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Implementation of forecasting methods to determine teaching and learning model policies during a pandemic in border areas

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Abstract
Indonesia is an archipelagic country with more than seventeen thousand islands, both in the interior and border areas. The border area is directly or indirectly a barrier to other countries. The purpose of this study is to provide an overview for readers to conduct forecasting method research. This study aims to describe the profile of the spread of the virus and provide input on education policies in border areas for forecasting. This research may need to be more thematically up-to-date and slow in publication. Still, researchers believe this is useful for policymakers to determine policies from reading existing patterns using equations in forecasting methods. Especially in the era of disruption, which is full of uncertainty, knowledgelike this is needed to make predictions. In this study, the characterization is divided into gender, age, occupation, and interaction. The results showed that the gender of COVID-19 patients in the border areas had the same proportion of both men and women, the age range of twenty to forty-eight years had a greaterprobability of being affected, employees/private sector were more dominant to be involved, groups and the most prevalent cause of transmission of COVID-19 is family interaction. In addition, using Brown's double smoothing exponential method shows that predictions for July, August, and November for suspects and patients with COVID-19 will increase. Thus, the recommendation from this research for the Education Office as a policy maker in border areas is that school learning activities should be postponed until conditionsare feasible.
Keywords: forecasting methods, Covid-19, education policy, teaching and learning activities

Implementasi metode peramalan guna menentukan kebijakan model belajar mengajar saat pandemic di daerah perbatasan

Abstrak
Indonesia merupakan negara kepulauan yang terdiri lebih dari tujuh belas ribu pulau, baik yang berada di pedalaman maupun di daerah perbatasan. Daerah perbatasan secara langsung atau tidak langsung menjadi pembatas dengan negara lain. Tujuan penelitian ini secara umum memberikan gambaran kepada para pembaca untuk melakukan sebuah penelitian metode peramalan. Secara kusus, dalam penelitian ini bertujuan untuk menggambarkan profil sebaran virus, dan memberikan masukan kebijakan pendidikan di daerah perbatasan atas peramalan yang dilakukan. Penelitian ini mungkin tidak up to date secara tema dan lambat dalam publikasi, namun peneliti berkeyakinan ini berguna bagi pengambil kebijakan untuk menentukan kebijakan dari membaca pola-pola yang ada menggunakan persamaan dalam metode peramalan. Apalagi di era disrupsi yang penuh dengan ketidak pastian, pengetahuan seperti ini sangat diperlukan untuk memprediksi. Dalam penelitian ini, karakterisasi dibagi menjadi empat yaitu jenis kelamin, usia, pekerjaan, dan interaksi. Hasil penelitian menunjukkan bahwa jenis kelamin pada pasien COVID-19 di daerah perbatasan memiliki proporsi yang sama baik laki-laki maupun perempuan, rentang usia dua puluh sampai empat puluh delapan tahun memiliki kemungkinan lebih besar untuk terkena, pegawai/swasta lebih dominan untuk terkena, kelompok lain dan juga penyebab paling dominan penularan COVID -19 adalah interaksi keluarga. Selain itu dengan menggunakan metode double smoothing exponential Brown menunjukkan bahwa prediksi Juli, Agustus hingga November kondisi suspek dan pasien COVID -19 akan naik. Dengan demikian, rekomendasi dari penelitian ini untuk Dinas Pendidikan sebagai pengambil kebijakan di daerah perbatasan adalah kegiatan belajar di sekolah sebaiknya ditunda hingga keadaan

sudah bisa dikatakan layak.
Kata Kunci: *metode peramalan, Covid-19, kebijakan pendidikan, kegiatan belajar mengajar*

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INTRODUCTION

COVID-19 does not affect people in the urban area only, but also people in the border areas. Indonesia has a population of more than 200 million with various activities and social interactions that lead to the susceptibility to virus transmission. The virus transmission in this study has a big potency to elevate the numbers of COVID-19 patients. This also has an impact on the education sector. The government, in this case, the education office in border areas, must be wise in making decisions regarding the teaching and learning model adopted. Of course, it takes work to determine. The education office needs data on the pattern of the spread of the virus for consideration.

The characterization in this study is grouped based on the distribution of sex type, age, occupation, and interaction that causes the patients to get affected by covid-19. This is also a study to understand the factors influencing students' meta-COVID-19 performance in the learning environment. A continuous learning mode is put in place due to the restrictions of this health crisis (Kanetaki et al., 2022). The characterization based on sex type is the grouping of distribution categorization of COVID-19 patients based on sex types. Wenham mentioned that the data selected based on sex type for Covid-19 shows the numbers of similar cases occurring between males and females. Yet, there is a difference in sex type in the mortality and susceptibility to the disease (Wenham et al., 2020). Jin also mentioned that females and males have exact prevalence, but male patients with Covid-19 are riskier to death, regardless of age (Jin et al., 2020). The characterization based on age is a grouping of distribution categorization of COVID-19 patients based on age. Cruz stated that children of preschool age and babies possibly possess worse clinical manifestations than older ones (Cruz & Zeichner, 2020). Meanwhile, Dong also said that children of every age are susceptible to COVID-19 (Dong et al., 2020). However, the clinical manifestation of COVID-19 in children is lighter than in adults. Children, mainly babies, are susceptible to getting affected. Kelvin stated that babies and children generally have a higher risk of getting treatment in hospitals after virus infection of the respiratory system (Kelvin & Halperin, 2020).

The characterization based on occupation is the grouping of distribution categorization of COVID-19 patients based on patients' work. The characteristics of employment which possibly interact with the public and require the worker to be in close range with the other workers not onlyput the workers at risk of getting affected by the disease but also have potency as the connector amongworkers. Burdorf stated that there are many national policies for reducing the distribution of the virus (Burdorf et al., 2020). Sim opined that the workers involved in the front line are at risk of infection (Sim, 2020). Baker also classified the workers with the potency to get affected by the COVID-19 virus as those working in the medical sector (Baker et al., 2020). However, the other workers in the different sectors, such as the public and social sectors, also have a mutual risk.

Meanwhile, the characterization based on interaction is the grouping of distribution categorization of COVID-19 patients based on their daily interaction. A trip is also a contribution towards the distribution of the virus, so quarantine is part of the solution to solve the problem. Interaction is also part of social contact. Lewandowski explains that social contact is the main transmission channel of infectious disease which is spread by the respiratory system or close-range contact (Lewandowski, 2020). Besides that, Chinazzi also states that the quarantine of the trip from Wuhan can defer the epidemic's growth for at least 3 to 5 days in China. Still, it has more visible effects internationally, where the imported cases are reduced up to 80% until the middle of Febuary

2020 (Chinazzi et al., 2020). Prem also opined the steps that should be taken; one of the steps is implementing social distancing, which is considered the most effective step to decrease the infection rate (Prem et al., 2020). Similarly, Kraemer stated that travel restriction affects the spread of COVID-19 in China (Kraemer et al., 2020). Moreover, Wuhan, as the hot spot of the virus, also regulates regulations. Lau stated that the correlation between domestic air traffic and the distribution of COVID-19 becomes weaker due to the limitation (Lau et al., 2020).

The forecast is the part that is integrated into the activity of decision-making. In this case, the prediction or the forecast used is implemented as the base for taking the policy regarding educational activity planning. Consequently, the government has issued a regulation to conduct online learningas long as the virus outbreak. Besides that, advancing knowledge also improves the understanding of various aspects that can be predicted. The ability to envision something also needs precision at every step.

Regardless, the thing to bear in mind is that the accuracy of the forecast is not only directly beneficial for the policymakers but can also be used as a reference in making decisions. Wheelwright stated that predicting can be used as a simple approach and emphasizes smoothing, which means that accuracy is not only the criterion (Chatfield et al., 1978). Armstrong also explained that the forecast method should be evaluated in the situation that will be used. The evaluation process underlies the need to examine the technique towards the logical alternatives (Armstrong, 2001). Weatherford analyzed revenue management, stating that smoothing exponential, pickup, and moving averages are stronger than regression (Weatherford & Kimes, 2003). Prediction in determining the suspects and COVID-19-positive patients is essential in education. It is considered that thelearning activity is closed and substituted by the school from home activity to anticipate the distribution of the virus.

Based on the explanation above regarding how the forecasting method works and the description of the border area, the researcher tries to implement this forecasting method. By implementing this forecasting method, researchers can help the local education office to make decisions in the education sector regarding the implementation of teaching and learning in the area. This argument is based on the visible and predictable pattern of virus distribution, and which analysis is based on a minor error. Taking this policy will indirectly help the success of government programs in suppressing the spread of the virus.

METHOD

The research was conducted using a quantitative approach. Quantitative research is systematic scientific research towards its parts, phenomena, and relationships. Quantitative research emphasizes the research paradigm of planning to collect, analyze, and report the data. Although quantitative research is considered conventional in organizations, the study of quantitative research is objective (Jean Lee, 1992; Yilmaz, 2013).

The population in fathoming characterization consisted of 218 patients who were positively affected by COVID-19 and lived in border areas. The samples were taken using the Slovin formula $n = \frac{N}{1 + a^2 N}$ by using $\alpha = 5\%$. Hence, it obtained the samples comprising 141 patients, yet to make some anticipation, this research involved 146 patients.

The sample in this study came from the border area of Batam. The number of pieces was one hundred and forty-six, which were patients affected by the virus. Early data was obtained from the website of the Batam Covid-19 handling task force. Researchers made observations based on four categories. The first category is gender, the second is based on age, the third is from the profession, and finally, which interaction is the most vulnerable to spreading. This, of course, will make it easier for the reader to see the distribution. More complete research sample data is shown in Table one below. The patients who were positively affected by COVID-19 as the samples of this study were 146 patients with the distribution as shown in Table 1.

To answer the research questions, besides descriptive statistics, the tests used were the chi-square test, Kruskal Wallis test, and to analyze the prediction using Moving Average (MA-3), Moving Average (MA-4), Moving Average (MA-5), Single Smoothing Exponential, Double Smoothing Exponential Brown Parameter where prediction will be taken considering the smallest value of Mean Square Error.

Table 1. *The Distribution of Covid 19 Patients in Border Areas*

No.	Categorization	Parameter	Observation frequency
1.	Sex Type	Male	74
		Female	72
2.	Age	Children	15
		Teenager	19
		Adult1	40
		Adult2	39
		Adult3	27
		Oldsters	5
		Seniors	1
3.	Occupation	Civil Servants	22
		Teachers	3
		Housewives	19
		Hospital Employees	3
		Private Employees	42
		Entrepreneurs	12
		Students	22
		Religious Leaders	2
		Policies	4
		Female Migrant Workers	1
		Masseurs	1
		Unknown	15
4.	Interaction	Family Interaction	57
		Work Interaction	33
		Social Interaction	27
		Business Trip	6
		Unknown	23

The analysis data will be used to show the inference of the data collected by researchers. Therefore, analysis data aim to observe the characterization of COVID-19 patients who live in border areas which consist of sex type, age, occupation, and interaction.

The chi-square test can be used as the goodness of fit for small and significant populations (Satorra & Bentler, 2001). Brumback also stated that the chi-square test aims to see the difference between two predictions and then compare them with a calculated passing grade (Brumback & Srinath, 1987). Meanwhile, the Kruskal Wallis test is a ranking-based one-way ANOVA (Brown & Hettmansperger, 2002). Chan opined that the advantage of the Kruskal-Wallis's test is its convenience in ordinal data (Chan & Walmsley, 1997). Breslow generalized the Kruskal Wallis test, which is the generalization of the Wilcoxon Gehan test, to examine the quality of continual distribution function with an observation (Breslow, 1970). The data with asymmetric distribution, the Kruskal Wallis test, works better than parametric equivalent ANOVA (Hecke, 2012). Data were essential to developing the product, yet the data will only be valid if they are good (Hidayat et al., 2015).

Meanwhile, in predicting, there are some methods to utilize. The first method is the moving average. According to Hansun, the moving average is a technique broadly used to predict the data in the future in the analysis of time series (Hansun, 2013). Meanwhile, Hannan states that the most crucial thing to consider is to notice the auto-aggressive mean system (Hannan & Kavalieris, 1984). Lee opined that using the ARIMA subset model in traffic cases could improve the accuracy of short-term prediction tasks in the time series model (Lee & Fambro, 1999).

Exponential smoothing is a continuous procedure to revise the forecast by smoothening the past value of a particular datum. Single smoothing exponential is used if the data pattern is horizontal or there is no historical cyclic variation or definite trend (Aimran & Afthanorhan, 2014). Batty also explained that when implementing single smoothing exponential, the first thing to do is relate to the variance of errors smoothened (Batty, 1969). Snyder also explained that the exponential average is used in various forecasts, such as selling and controlling supplies. It is always rationalized in the statistics

model, which has errors with constant variance (Snyder et al., 2002). Meanwhile, double smoothing exponential is a procedure conducted continuously with two times smoothening process. Double smoothing exponential is considering recent data and noticing historical data (Huang et al., 2012). Nazim also explains that double smoothing exponential is used when data show trends. Exponential average with trend works simply, except that the two components should be renewed in every period of level and trend (Aimran & Afthanorhan, 2014). Wang added that the order variance is based on the estimation of a simple exponential average which is always more significant than the order variance based on the analysis of a double exponential average (Wang, 2008).

The Mean Square Error (MSE) should be noticed in determining the best model. Some skill scores are sued and selected based on the size of the Mean Square Error and alternative climatological standards. The assessors of MSE minimum error possess excellent performance for the distribution with moderate errors (Dalton & Dougherty, 2011; Murphy, 1988).

RESULT AND DISCUSSION

Result

The results of the study started by testing whether there was a gender factor in the spread of the virus that occurred. As mentioned in the method section of the participant chapter, it was shown that one hundred and forty-six participants were involved as a sample. The hypothesis proposed by the researcher is as follows. The findings in this study can be shown from the analysis of Hypothesis 1.a.

H0: there is no difference in the proportion of sex type in COVID-19 patients in the border areas.

Hi: there is a difference in the proportion of sex types in COVID-19 patients in the border areas.

$$X^2 = \sum_{i=1}^{n} \frac{(f_o - f_e)^2}{f_e}$$

$$X^2 = 0{,}027$$

Based on the result of data analysis, it was obtained the value X^2 count amounted to 0,0274; meanwhile, the value of the X^2 table (through the approach of X^2 *table* with α = 5% and dk = k -1 = 1) was obtained X^2 *table* amounted to 3,841 where it can be shown that X^2 *count* < X^2 *table*, so the null hypothesis is accepted. It can be stated that there is no difference in the proportion of sex type in COVID-19 patients in the border areas.

The second research result that was explored was from the age demographic factor. Researchers are trying to find out whether the spread of the virus has anything to do with the sample's age. With the same example above, the researcher proposes Hypothesis 1.b.

H0: there is no difference in the proportion of age in COVID-19 patients in the border areas.

Hi: there is a difference in the proportion of age in COVID-19 patients in the border areas.

$$H = \frac{12}{n(n+1)} \sum_{i=1}^{k} \frac{R_{i^2}}{n_i} - 3(n+1)$$

$$H = \frac{12}{146(146+1)} \sum_{i=1}^{k} \frac{R_{i^2}}{n_i} - 3(146+1)$$

$$H = 131{,}178$$

The result of the data analysis shows that the value of the H count amounted to 131,783. Meanwhile, the value of the H table (through the approach of X^2 *table* with α = 5% and dk = 7 -1 = 6) obtained X^2 *table* amounted to 12,592 where it can be shown that X^2 *count* > X^2 *table*, so the null hypothesis is rejected therefore it can be stated that there is no age proportion in COVID-19 patients who live at the border areas, where the most dominant factor is on category adult 1 and adult 2 with the range of age among 20 – 48 years old.

The three researchers are looking to determine whether the profession affects how quickly the virus spreads. This is to make it easier for government or public agencies, which have the fastest spread. The assumption put forward is indicated by Hypothesis 1.c.

H0: there is no difference in occupation proportion in COVID-19 patients who live in the border areas.

H_i: there is a difference in occupation proportion in COVID-19 patients who live in the border areas.

$$X^2 = \sum_{i=1}^{n} \frac{(f - f_e)^2}{f_e}$$

$$X^2 = 141{,}836$$

Based on the result of data analysis, it obtains the value of the X^2 count amounted to 141,836 meanwhile, the value of the H table (through the approach of X^2 *table* with α = 5% and dk = k -1 = 11) obtains the X^2 *table* amounted to 19,675 where t shows that X^2 *count* > X^2 *table*, therefore the null hypothesis is rejected, and it shows that there is a difference of occupation proportion found in COVID-19 patients who live at the border area with the positive COVID-19 patients are dominated by the employees in private sectors.

The four researchers are trying to determine which interactions lead to the virus's rapid spread. Four variables try to explore—exchange in the family environment, workplace, public transportation/business trips, etc. The results for the fourth test are shown by Hypothesis 1.d.

H0: there is no difference in the interaction proportion of COVID-19 patients who live in the border areas.

H_i: there is a difference in the interaction proportion of COVID-19 patients who live in the border areas.

$$X^2 = \sum_{i=1}^{n} \frac{(f - f_e)^2}{f_e}$$

$$X^2 = 46{,}877$$

Based on the result of data analysis, it obtains the value of X^2 46,877; meanwhile, the value of the H table (through the approach of X^2 *table* with α = 5% and dk = k -1 = 4) obtains the X^2 *table* amounted to 9,488 where it shows X^2 *count* > X^2 *table*. Therefore, the null hypothesis is rejected, and it can be stated that there is a difference in interaction portion found in COVID-19 patients who live at the border areas. Therefore, family interaction is the most dominant in transmitting COVID-19.

Prediction and the analysis of the prediction model

This study implemented the calculation of the prediction value of initial data from March 26th, until June 25th, 2020, which comprised the suspects and the patients of COVID-19. The data were distributed as shown in Figure 1. The methods used to predict were Moving Average (MA-3), Moving Average (MA-4), MovingAverage (MA-5), Single Smoothing Exponential, and Double Smoothing Exponential Brown Parameter where the prediction was taken by considering the value of the smallest Mean Square Error.

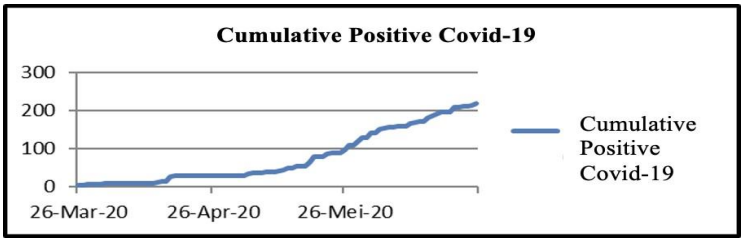

Figure 1. The distribution of COVID-19 patients in the border areas

Moving Average (MA-3) …. (1)

$$F_{T+1} = \frac{X_{T-2} + X_{T-1} + X_T}{3}$$

$$F_{T+1} = \frac{1}{3}\sum_{i=T-2}^{T} Xi \quad \text{……. (1)}$$

Using a similar analogy, MA-4 and MA-5 can be shown as (2) and (3).

Moving Average (MA-4) …. (2)

$$F_{T+1} = \frac{X_{T-3} + X_{T-2} + X_{T-1} + X_T}{4}$$

$$F_{T+1} = \frac{1}{4}\sum_{i=T-3}^{T} Xi \quad \text{……... (2)}$$

Moving Average (MA-5) …. (3)

$$F_{T+1} = \frac{X_{T-4} + X_{T-3} + X_{T-2} + X_{T-1} + X_T}{5}$$

$$F_{T+1} = \frac{1}{5}\sum_{i=T-4}^{T} Xi \quad \text{……... (3)}$$

Single Smoothing Exponential …. (4)

$$F_{T+1} = a_t X_t + (1 - \alpha_t) F_t \text{ ……. (4)}$$

Double Smoothing Exponential Brown Parameter …. (5)

$$F_{T+m} = a_t + b_t m \text{ ……. (5)}$$

The models above will be further used in predicting and comparing the best models by observing the value of Mean square error (MSE), which can be seen in Table 2.

Table 2. *Tabulation Mean Square Error (MSE) from Forecast Model*

No.	The method	Mean Square Error (MSE)
1.	Moving Average orde-3 (MA-3)	314,904
2.	Moving Average orde-4 (MA-4)	460,887
3.	Moving Average orde-5 (MA-5)	636,81
4.	Single Smoothing Exponential (α=0,1)	4859,397
5.	Single Smoothing Exponential (α=0,3)	699,584
6.	Single Smoothing Exponential (α=0,7)	172,387
7.	Double Smoothing Exponential (α=0,9)	90,808

Table 2 shows the calculation of MSE; therefore, the forecast method used is Double Smoothing Exponential (α=0,9) with a prediction model (5) were,

$$a_t = 2S_t' \; and \; b_t = \frac{\alpha}{1-\alpha}\left(S_t' - S_t^{"}\right)$$

It obtains the predictions, which can be shown in Table 3. Table 3 shows that the prediction of suspects and patients of COVID-19 is still high, which makes the public feel uncomfortable.

Discussion

Based on the calculation and analysis regarding the categorization, which consists of sex type, age, occupation, and interaction. In the first part of the hypothesis, it is shown that gender does not determine whether someone is susceptible to being infected with the virus or not. It shows that male

and female students have the same chance of being infected with the virus. Although some literature says that there are more women, it seems that the distribution area also needs attention (Bwire, 2020; Kopel et al., 2020; Thibaut & van Wijngaarden-Cremers, 2020). Thus, in this first part (gender) the education office does not need to consider policies concerning the gender of the students.

Table 3. *The Prediction of Double Smoothing Exponential Forecast Model*

No.	Period	Prediction	
		PDP	Covid-19 Positive
1.	26 – 31 July 2020	958 – 1.000	349 – 370
2.	26 – 31 August 2020	1.215 – 1.256	480 – 501
3.	26 – 30 September 2020	1.471 – 1.504	611 – 628
4.	26 – 30 October 2020	1.719 – 1.760	737 – 758
5.	26 – 30 November 2020	1.975 – 2.008	868 – 885

The second hypothesis concerns the age range. The distribution is more significant in the twenty to forty-year age category than in the other age categories. This aligns with other studies that have reported similar results (King et al., 2021; Singer et al., 2022). Based on these results, education units and local education offices must be vigilant and careful about educators and teaching staff at the age of categorization. This is a form of prudence by policymakers in making policies.

The third hypothesis tests which profession or sector can potentially transmit the virus. The results show that private sector workers are more dominantly exposed to the virus (Goh & Baum, 2021; Lekfuangfu et al., 2020; Zigron et al., 2021). Given that activities outside the home and interacting with many people can accelerate the process of transmitting the virus, this private sector population is very vulnerable. Interesting findings occur in the fourth hypothesis. Where it is known from the research results that transmission is mostly in families, this is an essential record for educationunits and offices to pay attention to this aspect in policy making (Hamadani et al., 2020; Posfay-Barbe et al., 2020; Rajmil, 2020). Feeling safe at home can make family members ignore health protocols.

If it relates to the learning activity where students who stay at home also have possibility to get affected by COVID-19. In the categorization of age also shows productive age which half of them are colleague students. This study is also an effort to obtain information and prediction of COVID-19 patients in border area, where that information can be used by the government which is related to education correlated towards teaching-learning activity planning, with the condition and prediction using double exponential smoothing of Brown parameter which shows the increase result. Subsequently, this information can be a recommendation for the stakeholders to postpone the learning activity at school until the situation is better. Dong also stated that children in every age seem to be susceptible to COVID-19 (Dong et al., 2020). Therefore, that potency can be used as the reference to postpone the face-to-face learning activity at school.

From Table 3, it can also be shown that the movement of data is experiencing relatively rapid data growth and requires the vigilance of people of productive age because they interact a lot outside, both with colleagues and other social aspects. From this, it can be used to evaluate and anticipate new variants. Although adults have more proportions to be infected and transmitted, children, adolescents, andadults have the same potential and risk. The government's efforts to minimize cases in the latest variantscan be carried out, among others, by health protocol efforts and full-dose vaccination. Keep a distancefrom others, use masks, increase air ventilation, avoid crowds, wash hands regularly, and cover your nose and mouth when coughing.

Regarding forecasting methods, researchers provide seven equations to determine the most appropriate and lowest error value. The seven equations are a 3rd order Moving Average (MA-3), a 4th order Moving Average (MA-4), a 5th order Moving Average (MA-5) and added with three Single Smoothing Exponentials with an alpha value of 0.1, 0.3, and 0.7 as well as one Double Smoothing Exponential equation. The results of the calculations are shown in Table 3 above (the research results section). Of the seven equations, the calculated data is compared with actual data in the field based on data released by the Covid-19 task force in the study population area. It is shown that the Double Smoothing Exponential equation is closest to the data in the field. Thus, researchers recommend using

this equation in predicting the spread of the virus due to minor errors. With this equation, the education unit and the local education office can see the movement of the virus's reach from time to time. Thus, it helps the education office as a policymaker to determine the model of teaching and learning in border areas.

In this forecasting method, the first step is deciding what to forecast and how best to define the variable, in this case, the spread of the virus. Since Covid-19 is a new thing, the tendency to assume variables are already defined does not apply to this study. So that the decision regarding which variable should be predicted depends on the interests of policy making, in this case, the education unit or the local education office. For example, forecasting is used to perform model training, image generation, and comparison of derivations of assumed degrees of epidemic distribution (Chen et al., 2022). The contribution of this forecasting, provided by the Education Office as a policy maker, is the period covered by the research variables, the level of accuracy provided, the required frequency, the appropriate variable segmentation, and the value of the research forecast itself. These aspects must be discussed and used for consideration in decision-making.

The above is also in line with Syed's et al. research (2021). With forecasting carried out by the government, it can take preventive measures after the Covid-19 event specifically for students and develop local health plans (Syed et al., 2021). The government should take steps to ensure free access to education for rural students once schools reopen and declare that all education is permitted and accessible for all. They should also offer financial support to students who are vulnerable to poverty. Because, like it or not, the decision to study from home will impact the use of technology. Furthermore, this will be a consideration in determining policy.

Due to the short timeframe in this forecasting, the limiting factors are inaccurate information with time, inaccuracy, and lack of detail. Researchers are limited to getting data from the web without being able to dig deeper into the data. However, this is not a hindrance. Researchers realize that if this is done in the long term, the concern that occurs is a poor understanding of the dynamic elements that are essential for forecasting. Input resources in the task force web in the study population will require a different design for the forecasting equation. Thus, the interim findings by researchers must be reflected in advance in the use of the local education office system. Parallel efforts by policymakers allow the system to maintain focus, resulting in more profit and input for the education office in determining policies in the education sector. Furthermore, cross-checking will give credibility to the forecast results based on the system designer's perspective.

CONCLUSION

Based on the results of this study, it can be concluded that the characterization condition in this study is divided into four, namely based on sex type, age, occupation, and interaction. The result showed that the sex type of positive COVID-19 patients in border areas, both male and female, had the same proportion, while the age categorization showed that the age of 20 - 48 had a greater chance of contracting it, while for the occupation categorization showed that employees/private sector were more dominant in an infected condition compared to other occupations and the most dominant cause of positive COVID-19 patients is precisely the interactions within the family. In the forecasting section, of the five methods proposed, the closest to the distribution in the population is using the double exponential smoothing Brownian parameter. It can be shown that the predicted results from July, August, September, and November will continue to increase for both suspected and positive COVID-19 patients, and the numbers shown are close to actual events. Thus, this method can be used as a reference for policymaking by the local education office. So that the recommendations given to the local education office are that all learning activities in the form of face-to-face learning activities should be postponed until there is a decrease in the tolerance limit.

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