report that people get much of their information through their mobile phones. Seven KIs reported word of mouth as a source of news and information. Thirty percent of respondents mentioned NGO / government coordinated campaigns as a source of information. One KI, who is a teacher, mentioned that she and her colleagues conducted awareness campaigns with students

and their caregivers. 5 KIs mentioned that public announcements aimed at spreading awareness were made near their homes. At the same time, it was not possible to evaluate the frequency of this outreach, nor its effectiveness or ability to reach all parts of the population.

15 of 23 respondents mentioned that they trusted the news they were getting, and some said they were somewhat trusting the sources. One KI specifically mentioned that she was not sure if the statistics provided by the media were accurate. One KI cited religious beliefs as leading some people to doubt the existence of COVID-19. Two KIs mentions that there is greater awareness among people who are considered to be well-educated, with people who have received less education being less likely to trust and/or understand the information.

Most of the respondents thought that they had all the information that they might need about COVID-19, but it was difficult for the respondents to say what information gaps might exist in the community at large.

Among the topics that were mentioned as insufficient / requiring more details, 2 KIs mentioned that they wanted to know more about the vaccination (availability of the vaccines as well as their effectiveness). One KI said that the statistics of daily cases and deaths did not feel very reliable to her, and another cited insufficient knowledge regarding less common symptoms.

Relevant Quotes:

"*The first is Television, then after these social media where people get more or less information on coronavirus. People also get awareness information from the imams of the mosque, also from senior citizens of the society*." *-Male caregiver, age 20-29, Ukhiya, rural*

"*NGOs are arranging different awareness programs to inform the villagers. So, people are getting information from there. Apart from this, almost all the families have access to television, radio, social media etc. Besides, people also get information and news from others." -Female teacher, age 20-29, Teknaf, rural*

"Some people believe this news, and some don't. Educated people trust this news, but those who are uneducated and don't understand the situation, don't trust the information." *-Female student, age 20-29, CXB Sadar, urban*

Quantitative results

The most commonly cited source of information overall was social media messaging apps (35% of respondents preferred), though this differed between age categories significantly. 43% of those in the 18–30-year category preferred social messaging apps, making it the most popular method in the age category. Meanwhile, in the other age categories, radio/television were the preferred information source. This remains consistent with reports of the most trusted information sources, where all age categories trusted radio/television sources significantly more than social messaging apps (table 42).

Variability was also seen by upazila (table 43). Respondents from upazilas Kutubdia, Pekua, Ramu, and Teknaf reported social media messaging apps as the most commonly used sources of information, whereas all other upazilas (Chakaria, CXB Sadar, Maheshkhali, and Ukhia) each reported radio and television as most used. Additionally, while most upazilas reported radio/television as the most trusted information source, Kutubdia respondents trusted social/media messaging apps more (38% respondents trusting social messaging apps compared to 30% trusting radio/television). Across all categories, the least used sources of information reported were newspapers, health workers, health workers via door-to-door campaigns, and community/ religious leaders (with each response reported by less than 1% of respondents).

Table 42: Sources of information by sex and age, (January 2022, Cox's Bazar, Bangladesh

			Respondent sex		Respondent age			
	Responses	**Total**	**Female**	**Male**	**18-30**	**31-45**	**46-59**	**60+**
Where / from whom do you currently get information?	Social media messaging apps	35%	35%	35%	43%	33%	25%	25%
	Radio/Television	33%	32%	32%	30%	34%	38%	39%
	From people	29%	30%	30%	25%	30%	36%	28%
	Newspapers/news websites	1%	0%	0%	0%	1%	1%	6%
	Health worker	1%	1%	1%	1%	1%	1%	2%
	Health worker via door-to-door campaign	1%	1%	1%	1%	1%	--	--
	Community/religious leader	0%	0%	0%	--	0%	--	--
Which source/ channel do you trust the most?	Radio/Television	47%	46%	48%	46%	45%	49%	58%
	Social media messaging apps	20%	21%	18%	27%	19%	10%	6%
	From People	19%	22%	15%	17%	19%	25%	18%
	Public Announcements	10%	7%	14%	7%	13%	12%	13%
	Health worker at health facility	2%	1%	2%	1%	1%	2%	2%
	Newspapers/News websites	1%	0%	1%	1%	--	2%	2%
	Health worker via door-to-door campaign	1%	1%	0%	0%	1%	--	--
	Other	0%	1%	--	--	1%	1%	--
	Do not want to respond/ don't remember	0%	1%	--	1%	0%	--	--
	Community/Religious Leader	0%	0%	0%	--	1%	--	--

Table 43: Sources of information by setting and upazila, (January 2022, Cox's Bazar, Bangladesh)

			Setting		Upazila							
	Responses	Total	Rural	Urban	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia
Where / from whom do you currently get information?	Social media messaging apps	35%	35%	38%	33%	35%	38%	32%	54%	32%	36%	31%
	Radio/Television	33%	31%	43%	36%	39%	24%	38%	25%	30%	25%	36%
	From people	29%	31%	19%	29%	24%	38%	27%	18%	34%	37%	30%
	Newspapers/ news websites	1%	1%	--	--	1%	--	3%	--	1%	1%	2%
	Health worker	1%	1%	--	1%	1%	--	--	3%	1%	1%	--
	Health worker via door-to-door campaign	1%	1%	--	1%	1%	--	--	--	1%	--	2%
	Community/ Religious leader	0%	0%	--	--	--	--	1%	--	--	--	--
Which source/ channel do you most trust to give you reliable information?	Radio/Television	47%	46%	49%	53%	51%	30%	50%	41%	43%	45%	42%
	Social media messaging apps	20%	19%	23%	13%	18%	38%	21%	31%	14%	19%	23%
	From people	19%	20%	14%	15%	15%	22%	17%	16%	30%	25%	18%
	Public announcements	10%	11%	8%	13%	11%	8%	11%	3%	10%	8%	13%
	Health worker at health facility	2%	2%	1%	4%	1%	--	--	7%	1%	--	--
	Newspapers/ news websites	1%	0%	2%	--	1%	3%	--	--	2%	--	1%
	Health worker via door-to-door campaign	1%	1%	--	1%	1%	--	--	--	--	--	2%
	Other	0%	0%	1%	--	1%	--	--	--	--	3%	--
	Do not want to respond/don't remember	0%	0%	1%	1%	1%	--	1%	--	--	--	--
	Community/ Religious leader	0%	0%	1%	--	1%	--	--	2%	--	--	--

4.4.7 Health care seeking behavior

Qualitative Results

Fifteen respondents reported that governmental clinics or hospitals were accessible from their area of residence. Five reported NGO clinics as the place to seek treatment, while 9 mentioned private health care providers. 3 KIs mentioned that they prefer private providers because of fears related to contracting COVID-19. Some of the KIs stated that they do not access health services from the same health center, rather they look for specialists in different locations as specialists provide best quality treatment. Overall, only 8 of 23 KIs classified accessing health care centers as 'easy'. The vast majority of respondents (20 out of 23) report that they have trust in health care providers.

Six of the KIs reported that safety measures (social distancing, mask wearing and handwashing) were introduced in the health centers where the community accesses health services. Seven participants stated

they only seek medical treatment when self-treatment is ineffective. One respondent said that previously people would try to take medicines by themselves, however since the start of pandemic they preferred going to the health center for medical assistance.

Among the factors that the KIs cited when choosing the health provider were the cost of treatment, but also quality of services and in some cases, attitude towards patient. A few of the KIs noted that they sometimes might need to change several health specialists before they find the one that provides the most effective treatment, which likely results in additional expenses for their household and might be delaying treatment.

11 KIs mentioned throughout their interviews that people from their area would be trying to go to the clinic if they have symptoms of COVID-19, which seems to also involve light infection cases that do not require medical assistance. However, 2 participants mentioned access issues related to poor roads systems and living too far from treatment facilities to seek proper care.

4 KIs reported that people from their area would be accessing services of "quack doctors"[1], or unlicensed village doctors. 4 people stated that poor people struggle to access health care, with 3 mentioning the need to take loans to cover health care costs.

Relevant Quotes

"*Because the community clinic is near to us, we first go there for any type of health-related issues and take health service. If we are not recovered from any sickness, then we take further steps. Based on the degree of sickness we decide what we will do." -Female housewife, age 20-29, Kutubdia, rural*

"When we become sick, we generally seek medical care from the Upazila Health Complex. If the patient's condition worsens, we take him to CXB or Chittagong City." -Male landlord, age 40-49, Chakaria, rural

"I decide myself. As I am poor, I always try to go where I can afford the expenses. I first try to recover by spending less money. If I am not cured, then I go to those doctors where I have to pay fees. We are living in a hilly area, and we need some time to reach there (health service providers). There is a pharmacy a few minutes from my house, I generally go there. A quack doctor practice there, I contact him first. Most of the time we get well by taking those medicines. But sometimes if not cured, we see the senior doctors by paying consultation fees." -(KI ID111)

"We usually seek care from different health service providers. If people think a health care provider is not good or can't cure diseases, they go to another health care provider. Doctors usually suggest to the patient where the patient should go." -(KI ID114)

"The road communication system is poor in our village. For this reason, we usually try to seek medical care from the available clinics here." -(KI ID115)

[1] People who in most cases do not have relevant education yet are providing health services for a lower price than private specialists and are therefore popular among people with low incomes

Quantitative Results

General access to health care

In terms of the types of health service providers most accessible, respondents most frequently reported pharmacies (74%), governmental hospitals (41%), unlicensed doctors (27%), and private licensed doctors (18%) as most physically accessible by their household. There was little variable across age groups and sex of the respondent (table 44). Respondents in urban areas were more likely to report access to hospitals (65% of urban respondents as compared to 35% of rural respondents); while respondents in rural areas rely more often on "quack" doctors (30% of rural respondents compared to 9% of urban respondents) (table 45). When asked about reasons the respondent would choose a type of provider, the most common factors were proximity (66% of respondents), affordability (42% of respondents), trust of quality services (34% of respondents), and specialized treatment options (33% of respondents). Particularly among people in the older age group, proximity seems to be a key factor in the provider selection (78%). Some variation can be seen across upazila, with fewer respondents from Pekua (48%) reporting proximity as the main reason to choose a provider compared to 84% in Kutubdia. Trust, on the contrary, was mentioned by only 16% in Kutubdia and by 52% in Pekua (table 45).

Table 44: Availability of health care providers and respondents' preferences by age and sex, (January 2022, Cox's Bazar, Bangladesh)

			Respondent age				Respondent sex	
Question	Responses	All	18-30	31-45	46-59	60+	Female	Male
In general, what types of health facilities are physically accessible to you and your household, in the event of a health concern or illness?	Pharmacy	74%	74%	74%	76%	68%	74%	74%
	Hospital (governmental)	41%	41%	39%	45%	43%	41%	40%
	Quack doctor (unlicensed)	27%	29%	24%	32%	19%	28%	25%
	Private doctor (licensed)	18%	16%	22%	8%	30%	19%	17%
	Private hospital	9%	10%	8%	9%	2%	7%	10%
	Community clinic (governmental)	7%	8%	5%	10%	10%	5%	10%
	Private clinic	7%	8%	7%	4%	6%	4%	10%
	Traditional healer	0%	1%	0%	0%	0%	0%	0%
	Other	0%	0%	0%	0%	0%	0%	0%
	none	0%	0%	0%	0%	0%	0%	0%
What would be the MAIN reasons for you to choose this particular health provider?	Provider was the closest	66%	65%	69%	56%	78%	62%	71%
	Provider was affordable	42%	38%	40%	55%	46%	41%	43%
	Provider is trusted	34%	36%	32%	30%	34%	34%	33%
	Specialized treatment was required	33%	34%	33%	33%	25%	39%	27%
	Provider ensures appropriate sanitary conditions	15%	19%	15%	11%	8%	19%	12%
	Only provider available	4%	4%	4%	8%	5%	5%	4%
	Provider was recommended	4%	6%	4%	3%	5%	4%	5%
	Provider's gender was a factor	1%	0%	1%	1%	0%	0%	1%
	Other	0%	0%	0%	1%	0%	1%	0%

Table 45: Availability of health care providers and respondents' preferences by setting and upazilla, (January 2022, Cox's Bazar, Bangladesh)

			Setting		Upazila							
Questions	**Responses**	**All**	**Rur**	**Urb**	**Chakaria**	**CXB Sadar**	**Kutubdia**	**Maheshkhali**	**Pekua**	**Ramu**	**Teknaf**	**Ukhia**
In general, what types of health facilities are physically accessible to you and your household, in the event of a health concern or illness?	Pharmacy	74%	76%	66%	80%	69%	71%	74%	68%	72%	80%	72%
	Hospital (governmental)	41%	35%	65%	39%	51%	21%	29%	66%	47%	34%	32%
	Quack doctor (unlicensed)	27%	30%	9%	31%	21%	14%	32%	17%	23%	36%	26%
	Private doctor (licensed)	18%	19%	15%	19%	13%	14%	18%	20%	30%	22%	13%
	Private hospital	9%	8%	12%	10%	12%	4%	8%	0%	4%	9%	19%
	Community clinic (governmental)	7%	7%	8%	11%	5%	14%	2%	15%	11%	2%	2%
	Private clinic	7%	6%	9%	4%	6%	7%	5%	2%	11%	13%	13%
	Traditional healer	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
	Other	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	none	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
What would be the MAIN reasons for you to choose this particular health provider**?**	Provider was the closest	66%	67%	65%	73%	63%	84%	68%	48%	66%	63%	62%
	Provider was affordable	42%	42%	42%	42%	42%	51%	41%	42%	51%	42%	27%
	Provider is trusted	34%	31%	43%	28%	34%	16%	32%	52%	38%	33%	39%
	Specialized treatment was required	33%	34%	29%	37%	25%	35%	31%	31%	34%	38%	35%
	Provider ensures appropriate sanitary conditions	15%	15%	14%	15%	12%	8%	22%	11%	15%	17%	17%
	Only provider available	4%	5%	3%	5%	3%	0%	2%	8%	10%	3%	3%
	This provider was recommended	4%	4%	6%	5%	5%	0%	4%	0%	2%	6%	11%
	Provider's gender was a factor	1%	1%	1%	1%	1%	3%	1%	0%	0%	0%	0%
	Other	0%	0%	1%	0%	1%	0%	0%	2%	0%	0%	0%

Access to health service for specific chronic or preventive health needs

19% of respondents reported a household member with a chronic illness. Of those respondents, 85% said that the household members were able to access care (table 46). This availability of care varied by upazila, with 100% of respondents in Kutubdia and Maheshkhali reporting access to care for chronic illness as opposed to 70% of respondents in Ramu (table 47).

When asked about childhood routine vaccinations, 76% said they did bring their children to be vaccinated during COVID-19 and 23% did not (table 48). This was relatively consistent across demographic categories, with the exception of the Kutubdia upazila respondents, of which 56% did access vaccinations and 44% did not. Those who responded no were then asked what the main factors were which influenced their decision. 7% of respondents said vaccinations were not available and 5% said they were not necessary in

the time frame of question. The majority of respondents reported “other” factors as the reasons for not accessing childhood vaccinations, with 74% of respondents choosing this option (tables 48 and 49).

Table 46: Prevalence of household members with chronic diseases and access to care by sex and age of the respondent, (January 2022, Cox’s Bazar, Bangladesh

			Respondent age				Respondent sex	
Questions	**Responses**	**All**	**18-30**	**31-45**	**46-59**	**60+**	**Female**	**Male**
Within your household, are there people who have chronic illnesses ?	No	81%	83%	82%	79%	71%	80%	83%
	Yes	19%	17%	18%	21%	29%	20%	17%
(If yes) Were they able to access treatment for their chronic condition/s?	Yes	85%	92%	80%	76%	94%	82%	89%
	No	15%	8%	20%	24%	6%	18%	11%

Table 47: Prevalence of household members with chronic diseases and access to care by setting and upazila, (January 2022, Cox’s Bazar, Bangladesh)

			Setting		Upazila							
Questions	**Responses**	**All**	**Rural**	**Urban**	**Chakaria**	**CXB Sadar**	**Kutubdia**	**Maheshkhali**	**Pekua**	**Ramu**	**Teknaf**	**Ukhia**
Within your household, are there people who have chronic illnesses?	No	81%	80%	87%	85%	79%	86%	88%	81%	77%	76%	74%
	Yes	19%	20%	13%	15%	21%	14%	12%	19%	23%	24%	26%
(If yes) Were they able to access treatment for their chronic condition/s?	Yes	85%	85%	80%	92%	81%	100%	100%	83%	70%	85%	80%
	No	15%	15%	20%	8%	19%	---	---	17%	30%	15%	20%

Table 48: Access to routine vaccination, by sex and age of the respondent, (January 2022, Cox’s Bazar, Bangladesh)

			Respondent age				Respondent sex	
Questions	**Responses**	**All**	**18-30**	**31-45**	**46-59**	**60+**	**Female**	**Male**
Did you bring your child to routine vaccination since the beginning of the COVID-19 pandemic in March 2020?	Yes	76%	82%	72%	75%	63%	73%	78%
	No	23%	18%	27%	22%	37%	26%	20%
	Do not want to respond/Don't remember	1%	1%	1%	4%	---	1%	2%
You just said that you did not bring your child to routine immunization since the start of pandemic, can you indicate the MAIN reason?	Other	74%	75%	76%	57%	82%	75%	74%
	Vaccinations not available	7%	14%	6%	---	---	11%	2%
	Children did not require vaccination over the stated period (vaccinations are on schedule though)	5%	2%	3%	23%	8%	---	14%
	Vaccinations were interrupted	5%	5%	5%	7%	---	6%	3%
	Forgot about vaccinations / not important	5%	---	6%	7%	10%	4%	5%
	Don't want to answer	2%	2%	2%	---	---	2%	2%
	Children have never been vaccinated	1%	2%	---	6%	---	2%	---
	Could not access health facility	0%	---	1%	---	---	---	1%

Table 49: Access to routine vaccination, by setting and upazila, (January 2022, Cox's Bazar, Bangladesh)

Questions	Responses	All	Setting		Upazila							
			Rur	Urb	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia
Did you bring your child to routine vaccination since the beginning of the COVID-19 pandemic in March 2020?	Yes	76%	75%	76%	77%	75%	56%	78%	69%	84%	78%	76%
	No	23%	23%	22%	23%	22%	44%	20%	25%	16%	22%	23%
	Do not want to respond/Don't remember	1%	1%	2%	---	3%	---	1%	6%	---	---	1%
You just said that you did not bring your child to routine immunization since the start of pandemic, can you indicate the MAIN reason?	Other	74%	79%	49%	79%	46%	94%	88%	83%	64%	81%	63%
	Vaccinations not available	7%	4%	24%	---	31%	---	---	8%	18%	---	---
	Children did not require vaccination over the stated period (vaccinations are on schedule though)	5%	5%	7%	---	12%	---	6%	8%	---	10%	11%
	Vaccinations were interrupted	5%	5%	4%	11%	---	---	6%	---	9%	10%	---
	Forgot about vaccinations / not important	5%	4%	9%	7%	4%	6%	---	---	9%	---	11%
	Don't want to answer	2%	2%	---	4%	4%	---	---	---	---	---	5%
	Children have never been vaccinated	1%	1%	3%	---	4%	---	---	---	---	---	5%
	Could not access health facility	0%	---	3%	---	---	---	---	---	---	---	5%

Health seeking behavior in case of recent illness

Quantitative results

The majority of the respondents (62%) reported nobody in their household being ill in the 30 days before the survey (table 50). Of those who reported an illness (be it themselves or another household member), the most commonly reported illnesses were fever (77%), diarrheal/stomach issues (12%), or existing chronic conditions (12%). These illnesses differed over age groups, with fever most reported in household members under 18 (92%) and least reported in those over 60 (45%). 94% of those who were ill sought treatment (though this was 100% among those over 60 years of age) (table 50).

The majority of those who were sick reported seeking care (94%), and mainly seeking advice at pharmacies (56%), "quack" doctors (unlicensed doctors) (21%), and governmental hospitals (20%). There was variation across age groups, with unlicensed doctors being more used among respondents aged 60+ and 18-30 (26% each) compared to age groups in between (16% in the 31-45 group and 6% in the 46-59 age group) (table 50). Responses differed across upazilas (table 51). Geographic proximity was the leading factor for choosing a health care source.

For those who did not seek care, the most common reason reported was "illness was not severe/could be treated at home" (86% of responses). Cost was cited as a reason not to seek care by 10% of those who

did not seek care for their illness, and it was driven by rural respondents. More respondents in the age group 31-45 (26%) reported cost to be a reason for not seeking care as well as more female (13%) than men (0%).

85% of respondents reported having to pay for health care services. 83% of these respondents reported being able to cover the costs of service in their entirety, 12% could pay for part of the treatment, and 4% could cover a small part of the treatment. Fewer respondents in the 60+ age group reported being able to pay for the entire treatment (66%).

Table 50: Health seeking behavior for illness events during the 30 days before data collection, by age and sex of the respondent, (January 2022, Cox's Bazar, Bangladesh)

			Respondent age					Respondent sex	
Question	**Responses**	**All**	**Age 0-17**	**Age 18-30**	**Age 31-45**	**Age 46-59**	**Age 60+**	**Female**	**Male**
In the last 30 days, have you or any member of your household had any illness?	none	62%	---	61%	62%	63%	65%	57%	67%
	Yes - another HH member(s)	26%	---	29%	24%	25%	23%	30%	21%
	Yes - myself	16%	---	12%	20%	16%	16%	17%	16%
	Do not want to respond/Don't remember	0%	---	0%	0%	0%	0%	0%	0%
How many HH members were sick in the past 30 days?		1	---	1	1	1	1	1	1
What type of illness did they have?	Fever	77%	92%	73%	77%	68%	45%	75%	80%
	Diarrhoeal / stomach issues	12%	12%	16%	11%	9%	9%	10%	14%
	Unwell with chronic condition	12%	1%	6%	17%	28%	29%	15%	8%
	Respiratory issues	9%	8%	10%	3%	7%	24%	7%	11%
	Emergency care (Injury/ accident)	3%	0%	2%	2%	5%	14%	2%	4%
	Unwell during pregnancy	1%	0%	7%	0%	0%	0%	3%	0%
	Not sure	1%	1%	0%	2%	0%	3%	1%	1%
	Other	1%	1%	0%	0%	2%	2%	1%	0%
Did this individual seek any advice or treatment?	Yes	94%	93%	91%	94%	95%	100%	92%	97%
	No	6%	7%	9%	6%	5%	---	8%	3%
Where did this HH member seek treatment?	Pharmacy	56%	50%	66%	63%	62%	34%	52%	61%
	Quack doctor (unlicensed)	21%	24%	26%	16%	6%	26%	17%	25%
	Hospital (governmental)	20%	22%	20%	13%	21%	35%	21%	20%
	Private clinic	15%	10%	8%	27%	8%	19%	16%	13%
	Private doctor (licensed)	12%	9%	8%	11%	25%	22%	12%	13%
	Private hospital	12%	9%	9%	16%	16%	9%	13%	10%
	Community clinic (governmental)	7%	10%	6%	7%	0%	10%	8%	7%
	Traditional healer	0%	0%	0%	0%	0%	0%	0%	0%
	Other	0%	0%	0%	0%	0%	0%	0%	0%
	none	0%	0%	0%	0%	0%	0%	0%	0%

			Respondent age					Respondent sex	
Question	Responses	All	Age 0-17	Age 18-30	Age 31-45	Age 46-59	Age 60+	Female	Male
Why did this HH member decide not to seek treatment?	Illness was not serious /could be treated at home	86%	88%	88%	74%	100%	---	81%	100%
	Cost too high	10%	0%	12%	26%	0%	---	13%	0%
	Other	4%	12%	0%	0%	0%	---	6%	0%
	Prefer not to answer	0%	0%	0%	0%	0%	---	0%	0%
	Did not know how to access care	0%	0%	0%	0%	0%	---	0%	0%
	Do not trust health service providers	0%	0%	0%	0%	0%	---	0%	0%
	Provider too far away	0%	0%	0%	0%	0%	---	0%	0%
	Fear of contracting COVID-19 at the facility	0%	0%	0%	0%	0%	---	0%	0%
Why did a HH member choose this particular provider? Please indicate one MAIN reason.	Provider is the closest	34%	33%	36%	33%	33%	31%	31%	36%
	Specialized treatment was required	27%	26%	21%	24%	31%	47%	26%	28%
	Provider is trusted	17%	21%	15%	19%	9%	13%	18%	16%
	Provider is affordable	11%	12%	14%	9%	13%	3%	12%	9%
	Provider ensures appropriate sanitary conditions	8%	6%	9%	12%	10%	3%	8%	9%
	Provider was recommended	2%	1%	4%	1%	5%	3%	4%	1%
	Only provider available in the area	1%	1%	1%	---	---	---	1%	1%
	Provider's gender was a factor	0%	---	---	1%	---	---	1%	---
Did this HH member have to pay for treatment or medications?	Yes	85%	84%	83%	88%	83%	82%	81%	89%
	No	15%	16%	17%	12%	17%	18%	19%	11%
Was this HH member able to afford cost of treatment?	Yes - was able to afford whole duration of treatment	83%	88%	86%	85%	73%	66%	81%	86%
	Yes - was able to cover part of the treatment	12%	9%	9%	15%	16%	14%	16%	7%
	No, was only able to cover small part of the treatment	4%	3%	5%	---	5%	20%	2%	6%
	No, was unable to cover treatment at all	1%	---	---	---	5%	---	1%	1%

Table 51: Health seeking behavior for general illness by setting and upazila, (January 2022, Cox's Bazar, Bangladesh)

	Setting			Upazila							
	Total	Rur	Urb	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia
In the last 30 days, have you or any member of your household had any illness?											
none	62%	62%	65%	68%	61%	76%	64%	66%	54%	56%	54%
Yes - another HH member(s)	26%	27%	22%	20%	28%	22%	23%	24%	34%	26%	33%
Yes - myself	16%	16%	16%	16%	15%	3%	17%	11%	18%	24%	18%
Do not want to respond/ Don't remember	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
How many HH members were sick in the past 30 days?											
	1	1	0	1	1	0	1	1	1	1	1
What type of illness did they have?											
Fever	77%	76%	82%	79%	73%	83%	74%	75%	78%	77%	83%
Diarrhoeal / stomac issues	12%	13%	8%	13%	6%	8%	14%	29%	13%	14%	5%
Unwell with chronic condition	12%	12%	9%	14%	18%	8%	7%	8%	13%	7%	9%
Respiratory issues	9%	9%	9%	13%	4%	0%	12%	8%	6%	6%	19%
Emergency care (Injury/ accident)	3%	3%	4%	3%	5%	0%	0%	4%	2%	4%	2%
Unwell during pregnancy	1%	1%	2%	0%	1%	0%	2%	0%	2%	1%	3%
Not sure	1%	1%	2%	0%	2%	8%	2%	0%	0%	0%	0%
Other	1%	1%	0%	1%	0%	0%	0%	0%	0%	3%	0%
Did this individual seek any advice or treatment for his / her condition? (also for children)											
Yes	94%	93%	98%	92%	98%	100%	93%	96%	91%	93%	95%
No	6%	7%	2%	8%	2%	---	7%	4%	9%	7%	5%
Where did this HH member seek treatment?											
Pharmacy	56%	56%	58%	62%	53%	33%	58%	39%	69%	59%	51%
Quack doctor (unlicensed)	21%	21%	16%	26%	15%	8%	18%	9%	20%	30%	25%
Hospital (public)	20%	19%	28%	22%	19%	33%	33%	43%	10%	6%	22%
Private clinic	15%	14%	19%	20%	10%	0%	3%	14%	25%	14%	19%
Private doctor (licensed)	12%	13%	10%	11%	15%	8%	8%	13%	12%	11%	20%
Private hospital	12%	12%	10%	12%	9%	17%	10%	5%	12%	13%	19%
Community clinic (public)	7%	8%	5%	6%	4%	8%	5%	17%	6%	9%	11%
Traditional healer	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
none	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Why did this HH member decide not to seek treatment?											
Illness was not serious	86%	85%	100%	100%	100%	---	100%	100%	80%	40%	100%
Cost too high	10%	11%	0%	0%	0%	---	0%	0%	0%	60%	0%

	Setting			Upazila							
	Total	Rur	Urb	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia
Other	4%	5%	0%	0%	0%	---	0%	0%	20%	0%	0%
Prefer not to answer	0%	0%	0%	0%	0%	---	0%	0%	0%	0%	0%
Did not know how to access treatment	0%	0%	0%	0%	0%	---	0%	0%	0%	0%	0%
Do not trust health service providers	0%	0%	0%	0%	0%	---	0%	0%	0%	0%	0%
Health service providers too far away	0%	0%	0%	0%	0%	---	0%	0%	0%	0%	0%
Fear of contracting COVID-19	0%	0%	0%	0%	0%	---	0%	0%	0%	0%	0%
Why did a HH member choose this particular provider? Please indicate one MAIN reason.											
Provider was the closest	34%	35%	28%	29%	38%	50%	25%	22%	45%	33%	29%
Specialized treatment required	27%	30%	14%	28%	23%	33%	28%	22%	18%	31%	40%
provider is trusted	17%	14%	32%	17%	26%	---	23%	30%	14%	6%	11%
provider is affordable	11%	10%	15%	15%	6%	17%	10%	26%	4%	16%	4%
Provider ensures appropriate sanitary conditions	8%	9%	6%	8%	2%	---	10%	---	14%	14%	11%
Provider recommended	2%	2%	4%	2%	4%	---	3%	---	2%	---	5%
Only provider available	1%	0%	2%	---	---	---	3%	---	2%	---	---
Provider's gender was a factor	0%	0%	---	2%	---	---	---	---	---	---	---
Did this HH member have to pay for treatment?											
Yes	85%	83%	90%	86%	88%	67%	91%	71%	89%	83%	79%
No	15%	17%	10%	14%	12%	33%	9%	29%	11%	17%	21%
Was this HH member able to afford cost of treatment?											
Yes - whole treatment	83%	85%	76%	85%	78%	100%	85%	88%	73%	89%	87%
Yes - part of the treatment	12%	11%	17%	11%	16%	---	15%	6%	15%	9%	7%
No, only small part	4%	4%	5%	3%	4%	---	---	6%	10%	2%	7%
Not at all	1%	0%	2%	---	1%	---	---	---	2%	---	---

Changes in health seeking behavior/ access to health services since the beginning of COVID-19

Qualitative Results

Thirteen respondents reported that access to service had increased since March of 2020, with 8 reporting an increase in number of health specialists, including doctors and nurses. While some of the interviewed KIs identified certain improvements to access of health services (such as more time and consideration to patients' problems from health specialists, and overall improvement in the quality of services), it might be assumed that these improvements are uneven among different communities. For example, all three interviewed KIs in Kutubdia (an island upazila that is considered rather difficult in terms of access) noted certain improvements in terms of service provision, accounting for 3 out of the seven who said quality of services has somehow improved.

Eight of the interviewed KIs said that people from their community and other locations at this point were concerned about going to the hospitals, as they feared that they might be infected there. One KI described avoiding their regular diabetes treatments for fear of contracting COVID-19. A few others noted some challenges linked to quality of checkups (as the doctors reportedly were not doing these properly due to fear of being infected), and that the specialists would give priority to the patients in the COVID-19 ward.

Fifteen respondents stated that the health care facilities were functional, though 7 said that accessing services was challenging. 6 respondents stated that there had been an increase in visits during the COVID-19 pandemic, with 5 stating that specialists paid less attention to patients since the pandemic started, as more attention is given to COVID-19 patients. He continued by saying that services that had previously been easy to access were now difficult. Another KI discussed issues arising from preventive measures, such as the doctors physically distancing from patients and not allowing caregivers to be present during examinations. One KI said that people from the host community were avoiding going to public health facilities, as they were crowded with refugees.

Relevant Quotes:

“Health facilities, like primary treatment, primary health care, doctors, hospitals, have been increased compared to the year 2020. I didn’t face any barriers.” -Female caregiver, age 60-69, Teknaf, rural

“Access to primary health infrastructure has been improved now. Many doctors were providing treatment to many people during the corona pandemic at the risk of their lives. Many of the doctors have died during this corona pandemic.” -Female housewife, age 40-49, Chakaria, rural

“We have to confess that access to health facilities have evolved since corona onset. All types of facilities have been increased now.” -Female teacher, age 20-29, Teknaf, rural

“The new problem is that doctors are giving more time to the patients in the corona ward. Other patients are given less time and they have to wait a bit. People have to sit at a distance. Services that used to be easily available are now difficult to get.” -Male teacher, age 30-39, Teknaf, rural

“Doctors don't observe their patients with care now. Previously, doctors examined patients by touching patients' bodies and diagnosed any problem. But now doctors don't examine the patients and talk from a

long distance. Some patients need a person to accompany them and describe their issues to the doctors, but this person is not allowed now." -Female teacher, age 20-29, Teknaf, rural

"I can give you an example of me, I'm a diabetic patient, and I also have high blood pressure. I used to go for my diabetic and blood pressure test every week previously. Now I don't go there for those tests regularly. I have a fear of corona now, and there is a chance of being affected by coronavirus. So, now I go there once a month only." -Female caregiver, age 60-69, Teknaf, rural

"Since the very beginning of the pandemic people used to do tests, if they had symptoms like high fever, cold, and cough. But at present, they don't want to go there. Because, there is no good treatment for corona in the country." -Male electrician, age 30-39, CXB Sadar, urban

"There is an increase in the number of Rohingya patients in the hospital. That's why local people are avoiding going to the government hospital there." -Female student, age 20-29, CXB Sadar, urban

"Less access to the primary health care facilities, doctors, nurses, etc., than before March 2020. At the first stage of the corona situation, doctors see their patients with care, but now they are not seeing patients like before. In addition, though the number of doctors and nurses has increased, the health care facilities did not reach that expectation." -Female housewife, age 50-59, CXB Sadar, urban

Quantitative results

When asked how health services access changed amidst the pandemic, 46% of respondents said services remained at the same level of accessibility, 35% said less accessible, and 18% said more accessible. More female than men (25% vs 11%) perceived the services as being more available. The percentages of respondents for each level of access remained relatively consistent across age categories (table 52).

These differing perceptions of access were also seen by upazila and setting. More urban respondents thought that access increased during the pandemic (30% vs 16% rural). Variability can be seen also across upazilas with 42% of the respondents in Pekua reporting services becoming more accessible compared to 6% in Teknaf. Almost half of the respondents in CXB Sadar (43%) reported that services became less available, while this was only 6% in Pekua (table 53).

Those who responded that health services had decreased were further polled regarding why the access had decreased. The majority of respondents reported that the fear of contracting COVID-19 while at the health provider was the main reason for decreased access (73% of respondents). Other main reasons cited were a decrease in the number of specialists (36% of respondents), cost of health services (28%), security concerns for reaching health care providers (21%), and that the quality of health services had decreased (24%). Cost was confirmed a barrier among respondents in the age group 60+. There was some variation across upazila.

Table 52: Changes in service availability and access since the beginning of the COVID-19 pandemic, by sex and age of the respondent, (January 2022, Cox's Bazar, Bangladesh)

			Respondent sex		Respondent age			
	Responses	Total	Female	Male	18-30	31-45	46-59	60+
Since the beginning of the COVID-19 pandemic, how did access to health services change for you and your household?	Services remained at the same level of accessibility	46%	38%	56%	44%	46%	52%	50%
	Services became less accessible	35%	37%	33%	35%	37%	26%	37%
	Services became more accessible	18%	25%	11%	21%	17%	20%	13%
	Do not want to respond/ Don't remember	1%	1%	1%	1%	0%	2%	--
You just said that services have become less accessible since the beginning of the pandemic, why so? Please choose the MAIN reasons	Fear of COVID-19 while visiting health provider	73%	76%	70%	74%	73%	66%	77%
	Number of health care specialists has decreased	36%	31%	42%	28%	41%	35%	55%
	Health services too expensive	28%	24%	34%	30%	24%	30%	45%
	Quality of health services decreased	24%	24%	23%	19%	30%	18%	14%
	Security concerns on the way to health provider	21%	17%	25%	25%	17%	20%	24%
	Health facilities became non-functional and the others are far	13%	12%	14%	15%	13%	9%	12%
	HH members have health issues that make access complicated	4%	5%	3%	6%	3%	7%	0%
	Other	0%	0%	1%	0%	0%	0%	6%
Since the beginning of COVID-19 pandemic last year, if you or a member of your HH was feeling sick or unwell, which health provider would you MOST commonly access?	Pharmacy	37%	35%	39%	36%	40%	27%	34%
	Hospital (governmental)	20%	19%	21%	19%	19%	26%	23%
	Quack doctor unlicensed)	18%	22%	14%	19%	16%	24%	11%
	Private doctor (licensed)	12%	13%	12%	12%	14%	8%	16%
	Community clinic (governmental)	6%	5%	6%	8%	4%	6%	13%
	Private hospital	4%	3%	4%	4%	4%	4%	2%
	Private clinic	3%	3%	3%	2%	4%	5%	---
	No one in the HH was sick since the beginning of the pandemic	0%	0%	0%	---	---	1%	2%
	Traditional healer	0%	0%	---	0%	---	---	---

Table 53: Changes in service availability and access since the beginning of the COVID-19 pandemic, (January 2022, Cox's Bazar, Bangladesh)

			Setting		Upazila							
	Responses	Total	Rur	Urb	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia
Since the beginning of the COVID-19 pandemic, how did access to health services change for you and your household?	Services remained at the same level of accessibility	46%	47%	41%	46%	34%	54%	56%	52%	46%	54%	36%
	Services became less accessible	35%	36%	29%	37%	43%	27%	32%	6%	34%	39%	41%
	Services became more accessible	18%	16%	30%	16%	22%	19%	12%	42%	20%	6%	20%
	Do not want to respond/don't remember	1%	1%	--	1%	1%	--	--	--	--	1%	3%
You just said that services have become less accessible since the beginning of the pandemic, why so? Please choose the MAIN reasons	Fear of COVID-19 while visiting health provider	73%	73%	77%	72%	66%	70%	78%	100%	77%	75%	78%
	Number of health care specialists has decreased	36%	37%	31%	38%	43%	40%	31%	25%	37%	34%	25%
	Health services too expensive	28%	30%	16%	28%	25%	40%	28%	0%	23%	30%	38%
	Quality of health services decreased	24%	26%	8%	28%	18%	30%	28%	0%	23%	30%	15%
	Security concerns on the way to health provider	21%	20%	26%	26%	27%	20%	13%	0%	13%	20%	15%
	Health facilities became non-functional and the others are far	13%	15%	6%	16%	12%	10%	16%	0%	10%	14%	13%
	HH members have health issues that make access complicated	4%	4%	4%	13%	3%	0%	3%	0%	0%	2%	0%
	Other	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Since the beginning of COVID-19 pandemic last year, if you or a member of your HH was feeling sick or unwell, which health provider would you MOST commonly access?	Pharmacy	37%	36%	38%	37%	31%	57%	43%	27%	30%	40%	37%
	Hospital (public)	20%	18%	31%	17%	28%	11%	15%	37%	17%	15%	18%
	Quack doctor unlicensed)	18%	20%	8%	18%	16%	11%	20%	11%	20%	25%	22%
	Private doctor (licensed)	12%	13%	9%	13%	13%	8%	13%	13%	16%	10%	7%
	Community clinic (public)	6%	6%	5%	6%	6%	14%	2%	6%	10%	4%	3%
	Private hospital	4%	3%	6%	2%	5%	---	4%	3%	5%	2%	7%
	Private clinic	3%	3%	3%	5%	1%	---	4%	2%	2%	4%	4%
	No one in the HH was sick since the beginning of the pandemic	0%	0%	1%	---	1%	---	---	---	---	1%	---
	Traditional healer	0%	0%	---	---	---	---	---	---	---	---	1%

4.4.8 Social interactions

Qualitative results

The majority of the interviewed KIs (18 out of 23) reported less frequent in-person social interactions because of the pandemic. Among those reporting less frequent interactions, all 5 KIs aged 60 and older stated that this was still the case for them at the time of the interviews. 16 KIs reported that there was less interaction with elderly people and 7 described less contact with other vulnerable persons (such as people with chronic illnesses). Some KIs reported that they did not have a chance to meet with relatives who live in other settlements for a long time (some citing personal concerns over getting COVID-19 and

some the road movement restrictions during lockdown). One KI described how behaviors of mothers and children had changed, stating that children now play indoors more often and that women meet to socialize less frequently. One KI discussed how restrictions, including school closure, increased the amount of family members staying at home. They speculated that this will ultimately increase the chance of infection within the homes, and she also noted that joblessness within the family unit is causing some to face mental health issues.

Some KIs stated that alternative communication was used when possible and the majority reported they would prefer to talk on the phone as opposed to meeting face to face, an option that might be less available to the poor. However, there were events and situations where face-to-face contact were necessary, such as weddings, participation in various family, community or religious events, seeking health care. Yet very few said that they themselves were taking part in these. Additionally, 12 of the KIs said that people would need to leave their houses to buy essential goods and 10 mentioned that they would leave the house to go to work.

KIs had conflicting views on the adherence of restrictions during different lockdowns. Some KIs stated that people were following the restrictions less in subsequent lockdowns, while others mentioned that people are taking it more serious in the latter lockdowns. Twelve respondents said that perception of containment measures has shifted over time, leading towards less strictly adherence. At the same time, the governmental agencies in Bangladesh do not have the capacity to enforce the restrictions in all locations, especially in remote villages. One respondent mentioned that people were fatigued with the pandemic, and therefore they were going out even though the enforcement agencies-controlled compliance during the lockdown. Several KIs noted that due to lack of enforcement people were taking the restrictions less seriously. Some of the KIs said that while in the beginning of the pandemic all social events were banned, during the most recent stage of the pandemic these resumed, albeit on a reportedly smaller scale than before, and with limited number of participants. Another KI stated that social distancing was decreasing as time goes on, and that people are once again visiting neighbors and family members. However, some KIs stated that meeting face to face is still avoided, one stated that a family member who has returned from abroad has not been allowed to visit yet as there is a fear he may have brought coronavirus with him. Another KI stated that some people's perception is that less face-to-face contact will help protect you from exposure to COVID-19.

Relevant Quotes:

"Face-to-face meetings have changed. By maintaining social distance through mobile phones and avoiding face-to-face meetings, the risk of corona has decreased in the country and in our village." -Male caregiver, age 20-29, Ukhiya, rural

"Especially the gathering of old people or chatting has decreased a lot. Now 2-4 people do not sit together and chat like before. And especially those who have a cold or cough, others do not want to talk or sit near them. It has decreased a lot." -Male teacher, age 60-69, Moheshkali, rural

"The movement of elderly or high-risk people was strictly controlled by their families. They were not allowed to go out easily from the houses." -Male retired NGO staff, age 60-69, Pekua, rural

"People are meeting with each other less than before. Previously, all the mothers used to sit together and gossip while their children used to play in the field. But this scenario is not common now. Children are playing in their own houses because of COVID-19. People don't visit others if there is no emergency." -Female housewife, age 50-59, CXB Sadar, urban

"Previously, people followed social distances strictly when they went to their relatives or neighbor's houses. But the prevalence of corona has now decreased, and people are not following any prevention measures now. I also believe that coronavirus will be extinct from our country very soon." -Male retired NGO staff, age 60-69, Pekua, rural

"Yes, social interactions were impacted. In last year people did not visit their relatives, family members, or friends. But now people have started meeting them again. Our life has been greatly impacted by the pandemic. Communication with people decreased but recently it has increased a bit." -Female caregiver, age 30-39, Moheshkali, rural

Quantitative results

Characteristics of social interactions the day before the survey

98% of respondents reported face-to-face interaction (5 or more minutes) with someone outside their household in the last 24 hours, with the average number of contacts in that time span being 2 (this average held across all categories, except for among female respondents (average 1 contact) and those in Pekua upazila (average 1 contact)). Those in the 18-30 and 31-45 age category were most likely to meet with those in their own age category (69% of 18-30 age category respondents and 47% of those in the 31-45 age category). Those in the two older age categories (46-59 and 60+) most often reported contact ages being in the 31-45 age category. 88% of female respondents also reported contacts being female, and 90% of male respondents reported contacts being male. Overall, the gender of respondents was similar, with 51% of total contacts reported being male and 49% female. Types of contact most reported were friend/neighbor (48% of respondents), relative (non HH member, 36% of respondents), or colleagues (6% of respondents overall, though this type was most reported by male respondents; table 54). These remained relatively consistent across upazila as well (table 55).

In terms of types of interaction with non-household members, most interactions did not involve physical contact (89% of total responses) though this differed between men and women (95% of women reported no physical contact compared to 82% of men). The most commonly reported locations of interaction were in the respondent's home (43%), in the street (18%), in another home (16%), or in the shop/market (15%). Women most often reported meeting in their home or another home (68% of responses and 21% respectively), whereas men had more variation in locations of interaction. Overall, 59% of interactions took place outdoors and 41% indoors, with differences by gender and upazila. In Maheshkhali and Kutubdia, the majority of interactions took place indoors. While most interactions were less than 15 minutes overall (59% of responses), when asked whether either person wore a mask during the interaction 75% of respondents reported neither wearing a mask. This too differed by gender, with 86% of women reporting neither party wearing a mask and 64% of men. 78% of respondents reported that the interaction would have been possible in a manner other than face-to-face. When asked why another

format was impossible, 50% of total respondents reported that the preference was to meet in person. This varied between genders and age groups, with 70% of those in the 60+ category citing preference as the primary reason. 70% of female respondents also reported the preference for in person meetings, whereas male respondents had more variability in responses (including that the topic matter was sensitive or that the type of services could not be provided remotely).

Changes in social interactions compared to before COVID-19 and during COVID-19

77% of respondents reported the frequency of their social interactions decreasing during the pandemic, and 80% reported meeting for shorter duration in interactions when compared to before COVID-19. These were relatively consistent across age and gender. 10% of respondents reported meeting more often during the pandemic, though this varied by age and gender. 15% of males compared to 5% of females reported meeting more frequently during the pandemic, and 17% of those in the 46-59 age category also reported increased frequency of social interaction. There was slightly more variability in these responses by upazila, with the highest percentage of respondents reporting decreased frequency of social interaction in Pekua (89%) compared to the lowest percentage in Teknaf (69%) (Table 56).

Table 54: Social interactions in the previous 24 hours: characteristics of contacts by sex and age of the respondents, upazila and setting, (January 2022, Cox's Bazar, Bangladesh)

		Respondent's age				Respondent's sex		Setting		Upazila							
Responses	**All**	**18-30**	**31-45**	**46-59**	**60+**	**F**	**M**	**Rural**	**Urban**	**Chakaria**	**CXB Sadar**	**Kutubdia**	**Maheshkhali**	**Pekua**	**Ramu**	**Teknaf**	**Ukhia**
Face-to-face contact	98%	97%	97%	98%	100%	97%	99%	98%	96%	100%	91%	100%	100%	100%	98%	100%	95%
# of people you interacted with	2	2	2	2	2	1	2	2	2	2	2	2	2	1	2	2	2
Contact's age																	
18-30	48%	69%	40%	26%	24%	54%	41%	47%	49%	52%	48%	48%	50%	34%	41%	49%	48%
31-45	37%	21%	47%	49%	40%	33%	41%	38%	35%	35%	38%	38%	36%	49%	41%	33%	35%
46-59	11%	5%	10%	21%	27%	8%	13%	11%	11%	9%	10%	12%	9%	17%	12%	13%	8%
1 to 17	2%	3%	2%	1%	1%	2%	2%	2%	2%	2%	2%	2%	3%	0%	4%	2%	5%
Contact's sex																	
Male	51%	41%	54%	62%	73%	12%	90%	51%	54%	56%	46%	54%	52%	57%	46%	53%	49%
Female	49%	59%	46%	38%	27%	88%	10%	49%	46%	44%	54%	46%	48%	43%	54%	47%	51%
Relationship to contact																	
Friend / neighbor	48%	50%	48%	44%	52%	46%	51%	49%	46%	49%	51%	52%	36%	61%	55%	46%	44%
Relative (not HH member)	36%	36%	35%	42%	34%	47%	26%	36%	36%	32%	32%	38%	46%	25%	35%	42%	40%
Colleague / business	6%	4%	8%	8%	4%	1%	11%	6%	6%	8%	6%	5%	7%	7%	3%	6%	5%
Shopkeeper/ vendor	3%	2%	4%	2%	2%	2%	4%	3%	4%	4%	4%	0%	3%	2%	1%	2%	4%
Teacher	1%	2%	1%	1%	1%	1%	2%	1%	3%	2%	2%	4%	2%	0%	0%	0%	1%
Religious / community leader	1%	1%	1%	2%	3%	0%	2%	1%	1%	2%	1%	0%	1%	4%	0%	1%	1%
Health worker	1%	0%	2%	0%	1%	1%	1%	1%	1%	1%	0%	0%	2%	0%	2%	0%	1%
Government official	1%	1%	1%	0%	0%	0%	1%	1%	1%	0%	1%	0%	2%	0%	1%	0%	1%
Driver (on tom-tom, rikshaw, taxi)	1%	0%	1%	1%	0%	0%	1%	1%	1%	1%	0%	0%	0%	1%	1%	0%	1%
NGO worker	1%	1%	0%	0%	0%	1%	0%	1%	0%	0%	1%	0%	0%	0%	1%	0%	2%
Schoolmate	0%	1%	0%	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%	0%	0%
Passenger on public transport	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%
Other (specify)	0%	0%	0%	1%	2%	0%	0%	0%	1%	0%	1%	0%	0%	0%	1%	0%	0%
Student	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%	0%	0%

Table 55: Social interactions in the previous 24 hours: characteristics of the interaction by sex and age of the respondents, upazila and setting, (January 2022, Cox's Bazar, Bangladesh)

		Respondent's age				Respondent's sex		Setting		Upazilas							
Responses	**All**	**18-30**	**31-45**	**46-59**	**60+**	**F**	**M**	**Rural**	**Urban**	**Chakaria**	**CXB Sadar**	**Kutubdia**	**Maheshkhali**	**Pekua**	**Ramu**	**Teknaf**	**Ukhia**
Was there any physical contact during your interaction, such as a handshake or a hug?																	
No	89%	87%	92%	81%	94%	95%	82%	88%	90%	86%	89%	93%	86%	93%	89%	91%	88%
Yes	11%	13%	8%	18%	6%	5%	18%	12%	10%	14%	11%	7%	14%	7%	11%	9%	12%
Don't remember	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Main location of the interaction																	
My home	43%	48%	42%	36%	32%	68%	18%	44%	35%	40%	41%	45%	48%	39%	42%	44%	41%
In the street	18%	17%	16%	22%	26%	6%	30%	17%	23%	21%	22%	14%	13%	18%	17%	15%	17%
Another home	16%	16%	15%	17%	12%	21%	10%	16%	16%	12%	19%	18%	13%	17%	17%	17%	16%
Shop/market	15%	10%	18%	17%	23%	3%	28%	16%	15%	18%	10%	15%	13%	21%	17%	16%	16%
At work	4%	4%	5%	4%	3%	1%	8%	4%	5%	4%	4%	1%	8%	3%	4%	4%	5%
Place of leisure	1%	1%	1%	1%	0%	0%	2%	0%	3%	1%	1%	0%	1%	1%	1%	0%	2%
School	1%	2%	0%	0%	0%	1%	1%	1%	2%	1%	1%	4%	0%	0%	0%	0%	2%
Place of worship	1%	1%	1%	0%	2%	0%	1%	1%	0%	1%	0%	3%	1%	1%	0%	0%	0%
Community building	1%	0%	1%	0%	2%	1%	1%	1%	1%	1%	1%	0%	2%	0%	1%	0%	1%
Public transport	1%	1%	1%	1%	0%	0%	1%	1%	0%	0%	1%	0%	1%	0%	0%	2%	1%
Restaurant / café	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%
Private transport	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Outdoors	59%	57%	61%	59%	54%	50%	68%	59%	59%	64%	59%	44%	48%	61%	61%	63%	62%
Indoors	41%	43%	39%	41%	46%	50%	32%	41%	41%	36%	41%	56%	53%	39%	39%	37%	38%
How long did you spend with this contact over the course of the whole day?																	
Less than 15 min	59%	63%	55%	61%	68%	62%	57%	59%	59%	60%	61%	64%	52%	75%	52%	60%	58%
15 min to an hour	36%	33%	40%	35%	28%	33%	39%	36%	35%	36%	32%	35%	43%	25%	40%	36%	38%
1-4 hours	4%	4%	5%	2%	4%	5%	3%	4%	4%	3%	5%	1%	5%	0%	7%	2%	5%
more than 4 hours	1%	1%	1%	2%	0%	1%	1%	1%	1%	1%	2%	0%	0%	0%	1%	1%	0%
Were masks worn during your interaction with this contact?																	
No – neither of us	75%	74%	77%	74%	76%	86%	64%	77%	68%	68%	71%	88%	77%	84%	77%	81%	75%
Yes – both of us	12%	15%	11%	13%	6%	7%	17%	12%	13%	18%	12%	3%	15%	4%	10%	7%	13%
Yes – only me	10%	9%	9%	12%	16%	4%	16%	9%	15%	11%	13%	5%	5%	10%	10%	11%	9%
Yes – only contact	3%	2%	4%	2%	3%	3%	3%	3%	4%	4%	3%	4%	2%	2%	3%	1%	3%
Would it have been possible to communicate with this contact in any other way other than by meeting with them face-to-face?																	
Yes	78%	75%	79%	80%	84%	79%	76%	79%	74%	73%	77%	83%	83%	83%	75%	81%	73%
No	22%	25%	21%	20%	16%	21%	24%	21%	26%	27%	23%	17%	17%	17%	25%	19%	27%
If no, what is the MAIN reason this meeting could not be conducted remotely?																	

		Respondent's age				Respondent's sex		Setting		Upazilas							
Responses	**All**	**18-30**	**31-45**	**46-59**	**60+**	**F**	**M**	**Rural**	**Urban**	**Chakaria**	**CXB Sadar**	**Kutubdia**	**Maheshkhali**	**Pekua**	**Ramu**	**Teknaf**	**Ukhia**
In person preferred	50%	54%	45%	46%	76%	70%	34%	49%	55%	55%	53%	22%	39%	37%	67%	36%	53%
Sensitive topic	20%	17%	21%	30%	14%	4%	33%	20%	19%	15%	23%	42%	18%	57%	6%	22%	24%
Services cannot be provided remotely	19%	22%	19%	17%	0%	14%	23%	20%	17%	24%	18%	28%	33%	6%	9%	21%	12%
It was a public / family event	5%	4%	5%	4%	10%	7%	4%	5%	7%	5%	5%	8%	5%	0%	7%	7%	3%
No access to phone	4%	2%	8%	3%	0%	2%	6%	5%	0%	2%	0%	0%	5%	0%	10%	14%	3%
No phone credit	1%	1%	2%	0%	0%	2%	0%	1%	3%	0%	3%	0%	0%	0%	0%	0%	5%
No access to internet	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
How often have you met with this contact in the last 30 days?																	
Daily	41%	42%	40%	40%	44%	46%	36%	41%	41%	40%	43%	40%	44%	32%	47%	40%	37%
At least once per week	40%	40%	40%	43%	36%	35%	44%	40%	41%	41%	39%	40%	37%	53%	36%	37%	41%
At least once per month	14%	11%	16%	14%	13%	13%	14%	14%	12%	13%	14%	10%	13%	14%	10%	16%	18%
Less than once per month	5%	5%	4%	2%	7%	5%	5%	5%	5%	4%	4%	10%	5%	0%	6%	4%	4%
Never met this person before	1%	2%	0%	1%	0%	1%	1%	1%	0%	1%	0%	0%	1%	0%	0%	3%	0%

Table 56: Changes in frequency and duration of social interactions i) compared to before COVID-19 pandemic and ii) during COVID-19; by sex and age of the respondents, upazila and setting, (January 2022, Cox's Bazar, Bangladesh)

		Setting		Upazilas								Age				Age	
	All	Rural	Urban	Chakaria	CXB Sadar	Kutubdia	Maheshkhali	Pekua	Ramu	Teknaf	Ukhia	18-30	31-45	46-59	60+	F	M
Since the start of COVID-19 pandemic, how did the frequency of your social interactions change **compared to the time before the COVID-19 pandemic**?																	
Met less often	77%	76%	84%	70%	83%	78%	77%	89%	75%	69%	83%	81%	77%	67%	84%	79%	75%
No change	13%	14%	10%	18%	8%	11%	14%	10%	15%	15%	6%	10%	14%	16%	8%	16%	10%
Met more often	10%	11%	7%	11%	8%	11%	9%	2%	10%	16%	11%	9%	9%	17%	8%	5%	15%
Since the start of COVID-19 pandemic, how did the duration of your social interactions change **compared to the time before the COVID-19 pandemic**?																	
Met for shorter time	80%	79%	83%	75%	83%	76%	79%	85%	80%	76%	88%	81%	79%	77%	84%	80%	80%
No change	15%	16%	9%	21%	14%	11%	15%	6%	16%	16%	9%	12%	17%	17%	11%	15%	15%
Met for longer time	5%	5%	8%	4%	4%	14%	6%	8%	3%	8%	3%	7%	4%	5%	5%	6%	5%
How did the frequency of your social interactions change **during the COVID-19 pandemic**?																	
Met less often	79%	78%	81%	73%	81%	81%	75%	90%	79%	73%	89%	81%	78%	73%	82%	81%	76%
No change	14%	15%	9%	15%	12%	8%	19%	8%	14%	20%	8%	11%	16%	15%	14%	13%	15%
Met more often	7%	7%	10%	12%	7%	11%	6%	2%	7%	7%	3%	8%	6%	12%	5%	5%	10%
How did the duration of your social interactions change **during the COVID-19 pandemic**?																	
Met for shorter time	80%	80%	83%	78%	85%	76%	73%	89%	82%	72%	92%	82%	80%	75%	84%	82%	78%
No change	16%	16%	14%	20%	14%	16%	20%	8%	15%	20%	7%	13%	17%	21%	14%	15%	18%
Met for longer time	4%	4%	3%	2%	1%	8%	7%	3%	3%	8%	1%	5%	3%	3%	2%	3%	4%

4.4.9 Impact of COVID-19 on daily life

Qualitative Results

Speaking about the impact the COVID-19 pandemic had on their community, 12 of the 23 respondents mentioned various financial challenges faced by their household or the wider community. According to some of the Kis, reduced job opportunities and decrease in household earnings may be pushing the population to adopt negative coping strategies.

Six respondents discussed disruptions to education, as educational institutions were closed for a long time. 1 KI reported that some guardians sent their boys to work and mentioned dropouts from school for students who have become breadwinners for their families. 2 Kis mentioned child marriage as a coping mechanism.

Respondents also mentioned that COVID-19 has made their lives difficult as the prices of daily necessities, such as fares for transport have increased beyond their means. One KI discussed fears related to using public transportation causing people to rely on private rentals of tom tom/autorickshaws. Another KI mentioned that people are not getting assistance from the government if they lose their jobs or need to quarantine, leading to loss of wages causing food shortages within the home.

Relevant Quotes:

"*More people are staying home now, but it hampers our country and community. Because of the closure of schools, colleges and works, the number of unemployed people has increased. Again, some girls are getting married because of the closure of schools and colleges." - Male pharmacist, age 20-29, Moheshkali, rural*

"*Many people lost their jobs because of the corona. If people don't have a job, then how will they earn money, how will they live their lives. Some of the food assistance services have been provided by the government in some areas, but these are not enough for us.*" *-Male teacher, age 40-49, Kutubdia, urban*

"*Corona has impacted people's lives greatly; people are losing jobs, not getting food or other assistance from the government during the lockdown. The education system of our country is also greatly affected by the pandemic*." *-Male electrician, age 30-39, CXB Sadar, urban*

4.4.10 Proximity to refugee camp variables in Teknaf and Ukhia

Within the Teknaf and Ukhia upazilas, proximity to a refugee camp was recorded for each respondent household. The distance was calculated from each sample point to the nearest camp boundary. The two groups ('near' and 'far) were planned to have equal samples (50% of respondents) in each category across the two upazilas. In total 106 households classified as 'near' a refugee camp boundary were included, and 110 households classified as 'far' from a camp boundary were included.

As can be seen in table 57, of those in Teknaf and Ukhia who were in urban settings, the majority were classified as 'far' from a refugee camp (27% of those 'far' from a refugee camp as opposed to 2% 'near'). Other demographic characteristics of those 'near' and 'far' held consistent with overall demographic data (see section 4.4.1).

Table 57. Demographic information for respondents from Teknaf and Ukhia upazilas (January 2022, Cox's Bazar, Bangladesh)

		Teknaf		Ukhia		Total (both upazilas)	
Proximity to refugee settlement		Near	Far	Near	Far	Near	Far
Total		56%	42%	40%	60%	49%	51%
Respondent's sex	Female	42%	52%	61%	53%	49%	53%
	Male	58%	48%	39%	47%	51%	47%
Respondent's age	18-30	31%	44%	37%	47%	36%	45%
	31-45	46%	40%	49%	34%	52%	36%
	46-59	14%	12.5%	12%	10%	15%	11%
	60+	9%	4%	2%	10%	7%	7%
Setting	Rural	97%	85%	100%	63%	98%	73%
	Urban	3%	15%	0%	37%	2%	27%

When looking at key household survey questions in table 58, we can see several differences in the reported answers of those classified as 'near' and 'far' from a refugee camp. A lower percentage of respondents 'near' refugee camps reported being aware of COVID-19 transmission in their community (25% vs 37% of respondents 'far' from camp boundaries), although answers were inversed within upazila (i.e. in Teknaf, more people far away camps reported knowing of a COVID-19 case in their community compared to those living near camps, while in Ukhia more people living near camps reported knowing of COVID-19 cases compared to those living farther away). Additionally, a higher percentage of those 'far' from camp boundaries reported meeting less frequently during the pandemic compared to those near camps (82% vs 68% respectively) and for shorter duration (86% far vs 77% near). Knowledge of prevention measures and general ratings of health access were similar across the two populations. However, the types of services accessed differed from the 'near' and 'far' populations. Those 'near' camp boundaries had comparably higher self-reported rates of being able to access pharmacies (83% vs 67% of those far from camp boundaries) and governmental hospitals (39% vs 25% of those far from camp boundaries) during the pandemic, whereas those 'far' from camp boundaries reported higher access to 'quack' (or unlicensed) doctors (38% vs 28% of those near camp boundaries).

Responses related to self-reported COVID-19 related practices (wearing a mask, hand washing, physical distancing), as well as willingness to be vaccinated were similar between the two groups.

Table 58: Key variables, near/far from camp boundary (January 2022, Cox's Bazar, Bangladesh)

		Teknaf		Ukhia		Total (both upazilas)	
Proximity to refugee settlement		**Near**	**Far**	**Near**	**Far**	**Near**	**Far**
Are you aware of any COVID-19 cases in your community in the last 10 days?	No	85%	52%	51%	64%	71%	57%
	Yes	14%	46%	46%	32%	25%	37%
	Unsure	1%	2%	3%	3%	2%	3%
Preventive measures knowledge: Classification score	Well Informed	3%	0%	2%	2%	3%	1%
	Informed	32%	38%	34%	40%	33%	39%
	A Little Informed	62%	58%	56%	52%	59%	55%
	Not at all informed	3%	4%	2%	2%	3%	3%
Since the start of the COVID-19 pandemic, how did the frequency of your social interactions change compared to the time before the COVID-19 pandemic?	Met less often	65%	75%	76%	88%	68%	82%
	No change	17%	13%	8%	5%	13%	8%
	Met more often	18%	13%	18%	7%	18%	9%
Since the start of the COVID-19 pandemic, how did the duration of your social interactions change compared to the time before the COVID-19 pandemic?	Met for shorter time	72%	81%	85%	90%	77%	86%
	No change	17%	15%	13%	7%	15%	10%
	Met for longer time	11%	4%	3%	3%	8%	4%
Since the beginning of COVID-19 pandemic last year, if you or a member of your HH was feeling sick or unwell, which health provider would you MOST commonly access? Choose ONE option.	Pharmacy	85%	72%	80%	61%	83%	67%
	Hospital (governmental)	36%	32%	43%	17%	39%	25%
	Quack Doctor (unlicensed)	40%	33%	20%	35%	28%	38%
	Private doctor (licensed)	20%	24%	17%	9%	19%	17%
	Private hospital	15%	0%	10%	30%	13%	15%
	Community Clinic (Governmental)	3%	--	3%	--	3%	--
	Private clinic	15%	8%	10%	17%	13%	13%
	Traditional Healer	--	--	--	--	--	--
	Other	--	--	--	--	--	--
	None	--	--	--	--	--	--

Since the beginning of the COVID-19 pandemic, how did access to health services change for you and your household?	Same level of accessibility	57%	52%	23%	44%	44%	48%
	Less accessible	37%	40%	38%	42%	38%	41%
	More accessible	6%	6%	38%	8%	18%	7%
	Do not want to respond/don't remember	0%	2%	0%	5%	0%	4%
If offered the vaccination against COVID-19, would you be willing to get vaccinated?	Yes - definitely	97%	98%	97%	98%	97%	98%
	Not decided yet – have doubts	3%	2%	3%	2%	3%	2%
Do you wear a mask covering your mouth and nose when you go out in public, for example inside public buildings, or in shops or markets, or in crowded outdoor locations?	Yes - always	54%	46%	64%	59%	58%	53%
	Yes- sometimes	40%	52%	31%	39%	37%	45%
	No - never	6%	2%	5%	2%	6%	2%
Do you try to maintain a physical distance from other people when in public, for example trying to keep 1 meter apart in shops or markets, or in other crowded spaces?	Yes - always	31%	21%	31%	31%	31%	26%
	Yes - sometimes	51%	69%	64%	64%	56%	66%
	No - never	18%	10%	5%	5%	13%	7%
Do you wash your hands with soap and water for at least 20 seconds after you have been in crowded public areas?	Yes - always	48%	54%	59%	61%	52%	58%
	Yes - sometimes	41%	44%	31%	34%	38%	38%
	No - never	11%	2%	10%	5%	11%	4%

5 Discussion

This study brings together complementary areas of research to generate a more comprehensive, albeit incomplete, understanding of the situation in the district of CXB, Bangladesh during the first year of the COVID-19 pandemic. With a high population of Rohingya refugees in Ukhia and Teknaf upazilas, and as one of the most densely populated countries on earth, CXB district and Bangladesh as a country, were considered as especially vulnerable to high COVID-19 transmission rates at the start of the pandemic. The health care system in Bangladesh was fragmented prior to the first cases of COVID-19, with disparate health care access in rural and urban areas, high rates of corruption, and poor governance across public, private, and informal health care providers nationwide. [42] While no study (to our knowledge) attempted to estimate the possible burden of COVID-19 in CXB district, modeling studies focusing on the Rohingya refugee camps predicted large-scale transmission beyond the capacity of the current health care system. [8]

The country experienced one of the highest burdens of reported COVID-19 infections within South Asia, with a total of 2.04 million confirmed cases as of December 1, 2022. [3] While contributing factors include the country's high population density (1,265 people per km^2) with 31.5% of the country's population living below the poverty line, the Government of Bangladesh has also been criticized for its management of the pandemic. [4] Specific concerns centered around the country's low testing rates, the delay and poor implementation of COVID-19 measures, and the overall lack of coordination between governmental bodies and district levels. [4]

The COVID-19 epidemiology from this study largely aligns with global COVID-19 epidemiology. The epidemic dynamic in the CXB district mirrors the national epidemic curve, and appears to have been influenced by several events such as the return of factory workers from Dhaka to their home communities at the start of the lock down (followed by the first increase in cases in the second half of April 2021); the end of the national lockdown at the end of May, allowing factories and mass transportation to renew operation; and Eid al-Fitr celebrations (May 23-24, 2020), which contributed to widespread travel and large gatherings.[32, 34] The main peak in June 2020 coincided with an increase in testing capacity in the district, as the CXB Medical College received its second PCR machine. [27] Following this rapid peak (which occurred nationwide), the Government of Bangladesh initiated a fee for PCR testing. [35] This spurred a significant decline in testing in July 2020. [35] While to a lesser degree than in June, the epidemic curve had another large wave in August and September 2020. Incidence rates began rising one to two weeks after large gatherings occurred around the country in celebration of Eid-ul-Adha on July 25, 2020. The rise in testing rates was delayed compared to the rise in incidence rates, suggesting that the increase in cases was not solely due to an increase in testing rates. An increase in cases may have spurred more people to get tested despite the testing fee.

Testing and incidence rates were higher in men than in women. The differential COVID-19 morbidity by sex aligns with other national-level studies that found that 72% of active cases from March 1 to August 10, 2020 were male. [17, 31] This gender disparity in CXB could be influenced by numerous factors such as greater knowledge of COVID-19 and higher adherence with preventive behaviors than men [43, 44] and disparate exposure (56% of the national workforce was male). [45] The lower incidence among women is likely also greatly influenced by their lower testing rates among women, possibly linked to the lower

autonomy and access to care than men. For example, women in camps have reported requiring their husband's approval, [46] while women in Bangladesh have lower health care seeking behavior than men. [47, 48] A lower likelihood to get tested, higher preventive practices, and potentially lower exposure could have contributed to the unequal morbidity patterns. However, despite differing incidence rates there was no significant difference in mortality due to COVID-19 between men and women. Odds of death rather increased with age, as we see globally. [49]

Incidence rates in all upazilas were lower than at national level, except for CXB Sadar, which had a 39% higher incidence rate. CXB Sadar had the second highest testing rate and the highest incidence rate among the upazilas in CXB district. Its high testing rate is likely due to the tests' increased availability at health facilities, including the CXB 250 Bed District Sadar Hospital and the CXB Medical College. Meanwhile, its high incidence rate is likely a factor of both the increased testing and its position as the economic hub of the district. Teknaf and Ukhia had the highest and third highest testing rates in the district. This high access to testing could be an artifact of the resources poured into preventing large outbreaks within the refugee camps and could partially explain why these two sub-districts had the second and third highest incidence rates, after CXB Sadar. However, while these two upazilas had similar incidence rates, Teknaf had a case-fatality rate five times greater than that of Ukhia, which had the lowest case-fatality rate of the eight. This higher CFR could be influenced by the age-specific incidence rates; Teknaf had higher incidence rates among people older than 50 than did Ukhia.

Specialized isolation and treatment facilities were established so that even mild cases could be treated and isolated if they could not adequately isolate at home. [30] As a result, 99.8% of the cases in CXB were reportedly isolated. This may have helped reduce inter- and intrahousehold transmission, reducing the overall morbidity and mortality.

While the reported data suggests that morbidity and mortality were not as severe as expected, it is important to highlight that with such limited testing capacity, the reported case counts are likely significantly underreported. The true incidence and mortality rates in CXB are likely much higher than what is reported in this paper. To our knowledge, no seroprevalence survey has been conducted in CXB district (beyond the refugees) which could provide a better estimate of previous infections. Published seroprevalence results from Chattogram during or close to our study period range from 54.2% in October 2020 - February 2021 [50] to 64.1% in March-June 2021.[51] Seroprevalence in the Rohingya camps was reported at 48.3% in December 2020. [52] While just an approximation, if a similar seroprevalence were to hold in CXB district, this would correspond to 1.5 million cases, well above the few thousand reported.

As in many countries around the world, essential health service delivery and utilization was affected both at the beginning and during the COVID-19 pandemic. We studied health care utilization of the population in Bangladesh using qualitative methods amongst health care workers and citizens of Bangladesh as well as quantitative interrupted time series analysis. We found a reduction in overall outpatient health consultations, consultations for respiratory infection in children under 5, vaccinations, and ANC. Findings from several studies at national level [53–56] reported a drop in a variety of health services encompassing outpatient consultations, maternal health, child vaccination, emergency admissions. While our findings mainly align with these studies, we identified different effects at primary health care facilities (community clinics and Union Health and Family Welfare centers) compared to hospital level (either upazila health

complex or district level). This difference points to adaptations in health care seeking behavior: for services such as outpatient consultations, respiratory consultations, and ANC, community members appeared to prefer visiting the nearby health facility, and seemed to be concerned about visiting larger hospitals. At the same time however, hospitals did see an increase in ANC visits in the months post lockdown, as if women preferred to go "straight" to the higher-level hospitals in case of a specific health need, instead of going first to primary health care facility and possibly having to go to a second visit. This interpretation is supported by HCWs, as well as by the results from the household survey stressing proximity as the main factor guiding the selection of the facility. While it is difficult to identify which specific factor triggers this decision, IPC standards were noted to be basic or relatively low at both hospitals and primary health care facilities [57, 58], suggesting that IPC may not have played an important role in patients' decision-making.

The reduction in utilization that was reported at the end of April 2020 is likely linked to government quarantine policies and level of enforcement of such policies, shortened outpatient visiting hours, task shifting of frontline HCWs, prior level of trust in health care system, accessibility, difference in socio-economic status of population and how adaptations to clinical services were implemented. [53] Fear of COVID-19 infections in health facilities, mobility restrictions, supply scarcity of medicines and material and COVID-19 infections among HCWs were the most common reasons for avoiding health care seeking. These align with existing evidence from other countries. [59–61] At the same time, mobility restrictions that forced patients to seek care at nearby clinics, lack of accessibility to other health facilities and the fear of COVID-19 motivating care seeking behavior for other diseases may explain an increase in service utilization. Shortage of materials and supplies, including PPE, masks, hand sanitizer, water (for handwashing), and soap at health facilities challenged the implementation of preventive measures, and prompted HCWs to improvise, or purchase these items themselves if feasible to do so. While supply chain challenges were common globally, and especially in low resource countries such as Bangladesh, the already fragile health care system had little capacity to absorb such challenges and to ensure implementation with IPC measures. [62] Many HCWs were infected during the first wave of COVID-19 in Bangladesh, also contributing to difficulty in providing services. The shortage of high-quality PPE and lack of training on how to use it effectively likely contributed to the high morbidity and mortality rate of medical personnel. [42, 63]

HCWs' perceptions on changes in provision of essential health services differed across specialties and across upazilas and were mainly formulated in terms of increases or decreases in consultations and service availability, rather than modified delivery mechanisms. Perceptions varied so that the same service was reported as increased or decreased by different health care providers. Often, as mentioned above, the level of health facility was associated with opposite perceptions.

A reduction in consultations for respiratory tract infections has been observed in several countries worldwide (among others, Vietnam, Uganda, Kenya, Zambia, and China) [64–68] as well as in refugee settings in Jordan and Uganda. [69, 70] This is likely due to a variety of reasons, ranging from changes in health seeking behaviors due to difficulty to reach health facilities and fear of being infected; to an effective reduction in common respiratory tract infections thanks to COVID-19 related preventive measures such as masks, physical distance, and school closure. HCWs reported no change in NCD services,

and laboratory services were reported as unchanged or having experienced temporary suspension. This was supported by the quantitative household survey, which saw a majority of those with chronic disease accessing care. A nationwide telephonic survey conducted among people with chronic conditions end of 2020 reported slightly higher proportion of people with difficulty in accessing care for chronic diseases in Bangladesh, especially in case of multimorbidity. [71]

A recent study estimated that nearly 3.2 million children in Bangladesh have missed childhood routine vaccinations during COVID-19. [72] From January to May of 2020, over 360,000 children missed their third dose of pentavalent vaccine and over 380,000 children missed their first dose of the measles and rubella vaccine. [53] Our data are consistent with these findings, with all upazilas showing a sharp drop at the beginning of the pandemic followed by a sharp increase a few months later and unstable pattern thereafter for uptake of the 3rd pentavalent vaccine doses delivered in CXB district. Additionally, HCWs reported a decrease in vaccination utilization across all respondents. On the contrary, our findings from the household survey highlighted high uptake of routine childhood vaccination during COVID-19.

There was a wide variability in where respondents accessed care during the pandemic period, with pharmacies being the first provider of choice for the majority of respondents, and unlicensed doctors the second provider (especially in rural areas). The high reliance on unlicensed doctors is a well-known behavior in Bangladesh, and so is the urban-rural divide. [73, 74] Given that proximity is the main factor affecting decision-making, expanding modern health care provision up to the community level and in more remote areas remains key. Physicians and nurses are concentrated in urban areas, while traditional healers, village doctors or traditional birth attendants are mainly present in rural areas. [75] The Government of Bangladesh has implemented a variety of programs and policies to retain medical professionals in rural areas for the last decades [74] and a new Health Work Force strategy has been approved in 2015. [76] Yet, it will likely take several years to ensure equitable distribution of human resources: as of 2019, 75% of doctors and nurses are still concentrated in urban areas and in tertiary facilities. [77]

Furthermore, affordability of services was one of the key factors guiding the decision where to seek care. Data from the 2015 Bangladesh National Health Account shows that 67% of the total health expenditure is met by out-of-pocket expenditure, which is the highest in the region. [78] Particularly worrisome is the finding that the elderly was less able to afford the cost of a full treatment given that this age group was among the most vulnerable to COVID-19. Financial barriers have likely increased during COVID-19 due to unemployment during lockdowns, increased prices for essential goods and services, competing priorities such as food, and lower wages. [79] This is reflected in an increasing number of community members who needed to borrow money during the first year of the pandemic to cover health related expenditures and food. [80]

Almost two years into the pandemic, the knowledge about COVID-19 risk factors and transmission patterns was moderate, and the concept of asymptomatic case was understood by only a minority. Pooled results from a systematic review of KAP studies [81] reported higher level of knowledge, however, the populations included in the review may be different from ours, as many of the studies were conducted online, early on in the pandemic, and none was performed in CXB district. Compliance with practices was quite high (especially wearing a mask), and had decreased over time, which has been seen worldwide,

and can be linked to lifting of requirements, reduced risk perception and fatigue. The need to meet basic needs was also a priority, especially following increasing unemployment and food insecurity due to reduced economic opportunities in 2020 and 2021. [79, 82] No rural vs urban divide could be identified in reported practices, however increased challenges faced by poorer community members were raised by respondents.

Vaccine acceptance was almost absolute across population groups. This is much higher than results from previous studies conducted in Bangladesh which reported vaccine hesitancy between 15% and 56%. [83] Possibly, by the time of data collection, trust in the vaccine had increased thanks to more information available and outreach activities. Yet, doubts related to vaccine effectiveness and possible side effects mixed with rumors about composition and consequences of the vaccine still existed among study participants but did not seem to influence their acceptability to be vaccinated. While the national vaccination program in Bangladesh started January 2021, limited supply meant that only few doses were distributed until the summer 2021. Several factors contributed to the sharp increase in daily vaccine doses delivered from late summer, including the first COVAX shipment which arrived in June 2021 [84] , changes to the registration process (to facilitate access especially to rural and poor population who could not register online), as well as changing eligibility rules. [85] By the time of data collection (January 2022), a bit more than 50% of the total population has received at least one dose of COVID-19 vaccine and one third completed the initial COVID-19 vaccination protocol. [3] After a slow start, the COVID-19 vaccination campaign was on target to achieve 70% of fully vaccinated people by June 22. [84] Efforts to maintain such positive attitude through communication and equitable distribution of access should continue with the booster doses.

With regard to social interactions relevant for the spread of diseases, little is known about habits and behaviors of Bangladeshi communities. We found that contacts with people outside of the households are common and occur daily, yet the number of interactions was relatively low. Physical contact was quite rare, and masks were worn in one fourth of the interactions. Furthermore, most encounters were short and occurring outside. These factors are relevant for future policies and studies aimed at containing the spread of diseases. Gender differences were also observed, with men having more variability in the location where the interaction occurred, and meeting more people outside of home settings. While this may be considered a riskier behavior, a higher proportion of men compared to women reported wearing a mask during recent interactions. Our findings are in line with the only other study (to our knowledge) about social contact in Bangladesh. [86]

Behaviors seemed to have changed during periods of COVID-19 restrictions, with fewer and shorter interactions which tended to avoid groups at higher risk, especially the elderly. While this was helpful to reduce the risk of infections, mental health and psychological consequences cannot be underestimated. A study about loneliness among people 60+ found that half of the participants felt lonely. [87] Although this decreased during the pandemic, it remained still quite high in 2021, pointing to the need for mental health support programs for the most vulnerable.

6 Limitations

COVID-19 epidemiology

Utilizing data from different sources can be challenging as discrepancies in data collection and management risk weakening analyses. In this study, the DHIS2 and WHO data sources were relatively similar, although the DHIS2 recorded higher numbers (table 59). The DHIS2 recorded 6,450 confirmed cases of COVID-19 and 82 deaths compared to 6,072 cases and 76 deaths recorded by the WHO. This represents a 6.2% difference in case counts and a 7.9% in deaths. Data from the testing line list showed that people from outside the district would come to CXB for testing and treatment. This could potentially explain some of the discrepancies, as the DHIS2 data was aggregated at the district level. Meanwhile, the discrepancy between the WHO Case Line List and the WHO Testing Line List could have arisen from the secondary methodology of upazila assignment, which may have overestimated the number of tests in CXB. Discrepancies between the case and testing line lists at the beginning of the pandemic also arose from incomplete data. While the confirmed case line list became less complete over time, the testing line list became more complete. Addresses were completely absent from March and April 2020 testing information, which impacted how tests could be categorized. Additionally, at least one positive test result appears to be missing from this dataset; in the WHO line list, the first case was reported in March 2020. However, in the testing dataset, there are only two tests recorded that month, both negative. Overall, though, the datasets were not largely different, adding confidence to the analyses.

Table 59: Comparison of Data Sources: Number of confirmed Cases (Cox's Bazar, Bangladesh, March 2020 – April 2021)

Source	CXB District	Chakaria	CXB Sadar	Kutubdia	Moheshkhali	Pekua	Ramu	Teknaf	Ukhia
WHO Case Line List	6,072	564	3180	106	394	221	458	512	637
Who Testing Line List	6,359	608	3298	116	395	225	446	543	606
DHIS2	6,450	NA	NA	NA	NA	NA	NA	NA	NA

Data completeness is the largest limitation in this analysis. While there were opportunities for a variety of data points to be collected, completeness restricted the analyses that could be run. For example, while the WHO line list included a section on severity of infection, this data was only 8% complete. The WHO line list was most complete during the beginning weeks of the pandemic. Once case counts began rising at a faster pace, only core data – date of detection, age, sex, and upazila – were consistently collected. "30-day outcome" was only completed the patient died; other outcomes like "recovered" or "hospitalized" were not documented. The case management data was particularly limited, with few indicators complete enough to analyze. These challenges limited the trends that could be identified in CXB.

Yet another limitation involved underlying population data. Bangladesh conducts a census every ten years; the most recent census was conducted in 2011 and published in 2014. The subsequent census was postponed due to the pandemic, and its implementation is only just being revisited (Byron and Zaman, 2022). The population of the district and each sub-district was estimated by applying the 2011 annual

growth rate to the 2011 population from the census. This may influence the incidence and testing rates if the estimates are significantly different from the true underlying population.

Furthermore, this study only examines the first year of the pandemic. Other research has suggested that the epidemic size significantly increased during the rest of 2021. Additional research should be conducted to examine the dynamics of the second year of the pandemic and the impact of more transmissible variants like Delta and Omicron.

Lastly, incidence and mortality rates do not alone adequately describe impact of COVID-19 on a community. With a limited health care system, the same incidence rate may impact CXB to a greater degree than other populations. Further research should be done on the indirect impacts of COVID-19 on the health and well-being of people living in CXB.

Routine health services

We attempted the approach used for CAR and DRC also with Bangladesh data, i.e., fitting a parametric model to capture the changes in indicators of interest during COVID-19 period using two terms (immediate change and change in slope). However, for enough facilities, model diagnostics consistently indicated that the model was not appropriate. Visual analysis of trends of outputs like outpatient consultations supported the idea that the two terms do not adequately capture the deviation in trends during the COVID-19 period. This could be because trends changed multiple times over the COVID-19 period (for example, immediate drop, followed by an increase in slope over X months, followed by decrease or stabilization in Y months). Because the model was not parameterized to take these multiple changes into account, the model fit was often poor, and/or counterfactual for the COVID-19 period was clearly predicting trends that were not driven by pre-COVID-19 period alone. For example, in Pekua Upazila Health Complex, during COVID-19 period, there was an immediate drop in outpatient consultations, followed by 6 months of rebound, and then 5 months of decrease / stabilization of consultations (figure 22). Because the changes during COVID-19 period were parameterized to only have an immediate change and a single change in trend, this heterogeneity in change spilled over into the estimate of the counterfactual model. As seen in figure 22, the counterfactual follows the trend we'd have expected until October 2020, but then has a clear decrease for the rest of the COVID-19 period that we would not have predicted had we not attempted to parametrize the COVID-19 period trends. In other cases, such as in Teknaf Upazila Health Complex, the best model fit resulted in an exuberantly high counterfactual (figure 23). As a result, we opted to avoid parametrization of trends during COVID-19 period for the analysis in Bangladesh. Instead, we fit a model for pre-COVID-19 period only, when trends were more stable and more easily captured by the model, and calculated the deviation from expected values and observed during COVID-19 period.

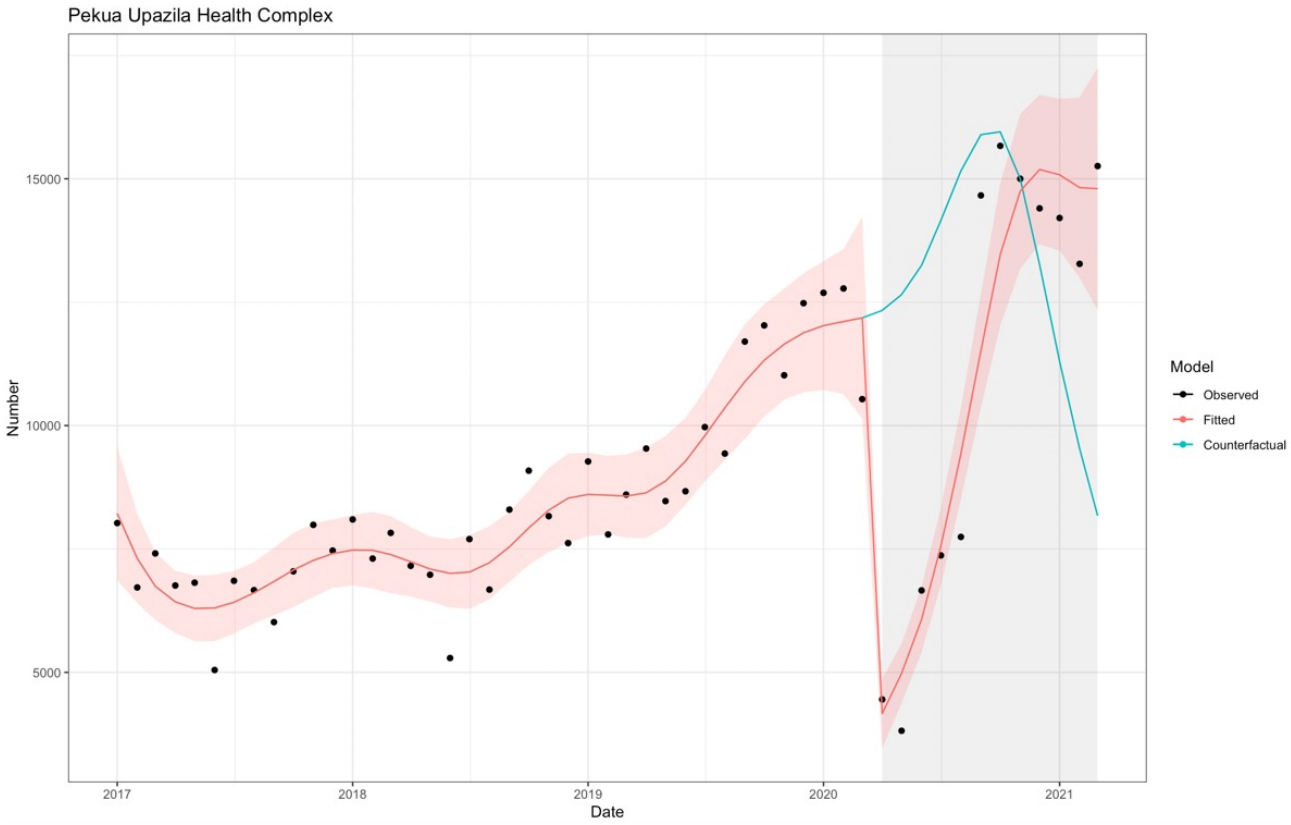

Figure 22: Trend in outpatient consultations, Pekua upazila health complex (2017-2021, Cox's Bazar, Bangladesh).

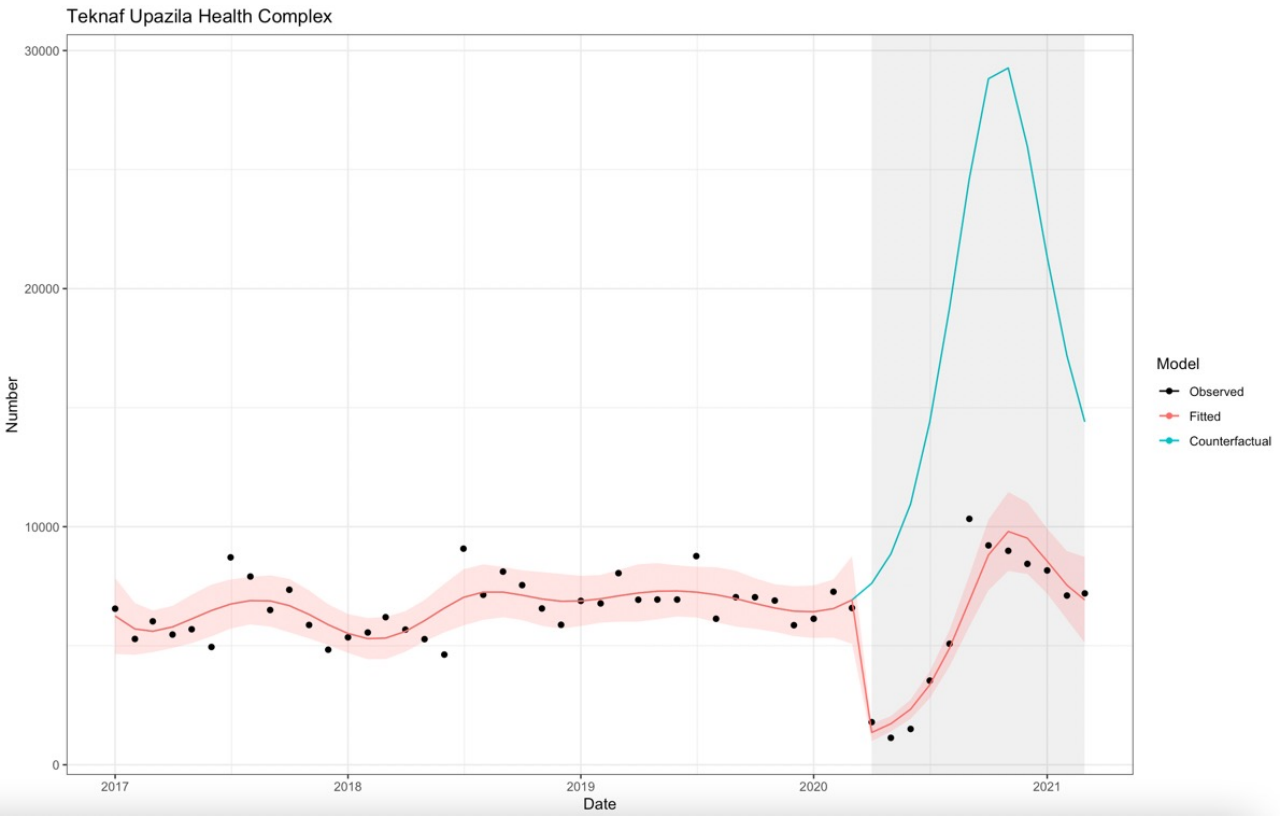

Figure 23:Trend in outpatient consultations Teknaf upazila health complex (2017-2021, Cox's Bazar, Bangladesh).

Health care workers' perceptions

Interviews with HCWs took place in health facilities supported by ACF, that may have had a different perception from HCWs from non-supported health facilities.

Health care seeking behaviors and social interactions

Lockdowns and movement restrictions impacted data collection of both qualitative and quantitative data. It was not possible to conduct Focus Group Discussions as gatherings were not allowed for many months. We therefore decided to conduct remote interviews of key informants. While we strived to select a variety of profiles, generalizability of responses may be lower than from FGD.

Quantitative data collection was also postponed for more than 1.5 year as non-essential activities were not allowed in 2020 and, later, delays in issuing authorizations for data collection meant that our national partner couldn't collect data until January 2022. This delay was not envisaged in the study protocol, and certainly complicated the triangulation and consolidation of results from the different study components as collected at different times. While the experience of lockdown has certainly been memorable, recall bias cannot be excluded.

7 Conclusions and Recommendations

1. Policies and their implementation

The Government of Bangladesh implemented some policies that attempted to reduce SARS-COV-2 infections such as lockdowns and the building of isolation centers. However, several events and policies, such as the return of factory workers from Dhaka to their home communities at the start of the lockdown, the end of the national lockdown at the end of May that allowed factories and mass transportation to renew operations, and the Eid al-Fitr celebrations (May 23-24, 2020), likely contributed to widespread travel and large gatherings, with consequent increases in COVID-19 infections. There was also an overall lack of coordination between governmental bodies and district levels. In the future, consistent policies and strong coordination from central level with the districts are needed to ensure a coherent response to large-scale epidemics.

Insecurity in CXB district did not appear to be a factor in accessing health services nor in population movement, unlike in other countries like the DRC. However, government quarantine policies and their level of enforcement, shortened outpatient visiting hours, task shifting of frontline HCWs, prior levels of trust in health care system, accessibility, difference in socio-economic status of population (affordability of services was one key factor in guiding decisions as to where to seek care) and how adaptations to clinical services were implemented did affect how communities accessed health services and at which levels (more on this in the health care access and utilization section below). Therefore, government policies and their implementation have immediate effects, such as where people go to access health services and why, as well as longer term effects such as trust in government and its services.

Shortage of materials and supplies, including PPE, masks, hand sanitizer, water (for handwashing) and soap at health facilities challenged the implementation of preventative measures, and prompted HCWs to improvise, or purchase these items themselves if feasible to do so. Many HCWs were infected during the first wave of COVID-19 in Bangladesh, also contributing to difficulty in providing services. This may have been particularly important as there was already a shortage of HCWs in Bangladesh, particularly in the rural and remote areas, despite numerous government policies to retain HCWs in remote areas in Bangladesh. The shortage of high-quality PPE and lack of training on how to effectively use it likely contributed to the high morbidity and mortality rate among medical personnel. In the future, the government needs to concentrate on the implementation of an effective supply chain of materials and supplies to ensure HCWs are protected, and communities have the confidence that there will be adequate supplies when they access health care services. Finally, health work force issues have been a problem in Bangladesh for a long period.

2. Diseases testing capacity and strategies

Ensure testing capacity for COVID-19 and future diseases of epidemic potential is quickly scaled-up at the beginning of an epidemic in Bangladesh is necessary to better understand the epidemiology of the disease. In our study, different upazilas in CXB had different levels of testing available. Higher testing in CXB Sadar may have related to the location of larger health facilities for the district, while in other upazilas, it may have been related to international assistance for refugees with mobile PCR machines. Regardless of the reasons, availability of tests, as well as a change in policy where people had to pay for tests, made

it difficult to interpret the incidence rates in and among the various upazilas in CXB district. Furthermore, testing amongst females was lower than amongst males. A testing strategy in the future should include a concerted effort to have equal access for females.

If rapid scale-up of testing is not possible across a district or country, the use a limited number of tests to undertake representative sample of tests to improve initial understanding of disease epidemiology and CFRs should be undertaken. For the latter, this may allay anxiety and encourage positive health seeking behavior if the population has a more realistic understanding of the mortality of the specific disease. It could also help build trust amongst the community and government authorities, which was noted as a barrier regarding understanding and positive health seeking behaviors.

While some population-based antibody serosurveys were undertaken in Bangladesh, none took place in CXB to improve the understanding of the epidemic and to allow for more informed policies and programs. Furthermore, serosurveys amongst specific groups, such as the refugees, should also include nationals, with significant power to disaggregate, to ensure that a more complete picture of the epidemiologic situation occurs as early on in an epidemic as possible.

3. Health systems data management

The COVID-19 line list was introduced at the beginning of the pandemic, and included a set of individual level variable encompassing case demographic characteristics, residence, test data, contact tracing, disease outcome. Unfortunately, due to the high number of reported cases the level of completeness decreased quickly, drastically limiting the capacity to analyze such data.

COVID-19 data were then integrated into DHIS2, yet initially with few aggregated and incomplete variables. For sustainability purposes, the district should sustain the integration of COVID-19 data into DHIS2 and ensure individual level data about co-morbidities, disease management and outcomes are aggregated and available as well, to improve understanding of the COVID-19 epidemiology.

4. Data from the community, and risk communication and community engagement

This study included a great deal of data from community members, including knowledge, attitudes and practices, and social interactions. Compliance with practices was quite high (especially wearing a mask) and decreased over time; this can be linked to lifting of requirements, reduced risk perception and fatigue. Interestingly, no rural-urban divide was identified in reported practices, however increased challenges faced by poorer community members were raised by respondents. Knowledge that the virus could be spread by persons who were asymptomatic was low, as in many other countries. There is a need to develop messages to address the concept of spread via asymptomatic cases.

Unlike many other countries, COVID-19 vaccine acceptance was rather high amongst people surveyed in CXB district. After a slow vaccine rollout in Bangladesh, COVID-19 vaccination campaign was on target to achieve 70% of fully vaccinated people by midyear. The accepting attitude of COVID-19 vaccine by this population should be studied further, and perhaps other changes could be built upon such positive attitudes related to other behavioral aspects for COVID-19 and other diseases of epidemic potential.

Little is known about social interactions during the COVID-19 pandemic amongst Bangladeshi communities. Our population-based social interaction study amongst people in CXB found that contacts

with people outside of the households were common and occurred daily, yet the number of interactions was relatively low. Physical contact was quite rare, masks were worn in 25% of interactions (more men than women), and most encounters were short and occurred outside. Gender differences were also observed. Behaviors seemed to have changed during periods of COVID-19 restrictions, with fewer and shorter interactions which tended to avoid groups at higher risk, especially the elderly. While this was helpful to reduce the risk of infections, mental health and psychological consequences cannot be underestimated. These factors are relevant for the development of future policies to contain the spread of diseases.

As always, RCCE programs need to be adapted according to data and evidence collected. While the concept of asymptomatic cases requires particular attention, there are many positive aspects of behavior, including social interactions, and COVID-19 vaccine acceptance, that can be built upon amongst the population in CXB district.

5. Health care access and utilization

While the reported data suggests that morbidity and mortality were not as severe as expected, it is important to highlight that with such limited testing capacity, the reported case counts are likely significantly underreported. The true incidence and mortality rates in CXB district are likely much higher than what is reported in this paper. In the future, testing strategies and improved data management systems are needed in CXB district to better understand the overall morbidity and mortality from widespread epidemics, such as occurred with the COVID-19 pandemic.

There was a need to improve the understanding of health care access and utilization during the COVID-19 epidemic in CXB district. The ITS data showed a reduction in overall outpatient health consultations, and consultations for respiratory infection in children under 5, vaccinations, and ANC. As in other studies, a reduction in respiratory tract infections could be due to people's fears of going to the health facilities and either being diagnosed with COVID-19 or catching COVID-19 at the clinics, or it could be due to a reduction in such infections due to improved IPC measures. Clearly, people adapted their health seeking behavior according to a variety of factors from quarantine that limited population mobility to socioeconomic factors. Households and HCWs interviewed stressed proximity to health services as an important factor in choosing where to go. Some people chose to use primary health care services for certain diseases while deciding to go to hospitals for other services. As in many other countries, there was a reduction in many people utilizing health care services at the beginning of the epidemic that coincided with lockdowns. Further investigation into the differential decision-making for services sought at health care facilities of different levels is needed to better understand which factors shaped communities' decisions. This information could help the government and its partners improve the effectiveness of health service provision, including supply chain and health care workforce. Furthermore, there appeared to be a need to expand the availability of trained HCWs in rural and remote areas.

6. Data triangulation

Our study shows the need to triangulate disease specific data, health systems data, and community-based data is essential for analysis and interpretation to inform strategies and programs.

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9 Annexes

9.1 Interview guide for health care workers

9.2 Interview guide household survey

9.3 Interview guide for key informant interviews