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HEALTH SOCIAL CREDIT SYSTEM SIMULATION OF COVID-19 PANDEMIC IN TANGERANG CITY DISTRICTS

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ABSTRACT

The spread of Covid-19 massively occurred in 2019 resulted in significant rate of morbidity and mortality. This study aimed to analyze data of factors contributing in the rise of Covid-19 cases. To analyze such factors, a comprehensive and thorough analysis of Covid-19 spread data in Tangerang city is required. Data evaluation have been conducted as of the occurrence of Covid-19 in early of 2020 until September 2022. From that data, an analysis of Covid-19 spread was conducted based on case phase and level. In the case, phase-based analysis, accumulation in each case number of each semester as well as analysis of factors that may bring any effect on the increase of Covid-19 cases have been conducted. While in case level, analysis of Covid-19 spread per semester has been done to measure the level of severity of its potential impacts. Such severity level was discovered from the total confirmed cases, the number of recovered cases, and the mortality rate arising in each level. The perilous level stage occured at level 4 in which the cases and its mortality cases are considerably high. Hence, in the area with the highest case, strict control and surveillance functions can be executed during the outbreak of Covid-19. Social credit system may be done by providing an evaluation and appreciation to regions with the lowest cases for Covid-19 spread. Dataset used in this paper was the data of Covid-19 spread in Tangerang city.

Keywords: Covid-19, Case Levels, Case Phases, Integration Data, Tangerang City

1. INTRODUCTION

Currently, an extraordinary event occurred almost throughout the world as a result of the Covid-19 virus in December 2019, and the such virus was perceived to likely emerge from wildlife trade in the market of Wuhan, China [1]. Covid-19 spreads directly, indirectly between people (through contaminated items or surfaces), or through close contact with the infected one through nasal or oral secretion. These secretions include saliva, respiratory secretions, or secretion droplets. These secretions come out of the mouth or nose, for instance when an infected individual coughs, sneezes, talks, or sings. People who are in close range of (1 meter) from the infected one may be exposed to Covid-19 when infectious droplets enter their mouth, nose, or eyes [2]. With the upsurge of the spread of Covid-19 cases, it results in morbidity and fatality in each affected area [3][4]. The best way to mitigate the spread of Covid-19 cases is by

wearing mask, washing hands with soaps, avoiding the crowd as well as keeping the distance [5].

In this study, analysis on the data of Covid-19 spread arising in 13 districts of Tangerang city were classified into several case phases and levels. In the case phase-based analysis, accumulation in case number of each semester as well as analysis of factors that have any effect on the increase of Covid-19 cases have been done. Each phase has an interval of 6 months as of January 2020 to September 2022. The spread of Covid-19 cases arising in each phase bears different cases and is affected by some factors. In this study, analysis on such factors of the data of Covid-19 spread has been conducted. Such factors are among others based on the number of population, age, educational level, job, and gender.

After conducting a per-phase analysis of the data on cases of the spread of Covid-19, this research will also analyze data based on cases per level. At the case-by-level stage, there is an analysis of the data on the spread of Covid-19 that occurs each

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semester. Analysis of the data on Covid-19 spread per semester has been done to measure the level of severity of its potential impacts. Such severity level can be obtained from the total confirmed cases, the number of recovered cases, and the mortality rate arising in each level. Moreover, the mutated Covid-19 virus on some levels brings affects the increase of the spread of Covid-19 cases.

So that the results of this study, after conducting simulations and data analysis on the spread of Covid-19 based on phases and levels, can look for the connection of several factors so that they can carry out surveillance in several areas and take preventive measures when the Covid-19 outbreak occurs.

2. STUDY PHASES

2.1 Data Analysis Phases

Before conducting a study on a particular case, there are several main processes that should be completed in order to obtain the best results that comprises determining the objectives to be achieved, data collection from credible sources and data analysis to be observed [6]. Then, the stages of this study comprises of five steps as indicated in figure 1 below.



Figure 1: Data Analysis Stage [6].

2.1.1 Defining study objectives

The first stage of the study is to analyze the data by determining the objectives to be achieved from the study object. Each study is to find out the problems of an event based on the existing data. Then, from the data, hypothesis and hypothesis tests have to be done to find solutions of the problems to be analyzed and to be beneficial for others. The first step of this study started with the following questions:

- a. How to analyze the factors that may bring impact on the increase of Covid-19 cases?
- b. How to analyze the data of the spread of Covid-19 cases on the potential impacts in each district?

2.1.2 Collecting data

Upon determining the objectives at the first stage, data shall be collected, and then it shall be combined to be analyzed, and determine which data would be required. This study used the data of the spread of Covid-19 cases from the Covid-19 information system of Tangerang city. Such data is integrated with each other between the Covid-19 patient and population database as well as the geospatial data of Tangerang City.

2.1.3 Cleaning data

After the data has been collected, the next step is to analyze the data. Before analyzing, a data cleaning process should be performed. It is necessary to avoid analysis errors for such data. In this study, the steps of data cleaning are as follows:

- Removing duplicate data: collected primary data needs to be recleaned by removing double data. The process of checking double data was done using SQL (Structured Query Language) order on the database by implementing count and group by function of such data. After the duplicate data were found out, then delete function was applied by using delete instruction of such double data.
- Completing data inconsistency: data completeness should be done for data features to be used in this study including report data of Covid-19 cases, patient age category, and types of Covid-19 cases. Inconsistency of data can be readjusted based on the study needs.

2.1.4 Defining objectives

The next stage is to analyze the data after the data cleaning is complete. The data analysis type is subject to the study objectives to be conducted. Data types of this study were pooled or panel data which comprised several objects including registered districts within a specific period from early 2020 to September 2022.

In this study, the spread of Covid-19 particularly in 13 districts was classified into several phases. Each phase comprises of 6 months or 1 semester. From each phase, it would portray a trend arising out in accordance with the confirmed cases. Trend variation at each phase may be affected by population density in a region or type of Covid-19 variant that has mutated with different contagious rates. www.jatit.org

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Figure 2: Types of Study Data.

2.1.5 Visualization of study results

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Following the completion of analysis stage, the next stage is to visualize the results of study conducted for the data of Covid-19 spread. Analysis results of this study will be visualized using geospatial data of Tangerang city so as to find out the spread of Covid-19 cases [7][8]. Each Covid-19 case arising out will be classified into different colors. Each color will represent the condition of such region. A district marked in dark red identifies that such region has higher Covid-19 cases.

Other visualization forms used in this study were by using a bar chart or line chart. Such diagrams were used to simplify the visualization process of the study results.



Figure 3: Map of Tangerang City District [9].

The use of map is a form of visualization in displaying information to be more interactive. Figure 3 above, it is a map of Tangerang city comprising 13 districts with 104 sub-districts. Mapping based on geospatial data was conducted earlier by measuring the coordinate points of the 13 districts respectively namely Batuceper, Benda, Cibodas, Ciledug, Cipondoh, Jatiuwung, Karang Tengah, Karawaci, Larangan, Neglasari, Periuk, Pinang, and Tangerang.

2.2 Total Districts Population

In Table 1, it shows the data of Tangerang City in Figures (KTDA) of 2020 with regard to the populations of each district in 2019 based on family card ownership from the Population and Civil Registry Office of Tangerang City. It can be seen that the data were sorted from the largest number to the smallest number. Cipondoh district has the largest population compared with any other districts. Karawaci is in the second rank and Pinang district is in the third rank, and Benda district has the smallest population number.

Table 1: Population by District in TangerangMunicipality, 2019 (by Familiy's Card Ownership).

No	DISTRICTS	TOTAL
1	Cipondoh	203.881
2	Karawaci	184.216
3	Pinang	168.477
4	Tangerang	153.793
5	Cibodas	149.192
6	Larangan	143.934
7	Ciledug	136.525
8	Periuk	134.741
9	Neglasari	115.162
10	Karang Tengah	108.405
11	Jatiuwung	104.419
12	Batuceper	90.053
13	Benda	78.294

2.3 Literature Review

Several previous studies have been conducted to find solutions to reduce the impact of the spread of Covid-19. The spread of Covid-19 that has occurred infected several areas causing many fatalities. The following are previous studies which are summarized below. <u>15th March 2023. Vol.101. No 5</u> © 2023 Little Lion Scientific

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the Covid-19 case occurred. Then from this analysis, we will look for relationships between these factors so that they can provide solutions and preventive measures such as increasing cases of Covid-19, knowing the level of public awareness during a pandemic, clustering locations for the spread of Covid-19, mapping patterns of increasing cases that occur visually with geospatial data and identify the level of danger of cases that occur in each region from the impact caused by Covid 19.

3. RESULTS AND DISCUSSION

3.1 Flow Diagram of the Research

The method used to accomplish the study's goals is shown in figure 4 below. This study commenced with a literature review of cases of the study to be explored by analyzing what causes may bring impact the increase of Covid-19 cases. It was performed to analyze the data of Covid-19 cases that remain taking place to date. Therefore, control and surveillance functions for each region can be implemented so as to consistently comply with health protocols.

The next stage is to identify problems in the study to be conducted on the study object. Upon problems identification, then data collection was done including data of the spread of Covid-19 cases, the integration of population data and geospatial data of Tangerang city were performed.

In this study, analysis on the spread of Covid-19 cases arising out in each district shall be conducted. Data analysis process was conducted to find out any other factors or causes that may affect the increase of Covid-19 cases. Each case arising out was classified into some phases and levels within the time range of per semester. Therefore, further analysis can be performed later by comprehending the existing patterns of such spread of Covid-19 cases in every district.

Table 2: Research on	previous	scientific	work on	the
Covid-19 case.				

Title	Process analysis	Components
Assessing functional propagation patterns in COVID-19 [1]	The dynamics of the spread of Covid-19 cases in several European countries with Granger causality.	Country, time series, confirmed cases and deaths.
Propagation analysis and prediction of the COVID- 19 [10]	This study uses the Gaussian distribution to analyze virus transmission.	Factors that influence the spread of the virus, such as the basic reproduction rate, the incubation period of the virus, and the daily infection rate.
Prevalence of underlying diseases in died cases of COVID-19: A systematic review and meta-analysis [11]	The aim of this study is to evaluate the prevalence of the underlying disease that causes people to die from Covid-19.	Patients with hypertension, cardiovascular disease and diabetes must be monitored and strictly adhere to health protocols.
Applications of GIS and geospatial analyses in COVID-19 research: A systematic review [7]	Use of web-based GIS applications in future public health emergencies with statistical science and socio-economic modeling techniques.	GIS (Geographic Information System) and geospatial analysis
Geospatial analysis of covid-19: A scoping review [8]	Researchers use spatial and statistical software to apply spatial analysis for the purposes of disease mapping, exposure mapping, and epidemiological modeling	GIS (Geographic Information System) and geospatial analysis

By referring to previous research, this study aims to contribute to measures to reduce and prevent the spread of Covid-19 cases that have occurred. In this study, a simulation process was carried out to analyze and map the spread of Covid-19 cases that occurred in Tangerang City. The analysis process was carried out per phase and per level from the time E-ISSN: 1817-3195

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Figure 4: Research Methodolo

3.2 Preparation of Data Analysis

Data showing the occurrence of cases of the spread of Covid-19 cases in Tangerang City is shown in the graph in Figure 5 below. To analyze data on the spread pattern of Covid-19 cases, then data analysis shall be done comprehensively from historical data or ongoing event data. In that data, it is suggested that cases arising out included confirmed (positive) cases, recovered cases, and death cases.

In the graph below, it shows the spread of Covid-19 cases that were classified into 6 levels, where each level has a period for 6 months. At each level, it has case spread level along with different severity levels of those suffered from Covid-19. It can be seen from the numerous confirmed cases or the increase of death cases.

In the case that occurred at the first level, it can be seen in the orange line, which explains that the increasing number of Covid-19 cases has started to occur and has begun to increase at level 1 to level 3, namely at the beginning of 2020 until June 2021 (first three semesters). Subsequently, the worst case took place at the level 4 entering fourth semester where confirmed cases and mortality cases were extremely high. In other words, level 4 entered a red zone. Case of severity level from the such impact was also affected by the type of Covid-19 variant that has already mutated.



Figure 5: Graph of Increase in Covid-19 Cases.

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At level 5, the spread of Covid-19 cases was extremely high, however, mortality cases decreased along with the increasing recovery numbers from time to time. Then, at level 6, the total number of confirmed cases showed the decreasing number with an increasing recovery rate and a significant decrease in mortality rate.

This dataset was collected from the Covid-19 surveillance information system managed by the Communication and Information Service Office and Health Office of Tangerang city. Data of Covid-19 patients who have reported from early 2020 to September 2022. In this study, the data analysis process will be classified into two parts from the occurrence of the spread of Covid-19 cases in Tangerang city as follows:

A. Case Phase-Based Analysis

Analysis of case per phase data is needed in this study to find the causes of the high spread of Covid-19 cases that have occurred in various districts and to find out the relationships that occur between the factors causing the increase in confirmed cases. Figure 6 below, it is a process of data analysis implemented for the spread of Covid-19 based on the phase. At each phase, it has a period of time of 6 months. The first phase, it shows a period of time of 6 months. Subsequently, at the second analysis phase, it shall be reaccumulated with the previous phase namely the first phase, and so on unto the sixth phase. At each phase, an analysis of factors that might bring any impact on the increase of Covid-19 in Tangerang city should have been done. Such factors are the population in each region, age category, education, job, and gender.



Figure 6: Phase Classification Scheme of Covid-19 Data Analysis.

B. Case Level-Based Analysis

Data analysis per level is used to discover how high the severity and danger of the impact caused by Covid-19 cases that occur at each level. Figure 6 below, shows a process of data analysis performed for the spread of Covid-19 based on the level of rising cases. In this study, the data to be analyzed have six levels, where in each level has 6 months period as of the start of Covid-19 cases. The analysis process was done to discover the increase of cases during the Covid-19 spread in Tangerang city in each level case and its danger level that is from the number of confirmed cases, recovered, and death numbers.

Several Covid-19 variants have mutated and entered Indonesia in 2021 including Alpha (B.1.1.7), Beta (B.1.351), Delta (B.1.617.2), and Omicron (B.1.1.529). From these four variants, the symptoms are similar such as cough, fever, headache, sore throat, muscle pain, and anosmia (the loss of smell). However, the variant which poses the biggest risk is Delta and which has mild symptoms is Omicron. From the transmission rate, Omicron is considered as the most rapid variant, approximately 500% compared with Delta. While the Beta variant, its transmission rate has not been clearly identified [12].

With vaccination, it has been influential in building herd immunity [13], so as to suppress the case fatality rate as a result of Covid-19 becoming lower. Timing of the second dose following the 1st shot is 28 days to 90 days as seen from the type of vaccine already administered [14], while the waiting time for a booster shot after the second shot is 3 months [15] where the Ministry of Health set out formerly 6 months [16]. ISSN: 1992-8645

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Figure 7: Classification Scheme of Covid-19 Data Analysis Level

2.3.2 Sort Pseudocode for Per Phase Case

A simulation in the form of pseudocode for perphase cases must be created to determine the relationship between the many factors that have contributed to the rise in Covid-19 instances that have happened in several districts. Figure 8 below, it is a pseudocode depicting the districts and factors with the highest Covid-19 cases in Tangerang city. In each district, five districts with the highest to the smallest cases were sorted out based on some factors ranging from age category marked with (B), education (C), job (D), and gender (E).

Furthermore, to get the highest array value in the Covid-19 case, by performing the count function sorted by descending, then cutting the data in the five districts with the highest cases filtered based on the time period based on the selected phase. The process can be written as follows:

- Select a district (A) with the highest case rate = 5 Districts.
- Period of time = phase 1, phase 2, phase 3, phase 4, phase 5, phase 6.
 - Phase 1: 2020-01-01 until 2020-06-30
 - Phase 2: 2020-01-01 until 2020-12-31
 - Phase 3: 2020-01-01 until 2021-06-30
 - Phase 4: 2020-01-01 until 2021-12-31
 - Phase 5: 2020-01-01 until 2022-06-30
 - Phase 6: 2020-01-01 until 2022-09-30
- Details of each factor selection are as follows: Step 1: find max. value of age category (B) Step 2: find max. value of education (C) Step 3: find max. value of job (D) Step 4: find max. value of gender (E)



Figure 8: Pseudocode of Factor-Based Highest Case.

3.2.2 Phase One Case

The pseudocode flow process has been described previously, and the next stage is to explain the spread of Covid-19 in the first phase, as shown in figure 9. At such phase, it was identified that five districts have the highest number of confirmed cases, then they were sorted out based on the highest to the lowest cases ranked number 1 to 5 among others Cipondoh, Karawaci, Tangerang, Ciledug, and Cibodas districts. In those five districts, some factors contributed to the highest risk based on age category including early adulthood and late adulthood.

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Subsequently, according to education level, it was dominated by Senior High School/Equivalent and Diploma IV/Undergraduate. While for the employment status of the society, it showed private employees. The last factor is gender with the highest number of confirmed cases occurring in women.



Figure 9: The Spread of Covid-19 Case at Phase One.

3.2.3 Phase Two Case

After the first phase has been described previously, the next step is to enter the second phase. As pictured below, it shows the spread of Covid-19 cases in the second phase. At such phase, it was identified that five districts have the highest number of cases confirmed which were sorted out again based on the highest to the lowest cases ranked number 1 to 5 among others Karawaci, Periuk, Cipondoh, Pinang, and Cibodas districts. In those five districts, some factors were contributing to the highest risk based on age category namely early adulthood, early elderly, and late adulthood. Subsequently, according to education level having the highest case, it was Senior High School/Equivalent and for the employment status of the society, it was private employees. The last is gender with the highest number of confirmed cases occurring in women and men.



Figure 10: The Spread of Covid-19 Case at Phase Two.

3.2.4 Phase Three Case

After the second phase is complete and the factors that have the highest cases of Covid-19 can be identified, the next step is to enter the third phase. As displayed below, it shows the spread of Covid-19 cases in the third phase. In such phase, it was identified that five districts have the highest cases confirmed which were sorted out again based on the highest to the lowest cases ranked number 1 to 5 among others Karawaci, Periuk, Pinang, Cipondoh, and Cibodas districts. In those five districts, some factors were contributing to the highest risk based on age category namely early adulthood and late adulthood. Subsequently, according to education level having the highest case, it was Senior High School/Equivalent and for the employment status of the society, it was private employees. As for gender, it was identified that the highest number of cases confirmed were women.



Figure 11: The Spread of Covid-19 Case at Phase 3.

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3.2.5 Phase Four Case

In the second and third phases, which have been described previously, there are almost similarities, namely in the order of 5 districts with the highest cases. Transmission of Covid-19 can easily occur in several districts that have a higher population density. Furthermore, as portraved in figure 12 below, it shows the spread of Covid-19 cases in the fourth phase, In such phase, it was identified that five districts have the highest number of cases confirmed, then they were sorted based on the highest to the lowest cases ranked number 1 to 5 including Karawaci, Cipondoh, Pinang, Periuk and Cibodas districts. In those five districts, some factors were contributing to the highest risk based on age category namely early adulthood. Subsequently, according to education level, it was Senior High School/Equivalent level and for the employment status of the society, it was private employees. As for gender, it was identified that the highest number of cases confirmed were men.



Figure 12: The Spread of Covid-19 Case at Phase 4.

3.2.6 Phase Five Case

The increase in cases that occurred in the fourth phase has been described previously and the next step is to enter the explanation of the fifth phase. As shown below, it shows the spread of Covid-19 cases in the fifth phase. In such phase, it was confirmed that five districts have the highest cases confirmed which were sorted out again based on the highest to the lowest cases ranked number 1 to 5 including Karawaci, Pinang, Cipondoh, Cibodas. and Larangan districts. In those five districts, some factors contributed to the highest risk based on age category i.e early adulthood. Subsequently, according to education level having the highest cases, it was Senior High School/Equivalent and for the employment status of the society, it was private employees. While for gender, it was identified that the highest number of cases confirmed were women and men.



Figure 13: The Spread of Covid-19 Case at Phase 5.

3.2.7 Phase Six Case

The sixth phase is the last phase that will be explained in this study. As illustrated below, shows the spread of Covid-19 cases in the sixth phase, In such phase, it was confirmed that five districts have the highest number of cases confirmed, then they were sorted out based on the highest to the lowest cases ranked number 1 to 5 including Cipondoh, Karawaci, Pinang, Tangerang, and Larangan districts.



Figure 14: The Spread of Covid-19 Case at Phase 6.

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In those five districts, some factors contributed to the highest risk based on age category i.e early adulthood. Subsequently, according to education level. it was dominated by Diploma IV/Undergraduate level and Senior High School/Equivalent level. While for the employment status of the society, it showed private employees. Lastly, for gender, it showed the highest number of confirmed cases were men and women.

3.3 Geospatial Spread of Covid-19

After the data were divided into 6 phases, then it could be clearly identified that the spread of Covid-19 cases arising in each area of Tangerang city. The increase in Covid-19 cases is influenced by the increasingly dense population in each district. It can be seen that certain places with the largest population particularly in a specific region had the highest cases spread significantly. It is closely associated since covid-19 patients can transmit it to others in the range of 1 meter.

Next, at this stage is to do a combination of perphase analysis with geospatial data for the City of Tangerang. This combination is used to facilitate analysis and find patterns of increasing Covid-19 cases that have occurred in several districts in the form of a visual map context as shown in figure 15.



Figure 15: The Spread of Covid-19 Cases at Phases 1 to 6.

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Cases in the first phase with the highest cases occurred in the two districts with the largest population, namely Cipondoh and Karawaci, followed by the surrounding districts which are directly adjacent. The highest transmission of Covid-19 cases can be seen in several districts which are marked with a circle and followed by a dotted yellow line which has a direct relationship to the Covid-19 transmission cycle.

3.4 Data Case Per Level

After analyzing the data on the spread of Covid-19 in per-phase cases with previously explored geospatial data, the next step is to analyze data based on cases per level that occur in each district. In figure 16, upon the analysis of Covid-19 transmission data classified into per semester, it was suggested that the data of each semester were divided into some levels for any case that occurred. Each level has different case levels, including the number of confirmed cases, recovered cases, and death cases. The initial cases rose significantly from level 1, level 2, and level 3 up to level 6. It was identified in accordance with the color of each level. The most severe case level occurred at level 4 with red, where the highest cases bear very high fatality numbers.

No	Incident	Jan to June 2020		Description	No		July to Dec 2020		Variant Tuno	Description				
NU	meident	Cases	Semester I	variant type	Description		NO INCIDEN	monuent	Cases	Semester II	vanan type	Description		
		Confirmed	756	SARS-CoV-2	Start Virus Transmission		2	Orange Level II	Confirmed	5.262	SARS-CoV-2	Transmission has occurred.		
1	Orango Lovel L	Recovery	22	SARS-CoV-2					Recovery	3.732	SARS-CoV-2	No vaccination yet.		
1	Change Level I	Dead	9	SARS-CoV-2					Dead	88	SARS-CoV-2			
		Total	787	SARS-CoV-2					Total	9.082	SARS-CoV-2			
No	Jan to June 2021		une 2021	Variant Type	Description		No	Incident	July to Dec 2021		Variant Type	Description		
	lineration	Cases	Semester III	vanan type	Description				Cases	Semester IV	vanan type	Description		
3		Confirmed	10.371	Alpha	Transmission has occurred.		4	Red	Confirmed	17.160	Delta	The virus has mutated.		
	Orange Level III	Recovery	6.465	Alpha	Start vaccination.				Recovery	18.936	Delta	High confirmed cases.		
ľ		Dead	124	Alpha	First vaccination.								Dead	271
		Total	16.960	Alpha	Second vaccination.]			Total	36.367	Delta	Vaccination continues.		
Jan to June 2022				1			July to Dec 2021							
No	Incident	Cases	Semester V	Variant Type	Description		No	No Incident	Cases	Semester VI	Variant Type	Description		
		Confirmed	44.538	Omicron	High confirmed cases.		6	6 Green	Confirmed	6.662	Omicron	Cases are starting to drop.		
5	Vallaur	Recovery	47.371	Omicron	Low case fatality				Recovery	5.493	. Omicron	Very low mortality.		
	Tellow	Dead	99	Omicron	Vaccination continues.				Dead	3	Omicron	Complete vaccination.		
		Total	92.008	Omicron	Complete vaccinations and boosters.]			Total	12.156	Omicron	Vaccination Booster.		

Figure 16: The Spread of Covid-19 Cases at Phases 1 to 6.

Mutation of the Covid-19 virus brings impacts on the increase of cases and severity level for patients even more for patients with comorbidities. It can be seen from cases increment rate and number of dead persons. The administration of vaccine dose 1 [17][18] and dose 2 [19] in semester 3 and semester 4 are measures in establishing herd immunity [13]. At level 4, vaccination was intensively implemented and per 15 September 2021, the first shot has reached 1,595,875 or 67.8 %, while the second shot has reached 592,415 or 40.0 % [20]. It can be seen at level 5 upon the complete vaccine doses and booster vaccine [21], despite confirmed cases remain relative, however herd immunity has been established. Therefore, the number of fatality cases becomes lower so as to significantly reduce the fatality numbers at level 6 [22].



Figure 17: The Highest Fatality Cases at Levels 1 to 6 Based on Age Category.

In figure 17 above is the flowchart of Covid-19 spread with the mortality rate in each level. It illustrates the fatality rate in 3 highest ranks in each level. Death cases occurred in early 2020 to September 2022. In other words, it shows that the highest number of death cases occurred in the age category i.e late elderly with the age range of 55 years old and over.

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4. CONCLUSION

The Covid-19 cases that appeared as of December 2019 have resulted in significant fatalities. This virus spreads so easily and quickly infects other people, so the best way to avoid contracting the virus is to wear a mask, wash your hands with soap, avoid crowds and keep your distance. Compliance of society in implementing health protocols is paramount to reducing the spread of Covid-19 cases.

To reduce the impact caused by the spread of Covid-19, it is necessary for the participation of the community in complying with health protocols and also conducting an analysis of the factors involved that can influence the increase in Covid-19 cases. In this study, conducting complete and in-depth research combined with geospatial data for the City of Tangerang can provide a detailed visual picture of the spread of Covid-19 cases in each district. So that the movement of cases that occur can be monitored properly and clearly in order to carry out surveillance steps at locations with the highest cases and take preventive measures at locations around them. There are two conclusions of this study including an analysis of case per phase and an analysis of case per level.

4.1 Results of Analysis of Case Per Phase

To analyze the data on Covid-19 spread, they were divided into 6 phases, then at each phase, observation of cases arising in some factors i.e age, education, job, and gender categories were conducted. In each factor, the highest result of the spread of Covid-19 cases was obtained.

After the analysis process was carried out on several factors from the data on the spread of Covid-19 in each phase, 2 age categories with the highest cases were obtained. The first age category, which has an age range between 26 to 35 years is included in the category of early adulthood, and then the age range of 36 to 45 years is included in the category of late adulthood. Meanwhile, based on education level, the highest cases occurred at the high school/equivalent education level and then followed by Diploma IV/Strata One. Furthermore, based on occupation, the highest cases occurred in patients who had jobs as private employees. Meanwhile, in the gender of the patient, the highest case occurred in the male patient.

The results of the analysis above, it can be concluded that the location of offices, industries, or factories can be a place for clusters to spread Covid-19 with the highest contributor to cases. It is in line since Tangerang city is known as an industrial hub with over 1000 industries. While for the compliance and awareness level of society during the pandemic Covid-19, it can be concluded that society's role in maintaining health protocol was lower.



Figure 18: Flowchart of Indicator Phases 1 to 6.

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With an analysis based on case-by-phase, the Social credit system may be done by providing an evaluation and appreciation to regions with the lowest cases of Covid-19 spread. This can be seen on the map of the spread of Covid-19 that occurs based on cases in each phase in each district.

4.2 Analysis Results of Case Per Level

Results of analysis conducted in case per level suggested that case increment was the result of mutation of the Covid-19 virus in several cases. At level 4, case increment was higher and the fatality rate was exorbitant. The highest fatality rate in each level has the age range of 55 years old or above falling within late elderly and seniors category.

Complete vaccination including dose 1, dose 2, and booster dose can significantly suppress the fatality rate. It can be seen from the analysis results of data by observing the case in each level. The decrease of death cases arose at levels 5 and 6 significantly as a result of vaccine administration.

REFERENCES:

- M. Zanin and D. Papo, "Assessing functional propagation patterns in COVID-19," Chaos Solitons Fractals, vol. 138, Sep. 2020, doi: 10.1016/j.chaos.2020.109993.
- [2] World Health Organization (WHO), "QA how is COVID-19 transmitted," 2022. https://www.who.int/indonesia/news/novelcoronavirus/qa/qa-how-is-covid-19-transmitted (accessed Sep. 13, 2022).
- [3] Y. Sudiyono, A. Trisetyarso, H. Prabowo, and M. Meyliana, "Linear Regression Model to Predict the Spread of COVID-19 in Tangerang City," in 2021 9th International Conference on Information and Communication Technology (ICoICT), 2021, pp. 121–126. doi: 10.1109/ICoICT52021.2021.9527424.
- [4] S. Kamidani, C. A. Rostad, and E. J. Anderson, "COVID-19 vaccine development: a pediatric perspective," Curr Opin Pediatr, vol. 33, no. 1, 2021, [Online]. Available: https://journals.lww.com/copediatrics/Fulltext/2021/02000/COVID_19_va ccine_development_a_pediatric.20.aspx
- [5] UNICEF (United Nations International Children's Emergency), "Tanya jawab seputar coronavirus (COVID-19)," 2022.
- [6] WILL HILLIER, "A Step-by-Step Guide to the Data Analysis Process," Feb. 2022. https://careerfoundry.com/en/blog/data-

analytics/the-data-analysis-process-step-bystep/ (accessed Sep. 10, 2022).

- [7] R. Ahasan, Md. S. Alam, T. Chakraborty, and Md. M. Hossain, "Applications of GIS and geospatial analyses in COVID-19 research: A systematic review," F1000Res, vol. 9, p. 1379, Nov. 2020, doi: 10.12688/f1000research.27544.1.
- [8] M. Fatima, K. J. O'keefe, W. Wei, S. Arshad, and O. Gruebner, "Geospatial analysis of covid-19: A scoping review," International Journal of Environmental Research and Public Health, vol. 18, no. 5. MDPI AG, pp. 1–14, Mar. 01, 2021. doi: 10.3390/ijerph18052336.
- [9] maps.tangerangkota, "Maps Tangerang Kota," 2020. https://maps.tangerangkota.go.id/ (accessed Aug. 11, 2022).
- [10] L. Li et al., "Propagation analysis and prediction of the COVID-19," Infect Dis Model, vol. 5, pp. 282–292, Jan. 2020, doi: 10.1016/j.idm.2020.03.002.
- [11] F. Javanmardi, A. Keshavarzi, A. Akbari, A. Emami, and N. Pirbonyeh, "Prevalence of underlying diseases in died cases of COVID-19: A systematic review and meta-analysis," PLoS One, vol. 15, no. 10, pp. e0241265-, Oct. 2020, [Online]. Available: https://doi.org/10.1371/journal.pone.0241265
- [12] Syora Alya Eka Putri, "Varian-varian Covid-19, Apa Perbedaannya?," Jan. 19, 2022. https://corona.jakarta.go.id/id/artikel/varianvarian-covid-19-apa-perbedaannya (accessed Oct. 01, 2022).
- [13] tangerangkota.go.id, "Percepat Herd Imunity, Kota Tangerang Gelar Vaksinasi Setiap Hari," Jun. 09, 2021. https://tangerangkota.go.id/berita/detail/26797/ percepat-herd-imunity-kota-tangerang-gelarvaksinasi-setiap-hari (accessed Sep. 30, 2022).
- [14] sehatnegeriku.kemkes.go.id, "Terlambat Vaksinasi COVID-19 Dosis Kedua Tidak Akan Pengaruhi Efektivitas Vaksin," Jul. 03, 2021.
- [15] covid19.go.id, "Update: Jarak Vaksinasi Primer dan Booster Minimal 3 Bulan," Mar. 02, 2022. https://covid19.go.id/artikel/2022/03/02/update -jarak-vaksinasi-primer-dan-booster-minimal-3-bulan (accessed Sep. 29, 2022).
- [16] news.detik.com, "Jarak Vaksin Kedua dan Booster Berapa Lama?Simak Penjelasannya," Feb. 25, 2022. https://news.detik.com/berita/d-5959002/jarak-vaksin-kedua-dan-boosterberapa-lama-simak-penjelasannya (accessed Sep. 29, 2022).

ISSN: 1992-8645	www.jatit.org	E-ISSN: 1817-3195
[17] tangerangkota.go.id, "Pemkot A Vaksin Untuk Masyarakat Ko Jan. 04, https://tangerangkota.go.id/berit pemkot-ajukan-2-4-juta-vaksin- masyarakat-kota-tangerang# (ac 2022).	Ajukan 2,4 Juta ta Tangerang," 2021. ta/detail/25083/ untuk- ecessed Sep. 30,	
 [18] tangerangkota.go.id, "Vaksinasi di Kota Tangerang Siap Dilaksa 2021. https://tangerangkota.go.id/berit vaksinasi-tahap-pertama-di-kota siap-dilaksanakan (accessed Ser 	Tahap Pertama nakan," Jan. 23, a/detail/25779/ a-tangerang- a. 30, 2022)	
[19] tangerangkota.go.id, "Pemkot T Memvaksin 65.262 Orang Pada Vaksinasi Massal," Mar. https://tangerangkota.go.id/berit pemkot-tangerang-telah-memva orang-pada-tahap-1-dan-2-vaksi (accessed Sep. 30, 2022).	Fangerang Telah a Tahap 1 dan 2 22, 2021. ca/detail/26437/ ksin-65-262- inasi-massal	
 20] tangerangkota.go.id, "Capaian Tangerang Menginjak 1 Juta J 2021. https://tangerangkota.go.id/berit capaian-vaksinasi-kota-tangerar 	Vaksinasi Kota Jiwa," Sep. 13, ra/detail/28023/ ng-menginjak-	
 1-juta-jiwa (accessed Sep. 30, 2) [21] tangerangkota.go.id, "Perdana di Kota Tangerang, Arief: Tahaj untuk Masyarakat Lanjut Usia, 2022, Accessed: Sep. 30, 2 Available: https://tangerangkota.go.id/berit perdana-vaksin-booster-di-kota- arief-tahap-awal-prioritas-untuk lanjut-usia 	022). Vaksin Booster p Awal Prioritas ," pp. 1–1, Jan. 2022. [Online]. ca/detail/29557/ tangerang- r-masyarakat-	
 [22] J. K. Hwang, T. Zhang, A. Z. W "COVID-19 vaccines for patier benefits likely outweigh risk Hematology and Oncology, v BioMed Central Ltd, Dec. (10.1186/s13045-021-01046-w. 	Vang, and Z. Li, nts with cancer: s," Journal of vol. 14, no. 1. 01, 2021. doi:	