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Short Communication

Characteristics of the COVID-19 epidemic and control measures to curb transmission in Malaysia

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ABSTRACT

The first wave of COVID-19 epidemic began in late January in Malaysia and ended with a very small size. The second wave of infections broke out in late February and grew rapidly in the first 3 weeks. Authorities in the country responded quickly with a series of control strategies collectively known as the Movement Control Order (MCO) with different levels of intensity matching the progression of the epidemic. We examined the characteristics of the second wave and discussed the key control strategies implemented in the country. In the second wave, the epidemic doubled in size every 3.8 days (95% confidence interval: 3.3, 4.5) in the first month and decayed slowly after that with a halving time of approximately 3 weeks. The time-varying reproduction number R_t peaked at 3.1 (95% credible interval: 2.7, 3.5) in the 3rd week, declined sharply thereafter and stayed below 1 in the last 3 weeks of April, indicating low transmissibility approximately 3 weeks after the MCO. The experience of Malaysia suggests that adaptive triggering of distancing policies combined with a population-wide movement control measure can be effective in suppressing transmission and preventing a rebound.
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Introduction

The first case of coronavirus disease 2019 (COVID-19) was confirmed in Malaysia on January 25, 2020, marking the first wave of infection in the country that lasted for about 3 weeks (Ministry of Health Malaysia (MOH, 2020). The total number of cases was low, with 22 confirmed infections, 20 of which were imported, and no fatalities.

A second wave broke out on February 27 after 11 days of no new cases. On March 11, a neighboring country, Brunei, traced its first infection to a large religious gathering in Kuala Lumpur, Malaysia, between February 27 and March 1 attended by about 14,500 participants. Approximately 2 weeks after the gathering on March 15, Malaysia recorded the first three-digit jump in a day with 190 new cases. The next day, authorities announced a nationwide Movement Control Order (MCO), a soft *cordon sanitaire* or partial lockdown that went into effect on March 18 to reduce social mixing (Ministry of Health Malaysia (MOH, 2020). This was followed by a stricter version called the enhanced MCO, an adaptive policy implemented indefinitely following March 27 to contain large epidemic clusters. Following the decline of cases, the MCO was subsequently relaxed and replaced by a Conditional Movement Control Order (CMCO) on May 4, and further relaxed under the Recovery Movement Control Order (RMCO) on June 10.

Here, we describe the characteristics of the second wave of the COVID-19 epidemic in the country and recount the major control strategies.

Methods

Refer to the supplementary material.

Results

By the end of August, there were 9340 confirmed cases with a recovery rate of 96.9%. Imported cases made up 8.8% (826), while a total of 127 deaths were reported. The nationwide 14-day delay-adjusted case fatality rate was 1.4% (95% confidence interval: 1.2%, 1.6%) for the current study period. The second wave of the

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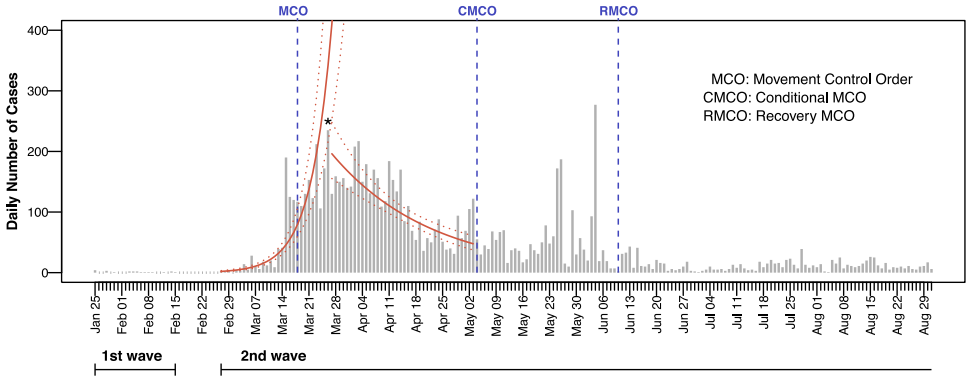

Figure 1. Daily COVID-19 cases from January 25 to August 31, 2020, shown as vertical bars. Vertical dashed lines indicate the start of control measures. Solid curved lines represent the predicted number of daily cases for the second wave based on two exponential models: one for the growth phase from February 27 to March 26 (asterisk), and another for the decay phase from March 27 to May 3, a day before the CMCO. Dotted lines represent the corresponding 95% confidence interval.

epidemic began on February 27 and grew at a rate of 18% (95% confidence interval: 15%, 21%) per day, with a doubling time of 3.8 (3.3, 4.5) days in the first month (Figure 1). If there had been no intervention, daily cases would have exceeded 400 after March 26 and escalated thereafter. The epidemic decayed slowly at a rate of −4% (−5%, −3%) after March 26, with a halving time of 18.1 (14.1, 25.2) days. Transmissibility, represented by R_t, peaked at 3.1 (95% credible interval: 2.7, 3.5) on March 15 and declined sharply afterwards, reaching 1 approximately 3 weeks after the national MCO (2 weeks after the enhanced version of the measure), and staying below 1 for the rest of April (Figure 2).

Discussion

Our results suggest that the COVID-19 epidemic in Malaysia appears to be under control. Analyses showed that approximately 3 weeks after the MCO, disease transmissibility had reduced substantially and remained low for the remaining period, except for two upswings in late May and early June due to transmissions among foreigners in detention centers (Figure 2) (Ministry of Health Malaysia (MOH, 2020). Decline in transmissibility started a few days before the official MCO measure, likely because of more public awareness and reduced social mixing because of earlier reports of increases in confirmed cases.

A mixture of interventions was implemented to curb spread. In the early stages of the second wave, authorities responded with MCO, a strict nationwide order to limit movement and border travel, in addition to ongoing contact tracing and proactive surveillance among individuals with influenza-like illness and severe acute respiratory infection. Community-targeted mass testing was also implemented selectively to contain epidemic hotspots. The exit strategy was executed in a few stages. The national MCO was replaced by CMCO and eventually by RMCO, while numerous new social distancing measures were introduced to suppress spread and prevent resurgence (Petersen et al., 2020). For example, restriction on the number of worshipers to the size of the buildings, staggered reopening of schools prioritizing students who will be taking school leaving examinations, a limitation of 250 people in public events, and access to digital technology to aid contact tracing, interstate travel and self-evaluation – which is useful for those under surveillance or quarantine (Petersen et al., 2020). These strategies are consistent with the suggestions of some early reports that noted combining multiple measures might offer effective options to minimize the risk of further lockdowns (Chen et al., 2020; Coulbourn, 2020; Cowling et al., 2020; Giordano et al., 2020; Prem et al., 2020).

Our observations suggest that intermittent triggering of adaptive measures coupled with population-wide distancing policies and proactive surveillance have provided effective control against the epidemic in the country. Until viable pharmaceutical options become available, the continuous evaluation of non-pharmaceutical strategies and the support for those

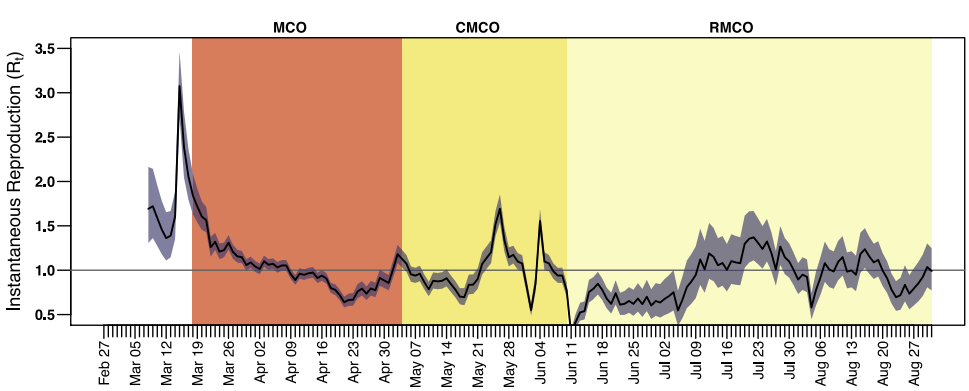

Figure 2. Instantaneous reproduction number estimated over weekly sliding windows for the second wave, shown as a solid line. The shaded area along the solid line represents the corresponding 95% credible interval. Background shading denotes the different periods under Movement Control Order (MCO), Conditional Movement Control Order (CMCO) and Recovery Movement Control Order (RMCO).

disproportionately affected will be important (Armitage and Nellums, 2020; Chung et al., 2020; Dorn et al., 2020).

Authors' contribution

CFSN and XS conceived the study with input from MS, MLM, LM and MABAT. CFSN extracted the data which were validated by MABAT. CFSN led the analysis with inputs from XS and MS. All authors contributed to the interpretation and writing of the final draft.

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Ethical approval

None.

Conflict of interest

None declared.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.ijid.2020.10.027.

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Erratum

Erratum to "Characteristics of COVID-19 epidemic and control measures to curb transmission in Malaysia" [Int J Infect Dis 101 (December) (2020) 409–411]

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The publisher regrets the following errors in the final published paper:

1 Highlights 2 and 3 are incorrect. The correct highlights are as follows:
- Instantaneous reproduction number Rt peaked at 3.1 and case fatality rate is 1.4.
- Movement control measures began 3 days after peaked Rt and implemented in stages.

2 Supplemental file was incorrect. Correct version has now been replaced online.

3 Correct Funding information should be:

This work was supported by Japan Agency for Medical Research and Development (AMED) [Grant Number 20wm0125006] under the Japan Initiative for Global Research Network on Infectious Diseases (J-GRID) program. The funder had no role in the study design, collection of data, preparation of the manuscript, or decision to publish.

The publisher would like to apologise for any inconvenience caused.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ijid.2021.01.024.

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Supplementary Material

Characteristics of the COVID-19 epidemic and control measures to curb transmission in Malaysia

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This file includes:
Methods
Additional references

Methods

We collected the daily number of confirmed COVID-19 cases and related deaths from the daily reports released by the Ministry of Health Malaysia (MOH, 2020). To estimate the growth rate of the second wave, we fitted an exponential model to the cases observed in the initial stage from February 27 to March 26, a period that included 9 days after the implementation of the Movement Control Order (MCO) to account for possible delays between existing infections and case detection (Pellis et al., 2020). The same method was used to estimate the rate of decay using data in the remaining time period until May 3, a day before the MCO was replaced by the Conditional Movement Control Order (CMCO) to ease the distancing measures.

We computed the time-varying reproduction number (R_t) to examine the transmissibility of the disease (Cori et al., 2013). R_t represents the average number an infected person would infect over his or her infectious period. We estimated the median and the 95% credible intervals of R_t using weekly sliding windows while accounting for uncertainty on the serial interval distribution. We assumed an uncertain distribution for the serial interval, and specified the mean and standard deviation of the distribution using estimates reported in a previous study of 468 confirmed COVID-19 cases in China (Du et al., 2020). The estimation process sampled 1,000 pairs of means and standard deviations based on the distribution, and for each pair, drew a sample of 1,000 in the posterior distribution of the reproduction number for each time window. All computations were performed using the *EpiEstim* package in R (Cori et al., 2013; R Core Team, 2020).

We calculated the lag-time adjusted case fatality rate and the 95% confidence interval using the Wilson score method (Wilson et al., 2020), with adjustment for 14-day lag as suggested by Baud et al. (2020).

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