

## A systematic assessment on COVID-19 preparedness and transition strategy in Bangladesh

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Abstract:	<p>Rationale, aims and objectives: The COVID-19 pandemic of 2020 has overpowered the most advanced health systems worldwide with thousands of daily deaths. The current study conducted a situation analysis on the pandemic preparedness of Bangladesh and provided recommendations on the transition to the new reality and gradual restoration of normalcy.</p> <p>Method: A complex adaptive system (CAS) framework was theorized based on four structural dimensions obtained from the crisis and complexity theory to help evaluate the health system of Bangladesh. Data sourced from published reports from the government, non-governmental organizations and mainstream media up to 15 June 2020 were used to conduct a qualitative analysis and visualize the spatial distribution of countrywide COVID-19 cases.</p> <p>Results: The findings suggested that Bangladesh severely lacked the preparedness to tackle the spread of COVID-19 with both short- and long-term implications for health, the economy, and good governance. Absence of planning and coordination, disproportionate resource allocations, challenged infrastructure, adherence to bureaucratic delay, lack of synchronized risk communication, failing leadership of concerned authorities and incoherent decision-making have led to a precarious situation that will have dire ramifications causing many uncertainties in the coming days.</p> <p>Conclusions: Implementation of response protocols addressing the needs of the community and the stakeholders from the central level is urgently needed. The development of mechanisms for dynamic decision-making</p>

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# **A systematic assessment on COVID-19 preparedness and transition strategy in Bangladesh**

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### **Ethical Clearance**

Publicly available data from Bangladesh Government were used in this study. They would be made available upon requesting the authors. The full data set is attached in the supplementary file 2.

### **Contributor statement**

RK Biswas conceptualised the study, formulated the model, coded the maps, synthesised the analysis plan, and drafted the manuscript. S Huq structured the manuscript, conducted literature review, and drafted the manuscript. A Afiaz compiled the data, coded the maps, finalized the model, and drafted the manuscript. HTA Khan critically reviewed the manuscript. The final manuscript was read and approved by all the authors.

# A systematic assessment on COVID-19 preparedness and transition strategy in Bangladesh

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## Abstract

**Rationale, aims and objectives:** The COVID-19 pandemic of 2020 has overpowered the most advanced health systems worldwide with thousands of daily deaths. The current study conducted a situation analysis on the pandemic preparedness of Bangladesh and provided recommendations on the transition to the new reality and gradual restoration of normalcy.

**Method:** A complex adaptive system (CAS) framework was theorized based on four structural dimensions obtained from the crisis and complexity theory to help evaluate the health system of Bangladesh. Data sourced from published reports from the government, non-governmental organizations and mainstream media up to 15 June 2020 were used to conduct a qualitative analysis and visualize the spatial distribution of countrywide COVID-19 cases.

**Results:** The findings suggested that Bangladesh severely lacked the preparedness to tackle the spread of COVID-19 with both short- and long-term implications for health, the economy, and good governance. Absence of planning and coordination, disproportionate resource allocations, challenged infrastructure, adherence to bureaucratic delay, lack of synchronized risk communication, failing leadership of concerned authorities and incoherent decision-making have led to a precarious situation that will have dire ramifications causing many uncertainties in the coming days.

**Conclusions:** Implementation of response protocols addressing the needs of the community and the stakeholders from the central level is urgently needed. The development of mechanisms for dynamic decision-making based on regular feedback and long-term planning for a smooth transition between the new reality and normalcy should also be urgently addressed in Bangladesh.

**Keywords:** Situational assessment, Health system, Crisis theory, Complexity theory, SARS-COV-2, Pandemic, LMIC

COVID-19 preparedness of Bangladesh

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**30 Introduction**

31 The outbreak of the 2019 novel coronavirus (COVID-19) has challenged existing health systems  
32 and national preparedness strategies on the outbreak of pandemics worldwide. COVID-19 has sur-  
33 passed the magnitude of two epidemics in last two decades: severe acute respiratory syndrome  
34 coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV).<sup>1,2</sup>  
35 General discussion about the pandemic up until June, 2020 has focused on the experiences of  
36 China, USA and Europe. Low- and middle-income countries (LMICs) such as Bangladesh started  
37 to experience the early onslaught of COVID-19 in early March 2020 with severe consequences in  
38 the offing.<sup>3</sup> To help address this gap, this study evaluated the health system of Bangladesh and  
39 its pandemic preparedness approach by means of a complex adaptive system (CAS) framework.

40 Following the introduction of International Health Regulations (IHR) in 2005 endorsed by 196  
41 countries, national level efforts were called for to strengthen health systems to help prevent the  
42 spread of infectious diseases on an international scale without disrupting international traffic and  
43 trade.<sup>4</sup> However, in LMICs, political resolve, insufficient resources and technical limitations have  
44 challenged the implementation of these recommendations.<sup>5,6</sup> Furthermore, the support from high-  
45 income countries towards LMICs has not been encouraging.<sup>7,8</sup> It was also recommended that  
46 policy implementation for all LMICs as a single body would not be practical in unprecedented  
47 circumstances, as is evident from the ongoing COVID-19 pandemic that demands country specific  
48 assessments.<sup>9</sup>

49 Bangladesh is an over-populated LMIC that has seen strong growth over the last decade in its  
50 export-based economy and improvements in multiple public health indicators.<sup>10,11,12</sup> Despite the  
51 goodwill from local and international non-governmental organizations, the existing health system  
52 is already stretched with only 7.4 skilled workers per 10,000 population.<sup>13,14</sup> The dawn of the  
53 COVID-19 crisis has positioned the whole system into a unique paradigm by challenging health,  
54 the economy, and law and order.

55 There has not been a formal evaluation on the preparedness of the Bangladesh health system  
56 for coping with pandemics or substantial analysis on the health system as a whole. A critical  
57 assessment is therefore needed in order to better prepare for the ongoing challenge and future  
58 pandemics. The objective of this study is to theorize a complex adaptive system (CAS) framework  
59 to evaluate the health system during a pandemic and assess the steps taken so far by Bangladesh

## COVID-19 preparedness of Bangladesh

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60 for tackling the COVID-19 crisis up to 15 June 2020.

61 For the purpose of discussing the preparedness and systematic transmission of Bangladesh  
62 during the COVID-19 crisis, the study applied the CAS framework. The parameters of the CAS  
63 and sources of data based on relevant theories were detailed in the next section (Methods) followed  
64 by a discussion on the agents, internal and external environments that impact the performance of  
65 the health system of Bangladesh during the pandemic. Before conclusion, a set of recommendations  
66 derived from the quantitative synthesis were listed, which would assist policymakers and relevant  
67 institutions to conduct a better transition from current crisis to normalcy.

### 68 **Methods**

69 The complex adaptive system (CAS) framework was used to assess the health system pre-  
70 paredness of Bangladesh since the performance is based on multiple dimensions of crisis theory  
71 and complexity theory. Crisis theory is characterizes the idea that unresolved or inevitable con-  
72 flict will change the existing paradigm and typical problem-solving mechanisms would not be  
73 efficient.<sup>15,16</sup> Due to the resulting disorganization from the crisis, interventions are applied to help  
74 the system to adapt and recover in the shortest possible time.<sup>17</sup> This theory was applied to explain  
75 the management of a recent country-specific epidemic such as SARS in Singapore.<sup>18</sup>

76 Complexity theory was proposed to explore the individual, organizational and systemic be-  
77 haviours of a social phenomenon.<sup>19,20</sup> Using complexity theory, complex and emerging health  
78 issues such as pandemics or epidemics can be elucidated.<sup>21</sup> Health systems can be non-linear  
79 and often unpredictable during a pandemic<sup>22</sup> and since complexity theory has been used in the  
80 literature for disease outbreaks,<sup>23</sup> several aspects of this theory were applicable in the context of  
81 COVID-19.

82 Four major dimensions were extracted from the crisis and complexity theories to encompass  
83 the preparedness of the Bangladesh health system for COVID-19 (Figure 1) and, based on these  
84 four dimensions, the CAS framework was assembled. The CAS framework is a continuing self-  
85 organization that uses a bottom-up approach based on multiple agents of a system to emerge  
86 a whole pattern based on both internal and external environment.<sup>24,25</sup> The CAS is regularly  
87 applied to explain the interdependencies among health system agents and their consequences in  
88 multiple spheres (macro, meso, micro and nano).<sup>26</sup> In this study, each of the four dimensions were

## COVID-19 preparedness of Bangladesh

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89 explored using the four concepts of the CAS framework: agents, emergence, internal and external  
90 environments, to elucidate the Bangladesh health system (Figure 1).

91 Data were sourced from reports published by the Bangladesh Directorate General of Health  
92 Services (DGHS) and World Health Organization (WHO) for instance, among others, as well as  
93 media articles up to 15 June 2020 for the situation analysis. Regular press briefings and data  
94 released by the Institute of Epidemiology, Disease Control and Research (IEDCR), the official  
95 source of COVID-19 information in Bangladesh, were collected and analysed. These include daily  
96 data on the number of tests, positive cases, deaths, recoveries and case locations as well as data on  
97 medical inventories specially supplied for COVID-19 preparation. The spatial mapping on district  
98 wise COVID-19 transmission was formulated using  $R$  (version 3.5.0).

### 99 **Results and Discussion**

#### 100 *1. Immediate response to crisis*

##### 101 *National level preparedness and coordination*

102 Previous pandemics related to the coronavirus have provided examples of healthcare workers  
103 being infected due to occupational exposure and demonstrate the importance of timely sharing of  
104 accurate information and proactive collaboration in generating an effective response.<sup>27</sup> Reinforce-  
105 ment of the IHR guidelines<sup>28</sup> has allowed effective management of crises through evaluation of risk  
106 communication strategies using information from risk assessments minimizing mass anarchy.<sup>29</sup>

107 Coordination and accountability are vital elements in forming an effective response to events  
108 such as COVID-19. Therefore, such mechanisms need to channel the implementation of evidence  
109 based decision-making at central level for its contextualization to the needs at local level. Coordi-  
110 nation also requires the incorporation of feedback from communities addressing their concerns that  
111 may be causing emotional distress and the development of effective relationships at local level.<sup>18</sup>

112 As part of its COVID-19 response, Bangladesh has established a number of committees at all  
113 levels comprising of decision-makers, administration, law and order, information, local & interna-  
114 tional organizations and various components of the health system.<sup>30</sup> A technical committee was  
115 formed at central level comprising healthcare stakeholders for the purpose of evaluating activities  
116 in the plan through a review process and for recommending resource mobilization.

117 The role of committees at local level is limited to the implementation of the plan devised  
118 at central level. According to Stacey (2003)<sup>20</sup> on the understanding of complex systems, the



COVID-19 preparedness of Bangladesh

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119 committee failed to include sector specialists (including public health experts) focusing on the  
120 respective service and information delivery relevant to the COVID-19 response. Such a scenario  
121 can contribute to a lower rate of information flow as well as prompt limited impact due to a lower  
122 level of diversity and differentials in risk perceptiveness between the various levels.

123 The status quo differentials between local and national interests might also affect the generation  
124 of any response due to the unavailability of feedback loops among the parts of the system based  
125 on these committees.<sup>31</sup> The differentials between local and national levels can affect the degree  
126 of accountability in these systems that are not specified in measured terms regarding the trend of  
127 the disease spread.

*128 Assessing the overall scenario and conducting strategic planning*

129 A total of 90,619 cases and 1209 deaths with a recovery rate of 20.6% have been reported  
130 until 15 June 2020 due to COVID-19 from the 519,503 tests conducted across 60 testing centres  
131 indicating an attack rate of 532.1/million people and case fatality rate of 1.33% in Bangladesh.<sup>32</sup>  
132 IEDCR estimates suggest that 53% of cases belong to the 21-40 years age group with 70% of cases  
133 being males.<sup>33</sup> Half of the centres are located in Dhaka (the capital) with those outside the city  
134 sited in scattered locations, not more than 3 centres other than Dhaka (excluding Dhaka city)  
135 (6), Chattogram (8), Rajshahi divisions (5). This situation can possibly lead to overloading of the  
136 test centres in Dhaka that can, in turn, contribute towards issues of timeliness of reporting of the  
137 number of cases as well as the quality of the test samples obtained.

138 Due to the lack of an effective health information system that would have contributed towards  
139 enhanced surveillance ensuring effective planning and monitoring of disease spread, government  
140 was forced to undertake stringent measures without meticulous assessment of the magnitude of  
141 disease due to data unavailability. As of 15 June 2020, the Dhaka city bears the major burden  
142 of COVID-19 cases (2859.6 per million). However, the virus has managed to spread to other  
143 neighbouring districts of Munshiganj (876.4 per million), Naryanganj (852.4 per million) as well as  
144 other major cities such as Cox's Bazar (494.9 per million), Chattogram (408.7 per million).<sup>34</sup> Such  
145 level of caseload is also evident on the case doubling rate of Dhaka, Naryanganj, Munshiganj, Cox's  
146 Bazar, Munishiganj within the range of 6-8 days. Even in other district, alarms are ringing as the  
147 case doubling rate in Feni and Noakhali is only 5 days.<sup>35</sup> However, the situation became quite  
148 difficult to control in the light of suspension of trade and other economic activities, the country has

COVID-19 preparedness of Bangladesh

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149 been divided into multiple zones 45 areas in Dhaka city and 11 in Chattogram for adhering strict  
150 control.<sup>36</sup> These indicate that community transmission is observed in Bangladesh and is shown in  
151 Figure 2.

152 Although a protocol has been designed,<sup>30</sup> its implementation and accuracy require assessment.  
153 Reports from WHO dated 20 April 2020 suggest that the discrepancy between the reported number  
154 of tests and the number of people tested indicates multiple testing of the same patient.<sup>34</sup> There  
155 is no available data on the quality control around the handling of the samples and is therefore  
156 another issue to explore in addition to the diagnostic characteristics of the tests available for the  
157 identification of the disease.

158 Deployment of inadequate resources at key periods has led to a deterioration of the scenario.  
159 A total of 718,921 people arrived in Bangladesh via air, land and seaports from 8 March 2020,  
160 when the first case was identified, up to 15 June 2020. Airport screening of such high numbers  
161 overwhelmed a pool of only 7 doctors, 10 nurses and 20 staff also operating without separate  
162 booths for passengers arriving from high-risk countries.<sup>37</sup> This situation heightens the possibility  
163 that passengers with virus symptoms travelling to the country in the early days of the pandemic  
164 were missed.

165 As part of the COVID-19 preparedness and response plan, 565 medical teams with isolated  
166 units in 493 upazila and separate outpatient departments for patients having respiratory tract  
167 infections at 443 upazila have been established as of 15 June 2020.<sup>32</sup> While all this looks good  
168 on paper, a disproportionate allocation of resources was widespread. For example, despite there  
169 being a higher case burden in Dhaka (2859.6/million) and in the neighbouring districts such as  
170 Narayanganj (852.4/million) and Munshiganj (876.4/million), as of 15 June 2020, all of them have  
171 a lower number of isolation beds than Sylhet (N = 481) that has 166.5 cases per million people.<sup>32</sup>  
172 A similar imbalance was observed in the formulation of medical teams. A total of 889 physicians  
173 and 738 nurses were involved in the designated COVID-19 response medical teams but only 185  
174 medical technologists and 504 support staff were included. A large number of teams consisted of  
175 only physicians and nurses, excluding other key personnel leading to an inadequate proportion of  
176 available healthcare workers, disorganization, and increased exposure.

177 As of June 15, 2020, a total of 1.3 million PPEs, 3.14 million mask, 562,439 gloves have  
178 stocked.<sup>38</sup> There is a huge shortage of supplies in those facilities located in areas with a higher  
179 case burden, especially the N-95 masks. These masks are being highly distributed in districts like

COVID-19 preparedness of Bangladesh

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180 Dinajpur (354) and Moulvibazar (388) but Narayanganj had only 10 of the N-95 masks despite  
181 having a much higher case burden.<sup>39</sup>

182 The quality of the supplied resources has been extensively questioned. News reports indicate  
183 a debacle with the quality of 20,600 of the N-95 masks where the supplier organization has sought  
184 exemption from punishment for providing below quality masks after packaging them with N-95  
185 marking.<sup>40</sup> These inadequacies played a part in the lead up to the health facility lockdowns as  
186 health workers were infected and services were halted as a result.<sup>41,42</sup>

### 187 *Bottlenecks and barriers for preparedness*

188 An effective response coordinating multilevel stakeholder activities during a pandemic could  
189 improve the healthcare infrastructure and contribute to a resilient healthcare system. A resilient  
190 healthcare system is expected to absorb the shock and adept to dynamic needs while maintaining  
191 the existing level of healthcare accessibility.<sup>43</sup>

192 Bangladesh activated a 6-level plan from preparedness to mitigation using the Infectious Disease  
193 (Prevention, Control and Elimination) Act 2018 as the guiding document detailing the contain-  
194 ment activities for the progressive development of COVID-19.<sup>30</sup> Early initiatives like quarantining  
195 arrivals from high-risk countries was hampered by crowd reactions to the appalling conditions  
196 at the quarantine sites that forced the government to allow home quarantine for new arrivals.<sup>44</sup>  
197 Other bottlenecks included the non-adherence to home quarantine and non-compliance with social  
198 gatherings as evident from the Gaibandha district where 2 US returnees with confirmed COVID-19  
199 status went to a wedding ceremony that had 500 attendees<sup>45</sup> along with mass religious gatherings  
200 in the Lakshmipur district.<sup>46</sup>

201 RT-PCR is an advanced molecular testing procedure with costs ranging from 54-100 Euros per  
202 test. In a country where the public healthcare expenditure is heavily donor dependent (60%), it  
203 will be difficult for the government to fund mass testing countrywide. Poverty played a role in lock  
204 down failure in Bangladesh when 370 ready-made garments (RMG) factories failed to pay their  
205 workers by the 16 April deadline, which affected the livelihoods of these workers<sup>47</sup> and prompted  
206 them to arrange protests risking community transmission. RMG sectors appeared to have no  
207 rescue packages to cover the salaries of workers in case of a pandemic emergency and immediately  
208 sought government assistance for paying them. This has caused an understandable if undesirable  
209 panic among RMG workers even among those in the big factories.

COVID-19 preparedness of Bangladesh

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210 The panic created by factory owners trying to resume work on 12 April 2020 with the decision  
211 then retracted the night before saw mass migration from rural to urban areas risking further  
212 transmission.<sup>48</sup> Furthermore, the fiasco created on the provision of false treatment and fabricated  
213 testing result lead to a trust issue on the private sector service delivery making the process rather  
214 complicated in the context of the fragmented public health infrastructure including international  
215 visa denials.<sup>49, 50, 51</sup>

216 Risk communication is a vital bottleneck for response and preparedness in a pandemic. This  
217 kind of communication includes understanding public perceptions and promptly addressing mis-  
218 information. Even though the protocol<sup>30</sup> mentions that a knowledge, attitude and practice survey  
219 had been conducted during the preparedness phase, there are no reports of such a survey having  
220 been completed. The shortage of drugs such as hydroxychloroquine created an artificial scarcity,  
221 media hype created through vaccine and other promising candidate downplaying the risk,<sup>52, 53</sup> and  
222 refusal to have routine check-ups due to a perceived fear of the spread of COVID-19 are embodi-  
223 ments of weak risk communication strategies.

224 There are 7.4 skilled health workers per 10,000 population in Bangladesh that accentuates the  
225 difficulty in monitoring COVID-19 cases effectively.<sup>54</sup> While several countries resorted to recruiting  
226 healthcare workers from their reserve or retired professionals,<sup>55</sup> the Bangladesh Government is  
227 still in the process of recruiting 2,000 physicians and 6,000 nurses in order to make up for staff  
228 shortages that demonstrates bureaucratic delay.<sup>56</sup> Other preparedness bottlenecks involve the  
229 equitable distribution of intensive care units (ICUs), limited access in the context of out-of-pocket  
230 expenditures, healthcare equipment including the availability of ventilators, protective equipment,  
231 and availability of essential medicines due to the halt in movement and trade.

### 232 *Information to the public*

233 Dissemination of correct information to concerned stakeholders is vital during a pandemic. It  
234 addresses the dimension of awareness in the healthcare access theory using mainstream and social  
235 media while maintaining order and safety.<sup>57, 58</sup> Timeliness and transparency in disseminating  
236 information have been shown to reduce panic and anxiety and helped in effectively engaging  
237 citizens with their social responsibilities during the 2003 SARS pandemic.<sup>59</sup>

238 Public communication measures in Bangladesh during the COVID-19 outbreak were unsatis-  
239 factory. The authorities constantly downplayed the magnitude of the threat posed by the virus

## COVID-19 preparedness of Bangladesh

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240 outbreak in the media along with the government's capacity for tackling such a crisis despite differ-  
241 ent claims in media reports.<sup>60,61</sup> These failings caused complacency among the people and sowed  
242 the seeds of confusion and distrust of authority.

243 Although the official protocol states that risk communication strategies have been discussed  
244 at length,<sup>30</sup> these measures have hardly been put into practice. The plan to counter the spread  
245 of misinformation was derelict<sup>60</sup> and focused on and issuing reminders and threats against the  
246 entities (individuals, media outlets) that spoke out against those in the government.<sup>62,63</sup>

247 The response plan included developing preventive appropriate message packages for different  
248 audiences based on key demographic characteristics and revolved around working with key stake-  
249 holders to build their capacity for awareness and health promotion through participatory interven-  
250 tions. However, no systematically established community information and feedback mechanisms  
251 have been made available leaving the government in the dark about how the adopted control mea-  
252 sures are functioning in the society that may have considerable implications for future planning  
253 and decision-making. Lack of accountability and transparency has led to the suspension of medical  
254 professionals at a time when they are most needed.<sup>64</sup>

### 255 *2. Mobilizing resources and addressing novelty*

#### 256 *New problem - new structure*

257 The current health system and the underlying healthcare infrastructure in Bangladesh are both  
258 considerably neglected and underdeveloped.<sup>65</sup> In recent times, the health system has struggled to  
259 deal with a recurring seasonal dengue outbreak that has been occurring regularly and increasing  
260 in severity since the turn of the century.<sup>66,67</sup> A review of the healthcare system in Bangladesh<sup>68</sup>  
261 revealed that non-transparent and corrupt practices, as well as ineffective oversight mechanisms,  
262 failed to uphold the safety of citizens and left them vulnerable to malpractice within the system.<sup>65</sup>  
263 These scenarios have been observed during the early onset of the COVID-19 outbreak.

264 Like many other countries, the COVID-19 outbreak has posed an unprecedented strain on the  
265 health system of Bangladesh. While the average health expenditure in south Asian countries and  
266 LMICs was 3.46% and 5.39% of GDP respectively,<sup>69</sup> the recent fiscal budget in Bangladesh has  
267 increased allocation to the health sector for the year 2019-2020 to a meagre 1.02%.<sup>70</sup> This translates  
268 to a weak health system and infrastructure that is unlikely to attain the WHO benchmark 1.3 or  
269 be capable of sustaining any financing mechanism ensuring there are enough funds for a timely

COVID-19 preparedness of Bangladesh

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270 response to public health emergencies, or conform to the IHR guidelines.<sup>28</sup>

271 In a country of more than 16 million people, there are 49 ventilators at government facilities  
272 (<sup>32</sup> last updated: 26 April 2020) and limited number of ICUs countrywide with no quality control  
273 mechanism.<sup>71,72</sup> These findings expose the urgent need for an updated health system framework  
274 that can address the aspects of access and mobilization of necessary resources in accordance with  
275 the current pandemic situation.

276 A pandemic scenario demands an improved efficiency in decision-making by devising necessary  
277 protocols that enable quick responses. This is fundamental to the process of strategising an effective  
278 call-to-action in any epidemic or pandemic requiring on the spot decisions and informed actions  
279 including effective mobilization of resources.<sup>73</sup> Bangladesh had time to prepare for the pandemic  
280 with the country's first case identified on 8 March 2020, over a month after WHO's declaration  
281 of a public health emergency of international concern.<sup>74</sup> Unfortunately, the authority's reluctance  
282 from the outset and persistence with typical bureaucratic procedures yielded weak preparedness.

### 283 *Contextualizing the health system*

284 It is expected that preparation of the health system would contextualize the new demands in the  
285 existing framework. Part of these preparations would involve setting up testing centres, dedicating  
286 disease-specific specialized health facilities and engaging with the context-specific needs of profes-  
287 sional bodies. All these are possible in Bangladesh but the capabilities of the test centres/health  
288 facilities during this crisis and the goodwill of the highly politicized professional associations could  
289 be questionable.<sup>75,76,77</sup>

290 Previous responses from Bangladesh during health crises are not encouraging. For example,  
291 during the Nipah virus (NiV) in 2004, patient caregiving practices were poor and hospitals were  
292 not equipped to handle contamination.<sup>78</sup> Due to overcrowding, health facilities are often subjected  
293 to nosocomial due to inadequate isolation units, bed space, sinks, waste management, and general  
294 hygiene practices.<sup>79</sup> During the 2004 crisis, many health facilities had been reluctant to treat  
295 patients who showed virus-like symptoms, often leaving them untreated and resulting in multiple  
296 deaths.<sup>80</sup> The current infrastructure could hardly address the burden of a pandemic of the size of  
297 COVID-19.

298 The lack of preparation for the COVID-19 crisis was evident within the first month (March  
299 2020). This included the closing of entire health complexes as health workers were COVID-19

COVID-19 preparedness of Bangladesh

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300 positive,<sup>81</sup> suspension of doctors due to their alleged unwillingness to treat patients,<sup>82</sup> physicians  
301 served with a 'show cause' for speaking out regarding lack of protective equipment,<sup>63</sup> and confession  
302 of faulty equipment already distributed to doctors that all serve to illustrate the severe lack of  
303 preparation by DGHS and mistrial incoordination that resulted in a failure to address stakeholder  
304 concerns.<sup>40</sup> Health workers in Bangladesh made up 12% of all the COVID-19 cases (at least 350  
305 out of 2948 recorded positive cases) as of 11am on 21 April 2020<sup>83</sup> despite a lengthy preparedness  
306 and response plan that shows the weakness in policy implementation.

*307 Mobilizing community engagements*

308 An important aspect of crisis management is the mobilization of local community level efforts  
309 including distribution of resources and handling mass panic. A well-articulated plan was required to  
310 ensure that food relief reached those in need and emergency services continued without disruption  
311 ensuring a successful lockdown. To manage unnecessary panic or rumours, central communication  
312 needed to reach to the root or local level to assure the unprivileged sections of society that the  
313 lockdown would not lead to starvation and they would receive adequate treatment.

314 Despite the worldwide lockdown and WHO's constant advice on social distancing and lock-  
315 downs, these decisions in Bangladesh were taken late and disregarded how the new normal would  
316 work. For example, the entire transport system was closed without any measures put in place to  
317 enable emergency workers to travel. Even after six weeks from the first identification of a COVID-  
318 19 patient (8 March to 15 June), the inadequate distribution of PPEs was being reported<sup>84</sup> in spite  
319 of government data showing there were adequate stocks.<sup>61</sup>

320 The Infectious Disease Act<sup>85</sup> should, on paper, have served the purpose of enabling appropri-  
321 ate dissemination of information and controlling any panic. However, emergency measures were  
322 delayed as lack of transparency at the Health ministry led to confusion.<sup>86,87</sup> Panic was further  
323 fuelled when the government accused healthcare workers of negligence in discharging their duties,  
324 that they had a weak mentality and claimed they would be replaced by foreign workers.<sup>88</sup> All  
325 these presented mixed messages to the community, where infection of COVID-19 was equated to  
326 confirming death in rural areas. Consequently, people were averse to testing and many fled from  
327 quarantine risking greater community transmission.<sup>89</sup>

COVID-19 preparedness of Bangladesh

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328 *3. Non-linearity*329 *Decision dynamics*

330 Any pandemic provides a unique scenario with intricate and rapid mechanisms. The current  
331 organizational approach that focuses on maximizing outputs often fails to recognize the interactiv-  
332 ity between the components of a complex system.<sup>90</sup> This is an important realization in the context  
333 of planning an effective response during a pandemic. Such an approach provides encouragement  
334 for innovation and synergised operation by accepting the non-linearity of a complex system and  
335 permits creative solutions to sudden and challenging problems.<sup>91</sup>

336 The idea of pre-emptive listing of the barriers to devising an appropriate response to the  
337 pandemic might not be exhaustive as more unexpected problems are likely to reveal themselves  
338 over the course of the pandemic. The leadership needs to make proper use of the intellectual capital  
339 available while discussing creative control measures and putting them into practice.<sup>90</sup> Coordination  
340 with international organizations, such as the WHO, UN and World Bank is essential in procuring  
341 necessary funds for LMICs and implementation of international guidelines.

342 Bangladesh came short in putting emergency procedures into practice. The initial safety mea-  
343 sures to be implemented at the airports were severely lacking even after the WHO had declared  
344 the COVID-19 outbreak a world health emergency.<sup>92,93,94</sup> However, this situation did not improve  
345 until the government was forced to ban almost all domestic and international flights from 28 March  
346 onwards after imposing a partial ban on 21 March.<sup>37,95</sup>

347 During the month of April, the second month of the crisis, the authorities failed to stop large  
348 gatherings taking place at Brahmanbaria and Barguna districts.<sup>96,97</sup> Lack of coordination across  
349 ministries and institutions, weak leadership and an inability to mobilize responses to unexpected  
350 events has put Bangladesh in a precarious situation amid the COVID-19 pandemic.

351 *Leadership*

352 It is to be expected that the health department would make prompt decisions efficiently during  
353 public emergencies. Often new ideas and fresh energy are required if the typical system fails.  
354 For example, China changed leadership in Hubei Province during the Wuhan outbreak<sup>98</sup> and the  
355 Netherlands made an opposition leader the temporary health minister to cover the crisis.<sup>99</sup> These  
356 moves were intended to restore public confidence and display political goodwill.

357 Bangladesh was ill-prepared for COVID-19. The same system that failed to meet regular



## COVID-19 preparedness of Bangladesh

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358 healthcare demands was put to a sterner test. This resulted in utilization of only one test centre  
359 in the first 3 weeks of the crisis (8 - 25 March 2020) that was only able to test 0.3% of those who  
360 raised a concern over their status.<sup>3</sup> Even the expansion of the test centres was sluggish indicating  
361 an inadequate laboratory infrastructure and slow dissemination of test kits.<sup>100,101,102</sup>

362 Lack of coordination among departments in the Bangladesh government could be a result of  
363 poor leadership. While the Health Minister failed to maintain composure, there were multiple  
364 irresponsible statements coming from other ministers including that Bangladesh would be capable  
365 of building hospitals in six days like in Wuhan, and downplaying COVID-19 as a non-deadly disease  
366 that did not help the greater cause.<sup>60</sup> These random, irresponsible dialogues equate to a loss of  
367 faith in the leadership and often give birth to fabricated news.

368 Typical political stances can block the possibility and potential of fresh ideas. While the  
369 Prime Minister proposed a 31-point directive in early April 2020, none of the points were fully  
370 implemented.<sup>103</sup> The planning stage of these proposals, just like the National Preparedness and  
371 Response Plan for COVID-19 and the infectious disease law, remained on paper due to absence  
372 of targeted assessment to address the burden properly alongside the feasibility for its successful  
373 implementation. These stereotypical politics and the fatigued health system are hardly in a position  
374 to put up a fight against the COVID-19 pandemic.

### 375 *4. Designing an escape plan*

#### 376 *Normalizing the new reality*

377 The current situation with COVID-19 will make it difficult to resume normal service in the  
378 country straight away. The increased transmission risk of COVID-19 in any congested working  
379 space minimizes opportunities for social distancing. Capacity building and legislature mechanism  
380 need to be the building blocks for preparing the health system for resumption of normal services  
381 in a progressive way.

382 Bangladesh, however, is not showing signs of deviating from its traditional infrastructure de-  
383 velopment process despite the pandemic. A meagre increment of 0.63% of the total budget is to  
384 be allocated to the health sector that is aimed at building a 1000-bed super specialized ward, a  
385 one-point check-up centre and a cancer building at Bangabandhu Sheikh Mujib Medical Univer-  
386 sity.<sup>104</sup> A private-public partnership was used to set up testing kiosks in Dhaka in April, but these  
387 low-quality facilities could actually put health workers at increased risk.<sup>47</sup>

COVID-19 preparedness of Bangladesh

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388 Economic growth is expected to be a trade-off for the lockdown to contain the ongoing spread.  
389 The cancellation of orders for the RMG sector amounted to USD 3 billion, as of 3 April 2020.<sup>105</sup> It  
390 has been reported an estimated loss of BDT 33 billion every day during the shutdown.<sup>106</sup> Restricted  
391 movements can contribute to the economic cycle affecting those with limited earnings as well as  
392 large industries dependent on day labourers.

393 In order to address the impact on the economy, the government has rolled out an incentive  
394 package of around BDT 950 billion. Around USD 589 million are allocated with a 2% service charge  
395 for the payment of all RMG workers for a duration of 3 months.<sup>105</sup> The Ministry of Health along  
396 with partners have planned a project of more than 30 million USD for a 9-month duration in order  
397 to address the bottlenecks of the health system.<sup>30</sup> Despite such packages, multiple attempts have  
398 been made to open the industries again, particularly RMGs, that threatens the disease containment  
399 objective of this short-term bail out.

#### 400 *Systematic transition mechanism*

401 Although the initial transition in Bangladesh was disjointed, lessons from that time can be  
402 used for cautioned opening. A second wave or more of the COVID-19 pandemic might not be  
403 affordable for the already hit economy.<sup>107</sup> Positive steps were taken to keep the economy going  
404 such as mobilizing community efforts for Boro-rice cultivation that not only addressed concerns  
405 due to an early flash flood, but also contributed towards temporary employment opportunities  
406 along with food shortages. A constant monitoring of these small-scale gatherings would provide  
407 indicators for the transition steps.<sup>108</sup> In order to implement the response mechanism effectively,  
408 more tests would be required and meticulous contact tracing system should be developed along  
409 with testing infrastructures that would utilize existing university laboratories.

410 It is expected that population-based risk assessments will be conducted routinely in order  
411 to isolate those at higher risk of contracting the virus. Classification of disease risk in terms  
412 of infection spread and exposure level covering all population groups will facilitate the issue of  
413 accountability and data-driven decision-making.<sup>109</sup> The availability of newer quarantine centres  
414 through conversion of existing facilities would need to be functional for some time in the event  
415 of any transition to normal services. Leadership and effective governance through coordination  
416 between the societal building blocks is pivotal for ensuring a smooth transition.

COVID-19 preparedness of Bangladesh

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417 **Recommendations**

418 The countries with the best performances during the COVID-19 pandemic, such as South  
419 Korea, provided a subsidy for living costs to individuals in isolation. Germany, Mexico and Chile  
420 provided funds through health insurance mechanisms to those that met the case definitions of the  
421 respective countries for COVID-19 or were referred by a doctor.<sup>55</sup>

422 A vaccine or a drug for treating COVID-19 has yet to be developed so disease management and  
423 accurate diagnosis are crucial factors in the context of this virus. An effective pipeline needs to be  
424 established for the provision of kits, PPEs and stocks for intensive care units as well as essential  
425 medicine addressing the continuum in terms of supply and quality control. Experience from France,  
426 China, Sri Lanka and Japan has shown the benefits of makeshift but sustainable health facilities  
427 to tackle an increased number of patients.<sup>55</sup> Bangladesh could take note from their quarantine  
428 strategies, lockdown policies and integrity in leadership to better handle the pandemic.

429 A protocol should be put in place for a smoother and sustainable transition between the lock-  
430 down period and normality. A pre-defined procedure on steps from lock down to cautioned open-  
431 ing should be documented and followed. For example, New Zealand have set a four-level risk  
432 assessment system or United Kingdom's five levels corona virus alert, which are allowing them to  
433 gradually return to normalcy.<sup>110</sup> A robust information system providing access to disease prognosis  
434 harnessing the power of informatics and telemedicine can be utilized to ensure adequate follow up  
435 and risk assessment on the diagnosed cases.<sup>111</sup> The summary of the recommendations is listed in  
436 Table 1.

437 Feedback mechanisms at the local level should be developed for a better understanding of  
438 priorities and be needs specific to the local context. The practice of social distancing needs to be  
439 strictly followed until the emergence of proper vaccines and extensive monitoring on inflation and  
440 control over artificial crises on trade and resources are required.<sup>107</sup> Meticulous understanding of  
441 the available evidence base is necessary to dispel the spread of misinformation and thus creating a  
442 cohesive environment for developing contextual and widespread evidence-based sustainable decision  
443 making.

## 444 Conclusion

445 The aim of this study was to evaluate the existing health structure in Bangladesh and its  
446 response in the early periods of the COVID-19 pandemic (March-June 2020). The results show  
447 that Bangladesh is not COVID ready due to complacency from its leaders at the beginning coupled  
448 with inadequate testing that has led to a scenario where decisions are not evidence-based but  
449 rather based instead on intuition and experience. While protocols or reports developed by the  
450 government indicated substantial planning, the field level response was insufficient to implement  
451 them. A change in health leadership, coordination with professional bodies enabling multi-sectorial  
452 partnerships and appropriate utilization of existing resources might be a plausible short-term  
453 solution. For a long-term transition process to achieve normalcy, awareness on health literacy, close  
454 monitoring, data-driven decision making and coordinated efforts from all relevant stakeholders are  
455 paramount.

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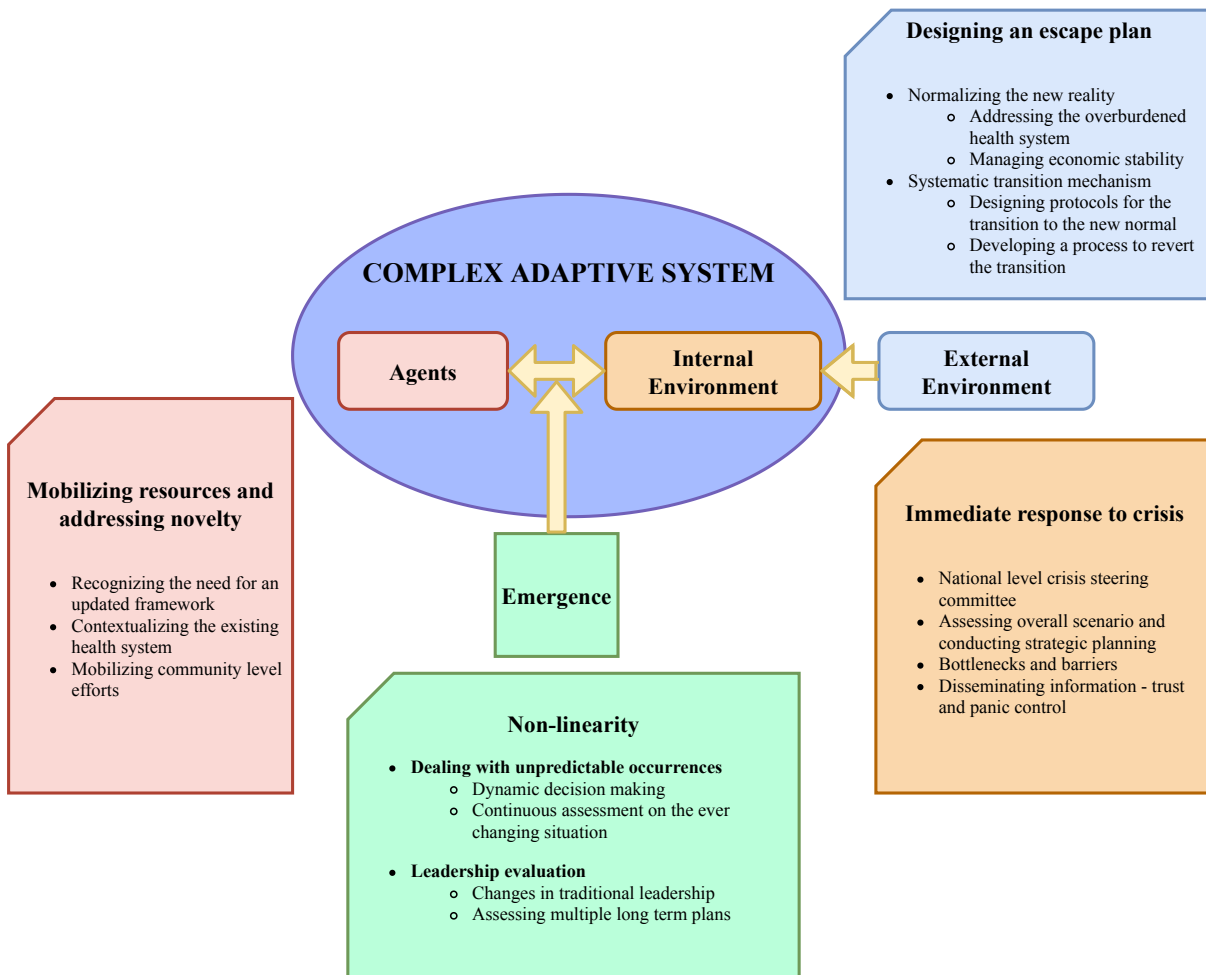


Figure 1: The complex adaptive system (CAS) framework complemented by crisis and complexity theory to ascertain the COVID-19 preparedness of Bangladesh health system

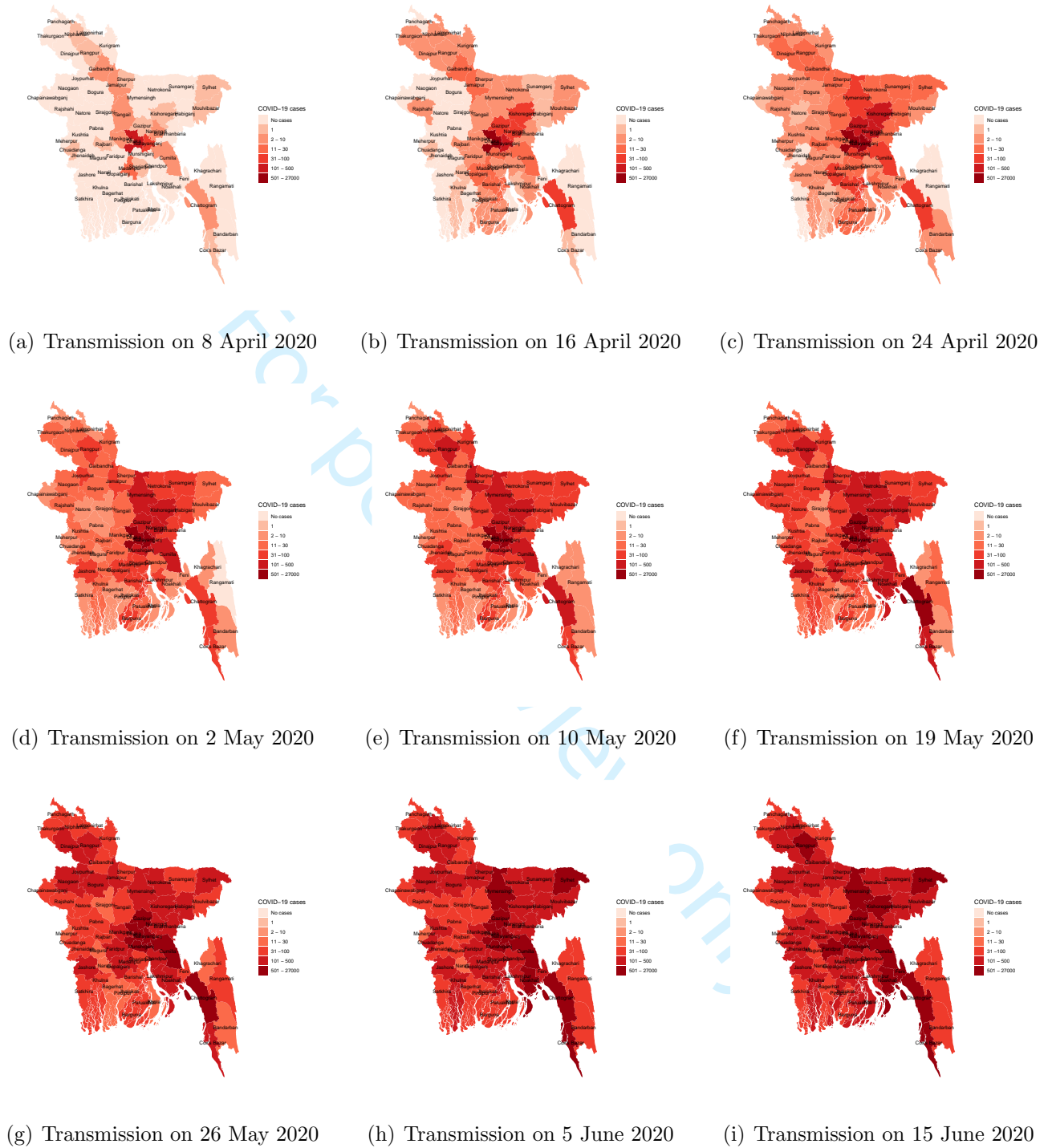


Figure 2: District-wise transmission of COVID-19 in Bangladesh from 8 April to 15 June 2020

25 July 2020

Dr Mathew Mercuri  
Editor in Chief  
Journal of Evaluation in Clinical Practice

RE: Decision on Manuscript ID JECP-2020-0430

Dear editor,

Thank you for providing us the opportunity to revise the manuscript entitled "A systematic assessment on COVID-19 preparedness and transition strategy in Bangladesh" for publication in the *Journal of Evaluation in Clinical Practice*.

We have addressed the reviewers' comments in our responses and incorporated the related changes into the original manuscript through a revision. For convenience, the reviewers' comments are highlighted in blue and our responses are highlighted in black font.

The primary changes made in the revised version of the manuscript include:

1. A new theoretical framework - The complex adaptive system (CAS).
2. New figures for maps have been recoded to include more recent information from 8 April to 15 June 2020.
3. A summary table of recommendations has been added for an easy one-glance overview.

In addition to the above, all authors have read and revised the manuscript. Some minor changes throughout the revised version of the manuscript are made, mostly to improve clarity of expressions.

We would like to thank you and reviewers for the valuable feedback and suggestions.

Sincerely,  
Authors



## A systematic assessment on COVID-19 preparedness and transition strategy in Bangladesh

(Manuscript ID: JECp-2020-0430)

### Reviewer #1

#### Reviewer's comment

1. This is a highly relevant paper for the journal. The paper is well written and the writer should be congratulated on the focus they have put into this research. The COVID-19 pandemic is an unknown quantity and I think the paper would be relevant to different stakeholders (e.g. academics, policymakers, non-government organisations).

I think the geographical illustrations (transmission rates) the authors have provided are excellent.

#### Authors' response

Thank you. We believe it is important for Bangladesh to have its health system assessed in light of the current pandemic to address the weaknesses and to improve in future.

Please note that we have changed the graphical illustrations. Previously we mapped the infection transmission from 8 April to 28 April. We have updated the maps and now addressing the changes from 8 April to 15 June.

#### Reviewer's comment

4. I have one recommendation for this paper, which I, as a reviewer, believe would make the paper even stronger. My recommendation is that the author includes a signpost statement in the introduction, i.e. how is the paper structured and what is the underlying argument.

#### Authors' response

Thank you for the suggestion. We have added the following paragraph at the end of Introduction (line 61-67 of page 3 of the revised manuscript) to address the signpost statement,

*"For the purpose of discussing the preparedness and systematic transmission of Bangladesh during the COVID-19 crisis, the study applied the CAS framework. The parameters of the CAS and sources of data based on relevant theories were detailed in the next section (Methods) followed by a discussion on the agents, internal and external environments that impact the performance of the health system of Bangladesh during the pandemic. Before conclusion, a set of recommendations derived from the quantitative synthesis were listed, which would assist policymakers and relevant institutions to conduct a better transition from current crisis to normalcy."*

## Reviewer #2

### Reviewer's comment

1. An analysis of a COVID pandemic in a LMIC like Bangladesh is most important for the field, and the authors are commended for their effort. However, the current manuscript is majorly deficient in its current form as it lacks a clear focus (the latter part is woolly and doesn't really connect to the main issues raised in the early parts), and lacks a clear anchoring in a conceptual space.

### Authors' response

Thank you. For a better anchoring and to address the signpost statements, we have included the following at the end of Introduction (line 61-67 of page 3 of the revised manuscript),

*"For the purpose of discussing the preparedness and systematic transmission of Bangladesh during the COVID-19 crisis, the study applied the CAS framework. The parameters of the CAS and sources of data based on relevant theories were detailed in the next section (Methods) followed by a discussion on the agents, internal and external environments that impact the performance of the health system of Bangladesh during the pandemic. Before conclusion, a set of recommendations derived from the quantitative synthesis were listed, which would assist policymakers and relevant institutions to conduct a better transition from current crisis to normalcy."*

Furthermore, to tie the later part of the manuscript with the main theme of the paper (evaluating health system's preparedness and current performance), multiple changes has been brought in each segment of 'Results and Discussion'. Each section was tied with the objective of the paper.

### Reviewer's comment

2. For a re-write I would suggest to anchor the paper in a complexity/complex adaptive systems framework (many examples have been published in this journal) as much of the analysis is referring to it (note the table referring to the methodology was missing). I further suggest to create a figure that shows the interdependencies and their consequences (largely failures) so a reader can get a "one glance overview" of the complexities inherent in the Bangladesh health and political system interactions.

### Authors' response

Thank you for suggesting it. We believe that complex systems framework would be a better suit than logic model in our paper. Thus, we have made the following changes and included a new diagram (Figure 1) to replace Table 1. We have made the following changes in Methods section,

*"The complex adaptive system (CAS) framework was used to assess the health system preparedness of Bangladesh since the performance is based on multiple dimensions of crisis theory and complexity theory.." (line 69-70 in page 3).*

*“Four major dimensions were extracted from the crisis and complexity theories to encompass the preparedness of the Bangladesh health system for COVID-19 (Figure~1) and, based on these four dimensions, the CAS framework was assembled. The CAS framework is a continuing self-organization that uses a bottom-up approach based on multiple agents of a system to emerge a whole pattern based on both internal and external environment.<sup>24,25</sup> The CAS is regularly applied to explain the interdependencies among health system agents and their consequences in multiple spheres (macro, meso, micro and nano).<sup>25</sup> In this study, each of the four dimensions were explored using the four concepts of the CAS framework: agents, emergence, internal and external environments, to elucidate the Bangladesh health system and its response mechanism to the COVID-19 pandemic (Figure 1).” (page 82-90 in page 3).*

For “one glance overview”, we have created a summary Table (Table 1) was added in the recommendation section which listed the suggestions based on the four dimensions. Please refer to line 432 in page 15 and the attached Table.

### Reviewer's comment

3. The text needs to be tightened up a lot, the conclusions need to be consistent with your findings, and the paper is unnecessarily long and markedly over-referenced with unimportant/outdated references but key references to the current complexity health systems literature missing.

### Authors' response

Thank you. We have conducted a full revision of the paper. Given our work was a systematic assessment, we needed to provide a large amount of evidence which lead to a high number of references. However, we have rechecked the reference list and only 3 out the 104 references were older than 2000. All three were related to theoretical framework. Half of our references were from 2020.

To address your concern, we have replaced few references and tightened the findings throughout.

# A systematic assessment on COVID-19 preparedness and transition strategy in Bangladesh

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## Abstract

**Rationale, aims and objectives:** The COVID-19 pandemic of 2020 has overpowered the most advanced health systems worldwide with thousands of ~~daily~~ deaths ~~daily~~. The current study conducted a situation analysis on the pandemic preparedness of Bangladesh and provided recommendations on the transition to the new reality and gradual restoration of normalcy.

**Method:** A ~~logic model~~ complex adaptive system (CAS) framework was theorized based on four structural dimensions obtained from ~~both the~~ crisis and complexity theory to help evaluate the health system of Bangladesh. Data sourced from published reports from the government, non-governmental organizations and mainstream media up to ~~28 April~~ 15 June 2020 were used to conduct a qualitative analysis and visualize the spatial distribution of countrywide COVID-19 cases.

**Results:** The findings suggested that Bangladesh severely lacked the preparedness to tackle the spread of COVID-19 with both short- and long-term implications for health, the economy, and good governance. Absence of planning and coordination, disproportionate resource allocations, challenged infrastructure, adherence to bureaucratic delay, ~~lack~~ of synchronized risk communication, failing leadership of concerned authorities and incoherent decision-making have led to a precarious situation that will have dire ramifications causing many uncertainties in the coming days.

**Conclusions:** Implementation of response protocols addressing the needs of the community and the stakeholders from the central level is urgently needed. The development of mechanisms for dynamic decision-making based on regular feedback and long-term planning for a smooth transition between the new reality and normalcy should also be urgently addressed in Bangladesh.

## COVID-19 preparedness of Bangladesh

*Keywords:* Situational assessment, Health system, Crisis theory, Complexity theory, SARS-COV-2, Pandemic, LMIC

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### Introduction

The outbreak of the 2019 novel coronavirus (COVID-19) has challenged existing health systems and national preparedness strategies on the outbreak of pandemics worldwide. COVID-19 has surpassed the magnitude of two epidemics in last two decades: severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV).<sup>1,2</sup> General discussion ~~up to now~~ about the pandemic up until June, 2020 has focused on the experiences of China, USA and Europe. Low- and middle-income countries (LMICs) such as Bangladesh started to experience the early onslaught of COVID-19 in early March 2020 with severe consequences in the offing.<sup>3</sup> To help address this gap, this study evaluated the health system of Bangladesh and its pandemic preparedness approach by means of a complex adaptive system (CAS) framework logic model.

Following the introduction of International Health Regulations (IHR) in 2005 endorsed by 196 countries, national level efforts were called for to strengthen health systems to help prevent the spread of infectious diseases on an international scale without disrupting international traffic and trade.<sup>4</sup> However, in LMICs, political resolve, insufficient resources and technical limitations have challenged the implementation of these recommendations.<sup>5,6</sup> Furthermore, the support from high-income countries towards LMICs has not been encouraging.<sup>7,8</sup> It was also recommended that policy implementation for all LMICs as a single body would not be practical in unprecedented circumstances, as is evident from the ongoing COVID-19 pandemic that demands country specific assessments.<sup>9</sup>

Bangladesh is an over-populated LMIC that has seen strong growth over the last decade in its export-based economy and improvements in multiple public health indicators.<sup>10,11,12</sup> Despite the goodwill from local and international non-governmental organizations, the existing health system is already stretched with only 7.4 skilled workers per 10,000 population.<sup>13,14</sup> The dawn of the COVID-19 crisis has positioned the whole system into a unique paradigm by challenging health, the economy and law and order.

## COVID-19 preparedness of Bangladesh

There has not been a formal evaluation on the preparedness of the Bangladesh health system for coping with pandemics or substantial analysis on the health system as a whole. A critical assessment is therefore needed in order to better prepare for the ongoing challenge and future pandemics.any kind of future challenge. The objective of this study is to theorize a complex adaptive system (CAS) framework logic model to evaluate frame the health system during a pandemic and assess the steps taken so far by Bangladesh for tackling the COVID-19 crisis up to ~~28 April~~15 June 2020.

For the purpose of discussing the preparedness and systematic transmission of Bangladesh during the COVID-19 crisis, the study applied the CAS framework. The parameters of the CAS and sources of data based on relevant theories were detailed in the next section (Methods) followed by a discussion on the agents, internal and external environments that impact the performance of the health system of Bangladesh during the pandemic. Before conclusion, a set of recommendations derived from the quantitative synthesis were listed, which would assist policymakers and relevant institutions to conduct a better transition from current crisis to normalcy.

### Methods

The complex adaptive system (CAS) framework was used to assess the health system preparedness of Bangladesh as well as since its performance is based on multiple dimensions of crisis theory and complexity theory. Crisis theory characterizes based on the idea that unresolved or inevitable conflict will change the existing paradigm and typical problem-solving mechanisms would not be efficientuseful.<sup>15,16</sup> Due to the resulting disorganization from the crisis, interventions are applied to help the system to adapt and recover in the shortest possible time.<sup>17</sup> This theory was applied to could explain the management of a recent country-specific epidemic such as SARS in Singapore.<sup>18</sup>

Complexity theory was proposed to explore the individual, organizational and systemic be behaviours of a social phenomenon.<sup>19,20</sup> Using complexity theory, complex and emerging health issues such as pandemics or epidemics can be elucidated.<sup>21</sup> Health systems can be non-linear and often unpredictable during a pandemic<sup>22</sup> and since complexity theory has been used in the

## COVID-19 preparedness of Bangladesh

literature for disease outbreaks,<sup>23</sup> several aspects of this theory ~~were applicable~~~~seemed to be useful~~ in the context of COVID-19.

Four major dimensions were extracted from the crisis and complexity theories to encompass the preparedness of the Bangladesh health system for COVID-19 (Figure 1) and, based on these four dimensions, ~~a logic model~~the CAS framework was assembled. The CAS framework is a continuing self-organization that uses a bottom-up approach based on multiple agents of a system to emerge a whole pattern based on both internal and external environment.<sup>24,25</sup> The CAS is regularly applied to explain the interdependencies among health system agents and their consequences in multiple spheres (macro, meso, micro and nano).<sup>26</sup> ~~Logic models are typically used in public health to~~

~~map a chain of causality to evaluate a system.~~<sup>24,25,26</sup> In this study, each of the four dimensions were explored using ~~different the four~~ concepts of the ~~logic CAS framework model agents, emergence, internal and external environments, to elucidate on~~ the Bangladesh health system. ~~This model is presented in Table 1 and its response mechanism to the COVID-19 pandemic (Figure 1).~~

Data were sourced from reports published by the Bangladesh Directorate General of Health Services (DGHS) and World Health Organization (WHO) for instance, among others, as well as media articles up to ~~15 June 28 April~~ 2020 for the situation analysis. Regular press briefings and data released by the Institute of Epidemiology, Disease Control and Research (IEDCR), the official source of COVID-19 information in Bangladesh, were collected and analysed. These include daily data on the number of tests, positive cases, deaths, recoveries and case locations as well as data on medical inventories specially supplied for COVID-19 preparation. The spatial mapping on district wise COVID-19 ~~transmission spared~~ was formulated using R (version 3.5.0).

## Results and Discussion

### 1. Immediate response to crisis

#### *National level preparedness and coordination*

Previous pandemics related to the coronavirus have provided examples of healthcare workers being infected due to occupational exposure and demonstrate the importance of timely sharing of accurate information and proactive collaboration in generating an effective response.<sup>27</sup> Reinforcement of the IHR guidelines<sup>28</sup> has allowed effective management of crises through

## COVID-19 preparedness of Bangladesh

evaluation of risk communication strategies using information from risk assessments minimizing mass anarchy.<sup>29</sup>

Coordination and accountability are vital elements in forming an effective response to events such as COVID-19. Therefore, such mechanisms need to channel the implementation of [evidencebasedevidence based](#) decision-making at central level for its contextualization to the needs at local level. Coordination also requires the incorporation of feedback from communities addressing their concerns that may be causing emotional distress and the development of effective relationships at local level.<sup>18</sup>

As part of its COVID-19 response, Bangladesh has established a number of committees at all levels comprising [of](#) decision-makers, administration, law and order, information, local & international organizations and various components of the health system.<sup>30</sup> A technical committee was formed at central level comprising healthcare stakeholders for the purpose of evaluating activities in the plan through a review process and for recommending resource mobilization.

The role of committees at local level is limited to the implementation of the plan devised at central level. According to Stacey (2003)<sup>20</sup> on the understanding of complex systems, the committee failed to include sector specialists (including public health experts) focusing on the respective service and information delivery relevant to the COVID-19 response. Such a scenario can contribute to a lower rate of information flow as well as prompt limited impact due to a lower level of diversity and differentials in risk perceptiveness between the various levels.

The status quo differentials between local and national interests might also affect the generation of any response due to the unavailability of feedback loops among the parts of the system based on these committees.<sup>31</sup> The differentials between local and national levels can affect the degree of accountability in these systems that are not specified in measured terms regarding the trend of the disease spread.

### *Assessing the overall scenario and conducting strategic planning*

[A total of 90,619 cases and 1209 deaths with a recovery rate of 20.6% have been reported till June 15, 2020 due to COVID-19 from the 519,503 tests conducted across 60 testing centres indicating an attack rate of 532.1/million people and case fatality rate of 1.33% in Bangladesh. <sup>32</sup> \(WHO, 2020\) As of 24 April 2020, a total of 4,689 cases and 131 deaths have been confirmed due to COVID-19 from 39,776 tests conducted across 21 test centres.](#)<sup>32</sup> IEDCR estimates suggest that



## COVID-19 preparedness of Bangladesh

4653% of cases belong to the 21-40 years age group with ~~68~~70% of cases being males.<sup>33</sup> Nearly Half of the centres are located in Dhaka (the capital) with those outside the city sited in scattered locations, not more than 3 centres other than Dhaka (excluding Dhaka city) (6), Chittagong (8), Rajshahi divisions (5). This situation can possibly lead to overloading of the test centres in Dhaka that can, in turn, contribute towards issues of timeliness of reporting of the number of cases as well as the quality of the test samples obtained.

Due to the lack of an effective health information system that would have contributed towards enhanced surveillance ensuring effective planning and monitoring of disease spread, the government was forced to undertake stringent measures without meticulous assessment of the magnitude of disease due to data unavailability. As of June 15, 2020, the Dhaka city bears the major burden of COVID-19 cases (2859.6 per million). However, the virus has managed to spread to other neighbouring districts of Munshiganj (876.4 per million), Naryanganj (852.4 per million) as well as other major cities such as Cox's Bazar (494.9 per million), Chittagong (408.7 per million). Such level of caseload is also evident on the case doubling rate of Dhaka, Naryanganj, Munshiganj, Cox's Bazar, Munishiganj within the range of 6-8 days. Even in other district, alarms are ringing as the case doubling rate in Feni and Noakhali is only 5 days- As of 20 April 2020, cases of the virus have been concentrated in Dhaka

~~(1,014 per million) and its neighbouring districts of Narayanganj (386 per million) and Gazipur (173 per million), with a fair presence in 57 out of a total of 64 districts.<sup>34</sup> This situation has led to a complete lockdown of 332 upazilas (sub-districts) based in 41 districts and a partial lockdown in 22 upazilas based in 19 other districts.<sup>35</sup> However, the situational become quite difficult to control in the light of suspension of trade and other economic activities, the country has been divided into multiple zones 45 areas in Dhaka city and 11 in Chattogram for adhering strict control.~~ <sup>36</sup> This information indicates there is community transmission in the country and is shown in Figure 1.

Although a protocol has been designed,<sup>30</sup> its implementation and accuracy require assessment. Reports from WHO dated 20 April 2020 suggest that the discrepancy between the reported number of tests and the number of people tested indicates multiple testing of the same patient.<sup>34</sup> There is no available data on the quality control around the handling of the samples and is therefore another issue to explore in addition to the diagnostic characteristics of the tests available for the identification of the disease.

## COVID-19 preparedness of Bangladesh

Deployment of inadequate resources at key periods has led to a deterioration of the scenario. A total of ~~161,788~~718,921 people arrived in Bangladesh via air, land and seaports from 8 March 2020, when the first case was identified, up to 24 April 2020. Airport screening of such high numbers overwhelmed a pool of only 7 doctors, 10 nurses and 20 staff also operating without separate booths for passengers arriving from high-risk countries.<sup>36</sup> This situation heightens the possibility that passengers with virus symptoms travelling to the country in the early days of the pandemic were missed.

As part of the COVID-19 preparedness and response plan, ~~507~~565 medical teams with isolated units in ~~468~~493 upazila and separate outpatient departments for patients having respiratory tract infections at ~~414~~443 upazila have been established as of 24 April 2020.<sup>32</sup> While all this looks good on paper, a disproportionate allocation of resources was widespread. For example, despite there being a higher case burden in Dhaka (~~2859.6~~226) and in the neighbouring districts such as Narayanganj(~~1308~~52.4) and ~~Gazipur (35)~~ Munshiganj (876.4), as of ~~24 April 2020~~15 June 2020, all of them have a lower number of isolation beds than Sylhet (481) that has ~~three~~166.5 cases per million people.<sup>32</sup> A similar imbalance was observed in the formulation of medical teams. A total of ~~622~~889 physicians and ~~560~~738 nurses were involved in the designated COVID-19 response medical teams but only ~~185~~31 medical technologists and ~~504~~314 support staff were included. A large number of teams consisted of only physicians and nurses, excluding other key personnel leading to an inadequate proportion of available healthcare workers, disorganization, and increased exposure.

~~There is no overall dearth of logistic supplies for tackling COVID-19. PPE Kits were distributed to 87.8% of the facilities while the availability of facemasks (89.5%), shields (90.4%), and sanitizers (82.7%) represents a good picture on paper. Earlier reports suggested shortage of items~~ In respect of facemasks, there is a huge shortage of supplies in those facilities located in areas with a higher case burden, especially the N-95 masks. These masks are being highly distributed in districts like Dinajpur (354) and Moulvibazar (388) but Narayanganj had only 10 of the N-95 masks despite having a much higher case burden.<sup>37</sup>

As of June 15, 2020, a total of 1.3 million PPEs, 3.14 million mask, 562,439 gloves have stocked. The quality of the supplied resources has been extensively questioned. News reports indicate a debacle with the quality of 20,600 of the N-95 masks where the supplier organization has sought

## COVID-19 preparedness of Bangladesh

exemption from punishment for providing below quality masks after packaging them with N-95 marking.<sup>38</sup> ~~T here exists a shortage of surgical masks in the most affected districts as well. The number of available masks in Dhaka (2356) and Narayanganj (4692) was surprisingly low with respect to Cox's Bazar (52802) and Rangamati (3213), all of which have a much lower number or no cases as yet.~~

~~PPE distribution is higher (67494) in all the divisional health facilities, however, there remains a low supply in the most affected Narayanganj and Gazipur districts when compared to other districts such as Jashore, Cox's Bazar and Pabna.~~<sup>37</sup> These inadequacies played a part in the lead up to the health facility lockdowns as health workers were infected and services were halted as a result.<sup>39,40</sup>

### *Bottlenecks and barriers for preparedness*

An effective response coordinating multilevel stakeholder activities during a pandemic could improve the healthcare infrastructure and contribute to a resilient healthcare system. A resilient healthcare system is expected to absorb the shock and ~~adept~~ adapt to dynamic needs while maintaining the existing level of healthcare accessibility.<sup>41</sup>

Bangladesh activated a 6-level plan from preparedness to mitigation using the Infectious Disease (Prevention, Control and Elimination) Act 2018 as the guiding document detailing the containment activities for the progressive development of COVID-19.<sup>30</sup> Early initiatives like quarantining arrivals from high-risk countries was hampered by crowd reactions to the appalling conditions at the quarantine sites that forced the government to allow home quarantine for new arrivals.<sup>42</sup> Other bottlenecks included the non-adherence to home quarantine and non-compliance with social gatherings as evident from the Gaibandha district where 2 US returnees with confirmed COVID-19 status went to a wedding ceremony that had 500 attendees<sup>43</sup> along with mass religious gatherings in the Lakshmipur district.<sup>44</sup>

RT-PCR is an advanced molecular testing procedure with costs ranging from 54-100 Euros per test. In a country where the public healthcare expenditure is heavily donor dependent (60%), it will be difficult for the government to fund mass testing countrywide. Poverty played a role in lock down failure in Bangladesh when 370 ready-made garments (RMG) factories failed to pay their workers by the 16 April deadline, which affected the livelihoods of these workers<sup>45</sup> and prompted

## COVID-19 preparedness of Bangladesh

them to arrange protests risking community transmission. RMG sectors appeared to have no rescue packages to cover the salaries of workers in case of a pandemic emergency and immediately sought government assistance for paying them. This has caused an understandable if undesirable panic among RMG workers even among those in the big factories. Furthermore, the fiasco created on the provision of false treatment and testing result created mass issues on trust on the private sector service delivery making the process rather complicated in the context of the fragmented public health infrastructure. The panic created by factory owners trying to resume work on 12 April 2020 with the decision then retracted the night before saw mass migration from rural to urban areas risking further transmission.<sup>46</sup>

Risk communication is a vital bottleneck for response and preparedness in a pandemic. This kind of communication includes understanding public perceptions and promptly addressing misinformation. Even though the protocol<sup>30</sup> mentions that a knowledge, attitude and practice survey had been conducted during the preparedness phase, there are no reports of such a survey having been completed. The shortage of drugs such as hydroxychloroquine created an artificial scarcity, media hype created through vaccine and other promising candidate downplaying the risk, <sup>52, 53</sup> and refusal to have routine check-ups due to a perceived fear of the spread of COVID-19 are embodiments of weak risk communication strategies.

There are 7.4 skilled health workers per 10,000 population in Bangladesh that accentuates the difficulty in monitoring COVID-19 cases effectively.<sup>47</sup> While several countries resorted to recruiting healthcare workers from their reserve or retired professionals,<sup>48</sup> the Bangladesh Government is still in the process of recruiting 2,000 physicians and 6,000 nurses in order to make up for staff shortages that demonstrates bureaucratic delay.<sup>49</sup> Other preparedness bottlenecks involve the equitable distribution of intensive care units (ICUs), limited access in the context of out-of-pocket expenditures, healthcare equipment including the availability of ventilators, protective equipment, and availability of essential medicines due to the halt in movement and trade.

### *Information to the public*

Dissemination of correct information to concerned stakeholders is vital during a pandemic. It addresses the dimension of awareness in the healthcare access theory using mainstream and social

## COVID-19 preparedness of Bangladesh

media while maintaining order and safety.<sup>50,51</sup> Timeliness and transparency in disseminating information have been shown to reduce panic and anxiety and helped in effectively engaging citizens with their social responsibilities during the 2003 SARS pandemic.<sup>52</sup>

Public communication measures in Bangladesh during the COVID-19 outbreak were unsatisfactory. The authorities constantly downplayed the magnitude of the threat posed by the virus outbreak in the media along with the government's capacity for tackling such a crisis despite differ-

ent claims in media reports.<sup>53,54</sup> These failings caused complacency among the people and sowed the seeds of confusion and distrust of authority.

Although the official protocol states that risk communication strategies have been discussed at length,<sup>30</sup> these measures have hardly been put into practice. The plan to counter the spread of misinformation was derelict<sup>53</sup> and focused on and issuing reminders and threats against the entities (individuals, media outlets) that spoke out against those in the government.<sup>55,56</sup>

The response plan included developing preventive appropriate message packages for different audiences based on key demographic characteristics and revolved around working with key stakeholders to build their capacity for awareness and health promotion through participatory interventions. However, no systematically established community information and feedback mechanisms have been made available leaving the government in the dark about how the adopted control measures are functioning in the society that may have considerable implications for future planning and decision-making. Lack of accountability and transparency has led to the suspension of medical professionals at a time when they are most needed.<sup>57</sup>

### *2. Mobilizing resources and addressing novelty*

#### *New problem - new structure*

The current health system and the underlying healthcare infrastructure in Bangladesh are both considerably neglected and underdeveloped.<sup>58</sup> In recent times, the health system has struggled to deal with a recurring seasonal dengue outbreak that has been occurring regularly and increasing in severity since the turn of the century.<sup>59,60</sup> A review of the healthcare system in Bangladesh<sup>61</sup> revealed that non-transparent and corrupt practices, as well as ineffective oversight mechanisms,

## COVID-19 preparedness of Bangladesh

failed to uphold the safety of citizens and left them vulnerable to malpractice within the system.<sup>58</sup> These scenarios have been observed during the early onset of the COVID-19 outbreak.

Like many other countries, the COVID-19 outbreak has posed an unprecedented strain on the health system of Bangladesh. While the average health expenditure in south Asian countries and LMICs was 3.46% and 5.39% of GDP respectively,<sup>62</sup> the recent fiscal budget in Bangladesh has increased allocation to the health sector for the year 2019-2020 to a meagre 1.02%.<sup>63</sup> This translates to a weak health system and infrastructure that is unlikely to attain the WHO benchmark 1.3 or be capable of sustaining any financing mechanism ensuring there are enough funds for a timely response to public health emergencies, or conform to the IHR guidelines.<sup>28</sup>

~~Disparities in the distribution and mobilization of medical accessories were also observed. According to the,<sup>32</sup> there are nearly 6 million gloves in storage (as of 18 April 2020), with more than 1.91 million of them in Dhaka district and 1.86 million of them at only one facility – Dhaka Medical College. In a country of more than 16 million people, there are 49 ventilators at government facilities (<sup>32</sup>last updated: 26 April 2020) and limited number of ICUs countrywide with no quality control mechanism.<sup>64,65</sup> These findings expose the urgent need for an updated health system framework that can address the aspects of access and mobilization of necessary resources in accordance with the current pandemic situation.~~

A pandemic scenario demands an improved efficiency in decision-making by devising necessary protocols that enable quick responses. This is fundamental to the process of strategising an effective call-to-action in any epidemic or pandemic requiring on the spot decisions and informed actions including effective mobilization of resources.<sup>66</sup> Bangladesh had time to prepare for the pandemic with the country's first case identified on 8 March 2020, over a month after WHO's declaration of a public health emergency of international concern.<sup>67</sup> Unfortunately, the authority's reluctance from the outset and persistence with typical bureaucratic procedures yielded weak preparedness.

### *Contextualizing the health system*

It is expected that preparation of the health system would contextualize the new demands in the existing framework. Part of these preparations would involve setting up testing centres, dedicating disease-specific specialized health facilities and engaging with the context-specific

## COVID-19 preparedness of Bangladesh

needs of professional bodies. All these are possible in Bangladesh but the capabilities of the test centres/health facilities during this crisis and the goodwill of the highly politicized professional associations could be questionable.<sup>68,69,70</sup>

Previous responses from Bangladesh during health crises are not encouraging. For example, during the Nipah virus (NiV) in 2004, patient caregiving practices were poor and hospitals were not equipped to handle contamination.<sup>71</sup> Due to overcrowding, health facilities are often subjected to nosocomial due to inadequate isolation units, bed space, sinks, waste management, and general hygiene practices.<sup>72</sup> During the 2004 crisis, many health facilities had been reluctant to treat patients who showed virus-like symptoms, often leaving them untreated and resulting in multiple deaths.<sup>73</sup> The current infrastructure could hardly address the burden of a pandemic of the size of COVID-19.

The lack of preparation for the COVID-19 crisis was evident within the first month (March 2020). This included the closing of entire health complexes as health workers were COVID-19 positive,<sup>74</sup> suspension of doctors due to their alleged unwillingness to treat patients,<sup>75</sup> physicians served with a 'show cause' for speaking out regarding lack of protective equipment,<sup>56</sup> and confession of faulty equipment already distributed to doctors that all serve to illustrate the severe lack of preparation by DGHS and mistrial incoordination that resulted in a failure to address stakeholder concerns.<sup>38</sup> Health workers in Bangladesh made up 12% of all the COVID-19 cases (at least 350 out of 2948 recorded positive cases) as of 11am on 21 April 2020<sup>76</sup> despite a lengthy preparedness and response plan that shows the weakness in policy implementation.

### *Mobilizing community engagements*

An important aspect of crisis management is the mobilization of local community level efforts including distribution of resources and handling mass panic. A well-articulated plan was required to ensure that food relief reached those in need and emergency services continued without disruption ensuring a successful lockdown. To manage unnecessary panic or rumours, central communication needed to reach to the root or local level to assure the unprivileged sections of society that the lockdown would not lead to starvation and they would receive adequate treatment.

## COVID-19 preparedness of Bangladesh

Despite the worldwide lockdown and WHO's constant advice on social distancing and lockdowns, these decisions in Bangladesh were taken late and disregarded how the new normal would work. For example, the entire transport system was closed without any measures put in place to enable emergency workers to travel. ~~Moreover, personal protective equipment (PPE), facemasks and other necessary items did not reach even the main hospitals in Dhaka, let alone those located in the peripheries despite constant assurances from the authorities.~~<sup>77</sup> Even after six weeks from the first identification of a COVID-19 patient (8 March to 24 April), the inadequate distribution of PPEs was being reported<sup>78</sup> in spite of government data showing there were adequate stocks.<sup>54</sup>

The Infectious Disease Act<sup>79</sup> should, on paper, have served the purpose of enabling appropriate dissemination of information and ~~controlling~~ any panic. However, emergency measures were delayed

as lack of transparency at the Health ministry led to confusion.<sup>80,81</sup> Panic was further fuelled when the government accused healthcare workers of negligence in discharging their duties, that they had a weak mentality and claimed they would be replaced by foreign workers.<sup>82</sup> All these presented mixed messages to the community, where infection of COVID-19 was equated to confirming death in rural areas. Consequently, people were averse to testing and many fled from quarantine risking greater community transmission.<sup>83</sup>

### 3. Non-linearity

#### *Decision dynamics*

Any pandemic provides a unique scenario with intricate and rapid mechanisms. The current organizational approach that focuses on maximizing outputs often fails to recognize the interactivity between the components of a complex system.<sup>84</sup> This is an important realization in the context of planning an effective response during a pandemic. Such an approach provides encouragement for innovation and synergised operation by accepting the non-linearity of a complex system and permits creative solutions to sudden and challenging problems.<sup>85</sup>

The idea of pre-emptive listing of the barriers to devising an appropriate response to the pandemic might not be exhaustive as more unexpected problems are likely to reveal themselves over the course of the pandemic. The leadership needs to make proper use of the intellectual capital



## COVID-19 preparedness of Bangladesh

available while discussing creative control measures and putting them into practice.<sup>84</sup> Coordination with international organizations, such as the WHO, UN and World Bank is essential in procuring necessary funds for LMICs and implementation of international guidelines.

Bangladesh came short in putting emergency procedures into practice. The initial safety measures to be implemented at the airports were severely lacking even after the WHO had declared

the COVID-19 outbreak a world health emergency.<sup>86,87,88</sup> However, this situation did not improve until the government was forced to ban almost all domestic and international flights from 28 March onwards after imposing a partial ban on 21 March.<sup>36,89</sup>

During the month of April, the second month of the crisis, the authorities failed to stop large gatherings taking place at Brahmanbaria and Barguna districts.<sup>90,91</sup> Lack of coordination across ministries and institutions, weak leadership and an inability to mobilize responses to unexpected events has put Bangladesh in a precarious situation amid the COVID-19 pandemic.

### *Leadership*

It is to be expected that the health department would make prompt decisions efficiently during public emergencies. Often new ideas and fresh energy are required if the typical system fails. For example, China changed leadership in Hubei Province during the Wuhan outbreak<sup>92</sup> and the Netherlands made an opposition leader the temporary health minister to cover the crisis.<sup>93</sup> These moves were intended to restore public confidence and display political goodwill.

Bangladesh was ill-prepared for COVID-19. The same system that failed to meet regular healthcare demands was put to a sterner test. This resulted in utilization of only one test centre in the first 3 weeks of the crisis (8 - 25 March 2020) that was only able to test 0.3% of those who raised a concern over their status.<sup>3</sup> Even the expansion of the test centres was sluggish indicating an inadequate laboratory infrastructure and slow dissemination of test kits.<sup>94,95,96</sup>

Lack of coordination among departments in the Bangladesh government could be a result of poor leadership. While the Health Minister failed to maintain composure, there were multiple irresponsible statements coming from other ministers including that Bangladesh would be capable of building hospitals in six days like in Wuhan, and downplaying COVID-19 as a non-deadly disease

## COVID-19 preparedness of Bangladesh

that did not help the greater cause.<sup>53</sup> These random, irresponsible dialogues equate to a loss of faith in the leadership and often give birth to fabricated news.

Typical political stances can block the possibility and potential of fresh ideas. While the Prime Minister proposed a 31-point directive in early April 2020, none of the points were fully implemented.<sup>97</sup> The planning stage of these proposals, just like the National Preparedness and Response Plan for COVID-19 and the infectious disease law, remained on paper due to absence of targeted assessment to address the burden properly alongside the feasibility for its successful implementation. These stereotypical politics and the fatigued health system are hardly ~~in a~~ positionable to put up a fight against the COVID-19 pandemic.

### *4. Designing an escape plan*

#### *Normalizing the new reality*

The current situation with COVID-19 will make it difficult to resume normal service in the country straight away. The increased transmission risk of COVID-19 in any congested working space minimizes opportunities for social distancing. Capacity building and legislature mechanism need to be the building blocks for preparing the health system for resumption of normal services in a progressive way.

Bangladesh, however, is not showing signs of deviating from its traditional infrastructure development process despite the pandemic. A meagre increment of 0.63% of the total budget is to be allocated to the health sector that is aimed at building a 1000-bed super specialized ward, a one-point check-up centre and a cancer building at Bangabandhu Sheikh Mujib Medical University.<sup>98</sup> A private-public partnership was used to set up testing kiosks in Dhaka in April, but these low-quality facilities could actually put health workers at increased risk.<sup>45</sup>

Economic growth is expected to be a trade-off for the lockdown to contain the ongoing spread. The cancellation of orders for the RMG sector amounted to USD 3 billion, as of 3 April 2020.<sup>99</sup> It has been reported an estimated loss of BDT 33 billion every day during the shutdown<sup>100</sup>. Restricted movements can contribute to the economic cycle affecting those with limited earnings as well as large industries dependent on day labourers.

In order to address the impact on the economy, the government has rolled out an incentive package of around BDT 950 billion. Around USD 589 million are allocated with a 2% service charge

## COVID-19 preparedness of Bangladesh

for the payment of all RMG workers for a duration of 3 months.<sup>99</sup> The Ministry of Health along with partners have planned a project of more than 30 million USD for a 9-month duration in order to address the bottlenecks of the health system.<sup>30</sup> Despite such packages, multiple attempts have been made to open the industries again, particularly RMGs, that threatens the disease containment objective of this short-term bail out.

### *Systematic transition mechanism*

Although the initial transition in Bangladesh was disjointed, lessons from that time can be used for cautioned opening. A second wave or more of the COVID-19 pandemic might not be affordable for the already hit economy. Positive steps were taken to keep the economy going such as mobilizing community efforts for Boro-rice cultivation that not only addressed concerns due to an early flash flood, but also contributed towards temporary employment opportunities along with food shortages. A constant monitoring of these small-scale gatherings would provide indicators for the transition steps.<sup>101</sup> In order to implement the response mechanism effectively, more tests would be required and meticulous contact tracing system should be developed along with testing infrastructures that would utilize existing university laboratories.

It is expected that population-based risk assessments will be conducted routinely in order to isolate those at higher risk of contracting the virus. Classification of disease risk in terms of infection spread and exposure level covering all population groups will facilitate the issue of accountability and data-driven decision-making.<sup>102</sup> The availability of newer quarantine centres through conversion of existing facilities would need to be functional for some time in the event of any transition to normal services. Leadership and effective governance through coordination between the societal building blocks is pivotal for ensuring a smooth transition.

### **Recommendations**

The countries with the best performances during the COVID-19 pandemic, such as South Korea, provided a subsidy for living costs to individuals in isolation. Germany, Mexico and Chile provided funds through health insurance mechanisms to those that met the case definitions of the respective countries for COVID-19 or were referred by a doctor.<sup>48</sup>

## COVID-19 preparedness of Bangladesh

A [vaccine or a drug](#) for treating COVID-19 has yet to be developed so disease management and accurate diagnosis are crucial factors in the context of this virus. An effective pipeline needs to be established for the provision of kits, PPEs and stocks for intensive care units as well as essential medicine addressing the continuum in terms of supply. Experience from France, China and Japan has shown the benefits of makeshift but sustainable health facilities to tackle an increased number of

Patients.<sup>48</sup> [Bangladesh could take note from their quarantine strategies, lockdown policies and integrity in leadership to better handle the pandemic.](#)

A protocol should be put in place for a smoother and sustainable transition between the lockdown period and normality. A pre-defined procedure on steps from lock down to cautioned opening should be documented and followed. For example, New Zealand have set a four-level risk assessment system or United Kingdom's five levels corona virus alert, which are allowing them to gradually return to normalcy.<sup>103</sup> A robust information system providing access to disease prognosis harnessing the power of informatics and telemedicine can be utilized to ensure adequate follow up and risk assessment on the diagnosed cases.<sup>104</sup> The summary of the recommendations is listed in Table 1.

Feedback mechanisms at the local level should be developed for a better understanding of priorities and be needs specific to the local context. The practice of social distancing needs to be strictly followed until the emergence of proper vaccines and extensive monitoring on inflation and control over artificial crises on trade and resources are required. Meticulous understanding of the available evidence base is necessary to dispel the spread of misinformation and thus creating a cohesive environment for developing contextual and widespread evidence-based sustainable decision making.

## Conclusion

The aim of this study was to evaluate the existing health structure in Bangladesh and its response in the early periods first six weeks of the COVID-19 pandemic (March-~~April~~-June 2020). The results show that Bangladesh is not COVID ready due to complacency from its leaders at the beginning coupled with inadequate testing that has led to a scenario where decisions are not evidence-based but rather based instead on intuition and experience. While protocols or reports developed by the government indicated substantial planning, the field level response was insufficient to implement them. A change in health leadership, coordination with professional bodies enabling multi-sectorial partnerships and appropriate utilization of existing resources might be a plausible short-term solution. For a long-term transition process to achieve normalcy, worldwide successful examples could be followed awareness on health literacy, close monitoring, data-driven decision making and coordinated efforts from all relevant stakeholders is paramount.

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**Table 1: Summary of recommendations for addressing the pandemic in Bangladesh**

Dimensions	Strategies	Output	Impacts	Outcomes
<b>1. Immediate response to crisis</b>	<ul style="list-style-type: none"> <li>a. Coordination among ministries</li> <li>b. Forming national emergency committee</li> <li>c. Assembling local committees</li> </ul>	<ul style="list-style-type: none"> <li>a. National emergency committee to steer local committees</li> <li>b. Local committee to coordinate community preparation</li> <li>c. Developing a feedback mechanism for context-specific changes</li> </ul>	<ul style="list-style-type: none"> <li>a. All parties to be aware of their duties</li> <li>b. Flexibility in decision making</li> </ul>	<ul style="list-style-type: none"> <li>a. Short time crisis aversion and transition to the new normal</li> <li>b. Effective delivery of mass information</li> </ul>
	<ul style="list-style-type: none"> <li>a. Data management and quality assurance</li> <li>b. Protocol design and implementation</li> <li>c. Enactment of the Infectious Disease Law</li> <li>d. Effective Health Information System</li> </ul>	<ul style="list-style-type: none"> <li>a. Protocols reflecting real-time data analysis</li> <li>b. Disseminating protocols</li> <li>c. Assessment on lock downs and disease spread</li> </ul>	<ul style="list-style-type: none"> <li>a. Appropriate distribution of responsibilities</li> <li>b. Evidence based decision on disease spread</li> <li>c. Enactment of lock downs</li> </ul>	

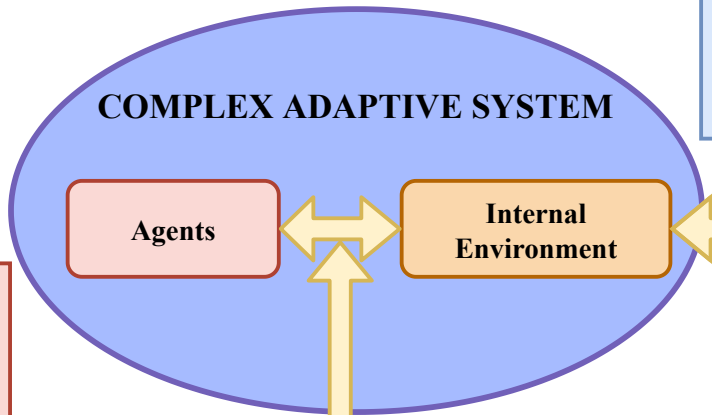
	<ul style="list-style-type: none"> <li>a. Identifying road blocks and pre-emptive strategies</li> <li>b. Multisectoral workforce involvement</li> <li>c. Sustained financing</li> </ul>	<ul style="list-style-type: none"> <li>a. Listing possible barriers and designing counter measures</li> <li>b. Enhanced surveillance</li> <li>c. Skilled workforce development</li> </ul>	<ul style="list-style-type: none"> <li>a. Minimize damage through pre-emptive measures</li> <li>b. Incorporating feedback from local clientele</li> <li>c. Resilience through IHR embedding</li> <li>d. Constraint reduction on service delivery</li> </ul>	
	<ul style="list-style-type: none"> <li>a. Liaising with stakeholders</li> <li>b. Enacting a media cell as news dispersion platform</li> <li>c. Monitoring misinformation</li> </ul>	<ul style="list-style-type: none"> <li>a. Engagement with the civil society and professional associations</li> <li>b. Media coordination</li> <li>c. Disseminating correct information</li> </ul>	<ul style="list-style-type: none"> <li>a. Public awareness on social responsibilities and control measures</li> <li>b. Panic minimization</li> </ul>	
<b>2. Mobilizing resources and addressing novelty</b>	<ul style="list-style-type: none"> <li>a. Minimizing bureaucratic delays</li> <li>b. Activating emergency protocols</li> </ul>	<ul style="list-style-type: none"> <li>a. Faster decision making</li> <li>b. Mobilization of necessary goods and enactment of new policies</li> </ul>	<ul style="list-style-type: none"> <li>a. Administrative delays avoided</li> <li>b. Strengthening production to service connection</li> </ul>	<ul style="list-style-type: none"> <li>a. Essential workers continue services throughout pandemic</li> <li>b. Community to adjust to the new normal with relative ease</li> </ul>
	<ul style="list-style-type: none"> <li>a. Co-ordination between professional associations and the lead emergency committee</li> <li>b. Ensuring all relevant stakeholders are prepared to deal with new uncertainties</li> </ul>	<ul style="list-style-type: none"> <li>Improving existing structure for an effective response</li> </ul>	<ul style="list-style-type: none"> <li>a. Protection of essential workers during pandemic</li> <li>b. Appropriate distribution of necessities</li> </ul>	



	<ul style="list-style-type: none"> <li>a. Appropriate distribution of resources</li> <li>b. Maintaining the law and order</li> </ul>	<ul style="list-style-type: none"> <li>a. Allowing emergency services to function</li> <li>b. Continuous aid assurance and appropriate distribution of resources</li> </ul>	<ul style="list-style-type: none"> <li>a. No scarcity of resources at the community level</li> <li>b. Curbing sudden panic stricken activities</li> </ul>	
<b>3. Non-linearity</b>	<ul style="list-style-type: none"> <li>a. Dynamic decision making</li> <li>b. Continuous assessment on the ever changing situation</li> </ul>	<ul style="list-style-type: none"> <li>a. Utilization of global research.</li> <li>b. Coordinating with international organizations and neighbouring nations</li> </ul>	Addressing changes based on real-time, fundamental research	Execution of plans with appropriate leadership and addressing the long-term effects
	<ul style="list-style-type: none"> <li>a. Changes in traditional leadership</li> <li>b. Assessing multiple long term plans</li> </ul>	<ul style="list-style-type: none"> <li>a. Fresh ideas to energize the traditional system</li> <li>b. Devising multiple backup plans for various post-pandemic scenarios</li> </ul>	<ul style="list-style-type: none"> <li>a. Greater confidence in the community</li> <li>b. Displaying political goodwill</li> <li>c. Utilization of revised plans</li> </ul>	
<b>4. Designing an escape plan</b>	<ul style="list-style-type: none"> <li>a. Addressing the overburdened health system</li> <li>b. Managing economic stability</li> </ul>	<ul style="list-style-type: none"> <li>a. Balancing between health system burden and economic sustainability</li> <li>b. Injection of economic rescue packages</li> </ul>	Economic security at community level	Allowing a smooth transition between the paradigms
	<ul style="list-style-type: none"> <li>a. Designing protocols for the transition to the new normal</li> <li>b. Developing a process to revert the transition</li> </ul>	<ul style="list-style-type: none"> <li>a. The gradual transition to the new normal</li> <li>b. Systematic restoration of previous normality</li> </ul>	<ul style="list-style-type: none"> <li>a. Transition to the new normal</li> <li>b. Employing primary transition experience to the restoration process</li> </ul>	

### Designing an escape plan

- Normalizing the new reality
  - Addressing the overburdened health system
  - Managing economic stability
- Systematic transition mechanism
  - Designing protocols for the transition to the new normal
  - Developing a process to revert the transition



### Mobilizing resources and addressing novelty

- Recognizing the need for an updated framework
- Contextualizing the existing health system
- Mobilizing community level efforts

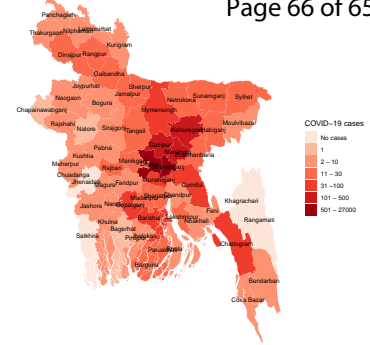
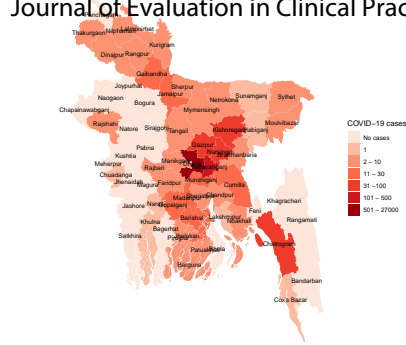
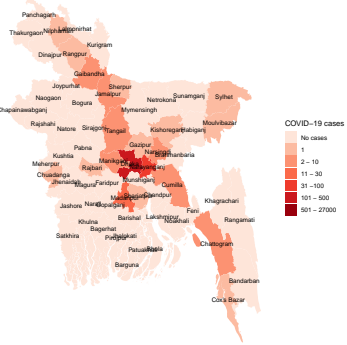
### Immediate response to crisis

- National level crisis steering committee
- Assessing overall scenario and conducting strategic planning
- Bottlenecks and barriers
- Disseminating information - trust and panic control

### Emergence

### Non-linearity

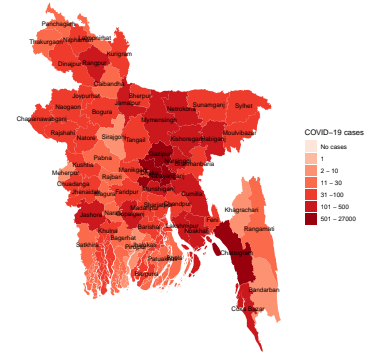
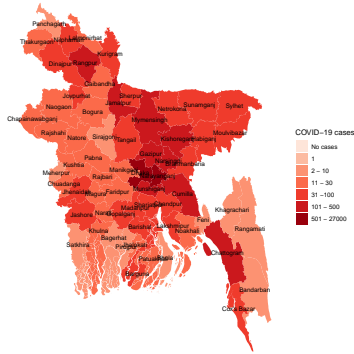
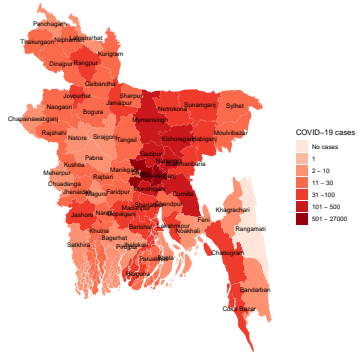
- **Dealing with unpredictable occurrences**
  - Dynamic decision making
  - Continuous assessment on the ever changing situation
- **Leadership evaluation**
  - Changes in traditional leadership
  - Assessing multiple long term plans



(a) Transmission on 8 April 2020

(b) Transmission on 16 April 2020

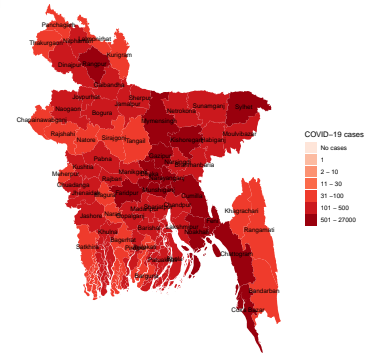
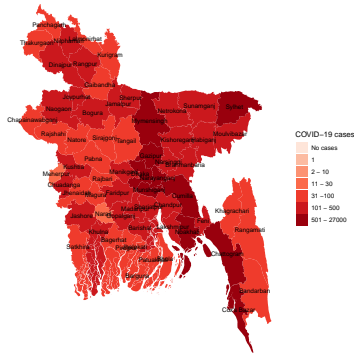
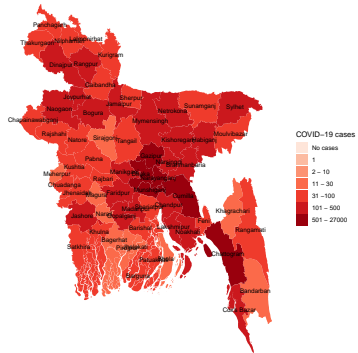
(c) Transmission on 24 April 2020



(d) Transmission on 2 May 2020

(e) Transmission on 10 May 2020

(f) Transmission on 19 May 2020



(g) Transmission on 26 May 2020

(h) Transmission on 5 June 2020

(i) Transmission on 15 June 2020