A simple note on the growth rate of Covid-19 in Indonesia based on a curve trend generated by a spreadsheet

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Abstract. This preliminary study is aimed at examining the growth rate of Covid-19 pandemic in Indonesia in a framework of a nationwide issue. Using a spreadsheet, this study generates time-series development of the disease from its early stage in March to the late of July 2020. The study focuses on the analysis of three indicators, namely the number of people confirmed infected, recovered, and dead, daily reported by the authorities to monitor the severe outbreak. A number of groups of people, such as people under observation (ODP), suspected (PDP), and with no symptoms (OTG) are excluded from selected indicators due to difficulties in detection of people accounted for in each group. Cases confirmed are given by the results of Polymerase Chain Reaction (PCR) tests from swab sampled and are not determined by those of rapid tests. The data were collected from The Ministry of Health, The Republic of Indonesia and National Agency for Disaster Relief (BNPB). We report findings on the effectiveness of a PSBB policy that includes physical and social distancing during different stages and the possible roles of four connected parameters, namely community resilience, government control, medical access and treatment, and economy recovery. From the data acquired and presented in separate curves, we analyse the growth rate of Covid-19 in Indonesia. Regarding distinct trends of the curves with an indication of a continuous transmission, we conclude that combined factors, involving ineffective implementation of the policy and a low community resilience make the infectious disease outbreak uncontrollable in some sense.

1. Introduction

A mysterious, pneumonia-like infectious disease was reported to affect most people in Wuhan district, China at the end of December 2019. It was initially speculated due to person-to-person transmission of the so-called novel Corona-virus (the 2019-nCoV), as claimed by [1]. Within weeks and months later, it has been spreading over other cities in mainland China and becoming a severe global pandemic [2]. Another name for this globally transmitted virus is Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV2) with a high probability of ‘local transmission’ between people having close distances, making it to be a worldwide spread outbreak [3].

In the context of Indonesia, two persons were confirmed to be the first case of positively infected by the Corona-virus on March 2, 2020. Speculation about the main cause for why these persons were infected was unresolved at the time but then the number of people infected rapidly increased within the next two weeks (https://nasional.kompas.com). This hardship has finally driven the government as
well as some local authorities since then to publicly socialise physical distancing and encourage ones to use medical masks for protecting them from possible droplets caused by unexpected cough during daily interaction. This policy was, in the middle of March, followed by a more serious rule of a wider limitation, namely social distancing in a nationwide scale by then promoting work from home (WFH) rather than in offices or workplaces, learning from home (LFH) rather than in schools and universities, and doing worships at homes rather than in mosques, churches, temples or other relevant places.

However, potential infection hence the quick spread of the disease by human interaction elsewhere are uncontrollable, rapidly increasing the growth rate of affected people with a Covid-19 epidemic [4]. In response to such a situation, the goverment officially announced the large-scale social limitation or ‘PSBB’ on March 31, 2020. This policy was applied to limited regions within the capital city, Jakarta, and its surroundings, starting from April 10, 2020 (Kompas, May 4 and May 5, 2020, printed editions) and subsequently followed by other regions outside Jakarta. Nowadays, per August 1, 2020 there have been 34 provinces affected by this ongoing outbreak with a total of more than 100 thousands of people positively infected and 5 thousands reported as deaths in the country.

Although the number of people recovered from this infection has increased throughout the country, particular attention should be given to the way in which prevention is the primary concern as fatalities (positively infected and dead cases) have also steadily climbed up in number. As clearly prompted by [5] from investigation into a pattern of the disease spread that relies much on personal transmission, the government has therefore carried out increased numbers of a rapid test for early personal detection prior to a more accurate, Polymerase Chain Reaction (PCR) test taken immediately following a swab sampled from anyone suspected. In addition, good practices of ongoing infection controls by either individuals or the authorities, including the use of personal and public hand-sanitizers to keep one’s hands washed, efforts in avoiding close contacts within crowds, as well as screening and surveillance in a public domain are persistently advised with no excuse.

There is irony on a current situation associated with the growth rate of the Covid-19 epidemic in Indonesia. This irony asks for the effectivity of the PSBB policy with continuously growing numbers of all cases considered, particularly the number of people positively infected with no knowledge of when this ‘health emergency’ will end (Kompas, May 16, 2020, printed edition) and all risks possible to come in the ‘backyard’ of lesser-tight issues of the policy (Kompas, May 18, 2020, printed edition). A number of recommendations towards a more comprehensive response were suggested by [6] for better handling of this health emergency (used in place of a ‘non-natural disaster’, which is actually an inaccurate term). These recommendations, however, were made on the basis of limited observations during a period of January – March 2020 only.

To better suit of the problem in question, we have collected Covid-19 numerical data in Indonesia and performed corresponding analyses to examine three indicators, namely cases of people confirmly infected, recovered, and dead reported by the authorities in terms of the growth rate of each indicator in time-series development. The results are given in the forms of different curves, where each curve describes a trend for each indicator. The trends are reported for different periods of time considering the roles of four parameters, including community resilience, goverment intervention, medical access and treatment, and economy recovery. Hence, the specific aim of this study is to determine whether the PSBB policy is effective in controlling the outbreak (not to predict the nature of the epidemic [7] as it is complicated). Notice that the data are accounted for examination with no separation of gender and age groups as these are not controlling factors [8].

2. Method
The method in the current study was simply to collect daily records of Covid-19 data in Indonesia from March 2 to July 31, 2020 prior to performing data processing and the corresponding analysis for each indicator. The records were accessed at sites https://loker.bnpb.go.id/s/G4jBmNCqTsCLyp8 and https://covid19.go.id officially managed by The Indonesian Ministry of Health, National Agency for Disaster Relief (BNPB) and The Indonesian Task-Force for Rapid Responses to Covid-19 (Gugus Tugas Percepatan Penanganan Covid-19), as well as from daily reports listed in Jawa Pos (daily news in printed edition). Due to space limitation, the data are not provided in a list but the curves generated for the different stages are given and discussed in the following section.
3. Results and Discussions

The continuous Corona pandemic takes everything with it while striking most in dense population. The infectious disease may come to everyone with no warning if the infected person ends up with being recovered or dead. The nature of the outbreak remains debateable, leading to a challenging issue since ‘airborne transmission’ has also been suggested as an effective way of the virus spreading [9] for places at further distances and in indoor environment. This comes nearly the same time with possible medical treatments reported [10].

However, this study does not concern with either of detailed transmissions and latest treatments. Instead, this work focuses on examination of the growth rate of the disease on the basis of the number of bodies infected, recovered, and dead as the three indicators. Plotted in Figure 1, 6 panels describe various stages of the pandemic. Each is completed with time duration (denoted by black solid lines) in which the PSBB policy was implemented. Due to the complexity of the pandemic spread throughout the country, we have decided DKI Jakarta that involves the capital city and its surrounding regions as reference for examination of the effectiveness of the PSBB policy implementation. This is acceptable considering that DKI Jakarta has contributed a large portion of Covid-19 cases for each indicator to the nationwide scale and become the first province applying the policy. The following paragraphs are constructed to provide information on the rates of positively infected and recovered bodies per day. These two indicators are selected to demonstrate how the PSBB policy is running in society, whether it brings effects into reduction in the number of populations affected by the outbreak.

During a time period from early March to the late of July 2020, there were at least 4 times in which PSBB regulation was implemented for people staying in DKI Jakarta. The first round of this regulation was applied to the society with no exception during 10–23 April 2020, corresponding to days 40 to 53, as depicted in Fig. 1(a). It is clear from the first panel that the rate of positively infected population is high, dated from the first case on March 2. The rate of an increase in positive infections seems to grow in an exponential function, as also claimed by [4, 7], with new cases infected per day on average were reported to be 2.92 (no need to be rounded to 3 for some reasons). In this stage, the average increase in the number of people recovered from Covid-19 was comparable to that of deaths. The recovering rate was found to be 0.36, much smaller relatively compared to the increasingly infected rate for this stage. These suggest that either individuals, communities, or the authorities in all levels within the country have not yet realised what factors affecting the continuous spreading hence how to control the spread.

The PSBB policy implemented during two weeks in April 2020 gave no effects on the number of fatalities. People sent to hospitals developed for specific purposes on demand have steadily increased. This situation forced the Jakarta’s authority to extend the regulation from April 24 to May 22 2020, corresponding to days 54 to 82, as seen in Fig. 1(b). During this period, public health measures as part of controlling the spread (isolating symptomatic individuals, tracing person-to-person communication, and quarantining their contacts) were forced once people being detected by the rapid or the PCR test. These direct procedures to stop increasing infectious agents were of importance, as discussed in [8]. These were accompanied by a set of strict regulations in the introduction of wearing protection masks, staying lives healthy by routine washing hands at any time, and/or avoiding close contacts or crowds. However, cases reported during this phase were about the same rate of 3.23 persons per day suffered from the virus while the rate for recovery per day increased to 0.78.

From May 23 to June 4, corresponding to days 83 to 95, the PSBB entered stage 3, as shown in Fig. 1(c), with its modified application for a transition to a ‘new normal’ phase starting in June for limited regions. All rules remained standing to ensure the rate of population suffered from the disease was in control. In this period, malls and offices were allowed to restart activities with strict protocols. These openings, however, called for protests from many scientists who concern with high risks of such a policy. Cases positively infected per day during this phase were reported to be 3.27, slightly higher than the previous stage while the recovery rate per day was found to increase to 1.08. A first look at these stages is as follows. While Covid-19 positively infected cases remains increasing, the number of people recovered also increases. This feature indicates advances in medical access and treatment in curing patients during their stay in hospitals but not showing effective implementation of the PSBB.

However, the pandemic started to get worsening in the next period of June 5–30, corresponding to days 96 to 121 although the PSBB came into society for stage 4, as seen in Fig. 1(d). During this stage,
Figure 1. Simple graphs, showing time-series development of the Covid-19 during different stages from 2 March to 31 July 2020 with blue, green and red open-circles representing the number of people confirmly infected, recovered, and dead, respectively. Panel (a) is given for a period of day 1 to 53 with two vertical black solid-lines representing duration from day 40 to 53 when PSBB stage 1 was implemented to apply physical distancing and to limit social interaction amongs people in Jakarta; panel (b) for a period of day 1 to 82 with the black solid-lines representing duration from day 54 to 82 when PSBB stage 2 was applied; panel (c) for a period of day 1 to 95 with the black lines representing duration from day 83 to 95 when PSBB stage 3 was applied; panel (d) for a period of day 1 to 121 with the black lines showing duration from day 96 to 121 when PSBB stage 4 (first transition phase) was applied; panel (e) for a period of day 1 to 136 with the black lines showing duration from day 122 to 136 when PSBB stage 5 (second transition phase) was applied; panel (f) for a period of day 1 to 152 (31 July 2020) with the black lines showing duration from day 137 to 152 when PSBB stage 6 (third transition phase) was applied.
‘new normal’ run with more common items permitted in various aspects of living, including modes of transportation, traditional markets, and industrial activities. With all these risks bringing together with a low-lying level of community resilience, the rate of people positively infected has been unstoppable, denoting 3.95 positive cases per day. Again, the recovery rate significantly increased during this stage to 1.75 persons per day but it gave no meaning in terms of the success of the government intervention. In the context of the pandemic spread, prevention ones from deaths is started by preventing them from suffering infections. A report was then provided by Kompas in June 16, 2020 (printed editions) using the so-called effective reproduction number $R_e$, that is, a number (usually given in two decimal places) showing a possibility of a continuous transmission and hence the spread of the outbreak to occur. Based on observations during the first half of June, the majority Indonesian provinces run with $R_e > 1$, leading to a value of $R_e = 1.07$ for the nationwide scale. It follows that person-to-person infections remain possible with placing society at high risks as mass mobility opens up.

The last two graphs, shown in Figs. 1(e) and (f), are stages 5 and 6 respectively, providing the light of which all efforts have thus been implemented. Figure 1(e) describes the growth rate of Covid-19 between July 1−15, where a relatively steep increase in the number of infected people per day was recorded to be 4.42. In accordance with this, a value of 2.18 was then noted as the recovery rate during the first two weeks of July. Figure 1(f) shows the growth rate of Covid-19 between July 15−31, where a slight increase in the number of infected people per day was confirmed to be 4.76 and a steadily increasing rate of 2.94 was found for the recovery. During July 2020, a large portion of activities in public domain, including buildings, offices, markets, stores and malls were allowed to run with health protocols but with no effect on reducing the rate of increasingly infected bodies.

The records on the Covid-19 positive cases throughout the country confirm that the implementation of the PSBB was overall ineffective in controlling the severe infectious disease. This is just because the primary task of the policy is to prevent anyone from being infected by the virus. It seems likely that the policy took its best practice in stage 3, where only a value of 1.2% increase relative to stage 2 (the smallest compared to that in other stages in this study) was obtained for the rate of infected cases. Another important feature from Fig. 1 is provided by apparent trends of ‘positive and recovery rates’. The two terms are here visually observed as the blue and green open circles in Fig. 1(a) to 1(f), where the recovery rate values of 0.36, 0.78, 1.05, 1.75, 2.18, 2.94 runs closer to the positive rate values of 2.92, 3.23, 3.27, 3.95, 4.42, 4.76 from the beginning of March to the late of July. This suggests that medical access and treatment both play a role in the right direction whereas the pandemic continuous spreading uncontrollable.

From the data acquired and presented in separate curve trends, we examine and analyse the growth rate of Covid-19 in Indonesia. Regarding the trends with indication of continuous local transmissions, we here argue that combined factors, involving ineffective implementation of the PSBB policy and low-lying levels of community resilience make the infectious disease uncontrollable. Thus, a key role in controlling the rapidly growing widespread of the ongoing infectious disease in the country includes points of strict regulation and strong intervention from the government, long-lived and high resilience of the society, better medical treatment and access, and good economy recovery.

4. Conclusions

In some provinces in certain periods of time in which the PSBB policy was successfully implemented to control social interaction, the rates of populations affected by the Corona virus seem decelerated or at least controlled from the likely exponential growth in number. The implementation of the policy in terms of a broader range of society, however, has no strict regulation as it was partially applied with varying restrictions, depending on local conditions. A low-lying level of community obedience found elsewhere makes this ongoing situation worse. In addition, limitation on medical access and treatment for public health measures as well as pressure from the need for economy recovery in the middle of the fast-growing spread of the pandemic all drive the nationwide problem into continuously worsening fatalities. It is then obvious from reported cases to date that there is no single solution to the problem. All parties with no exception including society self-conformity and awareness of the infectious disease and effective controls by the strong government intervention on the basis of relevant science applied
and other in-line instructive regulation are thus components required to prevent current situations from a more serious uncontrollable outbreak.

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