

Review article:

Forecasting cumulative COVID-19 cases in Malaysia and rising to unprecedented levels

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Abstract

Background: COVID-19 outbreak is being studied throughout the world. Adding more analysis to date strengthening the information about the illness. Here, we analysis the data of Malaysian Ministry of Health from February 15, 2020 until January 10, 2021 was analysed using linear regression model statistical analysis with aim to forecast the trend. **Materials and Methods:** This study reviewed the data by Malaysia Ministry of Health from February 15, 2020, until January 10, 2021. Linear regression model statistical analysis was used for predictive modelling. The forecasting of the linear trend of the Covid-19 outbreak prediction is purposed to estimate the number of confirm cases according to the number of recoveries patients. **Results:** Malaysia is currently anticipating another lockdown restriction as new confirmed case of COVID-19 hit new record high. The cumulative confirmed Covid-19 cases in MCO predicted a sharp increase. At the first of March, 2021, the predicted cumulative confirmed Covid-19 cases are 319,477 cases. **Conclusions:** Covid-19 cases projected to 315766 by end of February 2021 with 3000-4000 daily cases predicted. Initiative and proactive measurement by Malaysian government hopefully can reduce the number of cases and flatten the infection curve.

Keywords: Linear regression analysis; COVID-19; Forecasting

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Introduction

Early of the year 2020 has seen a massive outbreak of coronavirus disease 2019 (COVID-19) which has severely impacted our world. New normal lifestyle is being adapted including more online class teaching and business lockdown throughout the countries. The impact of the disease is devastating especially to the business sectors. The medical scientists have been gathering the data regarding these diseases including the working toward producing the vaccines. Since

the new variant emergence, the data, information, and analysis are being collected throughout the world (1). Study within 1-2 months period (January 22nd and March 15th 2020) showed the trending graph of disease's death and recovery was almost identical between Italy, China and French (2). The mortality of this disease is mostly affected those around 65 years and older in 21 industrialised countries (3). Furthermore, to date the data of the mortality is still being collected which shows variability between male and female.

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The impact of the disease to the healthcare workers and community is also being monitored. Psychological impact of COVID-19 to the front liner groups includes irritability, restless and distress signs among the nurse (4). The types of this psychological are varies including uncontrolled fear, boredom, confusion which is related with lockdown measures and social isolation (5). The future psychological impact to the society as whole is thought more clear in future when the data is collected (6).

Prevention of the death is to inhibit the mode of transmission to the patient. The transmission is known occurred because of the closed contact or person-to-person infection especially in the crowd areas. In addition, perinatal transmission is speculated having some degree of chance to occur. A pregnant COVID-19 positive mother was reported with the possible of uteroplacental transmission (7). Children infection is known to affect boys in half of the cases and the average age is 7 years old (8). To date, mode of transmission is being added to the data which is more related to the possible of lockdown.

Besides its known negative impact to the world, the contradicting consequence of COVID-19 especially to the environment has been shown. A region lockdown within a year (Jan 1-20, 2019 to Feb 10-25, 2020 has improved the concentration of nitrogen dioxide in the air (from 375-500 $\mu\text{mol}/\text{m}^2$ to less than 125 $\mu\text{mol}/\text{m}^2$) in Wuhan, China (9). The positive environmental is good indicator of the effect of lockdown measures implemented.

This study focuses on the analysis the data of Malaysian Ministry of Health from February 15, 2020 until January 10, 2021 using linear regression model statistical analysis aim to forecast the trend in Malaysia.

Methodology

This study was conducted by reviewing the Malaysia Ministry of Health's daily data, starting from February 15, 2020, until January 10, 2021. Statistical analysis was performed by using SPSS and Excel software through a linear regression model. Linear regression is one of the simplest and most common supervised machine learning algorithms that data scientists use for predictive modelling. This analysis allows the researcher to investigate the phenomenon of Covid-19 from its beginning. Linear regression analysis is found to be the most suitable for the case represent, then the forecasting of the linear trend of the Covid-19 outbreak will available prediction

purposed. This is very important to estimate the number of confirm cases according to the number of recoveries patients. Pattern searching shows that the best-fitting for death is the linear trend line. A specific pattern of confirm cases will be capture through the plotting trend line analysis. This is very useful specially to prevent and educate the public on the importance of good personal and family health care. The basic prediction equation expresses a linear relationship between an independent variable (x, a predictor variable) and a dependent variable (y, a criterion variable or human response) $y = mx + b$ where m is the slope of the relationship and b is the y intercept. In the study, the variables involved were the cumulative number of confirm cases, the cumulative number of confirm cases and the cumulative number of cases recovered.

Results

The deaths lines in Figure 1 show that the mortality rate shows only a slight increase. An active case line shows rapidly the number of active cases of COVID-19 is increasing. Meanwhile, recovery reading also shows increasing follow by active cases of COVID-19. On March 15, 2020, shows a drastic increase in COVID-19 cases by 428 active cases compared to 242 cases on March 14, 2020. On March 30, 2020, there are 2,626 confirmed cases in the country, with 37 deaths reported. As of April 14, 2020, it shows an increase in new Covid-19 infections in 170 cases. The patterns of COVID-19 will be increasing in confirmed cases, recoveries, and deaths until the end of April 2020.

On May 9, 2020, there are 6,589 confirmed cases of COVID-19 in Malaysia on a cumulative basis. At the same time, 4,929 confirmed COVID-19 cases have fully recovered, and 108 COVID-19 deaths in Malaysia. On June 10, 2020, the total number of confirmed cases of COVID-19 in Malaysia was 8,338. Simultaneously, 7,014 confirmed COVID-19 cases have completely recovered (84.1 per cent of total cumulative cases). Regretfully, there are 118 COVID-19 deaths in Malaysia. At the same moment, 8,976 COVID-19 confirmed cases in Malaysia on July 31, 2020. Around the same time, 8,644 confirmed COVID-19 cases had reported, and 125 COVID-19 of deaths. A total of 9334 confirmed cases of COVID-19 have occurred in Malaysia as of August 30, 2020, including 126 deaths. Sixty-seven new cases have been reported in the last seven days, a similar number compared to the previous seven days. A recent death has been reported in

the previous seven days. Cumulatively confirmed COVID-19 cases on 17 September 2020 are 10,052 cases, and 9,250 confirmed COVID-19 patients had been discharged.

Besides that, there were a total of 26,565 confirmed cases of COVID-19 in Malaysia as of 25 October 2020. Over the last seven days, 6067 new cases have been reported, a rise of 25.3 per cent relative to the previous week. On 24 October, Malaysia reported 1,228 new cases of COVID-19, the most considerable one-day surge since the epidemic started. In the last seven days, 42 recent deaths have been recorded. It raises the cumulative number of COVID-19 deaths in Malaysia to 229. On 6 November 2020, Malaysia recorded the highest ever number of positive COVID-19 cases at 1,755, taking the total number of positive cases to 38,189. The number of COVID-19 fully recovered cases is at 726, making the cumulative number of cases that had fully recovered to date to 26,380 cases, or 69.1 per cent of the total cases. In addition, there were two deaths recorded today, bringing the cumulative number of COVID-19 deaths to 279.

Malaysia surpassed the 100,000-mark with 1,581 new Covid-19 cases on December 24, 2020, bringing the cumulative number of cases to 100,318. And 1,085 patients recovered today bringing the total number of recoveries to 81,099. Malaysia ends 2020 (December 31, 2020) with new record high of daily Covid-19 cases. The cumulative number of cases now stands at 113,010 and eight deaths were reported. Still, reported a high daily number of healed or discharged patients, at 1,481 to make the total 88,941.

Malaysia recorded 3,027 new coronavirus cases with a record high of common infections on Thursday, January 7, 2021. Total active cases have started to rise, hitting 25,742 cases, although the country's overall count is now 128,465 cases. On Friday (January 8, 2021), Malaysia registered 16 deaths a day associated with Covid-19. It recorded the largest number of patients in intensive care and those needing ventilators to survive. In the last 24 hours, there were 2,643 new coronavirus cases, lower than the record high of 3,027 recorded the previous day. Malaysia is undergoing its third wave of Covid-19 and the most intense period that began in September.

Based on Figure 2 below, from July 1, 2020, to October 8, 2020, the number of confirm cases is slight increase in Malaysia. On October 9, 2020, the number of confirm cases sharp increase. The number

of confirm cases show increasing from November 2020 to January 2021. Based on Figure 1, the highest number of confirm cases was recorded on January 6, 2021 with 2,593 new confirmed cases of COVID-19. Malaysia is currently anticipating another lockdown restriction as new confirmed case of COVID-19 hit new record high. The cumulative confirmed Covid-19 cases in MCO predicted a sharp increase. At the first of March 2021, the predicted cumulative confirmed Covid-19 cases are 319,477 cases (red line). The prediction Cumulative Confirmed COVID-19 Cases in Malaysia from January 11 till March 1, 2021 in Malaysia was shown in Table 1.

Discussion

Centre of Disease Control and Prevention (CDC) had categorized Malaysia as a very high risk (level 4) country for travelling due to exponential increase case of Covid-19 on December 2020 (10). The daily cases of positive Covid-19 cases surge more than one thousand per day which is among the highest in South East Asia. Malaysia experienced three waves of Covid-19 infection and the third wave is the worst so far. The first wave was on 25th January 2020 when Malaysia reported its first case of Covid-19 (11). Responding to it, Ministry of health published a guideline for hospitals in Malaysia to manage any positive cases. Malaysian government also banned visitor from affected country mainly china and south Korea to come to Malaysia (12). The second spike of cases happened late February 2020 following a religious event that was held at Sri Petaling. 48% of the country's COVID-19 cases (3,347) had been linked to the Sri Petaling cluster in March (13). Following surge of cases, Malaysian government announced country lockdown known as Movement control order (MCO). The MCO started on 16th March and extended until 12th May 2020.

Implementation of MCO seems able to reduce transmission of Covid-19 during the second wave. Malaysia was among the highest number of positive Covid-19 cases in Southeast Asia in 26th March 2020 when 235 daily positive cases recorded. However, on June and July 2020, the daily positive cases reduced to single digit. Reduction of positive Covid-19 cases nationwide makes Malaysian government loose down the movement control and introduce recovery movement control order (RMCO) on 16th June 2020. Reduction of cases also make government held a state election in Sabah. The state election has been done on September 2020 which was believed to introduce the third and biggest wave of Covid-19

infection nationwide (14). Daily positive cases surge especially in Sabah and people who came back from the state. Increment of positive Covid-19 cases also detected among foreign workers (15) and Malaysian government take a proactive measure to screen foreign worker in Malaysia (16). 178 370 foreign workers had undergone Covid-19 screening up until January 2020 and 3520 people was detected positive (17). Cases of Covid-19 keep on increasing as daily cases of infection recorded more than 2000 on January 2021. This was contributed partly due to holiday season when people travel and the number of cases surge at the rural area (18).

We predict the total cumulative confirmed case of Covid-19 cases in Malaysia by 31st January 2021 will be 211,861 cases. It reflects increment of 3000-4000 cases per day from mid-January to end of January 2021. This is quite similar with projection by Malaysian Ministry of Health that predict number of cases could increase to 5000 cases per day by February 2021 due to increment of the basic reproduction number (R_0) of Covid-19 infections in Malaysia to 1.1 (19, 20). However, Institute for Health Metrics and Evaluation (IHME) projected higher daily Covid-19 cases in Malaysia (more than 8000 cases per day) by end of January and end of February (21).

To flatten and reduce the R_0 and infection rate, a few initiatives were taken by Malaysian government and Ministry of Health. The first proactive measure is by increasing hospital and treatment centre capacity nationwide. 25,456 Covid-19 beds have been prepared across hospitals and low risk quarantines and treatment centre nationwide with currently have 43% occupancy rate (20). There are also 871 beds available in intensive care unit and a total number of 1581 ventilators were reserved for Covid-19 patients (20, 22).

The next important initiative in battling Covid-19 pandemic is by enrolment of vaccine program. Malaysian government will provide free Covid-19 vaccine to all Malaysian targeting 80 per cent of the population starting from March 2021 (23).

The government signed a preliminary agreement with Covax, Pfizer, and AstraZeneca to procure the COVID-19 vaccine to secure a 40 per cent population coverage vaccine guarantee and another 40% vaccine supply from Sinovac, CanSino and Gamaleya (24). The vaccine will be given in three phases. The first phase will be given in March to frontlines and hospital workers. The second phase will be given to vulnerable groups involving those aged 60 and above and those with infectious and non-communicable diseases. The third phase will be given to all 17 million Malaysians, especially to those who are working (25). This vaccine hopefully can reduce the number of infection and break the COVID-19 chain in Malaysia.

Malaysian government also decided to re implement of MCO to flatten back the infection curve. The MCO will be done in six states which had most daily cases from 13 to 26 January 2021 (26). Interstate movement were not allowed during MCO nationwide and inter district movement are not allowed for state which undergone MCO. Hopefully with all the initiatives done by Malaysian government and with help from all Malaysian following all the standard operative procedure (SOP) make by the government, cases of COVID-19 could be reduced and controlled.

Conclusion

Cumulative Covid-19 cases in Malaysia had undergone three waves of surge. The third wave which started on September 2020 shows highest positive daily cases so far. Covid-19 cases projected to 315766 by end of February 2021 with 3000-4000 daily cases predicted. Initiative and proactive measurement by Malaysian government hopefully can reduce the number of cases and flatten the infection curve.

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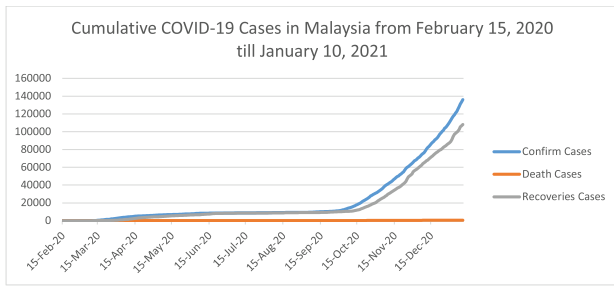


Figure 1: The Cumulative Number of COVID-19 Confirm, Death and Recoveries Cases from February 15, 2020 till January 10, 2021

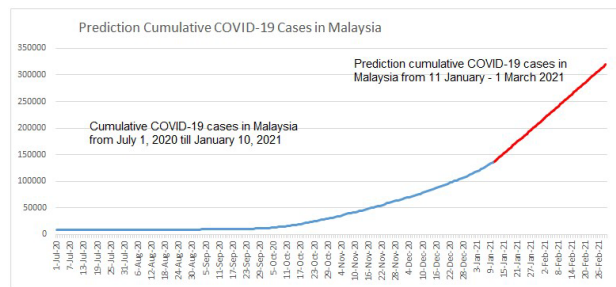


Figure 2: Prediction Cumulative Confirmed COVID-19 Cases in Malaysia from January 11 till March 1, 2021 in Malaysia

Table 1: Prediction Cumulative Confirmed COVID-19 Cases in Malaysia from January 11 till March 1, 2021 in Malaysia

Date	Cumulative number	Date	Cumulative number
11-Jan-21	137642	5-Feb-21	230415
12-Jan-21	141353	6-Feb-21	234126
13-Jan-21	145064	7-Feb-21	237837
14-Jan-21	148775	8-Feb-21	241548
15-Jan-21	152486	9-Feb-21	245259
16-Jan-21	156197	10-Feb-21	248970
17-Jan-21	159908	11-Feb-21	252681
18-Jan-21	163619	12-Feb-21	256392
19-Jan-21	167330	13-Feb-21	260103
20-Jan-21	171040	14-Feb-21	263814
21-Jan-21	174751	15-Feb-21	267524
22-Jan-21	178462	16-Feb-21	271235
23-Jan-21	182173	17-Feb-21	274946
24-Jan-21	185884	18-Feb-21	278657
25-Jan-21	189595	19-Feb-21	282368
26-Jan-21	193306	20-Feb-21	286079
27-Jan-21	197017	21-Feb-21	289790
28-Jan-21	200728	22-Feb-21	293501
29-Jan-21	204439	23-Feb-21	297212
30-Jan-21	208150	24-Feb-21	300923
31-Jan-21	211861	25-Feb-21	304634
1-Feb-21	215572	26-Feb-21	308345
2-Feb-21	219282	27-Feb-21	312056
3-Feb-21	222993	28-Feb-21	315766
4-Feb-21	226704	1-Mar-21	319477

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