

Society Mobility Index Analysis During Transition Period of Covid-19 Pandemic in East Java

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Abstract. Covid-19 pandemic occurred in Indonesia and also almost all countries in the world has a big impact in various fields, both in health, education, social and economic. The government issued a policy to stay at home to minimize spread of covid-19 virus. In early June 2020 the government issued a new policy, namely New Normal policy. Society mobility indeks of course has changed starting from the stay at home policy until the new normal policy implemented. Google responds to society mobility during the covid 19 pandemic by using navigation technology installed on individual accounts. The aim of visits during pandemic to the transition period is recorded and presented in form of a daily mobility index. This study aims to determine the mobility index of the people of East Java during the transition period of covid 19 pandemic. The results of analysis society mobility index show that average society mobility index in workplaces has decreased by 20% compared to the baseline period, on the contrary average society mobility index in residential has increased by 11% compared to baseline period. compared to the baseline period. The average society mobility index in retail & recreation, grocery & pharmacy, parks and transit stations also decreased by 6%, 2%, 8% and 32 % respectively compared to baseline period. Based on the results of society mobility index analysis, there was a significant change in society mobility index in East Java during transition period compared to baseline period.

Keywords: *Society Mobility Index, Covid 19 Pandemic, East Java.*

1. INTRODUCTION

East Java is one of provinces that has a quite high increase in number of confirmed cases covid 19 virus, even at the end of June 2020, East Java had become province with the highest confirmed cases of covid-19 exceeding DKI Jakarta. Until now, several cities in East Java are still in the red zone for spread of the covid 19 virus. Covid-19 pandemic has occurred in Indonesia since March 2020 has changed people's lifestyles, habits and routines, thus requiring people to be able to adapt to new habits. Since the beginning of June 2020 the government issued a new policy called New Normal to accommodate society activities that must maintain productivity amid the covid-19 pandemic [1]. This New

Normal policy needs to be implemented because a definitive vaccine with international standards has not been found for the treatment of the covid 19 virus. New Normal Policy is implemented to maintain society productivity while remaining safe from exposure to covid-19 virus. These new habits and behaviors are based on adaptation to cultivate a clean lifestyle by implementing several health protocols, namely washing hands regularly with soap, wearing masks when leaving the house, taking care safe distance and avoid crowds [2]. The society mobility of course was changes when the new normal policy was implemented. Society has started to carry out activities outside the home, of course, by implementing the health protocol recommended by the government. Google responds to

society mobility during the covid 19 pandemic by using navigation technology installed on individual accounts. Google's mobility index data can be accessed on <https://www.google.com/covid19/mobility/> [3]. Changes in society mobility are reaction to covid 19 pandemic in Indonesia. The society must be able to adapt in carrying out normal activities but still adhere to health protocols. The purpose of this research on mobility index analysis is to determine the average mobility index of the people of East Java during the Covid 19 pandemic transition. The results of this study can be used as input to assist the government and health workers in making policies against the covid19 pandemic [4].

2. RESEARCH METHODS

Analysis of Society Mobility Index during covid 19 pandemic transition period in East Java Province refers to the Google mobility index data available from the covid 19 pandemic to the Covid 19 pandemic transition period. Google provides mobility index data that shows changes in the number or length visits of a person in several places in one day compared to the baseline days period [5]. The baseline day value is the median per day calculated using visit data for the period January 3, 2020 to February 6, 2020. The baseline period is before the

covid 19 pandemic occurred in Indonesia which is used as a comparison of changes in society mobility. The mobility index is presented in the form of a percentage (%) which is an aggregate of individual data whose visits are recorded after the location history feature is active via Google Maps. Google uses anonymization technology to maintain the privacy and security of users, this technology makes it possible to display visit data without identifying each user [6]. There are six categories of places of visit that were recorded, namely (1) Workplaces, (2) Residential, (3) Transit Stations, (4) Retail and Recreation, (5) Grocery & Pharmacy and (6) Parks [7]. There are two types of mobility indices, namely a positive (+) mobility index and a negative (-) mobility index. A positive (+) mobility index means that number or length of visits on a certain day and place is more than the baseline days and it can be interpreted that society mobility increases compared to baseline days. Meanwhile, the negative (-) mobility index means that number or length of visits on a certain day and place is less than the baseline days and it can be interpreted that society mobility decreases compared to the baseline days [8]. An overview of type mobility index is presented in Figure 1 as follows :

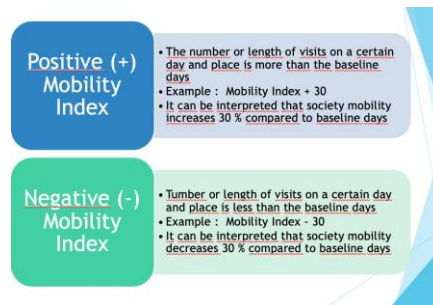


Fig 1. Type Mobility Index

Research on the analysis of society mobility index during the transition period of the covid 19 pandemic in East Java was conducted over a period of one month from 25 August 2020 to 25 September 2020 to find out the average visit patterns of East Java people during the transition period. East Java is one of the provinces that is included in the red zone of spread the Covid 19 virus and every day there are quite a lot of confirmed cases of covid 19. So that this analysis of society mobility needs

to be done so that it can be used as input in making policies against the covid 19 pandemic. East Java society visits to six categories in a one month period are recorded, then descriptive statistical analysis is carried out which can then be interpreted to see an increase or decrease in society mobility during the transition period of covid pandemic 19. The average society mobility index in last one month can be calculated using the following equation [9]:

$$\text{Average Society Mobility Index} = \frac{\sum_{i=1}^n S_i}{n} \quad (1)$$

The average society mobility index was calculated for each category of place visit. So there are a total of six different average society mobility in six different categories of places of visit. Based on the average value

of society mobility, information on increase or decrease in society mobility in different categories of places of visit can be obtained. If the average value of society mobility is positive (+), it means that there is an increase

in visits to that category compared to baseline period, but if the average value of society mobility is negative (-) it means that there is a decrease in visits in that category compared to baseline period [10].

3. RESULT AND DISCUSSION

3.1 Result

The average value of society mobility index during the transition period of covid 19 pandemic was obtained in the last one month, namely 25 August 2020 to 25 September 2020 which is calculated using equation (1). The results of the average value of society mobility index in the six categories of places of visit are presented in Table 1 as follows:

Table 1. Average of Society Mobility Index

No.	Categories	Average of Society Mobility Index
1	Residential	(+) 11%
2	Workplaces	(-) 20%
3	Transit Stations	(-) 32%
4	Retail and Recreation	(-) 6%
5	Grocery & Pharmacy	(-) 2%
6	Park	(-) 8%

The results of analysis society mobility index show that the average society mobility index in workplaces has decreased by 20% compared to the baseline period, on the contrary average society mobility index in residential has increased by 11% compared to baseline period. This represents change in daily mobility after WFH (Work From Home) is applied. There has been an increase in society activity at home and a decrease in society activity at work since the covid 19 pandemic to transition period covid 19 pandemic. Although the WFO (Work From Office) system with alternating schedules has been implemented during the transition period, society mobility on the workplaces has decreased compare with baseline period and society mobility in residences has increased compare with baseline period. The average society mobility index in retail & recreation, grocery & pharmacy and parks also decreased by 6%, 2% and 8% respectively compared to baseline period. Decrease visits in three categories of places visits indicates that society still limits some activities outside home, although the decrease in average society mobility index is quite small compared to baseline period. During the transition covid 19 pandemic, people have many choices to fulfill their daily needs, namely using various online shopping platforms. People as consumers can stay at home to avoid meeting many people but their daily needs are still met. The decline in average society mobility index was greatest in visits to transit stations. Transit stations include train stations, terminals and airports. The average society mobility index for transit stations decreased by 32% compared to

baseline period. This shows that society prefers to use private vehicles and limits use of public transportation, in addition to decrease in average society mobility index in transit stations is due to the large-scale social restriction policies implemented by the government to restrict people from traveling outside city.

3.2 Discussion

Based on this research known that average society mobility index in five categories of places visits namely workplaces, transit stations, retail & recreation, grocery & pharmacy and park has decreased during the covid 19 pandemic transition period compared to the baseline period, meanwhile for the average society mobility index in Residential experienced an increase during the transition period of covid 19 pandemic compared to baseline period. However, the decline in the average society mobility index in the three visiting categories, namely retail & recreation, grocery & pharmacy and Park, was very small compared to the baseline period, which was below 10%, which indicates that the mobility of the people in these three places was almost the same as the baseline period, namely before the covid 19 pandemic occurred. This can be a discussion, can the mobility of the community be a factor in the increasing number of confirmed cases of covid 19 every day? Further research is needed to answer this. The government is advised to provide more strict regulations regarding the implementation of health protocols outside the home because during this transitional period people have been doing a lot of mobility outside the home so

that the number confirmed cases of covid 19 does not continue to increase.

4. CONCLUSION

The results of society mobility index analysis show that average society mobility index in workplaces has decreased by 20% compared to the baseline period, on the contrary average society mobility index in residential has increased by 11% compared to baseline period. The average society mobility index in retail & recreation, grocery & pharmacy and parks also decreased by 6%, 2% and 8% respectively compared to baseline period. The decline in average society mobility index was greatest in visits to transit stations. Transit stations include train stations, terminals and airports. The average society mobility index for transit stations decreased by 32% compared to baseline period. Based on the results of society mobility index analysis, there was a significant change in society mobility index in East Java during transition period compared to baseline period.

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