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Data Analytics on the Interagency Task Force Health Protocol Violators: Tracing the Trends and Determining Future Violations using Time Series and ARIMA (1, 0, 1) model

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Abstract: ***The Interagency Task Force (IATF) is the agency that is responsible for ensuring the safety of every individual amidst COVID-19 pandemic. The agency has in placed the minimum health protocols for the community to adhere with as a way of ensuring safety among individual. This study determined the trends of violations committed against the minimum health standards and provides predicted data of its violations. The time series analysis and quantile regression are used for trend analysis and forecasting. The study will provide inputs to the authority as benchmark of their intervention plans in mitigating the violations against health protocol imposed by the national and local government.***
Keywords: COVID-19; Minimum Health Protocols; Pandemic; Safety Violations

I. INTRODUCTION

The COVID-19 pandemic is continuously spreading throughout the world since the first quarter of 2020 (Ioannidis, 2020; Schuchat, Covid & Team, 2020; Utunen, Ndiaye, Piroux, George, Attias, & Gamhewage, 2020). The disease continuously affects the economy of the different countries (Rahman, Zaman, Asyhari, Al-Turjman, Bhuiyan, & Zolkipli, 2020; Joshi, Bhaskar, & Gupta, 2020; Kalogiannidis, Chatzitheodoridis & Kontsas, 2020) by its transmission from one person to the other. Moreover, the pandemic brought the closures of the different companies all over the world like manufacturing companies, malls, churches, or even educational institutions which affects every aspect of the lives of every individual (Walmsley, Rose, & Wei, 2020; Huang, Makridis, Baker, Medeiros & Guo, 2020).

Majority of the countries around the world have come up with their unique way of mitigating the spread of the dangerous disease to protect humanity (Ahidjo, Loe, Ng, Mok & Chu, 2020; Jeong, Song, Yoon, Kim& Kwon, 2020). In the early stage of COVID-19, lockdowns of the different national and international boarders were implemented as strategy to mitigate the spread of the virus (Di Domenico, Pullano, Sabbatini, Boëlle & Colizza, 2020; Bonardi, Gallea, Kalanoski & Lalive, 2020; Tabari, Amini, Moghadami, & Moosavi, 2020). Almost all domestic and international flights were cancelled that leads to economic crisis all over the world (Ozili & Arun, 2020). Through this strategy, it can mitigate the transmission of the disease from one another (Schlosser, Maier, Jack, Hinrichs, Zachariae & Brockmann, 2020).

The main purpose IATF of the Philippines with minimum health protocol to be observed by an individual is to protect everyone against infection of the COVID-19 and to mitigate its widespread and eventually flatten the curve of the disease in the country (Ahmed, Jafri, Majid, Khan, Ghani, & Siddiqui, 2020; Talidong & Toquero, 2020; Lam, Hung, & Chien, 2020; Favero & Pedersen, 2020). However, data showed that from the start of the implementation of the minimum health standards there were several citizens violating the law that hinder the goal of the government in winning the fight against the virus (Rusydi & Sulchan, 2021; Ip, & Lee, 2020). Considering the growing number of violators of the minimum health standards, a need to visualize and to predict future violations is necessary that eventually give inputs to the authority for them to strengthen their plans in mitigating the spread of the virus. Further, these data are needed by the authority to be presented to the community as part of their symposiums that support the dissemination of harmful effect of being negligent of the protocol designed by the authority. This kind of activity is not only considered during the COVID-19 pandemic but is continually done to educate the citizens that eventually protect the entire country and the world as a whole against harmful diseases.

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II. MATERIALS AND METHODS

A. The Locale of the Study

The study is conducted in the Province of Zamboanga del Sur, Philippines. There were five municipalities included in the study namely: Molave, Tukuran, Aurora, Mahayag and Dumingag.

B. Data Collection

The data of the minimum health protocol violators from the Provincial Police Office of Zamboanga del Sur was used in the study which were generated through the information system of the Philippine National Police. The data includes the age of the violators, gender, address as to municipality and the type of violations committed.

C. Study Architecture

The architectural design of the study is presented in Figure 1. The violator's data of the minimum health standards protocol from the IATF was retrieved from the Provincial Police Station of Zamboanga del Sur excluding the names of the violators considering the data privacy law of the Republic of the Philippines. The retrieved data is used as input in generating the trends using the time series analysis and the same time it is utilized to generate the forecasted violations through Quantile Regression. The time series analysis and the Quantile Regression functions is executed through the GRETL software.

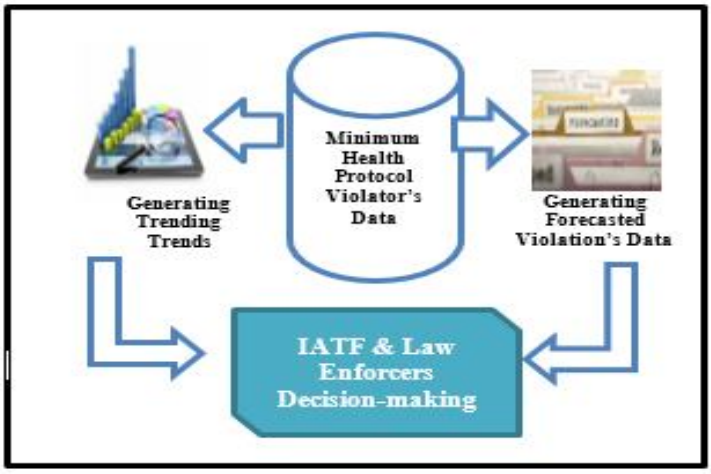


Fig. 1 Architectural Design of the Study

III. RESULTS AND DISCUSSIONS

A. Minimum Health Protocol Violators as to their Profile

The study includes the profile of the violators as to their age and gender. The age is categorized into three (3): below 18 years old, above 65 years old and 18 to 64 years old. On the other hand, there were four (4) identified restrictions of the IATF included in the study namely: Facemask violation, Face shield violation, curfew violation and social gathering violation. These violations were included in the study since these are the usual restrictions of the IATF in the entire country.

Table 1. Age Profile of the Minimum Health Protocol Violators

No.	Age	Facemask	Faceshield	Curfew	Social Gathering
1	Below 18 years old	280	0	0	32
2	Above 65 years old	115	0	27	18
3	18-64 years old	1551	9	516	100
	Total	**1946**	**9**	**543**	**150**

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Results showed that most of the violations of the citizens towards the minimum health standards is on the wearing of face mask and most of them were 18-64 years old as evident in table 1. Result signifies that there were several violators for the age bracket or 16 to 64 years old since these group of citizens were aloud to move around the community. The IATF and the Local government units restricted the vulnerable citizens from going outside in their respective residences.

Table 2. Gender Profile of the Minimum Health Protocol Violators

No.	Gender	Facemask	Faceshield	Curfew	Social Gathering
1	Male	902	9	515	102
2	Female	119	0	129	20
	Total	**1021**	**9**	**644**	**122**

It is evident in table 2 that majority of the violators of the minimum health standards were male and majority of them violated the wearing of facemask policy. There were a number of male violates curfew restrictions and social gathering. Result entails that men has a higher chance of violating any policies in the community. Thus, law enforcers and other concerned agencies may conduct intensive campaign in the community pertaining to the importance of following restrictions for the benefit of the entire community.

B. Trend Analysis

The time series trend analysis was used to trace the trends of the violations to the minimum health standards among the community.

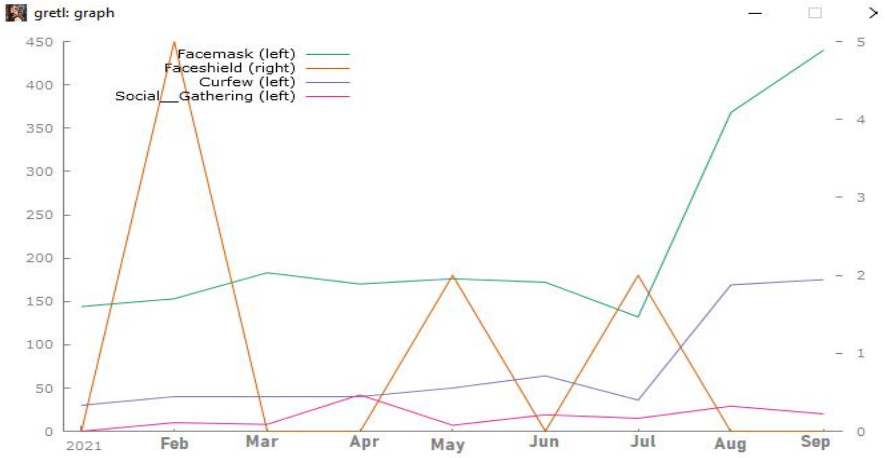


Fig. 2 Time Series Plot of the Violations Committed

The time series plot presented in figure 2 showed the trends of the violations committed by the citizens in the province from January 2021 until September 2021.The trend for the facemask, curfew and social gathering violations utilized the numbers in the left side of the graph and only face shield violation utilized the numbers in the right side of the graph.

The face shields violations in the province showed an increase in February 2021 and eventually decrease its violations on March and April 2021. There was a decreasing pattern of the violations starting August and September 2021. On the other hand, the face mask and curfew violations showed an increasing pattern from July until September 2021. Further, among the violations recorded, the social gathering violations showed the lowest number of violators. However, result showed that the social gathering restrictions obtained its highest number of violations on April 2021.

C. The Future Violations

The future violations should be determined to give inputs to the law enforcers in designing preventive actions to mitigate its number of violations. In the study, the ARIMA (1,0,1) model was used for the forecasting. Figure 3 to 6 presented the forecasted data of each IATF restrictions in the province. Results showed that the IATF restrictions violations showed a decreasing patterns for the face mask, face shield and curfew in the next 9 months from October 2021 until July 2022. On the other hand, it is evident in figure 6 that there is unstable behavior of the forecasted data for the social gathering in the next 9 months.

Thus, restrictions implementers and law enforcers should consider in their planning the monitoring of the community in terms of future social gatherings that might be a contributing situation for another surge of COVID-19.

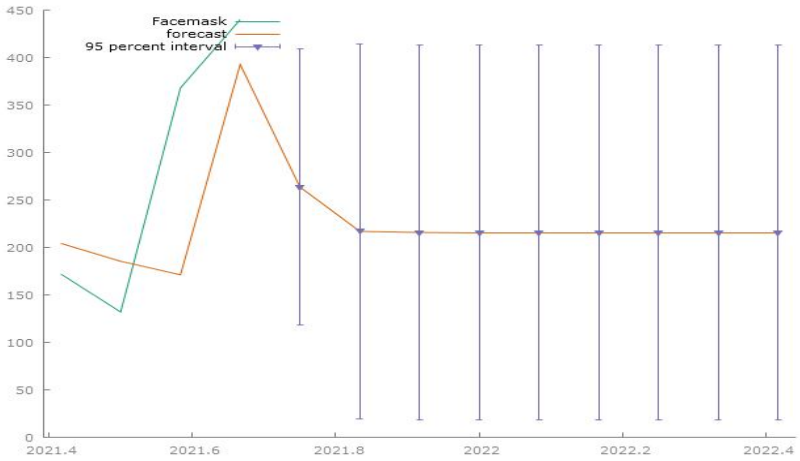


Fig. 3 Graph for the Forecasted Facemask Violations

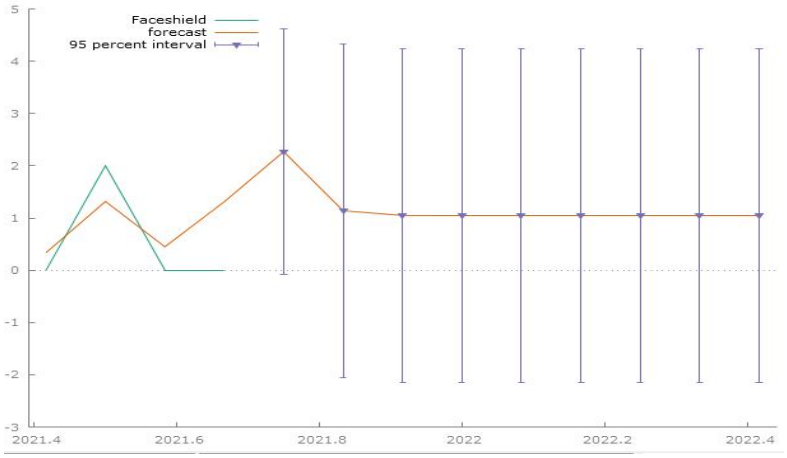


Fig. 4 Graph for the Forecasted Face shield Violations

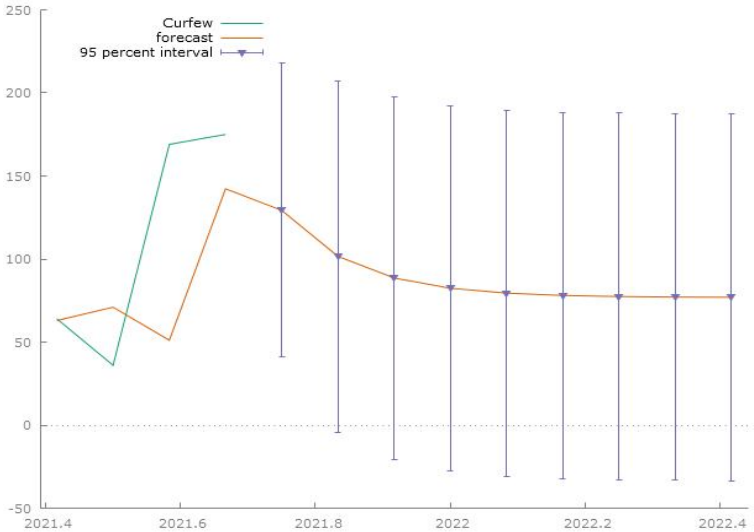


Fig. 5 Graph for the Forecasted Curfew Violations

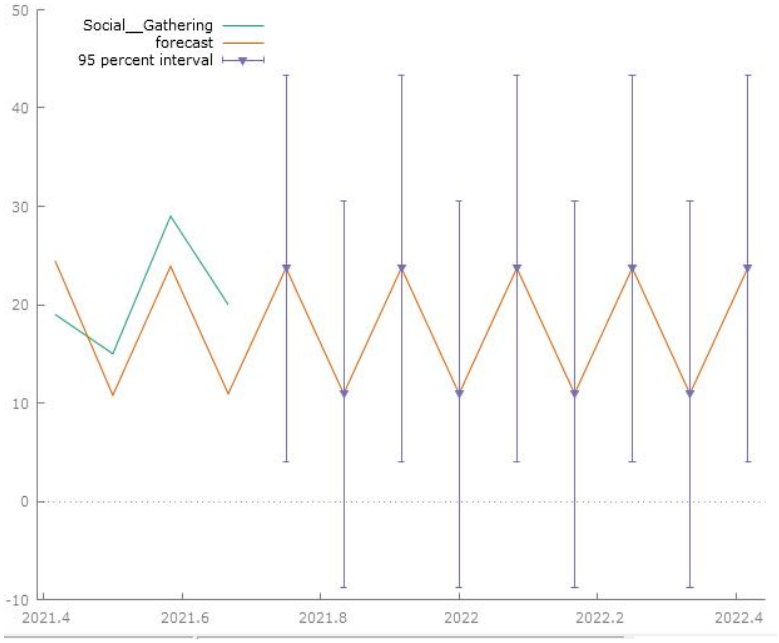


Fig. 6 Graph for the Forecasted Social Gathering Violations

IV. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study, the violators of the different restrictions imposed by the IATF were male showing a greater number based on the data analytics and they were belonging to 18 years old and below and above 64 years old group of citizens. There was a greater number of facemask violations followed by curfew violations in the identified municipalities of Zamboanga del Sur. On the other hand, it is evident in the results of the study that there is a decreasing patterns of violations to the restrictions except for the social gathering violations.

Thus, it is recommended that the restrictions implementers and law enforcers should consider in their planning the monitoring of the community in terms of future social gatherings that might be a contributing situation for another surge of COVID-19.

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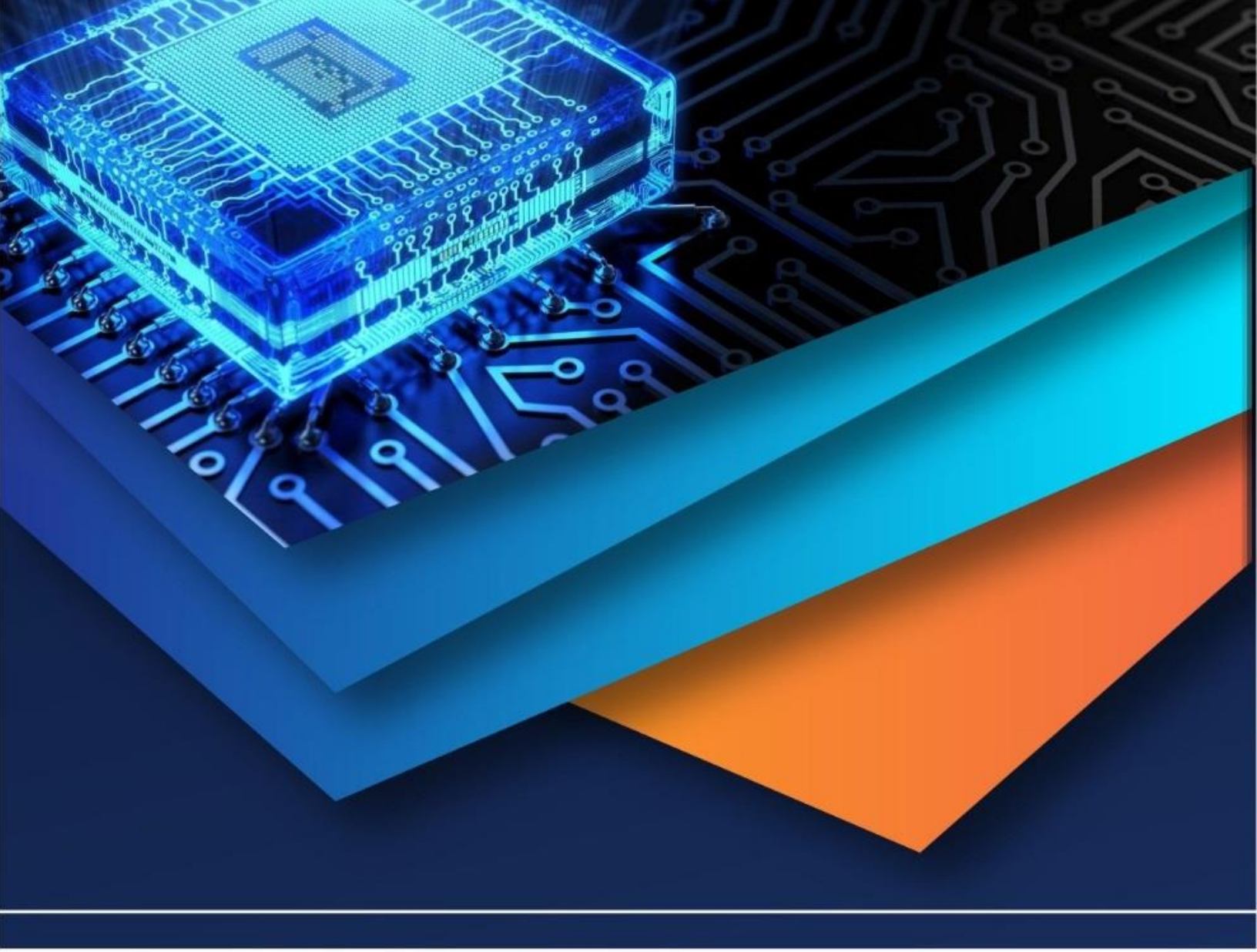
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