The Impact of the Social Restrictions Policy on Silent Behavior in South Sulawesi Community Houses

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INFO ARTICLE

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ABSTRACT

South Sulawesi was one of the first regions in Indonesia to implement the Large-Scale Social Restriction (LSSR) policy, which runs from April 24 to May 22, 2020, and is one of the non-pharmaceutical strategies used to encourage people to stay at home more in order to suppress the spread of the Covid-19 virus. The purpose of this study is to determine the impact of the LSSR policy on the behavior of people in South Sulawesi who stay silent in their homes, as well as how long the impact will last. The data used is big data in the form of the Google Mobility Report, specifically community mobility data in the form of a percentage change in the number of visits (towards the baseline) for places classified as residential areas measured daily from March 20 to May 22, 2020. The intervention ARIMA model (1,0,0) with the intervention order b=0, r=0, s=8 shows a significant impact from the implementation of LSSR in South Sulawesi using the univariate ARIMA (Autoregressive Integrated Moving Average) statistical analysis method. This is because of contradictory policies that encourage people to begin activities outside the home. The implementation of this policy, which was followed by the beginning of people leaving their homes in May 2020, also had an impact on rising prices due to decreased distribution of goods/services, resulting in scarcity. The study concludes that the LSSR policy has a significant effect on the behavior of people in South Sulawesi staying silent in their homes from its implementation until eight days later.

INTRODUCTION

The provincial government of South Sulawesi officially announced a new case of the SARS-CoV-2 virus, also known as the Covid-19 virus, on March 19, 2020. South Sulawesi became one of the regions outside of Java with a red zone status after the addition of daily confirmed cumulative cases, beginning with the first two cases and reaching 127 people on April 7, 2020. Nonetheless, the South Sulawesi government is regarded as having been successful in dealing with and preventing the spread of the Covid-19 virus in Indonesia during the year 2020.

The Governor of South Sulawesi received three Covid-19 Innovation awards from the Ministry of Home Affairs on June 22, 2020. Furthermore, the early April red zone status was finally changed in early October 2020. One of the government's efforts was the Large-Scale Social Restrictions (LSSR), which went into effect from April 24 to May 22, 2020. This step is in line with the third goal of the SDGs (Sustainable Development Goals), which is to ensure healthy lives and prosperity for all people of all ages (Bappenas, 2017).

South Sulawesi's social restriction policy aims to reduce population mobility in order to reduce the daily increase in the number of COVID-19 cases at the start of the pandemic. Several countries have implemented similar policies to reduce population mobility in order to reduce the daily increase in Covid-19 cases. Warren and Skillman conducted a study in 2020 and concluded that there had been a significant decline in mobility, both in the United States and globally. Significant mobility reductions have been observed in the United States since the onset of the COVID-19 threat and specific government directives (Warren & Skillman, 2020). Meanwhile, Engle et al. concluded in 2020, with their study titled "Staying at Home: Mobility Effects of COVID-19," that the official stay at home order reduced mobility by 7.87 percent in the United States. (Engle and colleagues, 2020) Badr et al2020.'s study concluded the importance of social distancing as an effective way to reduce COVID-19 transmission in the United States (Badr et al., 2020). The importance of social restrictions in suppressing the spread of the Covid-19 virus is also supported by Guzzetta et al., 2021's research in Italy, which concluded that the lockdown policy was able to reduce new daily cases to less than 1% for fourteen days (Guzzetta et al., 2021). Mendoza et al., who studied Latin American countries in 2021, and Figueiredo et al., who studied China in 2020, as well as other studies, concluded that early prevention measures such as strict lockdown and social distancing can effectively reduce mobility rates, daily cases, and deaths in several countries (Arimura et al., 2020; Askita et al. , 2020; Corpus-Mendoza et al., 2021; Figueiredo et al., 2020; Gaskin et al., 2021; Iacus et al., 2020; Matrajt & Leung, 2020; Mendolia et al., 2021; Pullano et al. , 2020b; Zhou et al., 2020).

Some of the studies mentioned above show the effectiveness of social restrictions but do not specify how long the policy has been in effect. Furthermore, due to geographical factors that allow them to be implemented, several countries implement comprehensive social distancing policies. In contrast to Indonesia, which has geographical conditions in the form of islands and varying levels of virus spread in each administrative area, the implementation of social restriction policies in South Sulawesi is also local. Because of the unprecedented spread of the Covid-19 virus, non-pharmaceutical intervention is the most widely used strategy to limit physical movement and interaction in order to reduce virus transmission, particularly in the early stages in South Sulawesi. As a result, it is critical to understand the extent to which the new policy is implemented.

The next, and equally important, challenge is data availability. In a time of limited resources and the need for effective policies, governments and stakeholders can benefit greatly from timely and accurate big data analysis on human mobility. Sirait explained several opportunities for using big data in the public sector in 2016, including gathering feedback and public responses from government service information systems and social media as a foundation for developing policies and improving public services, as well as using data to find solutions to existing problems (Sirait, 2016). Hu et al., in 2021, and Huang et al., in 2020, conducted research on the effectiveness of social restriction policies using big data (Huang et al., 2020; Hu et al., 2021). As a result, the use of big data in the analysis of population mobility patterns is a viable and up-to-date alternative solution.

Based on the description above, it is hoped that research will be conducted to determine how effective and adaptive the policies implemented by the government, particularly in the regions, in dealing with the spread of the Covid-19 virus are, so that they can be used as material for future evaluation and planning in observing community compliance in terms of mobility patterns (not from interviews or public acknowledgment). Based

on this context, the purpose of this study is to determine whether the LSSR policy has a significant impact on the behavior of people in South Sulawesi who stay silent in their homes, as well as how long the policy's impact will last.

METHOD

This study is a quantitative time series study that will be conducted in South Sulawesi in 2020. The data used is secondary information obtained from Google reports on population mobility during the Covid-19 pandemic. The data used is a percentage change in the number of daily visits made by the community when compared to normal conditions (base line) for places classified as residential areas in South Sulawesi. Each day's normal value is represented by the bottom line. The median value taken over a 5-week period between January 3 and February 6, 2020, is used as the base day of measurement. Data is collected on a daily basis from March 20 to May 22, 2020. (daily data).

ARIMA (Autoregressive Integrated Moving Average) Intervention was used as the analytical method. The goal is to measure the intervention's effect, the duration of the intervention's impact over time, and to estimate the magnitude of the intervention's effect (Box et al., 1994). In this study, the intervention was the implementation of the Large-Scale Social Restrictions (LSSR) policy in South Sulawesi from April 24-May 22, 2020. The SAS University Edition software and the Eviews 11 Student version were used to process the data. The ARIMA intervention model takes the following general form:

$$Y_t = \frac{\omega_s(B)B^b}{\delta_r(B)} S_t + N_t \qquad (1)$$

with:
Yt =mobility at time t
St = intervention variable at time t, with a value of 0 or 1 which indicates whether there is an intervention effect
Nt = *noise* that follows the ARIMA model without the influence of intervention
b = delay in the occurrence of the intervention effect
r = autoregression level
s + 1 = number of parameters ω

In the above equation, the general form of the ARIMA Intervention model shows the size and period of the intervention effect based on the b, r, and s orders. Order b shows when the intervention starts to have an effect, order s shows when the response value starts to decrease or increase, and order r is the residual pattern. The procedure for establishing the Intervention ARIMA model, which includes the following steps: data stationarity testing, ARIMA formation prior to intervention, ARIMA model goodness testing, forecasting data after intervention using the ARIMA model, plotting the residual forecast results, determining the b, r, and s orders, establishing the Intervention ARIMA model, testing the goodness of the ARIMA Intervention model through residual correlation (white noise), and selecting the best model.

RESULTS AND DISCUSSION
ARIMA Intervention Model Development

The ARIMA Intervention model is created by first performing a data stationarity test to ensure that the data is stationary at the level. Prior to the intervention, the ARIMA model was ARIMA (1,0,0). The model formed also met the requirements for forecasting (data stationarity test, parameter significance test, model goodness test) to form the Intervention ARIMA model. The ARIMA models that were created are as follows:

$$y_t = 7{,}763 + 0{,}467 y_{t-1} \qquad (2)$$

The ARIMA equation above explains that the magnitude of the change in the percentage of South Sulawesi people who are active in the housing environment is influenced by the pattern of community activities the previous day prior to the implementation of the intervention in the form of the implementation of LSSR in South Sulawesi. After forming the ARIMA model prior to the intervention above, determine the order of b, r, and s by plotting residuals for the formation of the Intervention ARIMA model. The three intervention orders are determined by testing all possibilities until the most appropriate order is obtained. The following are the outcomes of several possibilities that were considered.

Table 1. Results of Intervention Order Processing

Orde			Parameter Significance Test	Assumption White Noise	AIC
b	r	s			
0	0	0	Significant	No	326.4027
0	*0*	*8*	*Significant*	*Yes*	*291.9173*
1	0	0	not significant		
3	0	2	not significant		
8	0	0	Significant	Yes	297.9234
10	0	5	not significant		
18	0	3	not significant		

Determination of the order of b, r, and s from plotting the residual ARIMA model before forecasting interventions with original data since the LSSR policy was implemented (24 April-22 May 2020). The best intervention ARIMA model is selected based on the parameter significance test, meets the white noise assumption, and has the lowest AIC value. As a result, the model formed is ARIMA (1,0.0) of order b=0, r=0, s=8, and the parameter estimation of the Intervention ARIMA model is obtained as follows based on the data processing results.

Figure 1. Parameter Estimation Results ARIMA Intervention with SAS

Based on the output in the image above, the parameter values for are obtained $\hat{\phi}_1 = 0.98625$, $\hat{\omega}_0 = 9.27688$, and $\hat{\omega}_1 = 6.73956$. The ARIMA Intervention equations formed are:

$$Y_{(t)} = \frac{\omega_8(B)}{\delta_0(B)} BS_t + N_t \qquad (3)$$

$$Y_{(t)} = [(\hat{\omega}_0 - \hat{\omega}_1 B)B]S_t + \frac{e_t}{(1-\hat{\phi}_1 B)(1-B)} \qquad (4)$$

$$Y_{(t)} = 9{,}27688 S_t - 6{,}73956 S_{t-8} + \frac{e_t}{(1-0.98625B)(1-B)} \qquad (5)$$

S_t is the intervention variable used to implement the LSSR policy, with a value of 1 from April 24 to May 22, 2020, and a value of 0 for the previous period. Equation (5) above shows a positive impact from the implementation of LSSR in South Sulawesi, indicating that the percentage of people living in residential areas has increased as a result of the implementation of LSSR. In other words, since the implementation of the LSSR policy, the people of South Sulawesi have reduced their outside activities and spent more time at home. This increase was felt on day zero, or the day the government mandated the LSSR, which was April 24, 2020. The increase in activity in the settlement lasted for 8 (eight) days, until May 2, 2020.

Community Behaviour Prior to the Implementation of LSSR

The Large-Scale Social Restriction Policy (LSSR), which was implemented in South Sulawesi from April 24 to May 22, 2020, had a significant impact on the people of South Sulawesi's behavior of remaining silent in their homes. People tend to limit their outdoor activities and spend more time indoors. Before the implementation of LSSR, there was a trend of changing mobility patterns. This is reflected in the publication of the results of a Central Statistics Agency survey titled Social Demographic Survey Results for the Impact of Covid-19 South Sulawesi Province 2020, which took place on April 13-20, 2020 (Badan Pusat Statistik, 2020a). Several things were discovered related to the behavior of respondents during the survey by using a combination sampling methodology from Convenience, Voluntary, and Snowball Sampling, including the following:

1. In terms of level of concern, 74.20 percent of respondents feel worried/very worried when they leave the house, while 24.26 percent feel a little and quite worried.
2. The majority of respondents are already aware of the use of Physical Distancing or Maintaining Distance. 55.80 percent of respondents are very knowledgeable.
3. Approximately 72.76 percent of respondents admitted to avoiding public transportation during the Covid-19 pandemic.
4. During the Covid-19 pandemic (at least until the end of the survey), at least 56% of respondents admitted to increased spending, particularly on health, food, and credit/data packages. On the other hand, more than 40% of respondents said their spending on gasoline and public transportation had decreased.
5. Based on the types of activities that respondents rarely and frequently do during a pandemic, it is concluded that going out of the house, gathering with friends, and taking walks are activities that the majority of respondents rarely do during a pandemic. While the majority of respondents spend the majority of their time at home, washing their hands, and spending time with family during the pandemic.

The research based on the results of indirect interviews or self-enumeration in the survey conducted by the Central Statistics Agency above is consistent with the findings of this study, which is based on a method of directly observing people's mobility patterns. The general public is aware of the public's mentality, attitude, knowledge, and behavior in response to the spread of the Covid-19 virus. Concern about leaving the house, knowledge about physical separation, use of public transportation, and the amount of expenditure (food, health,

and credit/data packages), as well as reducing activities outside the home during the final week of enumeration, indicate a positive response for the people of South Sulawesi to avoid being exposed to the virus. the spread of a virus classified as rapidly transmissible As a result, the community has responded positively to the implementation of the LSSR policy, which began on April 24, 2020, by doing more activities at home and reducing physical activity outside the home.

Community Conditions in South Sulawesi During the Implementation of Large-Scale Social Restrictions (LSSR)

The ARIMA model (1,0,0) with intervention orders of b=0, r=0, and s=8 also shows the effect of the intervention (LSSR implementation) from the day the intervention begins on April 24, 2020 until 8 days later, on May 2, 2020. Following that, people tend to engage in activities outside of their homes. One of the reasons for this shift in community activity is policy packages such as the Pertamina discount program, which offers a 50 percent cashback from May 3 to July 31, 2020, and is intended for 10,000 public transportation (including online motorcycle taxis) rides per day with no purchase limits. In addition to the urban transportation stimulus program, there are several Pertamina programs aimed at assisting the people of South Sulawesi in their economic recovery, such as Pertamina Delivery Service, which provides convenience in the fulfillment of fuel oil products, liquefied petroleum gas, and lubricants. These programs assist public transportation drivers in returning to operations that were previously restricted by the rules for limiting the number of passengers during the LSSR's implementation. With the operation of public transportation and the relatively minor increase in transportation prices, it encourages people, particularly those in the lower middle class, to return to activities outside the home in order to meet the needs of their families.

When people began to leave their homes in early May 2020, when the LSSR policy was still in effect until May 22, 2020, it had an impact on South Sulawesi's economic conditions. The LSSR policy continues to disrupt the distribution chain of goods and services, such as restrictions on the operation of public transportation, private transportation, operating hours of markets/shops/shopping centers, and other strategic locations. The increase in prices during the month of May 2020 demonstrates this.

The impact of social restrictions can also be seen in economic conditions, such as the rise in commodity prices for goods and services, which resulted in inflation in May 2020. Inflation is defined as the percentage increase in the price of a variety of goods and services that are commonly purchased by households (Badan Pusat Statistik, 2020b). According to the Central Bureau of Statistics' Official Gazette of Statistics No. 31/06/73/Th. XXIV, 2 June 2020, South Sulawesi experienced 0.5 percent inflation in May 2020, or an increase in the Consumer Price Index (CPI) from 104.71 in April 2020 to 105.23 in May 2020 (Badan Pusat Statistik, 2020b). Transportation expenditure has the highest inflation rate of 3.23 percent, or an increase in the price index from 102.64 in April 2020 to 105.96 in May 2020. This expenditure group also contributes the most to price increases. The general price of goods and services in South Sulawesi is 0.368 percent. Air transportation fares, intercity transportation fares, online four-wheeled vehicles, cars, and vehicle washing costs are examples of commodities that contribute to inflation in this category.

The condition of the above-mentioned price increase in the transportation group was caused by a decrease in the amount of supply from the producer side as a result of social restrictions policies resulting in scarcity, such as restrictions on the number of passengers in public transportation (land, sea, and air) as well as restrictions on travel routes, particularly in the epicenter area (Makassar, Gowa, and Maros). From the producer's perspective, the limited number of passengers is confronted with operational costs, maintenance, production, and so on, forcing price increases that have an impact on market inflation. Consumer demand for transportation services is increasing as people begin to engage in outdoor activities. Furthermore, travel demand is a derivative need that arises to meet other needs when there is a driving factor, such as the need for humans to move to other locations for activities or the need for goods to move from producers to consumers. As a result, the transportation sector is extremely volatile in terms of time and market conditions. The rise in the price of other commodities will have an impact on the transportation sector, particularly public transportation services.

The same pattern can be seen in other inflation-affected expenditure categories, such as Food, Beverages, and Tobacco; Clothing and Footwear; Equipment, Equipment, and Routine Household Maintenance; and others. 2020b (Badan Pusat Statistik, 2020b). When the community began to participate in outdoor activities, they were met with a limited supply of goods/services due to the LSSR policy, which resulted in scarcity and rising prices. Aside from that, one expenditure group, Information, Communication, and Financial Services, experienced deflation (a drop in the price level) of 0.01 percent. Mobile phone credit costs were among the commodities that contributed to deflation in this group. This condition is related to an increase in the number of requests for pulses as a result of the LSSR implementation, which encourages people to stay at home. With more activities at home, the need for credit grows, which has implications for lower prices from internet/telephone service providers, resulting in a community state of deflation. Scarcity does not exist in this sector because the supply of these commodities is only provided by the government or certain private parties, resulting in relatively stable and even declining prices.

The Effectiveness of Large-Scale Social Restrictions in South Sulawesi

The results of this study were obtained through the use of direct community mobility pattern data, so they were more accurate than the results of other conventional surveys (such as interviews and filling out questionnaires independently). Mobility data from various big data sources, such as Google, Apple, Facebook, Unacast, Twitter, and others, can be used to better understand how changes in community mobility, both in the outdoor and indoor environment, can affect the spread of Covid-19 infection and help predict future events (Kurian et al., 2020). It provides a relevant picture of the current situation in society by using up-to-date data, which is useful in evaluating policies and anticipating various future possibilities.

The occurrence of inflation in May 2020 provides a small illustration of the LSSR policy's effectiveness. The policy, which was in effect for 29 days (from April 24 to May 22, 2020), was only effective in responding to the community for eight days. Due to the still limited distribution of goods/services due to LSSR, scarcity in the community affects market prices. In addition to limiting community mobility and interaction to reduce virus transmission, the government and related stakeholders must focus on policy packages aimed at economic recovery (Pullano et al., 2020a). Care must be taken and careful consideration must be given in determining how long the community's activities will be restricted because, on the other hand, the community must be active in order to meet their needs. This is evident in the community's decision to remain silent on the eighth day, which coincides with the 50 percent cashback program for public transportation drivers, which encourages people to leave the house. This study demonstrates how contradictory policies are between restricting movement outside the home and policy stimulus in the transportation sector that pushes people out of the house.

The study's limitation is that it only looks at the impact of social restriction policies on community mobility, specifically the behavior of staying at home, rather than the indirect impact on the decrease in daily cases of Covid-19 in South Sulawesi. Furthermore, this is a univariate analysis that only looks at the effect and estimates the magnitude of the intervention's effect. It is possible to conduct additional research into the existence of other factors that influence the level of community mobility, such as geographical conditions (temperature and regional boundaries) and other socioeconomic variables in the community. This study is also limited to one intervention variable, namely Large-Scale Social Restrictions (LSSR), which are in effect from April 24 to May 22, 2020, with no regard for other government interventions in South Sulawesi during the Covid-19 pandemic.

The findings of this study provide an overview of how Large-Scale Social Restrictions were one of the effective preventive measures put in place during the early stages of the Covid-19 virus's spread in South Sulawesi. Unlike previous studies, this research is able to map out how long the effects of LSSR policies on society are so that a more comprehensive picture of socio-economic phenomena that arise in the people of South Sulawesi after the policy's implementation is obtained. Since the policy's implementation, the community has responded positively by reducing outdoor activities and spending more time at home. These findings are expected to be used as material for stakeholder evaluation and planning, taking into account factors beyond the

scope of this study. Furthermore, this research is expected to be a good consideration for future research in order to enrich more comprehensive information in dealing with the Covid-19 virus's spread.

CONCLUSIONS

This study found that the policy of Large-Scale Social Restrictions (LSSR) has a significant effect on the behavior of people in South Sulawesi staying silent in their homes from the time it was implemented until eight days later. Care must be taken in determining how long the LSSR policy will be effective in relation to the socioeconomic conditions of the community, as well as in relation to the implementation of other policies that are not contradictory. Long-term social restrictions have an effect on increasing the prices of goods and services in general due to scarcity. As a result, similar policies in the future must focus on ensuring the flow of goods/services in order to avoid price increases. With the availability of data at a later date, a similar study using a multivariate time series model can be used to determine the significance of government policies and other variables that can affect people's mobility, particularly in South Sulawesi, resulting in more comprehensive and useful results.

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