**Policy Brief**
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COVID-19 Modelling Consortium

# Modelling the potential impact of various interventions on the COVID-19 epidemic in the Kyrgyz Republic

By A.Moldokmatova[1], A.Dooronbekova[2,4], Ch.Zhumalieva[2,4], A.Estebesova[3], A.Mukambetov[2], A.Kubatova[2,4], Sh.Ibragimov[2], R.Aguas[1], P.Ariana[1], L.White[1]

## Executive Summary

Despite the set of measures introduced in the Kyrgyz Republic in response to COVID-19, including lockdown and closure of borders, the epidemic has spread across all regions, except Talas Oblast, with an alarming rate of infection among healthcare workers. There is an urgent need for a tailored, evidence-based strategy to inform decisions on effective response measures to COVID-19 for Kyrgyzstan. This brief presents preliminary findings of mathematical models projecting the course of the COVID-19 epidemic in the Kyrgyz Republic given various interventions.

The simulation is based on local epidemiological data as of **17 April 2020** and assumptions on current interventions, on an appreciation of local social contexts, as well as on existing global evidence regarding the nature of the disease and its spread. There remain **many uncertainties** as evidence is rapidly generated; thus, results will change as we learn more about the nature of disease and the impact of interventions on the disease outcomes, and receive more reliable data on intervention intensity and coverage.

### Key assumptions:

- Due to unavailability of direct values of the intervention coverage, adherence and efficacy, the related model assumptions were based on other existing proxy data and information, including Google Map analysis of the community mobility in countries (Google Map, 2020), EpiCOVID on-line survey in Central Asia (EpiCOVID, 2020) and weekly reports of the Disaster Response Coordination Unit in the Kyrgyz Republic (DRCU, 2020).
- The currently accepted global evidence on the nature of disease, which is yet to be updated, was used for the disease parameters (CDC China, 2020; Korean Society of Infectious Diseases et al., 2020; Liu et al., 2020; Riou et al., 2020; WHO, 2020a).
- The demographics parameter values for the population age structure were based on UN data for the period of 2019 (UN, 2020).
- The social contact matrices projection in 152 countries (Prem et al., 2017) was used to measure the contact patterns between different age groups in Kyrgyzstan.

### Key findings:

- The model predicts that a **new wave of the epidemic with a high spread in the population may occur if the lockdown is lifted without subsequent interventions;**
- **Self-isolation** of individuals with symptoms and those diagnosed positive without symptoms, **screening/testing, voluntary quarantine** of those who were in contact with positive cases and **social distancing** are the **most effective measures** predicted to stabilize the epidemic;
- **Extending the lockdown alone without accompanying interventions is predicted to bear a risk of a second wave of outbreak** with a high spread in the population;
- **Two approaches should be pursued simultaneously: prevention and health system preparedness.** A high level of prevention activities may reduce the burden on the health system but the health system needs to ensure sufficient capacity to accept and treat all patients.

The model is sensitive to the input data, changes to which may significantly affect the model outputs.

1. *University of Oxford, UK*
2. *Soros Foundation in the Kyrgyz Republic*
3. *USAID Mission in the Kyrgyz Republic*
4. *Public Fund "Institution of Social Development", Kyrgyz Republic*

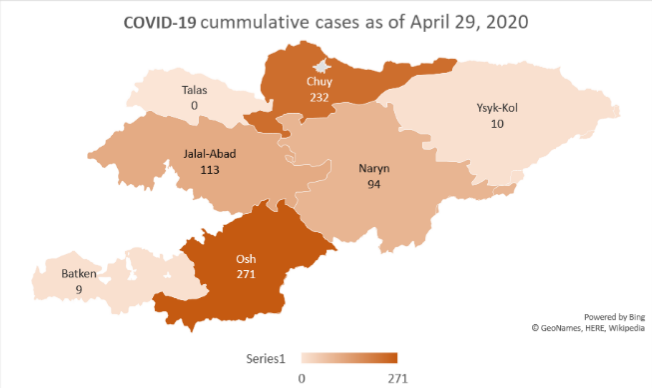
## Key conclusions

Current issue: There is an urgent need in the country for tailored, evidence-based and emergent practices to inform the high-level decision regarding effective response measures to COVID-19.

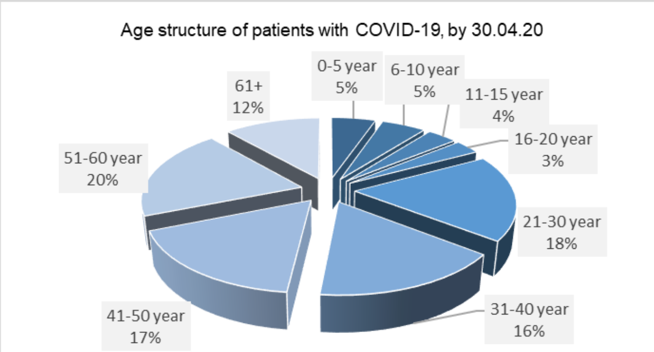
**Conclusion 1:** Prevention is essential
**Conclusion 2:** Rapidly scale up screening and hospital capacity
**Conclusion 3:** The model is a tool, under a set of assumptions, to help consider all the policy options given the UNCERTAINTY about the virus and its epidemiology

## Situation

Cases of COVID-19 continue to grow in the Kyrgyz Republic with the first three cases reported among travellers returning from pilgrimage to Saudi Arabia on 16 March 2020. By 29 April, cases had reached 729 (MoH, 2020a). The majority of cases (393) are concentrated in the south of the country (Osh and Jalalabad provinces), followed by Bishkek (180), and the remote Naryn province (94). Unlike international trends, 71% of cases have occurred among those aged 20-60 years old, while cases among those aged over 60 years old accounted for 12 percent only (chart "Age structure of patients with of COVID-19").




Gender distribution is almost equal with slightly higher rates among females (54%). Every fourth case is among health workers (26%). As of April 17, the Ministry of Health of Kyrgyz Republic (MoH KR) has reported a total of eight deaths, mainly among elderly people over the age of 65 and those with pre-existing health conditions. Thus, the case fatality rate (CFR) constituted 1.1% (MoH, 2020a).




Available data points at a decrease in imported cases but an increase in local transmission despite the current lockdown and quarantine measures. More evidence is needed to determine the effectiveness of various interventions in the context of Kyrgyzstan. It is possible that the increased detection of cases may be due to improved diagnostic capacity and availability of the testing resources.

According to the World Health Organization, different countries exhibit variations in the rates of disease severity, mortality and hospital admissions. In China about 15-20% of cases required hospitalization, of whom 15% had severe symptoms and 5% required ventilation and other intensive care manipulations. In Italy and Spain about 40-55% of positive cases were admitted to hospitals, 7-12% of which needed intensive care (WHO, 2020b). This variation, may be driven by factors such as population structure, efficiency of prevention and control measures and preparedness and capacity of health systems.

The Ministry of Health of Kyrgyz Republic has developed a plan on preparation of hospital capacities and reorganized existing hospitals to treat COVID-19 patients. In total, over two thousand hospital beds, including 226 in intensive care units will be set up in several stages (MOH Order #181, March 23, 2020). The current stock of respiratory ventilators is 625, and 150 of them require maintenance (MoH, 2020c).

The government responded rapidly to the pandemic and introduced emergency measures in two major cities (Bishkek, Osh) and in the affected Osh and Jalabad provinces on 22 March with a closure of borders and travel ban, testing, isolation and quarantine, physical distancing, and health communication. In response to the growing rates of the infection, the country declared of the state of emergency from 25 March to mid-April, and later extended the lockdown to the end of April. Stricter measures, including curfews, checkpoints and closure of all businesses except essential ones (e.g. groceries, pharmacies and gas stations) were rolled out under the state of emergency. As the lockdown affects people's wellbeing and socio-economic challenges grow, there is an urgent need for clear evidence to inform the country's next steps to tackle the pandemic while acknowledging the wider health, social and economic consequences.

## Alternative interventions/ scenarios

In response to the current situation, a Kyrgyz team of researchers and experts, in cooperation with the COVID-19 International Modelling Consortium (CoMo Consortium) under the leadership of Lisa J. White (Professor of Epidemiology and Mathematical Modelling, University of Oxford, UK), and the Soros Foundation in the Kyrgyz Republic projected a possible course of the pandemic in the country through modelling several scenarios with varying interventions. The team has applied the mathematical modelling framework developed by the Oxford Modelling Group for Global Health (OMGH) in collaboration with CoMo Consortium. The model estimates the impact of potential intervention strategies on the course of the COVID-19 epidemics in individual countries and informs policy decisions. We included three levels of potential disruption on social and economic situation in Kyrgyzstan (Table 1) and projected six scenarios with varied interventions and timelines, addressing the following questions:

- *What would be the scale of the epidemic if lockdown is lifted on 1 May 2020 and not followed by any interventions?*
- *What would be the impact of 'low disruptive interventions' with low level of intervention intensity after the end of lockdown on 1 May, 2020?*
- *What would be the impact of 'medium disruption interventions' with low or medium level of intervention intensity after the end of lockdown on 1 May, 2020?*
- *What would be the impact of 'high disruptive interventions' with medium level of intervention intensity after the end of lockdown on 1 May, 2020?*

***Table 1.*** *Level of disruption of intervention scenarios on social life and the economy*

| Level of disruption | Scenarios | Interventions |
|---|---|---|
| **Low** | Scenario 1<br>Scenario 2 | Self-isolation if symptomatic, and test positive; voluntary quarantine if contacted with positive cases |
| **Medium** | Scenario 3A<br>Scenario 3B | Self-isolation if symptomatic, and test positive; voluntary quarantine if contacted with positive cases; social distancing |
| **High** | Scenario 4A<br>Scenario 4B | Extended lockdown, including: Self-isolation if symptomatic, and test positive; voluntary quarantine if contacted with positive cases; social distancing; school closure; working from home; travel ban and cocooning elderly |

The counterfactual for each scenario described below was the baseline of the lockdown lifted as planned in May with the baseline parameters (Table2) and future parameters (Table 3):

- **Scenario 1 (Baseline, no intervention):** ***Lifting*** lockdown on the 1st week of May. *Please refer to tables 2 and 3 for more details.*
  - ✓ Hand hygiene recommendations until the end of the year
  - ✓ **NO other interventions**

- **Scenario 2 (Low social disruption):** ***Lifting*** lockdown on the 1st week of May (NO changes in coverage, adherence and efficacy of measures). *Please refer to tables 2 and 3 for more details.*
  - ✓ Hand hygiene recommendations until the end of the year
  - ✓ Voluntary quarantine of contacts of index cases for **14 weeks**

- ✓ Self-isolation of symptomatic cases & screening for **14 weeks**

- ➢ Scenario 3A (Medium social disruption): ***Lifting*** lockdown on the 1st week of May (***with some changes in coverage, adherence and efficacy of measures***) *Please refer to tables 2 and 3 for more details.*
  - ✓ Hand hygiene recommendations until the end of the year
  - ✓ Voluntary quarantine of contacts of index cases for **14 weeks**
  - ✓ Self-isolation of symptomatic cases & screening for **14 weeks**
  - ✓ Social distancing for **14 weeks**

- ➢ Scenario 3B (Medium social disruption): ***Lifting*** lockdown on the 1st week of May (with ***some changes in coverage, adherence and efficacy of measures****). Please refer to tables 2 and 3 for more details.*
  - ✓ Hand hygiene recommendations until the end of the year
  - ✓ Voluntary quarantine of contacts of index cases for **19 weeks**
  - ✓ Self-isolation of symptomatic cases & screening for **19 weeks**
  - ✓ Social distancing for **14 weeks**

- ➢ Scenario 4A (High social disruption): ***Extended*** lockdown for **5 more weeks** from the 1st week of May (***NO changes in coverage, adherence and efficacy of measures***). *Please refer to tables 2 and 3 for more details.*
  - ✓ Hand hygiene recommendations until the end of the year
  - ✓ **NO** other interventions

- ➢ Scenario 4B (High social disruption): ***Extended*** lockdown for **10 more weeks** from the 1st week of May (***with some changes in coverage, adherence and efficacy***). *Please refer to tables 2 and 3.*
  - ✓ Hand hygiene recommendations until the end of the year
  - ✓ Voluntary quarantine of contacts of index cases for cases until the end of the year
  - ✓ Self-isolation of symptomatic cases & screening until the end of the year
  - ✓ Social distancing until the end of the year

***Table 2.*** *Baseline (current) lockdown parameters included in the model*

| Intervention | Intense | Start date |
|---|---|---|
| **Self-isolation if symptomatic (not including those hospitalised)** | | |
| *Coverage* | 50% | 25/03/2020 |
| *Adherence* | 50% | |
| **Additional intervention to increase self-isolation: Screening** | | |
| *Coverage* | 10% | 25/03/2020 |
| Hand/Other hygiene | | |
| Efficacy | 5% | 01/02/2020 |
| **Social Distancing** | | |
| *Coverage* | 80% | 25/03/2020 |
| *Adherence* | 60% | |
| **Voluntary quarantine of those who had contact with COVID-19 positive cases** | 50% | |
| *Efficacy* | 14 days | 16/03/2020 |
| *Days in isolation* | 50% | |
| *Decrease of external contacts* | 100% | |
| *Increase of home contacts* | | |
| **Travel ban** | | 25/03/2020 |
| Efficacy | 80% | |
| **School closure** | | |
| *Efficacy* | 80% | 16/03/2020 |
| *Home contact inflation* | 10% | |
| **Working from home** | | |
| *Coverage* | 70% | 25/03/2020 |
| *Efficacy* | 80% | |
| *Home contact inflation* | 10% | |

| | | |
|---|---|---|
| **Cocooning the elderly** | | |
| *Coverage* | 30% | 25/03/2020 |
| *Adherence* | 40% | |
| *Age limit* | 70 years old | |

***Note**: Due to unavailability of direct values of intervention coverage, adherence and efficacy, the model assumptions on intervention parameters were based on other existing proxy data and information, such as the findings of Google Map analysis, EpiCOVID survey in Kyrgyzstan and weekly reports of the Disaster Response Coordination Unit.*

***Table 3.** Parameters for future intervention scenarios included in the model*

| Interventions | Scenario 1 | Scenario 2 | Scenario 3A | Scenario 3B | Scenario 4A | Scenario 4B |
|---|---|---|---|---|---|---|
| **Baseline (current) lockdown**<br>*(until 1st week of May)* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Lockdown extension I**<br>*(for 5 more weeks)* | | | | | ✓ | |
| **Lockdown extension II**<br>*(for 10 more weeks)* | | | | | | ✓ |
| **Additional interventions after relaxing the lockdowns (Baseline / Extension I / Extension II)** | | | | | | |
| **Self-isolation if symptomatic**<br>*Coverage*<br>*Adherence*<br>*Duration of intervention* | | ✓<br>50%<br>50%<br>14 weeks | ✓<br>70%<br>70%<br>14 weeks | ✓<br>70%<br>70%<br>19 weeks | | ✓<br>70%<br>70%<br>19 weeks |
| **Additional to self-isolation: Screening**<br>*Coverage*<br>*Duration of intervention* | | ✓<br>10%<br>14 weeks | ✓<br>20%<br>14 weeks | ✓<br>20%<br>19 weeks | | ✓<br>10%<br>14 weeks |
| **Hand/Other hygiene**<br>*Efficacy*<br>*Duration of intervention* | ✓<br>5%<br>till end Dec | ✓<br>5%<br>till end Dec | ✓<br>5%<br>till end Dec | ✓<br>5%<br>till end Dec | ✓<br>5%<br>till end Dec | ✓<br>5%<br>till end Dec |
| **Social Distancing**<br>*Coverage*<br>*Adherence*<br>*Duration of intervention* | | | ✓<br>50%<br>60%<br>14 weeks | ✓<br>50%<br>60%<br>14 weeks | | ✓<br>50%<br>60%<br>19 weeks |
| **Voluntary quarantine of those who had contact with COVID-19 positive cases**<br>*Efficacy*<br>*Days in isolation*<br>*Duration of intervention* | | ✓<br>50%<br>14 days<br>14 weeks | ✓<br>70%<br>14 days<br>14 weeks | ✓<br>70%<br>14 days<br>19 weeks | | ✓<br>70%<br>14 days<br>19 weeks |

## Limitations and Assumptions

- We need to take into account limitations of this modelling analysis based on uncertainties about the virus and its epidemiology, as well as assumptions regarding current intervention coverage and efficacy affected by social, cultural and economic factors. The model outputs will change as we learn more about the disease and the impact of interventions on the nature of disease and receive more reliable data on intervention intensity and coverage.
- The current model did not include vaccination as a pharmaceutical intervention for the prevention of the COVID-19 infection, though the modelling tool has foreseen this option with the assumption of its availability in a later period.
- We have not included seasonality due to a lack of evidence on whether this epidemic will have a seasonal pattern, and if so, whether it will have the same pattern as flu.
- Another important limitation of this projection is that it did not include an analysis of the effect of high rates of the COVID-19 infection among healthcare workers on the health system's capacity to respond to the epidemic.
- The model is based on the epidemiological data as of April 17, 2020 (MoH, 2020b). There is need to continually update the simulation with new data/evidence.

Thus, the following outputs should be interpreted in light of the above assumptions and limitations.

## Projected model outcomes

There are unintended consequences of the options chosen, as these projections are only for COVID-19 and do not account for the interplay of other factors, diseases and impact on vulnerable populations.

The model predicts comparatively higher rates of the new cases averted and deaths averted compared to the baseline within shorter period of time in the 'Medium Social Disruption scenarios'. This includes the lockdown being lifted as planned on 1 May and followed up with:

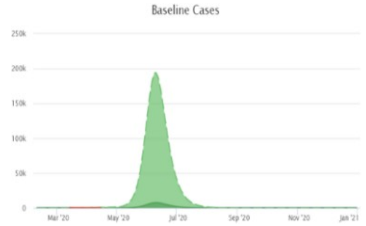
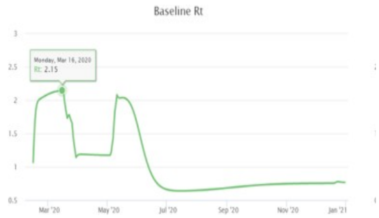
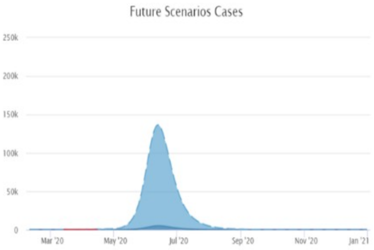
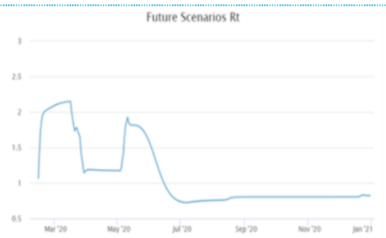
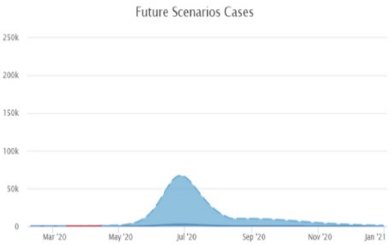
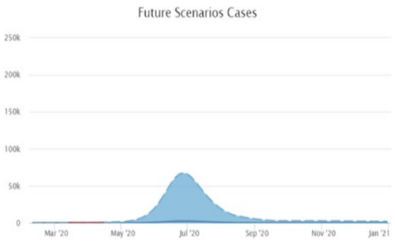
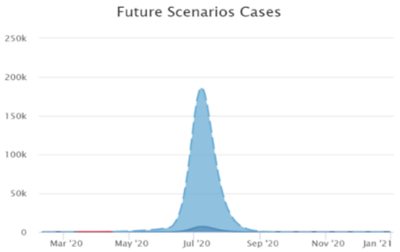
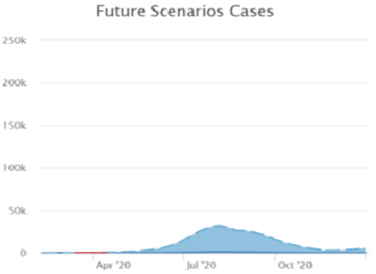
| Scenario # | New cases averted vs. baseline (%) | Death cases averted vs. baseline (%) |
|---|---|---|
| Scenario 1 | Reference | Reference |
| Scenario 2 | 17.3 | 18.9 |
| Scenario 3A | 23.0 | 41.1 |
| Scenario 3B | 28.6 | 48.4 |
| Scenario 4A | 0.3 | 0.6 |
| Scenario 4B | 33.9 | 53.6 |

- *self-isolation of symptomatic cases,*
- *screening,*
- *voluntary quarantine* of those who had contact with COVID-19 positive cases, and
- *social distancing* for 14 weeks (in Scenario 3A) and 19 weeks (in Scenario 3B).
- *Hand hygiene recommendations until* the end of the year was included in all scenarios.

The 'highly social disruptive scenario' (4B) with lockdown extended for 10 more weeks has been predicted to have the highest percentage of averted new cases and deaths. However, this may result in adverse consequences for the social and economic life of the country and have unintended implications on the mental health of the people. It is interesting to note that the extension of the current lockdown without any follow up interventions may have very little impact on the prevention of the new cases and deaths (scenario 4A).

Decisions on the strategy should be made with caution given the uncertainty around the COVID-19 (Graphs 1,2).

**Graph 1. Projected impact of intervention scenarios on COVID-19 cases**

| | Incidence | Reproductive number ($R_t$)[1] | New cases averted |
|---|---|---|---|
| **Scenario 1 (Baseline)** |  |  | Reference |
| **Scenario 2** |  |  | 17.3 % |
| **Scenario 3A** |  |  | 23.0% |
| **Scenario 3B** |  |  | 28.6% |
| **Scenario 4A** |  |  | 0.3% |
| **Scenario 4B** |  |  | 33.9% |

*[1]**Note**: the reproductive number is an epidemiological value indicating the level of contagiousness of the infection, i.e. it is the expected number of cases generated by one infected person during the period of his disease. If Rt = 1, the epidemic is stabilised; Rt > 1 epidemic is increasing; If Rt is < 1, the epidemic is decreasing.*

- In Scenario 1, the simulation predicts that the wave of the epidemic may sharply increase after relaxing the lockdown and about 82.7% of the population may get infected in the ensuing months. It should be noted however, that the majority may experience only mild or no symptoms. Moreover, the reproductive number ($R_t$), currently balanced at the level of 1.2-1.3, may increase to about 2.1 right after relaxing the lockdown and gradually decrease along with the saturation of the population with the virus transmission (i.e. achieving the herd immunity). Note that Scenario 1 is referred as a 'baseline scenario' against which the other scenarios will be compared.

- In Scenario 2, the model predicts that compared to the baseline scenario, the peak may decrease by about 20%, and about 17.3% more of new cases are likely to be averted. In total, about 65.0% of the population may get infected during the course of the epidemic (majority with mild or no symptoms). Though the increase in the ($R_t$) value after relaxing the lockdown may still be observed, its trend may be slightly lower compared to the baseline scenario due to extended current interventions focused on those who have symptoms or are diagnosed positive and those who had contacts with positive cases.

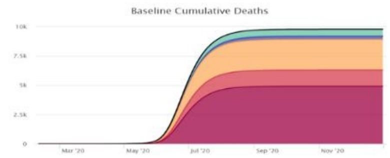
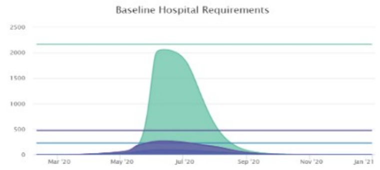
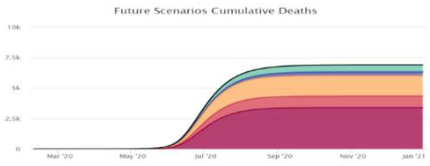
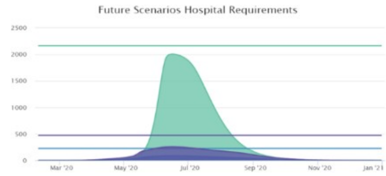
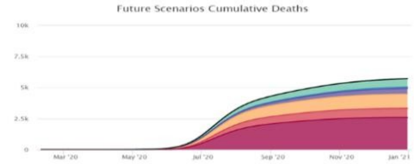
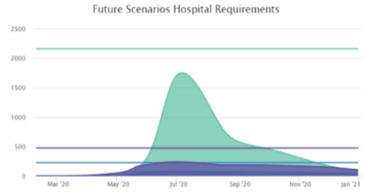
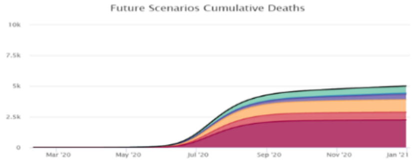
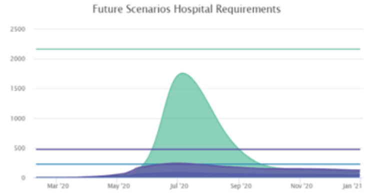
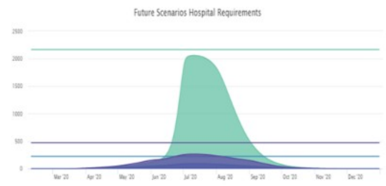
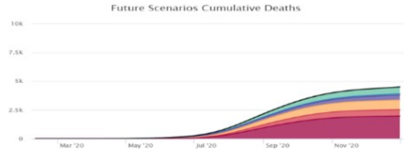
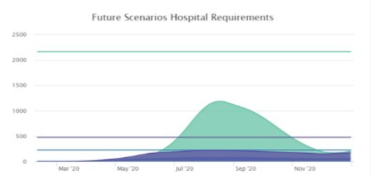
- In Scenario 3A, the model predicts that compared to the baseline scenario, the peak may decrease by about 70% and about 23.0 % more of new cases are likely to be averted. In total, about 59.7% of the population may get infected during the course of the epidemic (majority with mild or no symptoms). As shown in the graph, the course of the epidemic may continue until the end of the year. Though the slight increase in ($R_t$) after relaxing the lockdown may still be observed, its trend may go down to the value of 1.5 with a further decrease over a time due to extended (14 weeks) and intensified interventions focused mainly on social distancing and those who have symptoms or diagnosed positive and those who had contacts with positive cases.

- In Scenario 3B, the model predicts that compared to the baseline scenario, the peak may decrease by 70% and about 28.6 % more of new cases are likely to be averted. Compared to Scenario 3A, the course of the epidemic is likely to stop earlier. In total, about 54.1% of the population may get infected during the course of the epidemic (majority with mild or no symptoms). Though the slight increase in ($R_t$) after relaxing the lockdown may still be observed, its trend may go down to the value of 1.5 with a further decrease over a time due to extended (19 weeks) and intensified interventions focused mainly on social distancing and those who have symptoms or diagnosed positive and those who had contacts with positive cases.

- In Scenario 4A, the model predicts that the peak may remain as high as in the baseline scenario, but the epidemic curve may move forward to the period relatively equivalent to the extension timeline (5 weeks). In total, about 82.4% of the population may get infected during the course of the epidemic (majority with mild or no symptoms). The $R_t$ value may increase to the value equivalent to the baseline scenario and reach about 2.0 right after relaxing the lockdown and gradually decrease along with the saturation of the population with the virus transmission (i.e. with achieving the herd immunity).

- Scenario 4B is likely to be the most effective in terms of epidemiological implications, but at the same time it includes highly disruptive interventions extended for a longer time (10 weeks) after the initial lockdown. In this scenario the model predicts that the peak will be flattened by 90% compared to the baseline option and about 33.9 % more of new cases are likely to be averted. Moreover, the $R_t$ value will remain low enough, indicating the stabilised epidemic throughout the year. In total, about 48.8% of the population may get infected during the course of the epidemic (majority with mild or no symptoms).

**Graph2. Projected Impact of Intervention Scenarios on cumulative deaths[2] and Projected requirements/need in hospital and ICU beds, ventilation**

| | Cumulative death | Hospital requirements/needs | Death cases averted |
|---|---|---|---|
| **Scenario 1 (Baseline)** |   |   | Reference |
| **Scenario 2** |   |   | 18.9 % |
| **Scenario 3A** |   |   | 41.1% |
| **Scenario 3B** |   |   | 48.4% |
| **Scenario 4A** |   |   | 0.6% |
| **Scenario 4B** |   |   | 53.6% |

*Legend*

***Cumulative death among those who***

- required ventilation but denied treatment
- required ICU bed but denied treatment
- required hospital bed but denied hospitalisation
- received ventilation treatment
- received ICU treatment
- received hospital treatment

***Hospital requirements***

- required number of hospital beds
- required number of ICU beds
- required number of hospital beds

[2]**Note**: *Deaths due to being denied hospital and/or ICU aid and/or ventilation.*

- In Scenario 1, the simulation predicts that considering relevant interventions and planned hospital beds in general wards, ICU beds and ventilators, the health system will be overwhelmed with the flow of patients during the peak time of the epidemic. As shown in the above chart (column "hospital requirements/needs"), the peak of the number of patients in need for medical assistance will reach close to the maximum health system capacity (threshold lines), which will increase the possibility of denying relevant hospital support to some patients. As a result, the number of death cases among those who needed hospitalisation and intensive care support (including lung ventilation), but not received the relevant medical assistance, may become significant (refer to column "cumulative death"). Note that Scenario 1 is referred as a 'baseline scenario' against which the other intervention options will be compared.

- In Scenario 2, the model predicts that the health system will still be overwhelmed with the flow of patients during the peak time of the epidemic. However, the number of potential deaths among those who would be denied hospitalisation in the general ward or ICU or who would not be treated with lung ventilation will slightly decrease (column "hospital requirements/needs"). This may be due to the decrease of patients as a result of continued interventions focused on limiting the spread of the infection from positive cases.

- In Scenario 3A, the model predicts that the health system will be less burdened compared to the above scenarios (baseline & 2), though the number of ventilators may still be insufficient. This can be seen from the chart "cumulative deaths", where the number of people in need for ventilators who have been denied relevant treatment is still significant. The decreased burden on the health system may be due to the decrease of patients as a result of continued (14 weeks) and intensified interventions focused on limiting the spread of the infection from positive cases.

- In Scenario 3B, the model predicts that the health system will be less burdened compared to Scenario 3A, though the number of ventilators may be insufficient. This can be seen from the chart "cumulative deaths", where the number of people in need for ventilators who have been denied relevant treatment is still high. Lower burden on the health system may be due to the decrease of patients as a result of continued (19 weeks) and intensified interventions focused on limiting the spread of the infection from positive cases.

- In Scenario 4A, the simulation predicts that the health system will be overwhelmed at the same level as in the baseline scenario. As a result, the number of cases and deaths among those who needed hospitalisation and intensive care support, including lung ventilation, but have not received the relevant medical assistance may become as significant as in the baseline scenario.

- Scenario 4B, as the simulation predicts, is the most effective in terms of epidemiological implications with the least burden on the health system and lowest number of deaths among those who might have been denied relevant hospital treatment. However, as mentioned earlier, this scenario involves the most disruptive interventions for a long period of time (10 additional weeks for lockdown plus other low disruptive interventions throughout the year), which is not feasible to implement in Kyrgyzstan.

## Conclusion 1: Prevention is Essential

It is critical to combine a phased transition after lockdown with key epidemiological prevention interventions, such as **quarantine** for those who had contact with positive cases, **self-isolation** if symptomatic and **screening** (testing), as well as **social distancing** for reduction of the infection transmission**. Hand hygiene recommendations** should remain an integral part of any set of measures. Rapid development of the effective, responsive and tailored risk communication strategy, including motivational strategies to encourage adherence to the key preventive interventions among population is important.

## Conclusion 2: Rapidly Scale Up Screening and Hospital Capacities

**The model predicts the need for two approaches to be pursued simultaneously: prevention and health system preparedness.** A high level of prevention activities may reduce the burden on the health system but the health system needs to ensure sufficient capacity to accept and treat all patients. Sufficient capacities of health system in responding to increased demand in COVID-19 testing, contact tracing, quarantine and treatment are crucial in saving lives and reducing risks. Substantial focus on infection prevention control (IPC) is critical to address increasing rates of infected healthcare workers.

## Conclusion 3: Uncertainty and Updates

All results of the modelling shall be used with caution due to the limited evidence on the spread of COVID-19 and its epidemiology. The model and projections should constantly be updated, as more evidence becomes available. It is also important to be aware of the unintended consequences of the options chosen, as the model projections are only for COVID-19 and do not account for interplay of other factors, diseases and impact on general and vulnerable populations.

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