



## Analysis of changes in public behavior regarding 3M<sup>1</sup> health protocols during the Covid-19 pandemic in Indonesia

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### ARTICLE INFO

#### Article history:

Received 22 June 2021

Received in rev. form 25 July 2021

Accepted 27 July 2021

#### Keywords:

Pandemic, Changes in Behavior, Health Protocol, Dependency Analysis, Factor Analysis and Multinomial Regression.

#### JEL Classification:

O15, P36

### ABSTRACT

The Covid-19 pandemic has occurred in Indonesia since March 2020. The pandemic period required adjustments in all sectors of life, including changes in people's behavior, namely spending more time at home. Changes in people's behavior are needed to break the chain of Covid-19 transmissions, one of which is the implementation of Health protocols. Research on the behavior of the Indonesian people in dealing with the Covid-19 pandemic includes public knowledge and understanding, compliance in implementing the 3M health protocols, and the important factors that influence changes in people's behavior to comply with the health protocol. Data was collected by distributing online questionnaires, surveys to crowd locations and FGDs. National online and offline surveys are divided into 3 regions, namely Java, West Indonesia and East Indonesia. The analysis was carried out using statistical methods, namely dependency analysis, factor analysis, and multinomial regression. The conclusion is that people who have implemented the 3M protocol and have confidence in the effectiveness of 3M tend to believe that the 3M protocol is important to continue to be implemented. In addition, it is known that social media, TV, and online media almost always ranked in the top three of the most media respondents to get information about the importance of implementing health protocols.

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## Introduction

Corona Virus Disease 2019 (Covid-19) was first discovered in China at the end of 2019. This outbreak rapidly began to infect other countries around the world including Indonesia. The first case in Indonesia was announced by the president on March 2, 2020, which was then followed by other cases until the World Health Organization (WHO) declared COVID-19 as a global pandemic. In Indonesia until November 23, 2020, the transmission of Covid-19 was reported that the total number of confirmed cases was 516,753 cases with the number of recovered patients being 433,649 or 83.9% of confirmed cases and 16,352 deaths or 3.2% of confirmed cases (Kementerian Kesehatan Republik Indonesia, 2020). From March to November 2020, positive cases in Indonesia have increased to more than 5000 new cases per day. On the other hand, the number of recovered patients continues to rise. According to the Covid-19 Task Force expert team, there are five major clusters of Covid-19 transmission, namely densely populated settlements, markets and fish auction centers, health service centers, offices, and places of worship (Covid19.go.id, 2020).

The government has made various efforts to prevent the transmission of Covid-19 by enforcing various policies during the pandemic, such as studying and working from home, urging people to stay at home, implementing Large-Scale of Social Restrictions (PSBB) in certain areas, and campaigning healthy lifestyle. The pandemic period required adjustments in all sectors of life, including changes

<sup>1</sup> Wearing masks, Washing hands and Keeping distance

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<https://doi.org/10.20525/ijrbs.v10i5.1304>

in people's behavior, namely more time spent at home. Changes in behavior can also be seen from changes in behavior in communication, shopping, and social life in their communities.

The study of Nielsen said 82% of respondents were from the upper class said that they knew about Covid-19 in early February 2020. After the announcement of President Joko Widodo about the first Covid-19 case on March 2, 61% of respondents were looking for news related to Covid-19 to several times every day through various media channels. The study found that social media (80%), television news (77%) and online search engines (56%) are the most accessible sources of information to get the latest news about Covid-19. In another study released on Wednesday (8/4), Nielsen said that since the enactment of appeals to stay at home to prevent the spread of Covid-19, around 30% of consumers plan to shop more often. In terms of consumption, as many as 49% of consumers become more frequent cooking at home. This prompted the increase in the sale growth of staple needs such as eggs that increased by 26%, meat experienced a 19% sales increase, demand for poultry increased by 25%, and sales of fruit and vegetables increased by 8% (Nielsen, 2020).

In addition to Nielsen, the Alvara Research Center also conducted a survey on changes in people's behavior due to the Covid-19 pandemic, answered by 504 respondents spread from various regions whose survey was conducted online. The survey shows a high level of concern from the community, 94.9% of the public are worried that their family members are infected with Covid-19. In addition, 89.9% are worried about price increases and 61.8% are worried about the availability of food ingredients. While 63.3% are worried about losing their job, and 60.1% are worried about paying the installments. The majority of the public carry out the advice to stay at home, at most leaving the house only for 1-2 times a week. However, there is a tendency for groups of people with lower socioeconomic status to leave their homes at a higher frequency (Alvara Research Center, 2020).

The spread of the Covid-19 virus can be stopped depending on two things, firstly the accuracy and firmness of government policies, and secondly, discipline and active public participation in implementing social or physical distancing. Changes in community behavior needed in the application of health protocols to prevent and break the chain of Covid-19 outbreaks are in accordance with the policy direction from the President of the Republic of Indonesia regarding the adaptation of new habits towards a productive and safe community during the Covid-19 era, which in its implementation is guided by the Terms of Reference of Activities and Budget Plan for Covid-19 Handling Activities through the Behavior Change Program in the Implementation of Health Protocols, as well as controlling the implementation of activities and budgets usage (Satuan Tugas Penanganan Covid-19, 2020).

Several previous studies have discussed about the Changes in Community Behavior due to the Covid-19 Pandemic that occurred in many countries. Pan, et al. on 2020 conducted a study using an integrated dataset of real-time mobile device location data in the United States to evaluate changes in people's mobility patterns in the presence of the Covid-19 pandemic. It was found that government instructions and local severity had a significant effect on people's mobility (Pan *et al.*, 2020). Rawat *et al.* (2020) examined the impact of the Covid-19 pandemic on lifestyle behavior focusing on changes in diet, stress, sleep patterns, and activity levels of the population in India. The results showed that the population experienced mental stress, weight gain, decreased physical activity, and decreased sleep quality. The research shows the need for programs to improve lifestyles through the use of E-media platforms to disseminate health information. In addition, research on behavior change was also conducted by Lim, et al. which focuses on how public perception and trust in government communications affect the implementation of protective behavior in Singapore during the Covid-19 pandemic using a multivariable logistic regression model. The study concluded that 99.1% of the public agree that they trust information from official government sources. Government communication also affects people's protective behavior with the Covid-19 pandemic (Lim *et al.*, 2021).

The purpose of this research on the Analysis of Public Behavior Changes Related to the 3M Health Protocol during the Covid-19 Pandemic in Indonesia is to get an overview of the community's knowledge and understanding of Covid-19 and its sources of information, obtain an overview of community behavior in dealing with Covid-19, whether the community have implemented the 3M Health protocol during the Covid-19 pandemic, know what important factors influence changes in people's behavior to comply with health protocols, and provide recommendations as a basis for effective policies that can change people's behavior in order to cope with the Covid-19 pandemic. Beneficiaries of the research results on Changes in Community Behavior related to the Implementation of Health Protocols are the central government, local governments and the public in general. Meanwhile, the benefit of the results of this study is that it can be used as consideration for formulating a follow-up plan for implementing interventions to the society as an effort to encourage community compliance on the application of health protocols and encourage community resilience in dealing with the Covid-19 pandemic and its impacts.

## **Research and Methodology**

### **Test on the Relationship between Variables**

Analysis of survey data using several statistical methods, including to examine the relationship between variables, namely using the Chi-square test, and calculating the correlation between variables. To find out whether there is a relationship between two variables measured through multinomial sampling developed by Agresti, using the following statistic equation test (Agresti, 2002).

$$\chi^2 = \sum_i \sum_j \frac{(n_{ij} - \hat{\mu}_{ij})^2}{\hat{\mu}_{ij}}$$

where :  $\hat{\mu}_{ij} = n\hat{\pi}_{i+}\hat{\pi}_{+j} = n_{i+}n_{+j}/n$   
 $\hat{\mu}_{ij}$  = Expected value of  $i$ -th row,  $j$ -th column  
 $n_{ij}$  = Observed value of  $i$ -th row,  $j$ -th column  
 $n_{i+}$  = Observed value of  $i$ -th row  
 $n_{+j}$  = Observed value of  $j$ -th column

The relationship between variables also uses a correlation calculation based on Cramer's V chi-square (9) which is defined as follows.

$$V = \sqrt{\frac{\phi^2}{t}} = \sqrt{\frac{\chi^2}{nt}}$$

$$t = \min(r - 1, c - 1)$$

where  $r$  is the number of rows and  $c$  is the number of columns. Using information that takes into account the dimensions of the contingency table, Cramer's V corrects the problem where the correlation measures of the contingency tables for different row and column dimensions are difficult to compare. Cramer's V results 0 when there is no relationship between two variables, and generally has a maximum value of 1 regardless of table dimensions or sample size. A table with a high Cramer's V value can be considered to have a strong relationship between the variables and a small value indicates a weak relationship (Berry, Johnson & Mielke, 2018).

### 1. Correspondence Analysis

Correspondence analysis is a graphical method used to describe relationships in a contingency table. For a contingency table with  $I$  rows and  $J$  columns, the resulting plot will contain two types of points. A collection of points  $I$  which is a row and a collection of points  $J$  which is a column. The position of the point describes the relationship (Johnson & Winchen, 2007).

In the correspondence analysis, the matrix  $N$  with  $n_{ij}$  elements arranged in a two-dimensional contingency table measured as  $I \times J$ . The calculation of the  $P_{ij}$  matrix can be done through  $n_{ij}/n$ .

Row profile matrix:

Column profile matrix:

$$R = D_r^{-1}P^T = \begin{bmatrix} \tilde{r}_1^T \\ \vdots \\ \tilde{r}_I^T \end{bmatrix} \qquad C = D_c^{-1}P^T = \begin{bmatrix} \tilde{c}_1^T \\ \vdots \\ \tilde{c}_J^T \end{bmatrix}$$

Where:

$$D_r = \text{diag}(r_1, r_2, \dots, r_I)$$

$$D_c = \text{diag}(c_1, c_2, \dots, c_J)$$

$r$  = row vector and  $c$  = column vector from matrix  $P = (P_{ij})$ ,  $P_{ij} = n_{ij}/n$

The calculation of the Singular Value Decomposition (SVD) is to obtain the coordinates of the row and column profiles so that the correspondence analysis can be visualized in graphical form. The calculation of the SVD value can be done through the following equation.

$$P - rc^T = \sum_{k=1}^K \lambda_k (D_r^{-1/2}u_k)(D_c^{-1/2}v_k)^T$$

Where  $P - rc^T$  is the singular value of the general decomposition of the matrix  $P$ ,  $\lambda_k$  is the singular value which is the result of the square of the eigenvalues of the matrix  $P$ ,  $u_k$  vector with the size  $(I \times 1)$  and vector  $v_k$  with the size  $(J \times 1)$ , and the rank value ( $k$ ) represents the number of dimensional solutions in the matrix  $P$  with  $k=1,2,\dots$ , where  $I$  denotes the row profile and  $J$  represents the column profile with  $k = \min[(I - 1), (J - 1)]$ . While the equation in determining the row and column profile coordinates can be defined in the following equation:

Row profile coordinates :  $F = \lambda_k D_r^{-1/2}u_k$

Column profile coordinates :  $G = \lambda_k D_c^{-1/2}v_k$

**Multinomial Logistic Regression**

Multinomial logistic regression is a logistic regression used on data from *polychotomus* response variables or multinomial. The response variables used in multinomial logistic regression are derived from multinomial distributions. The multinomial distribution is a generalization of the binomial distribution with more than two or more categories with the distribution function as follows.

$$\Pr(y_1, y_2, \dots, y_k) = \frac{n!}{y_1! y_2! \dots y_k!} p_1^{y_1} p_2^{y_2} \dots p_k^{y_k}$$

where each  $y_i$  is the number of the  $i$ -th event,  $p_i$  is the probability of the  $i$  event occurring, and  $n$  is the number of events. In general, multinomial logistic regression is used to predict the probability of one category relative to other categories (Azen & Walker, 2011). In logistic regression, the addition of the response variable to more than two categories will result in an unclear logistic regression model, it is necessary to do modeling using multinomial logistic regression to overcome the addition of categories to the response variable (Christensen, 1997).

For example, the response variable with three categories, namely  $Y=1, 2, 3$ . One of the categories is used as a control/comparison variable. For response variables with  $k$  categories,  $k-1$  logit function is needed (Scott, Hosmer & Lemeshow, 2013). For the response variables with 3 categories, the logit function is stated as follows.

$$g_1(x) = \ln\left(\frac{p_1}{1 - p_1 - p_2}\right) = \mathbf{X}\vec{\beta}_1$$

$$g_2(x) = \ln\left(\frac{p_2}{1 - p_1 - p_2}\right) = \mathbf{X}\vec{\beta}_2$$

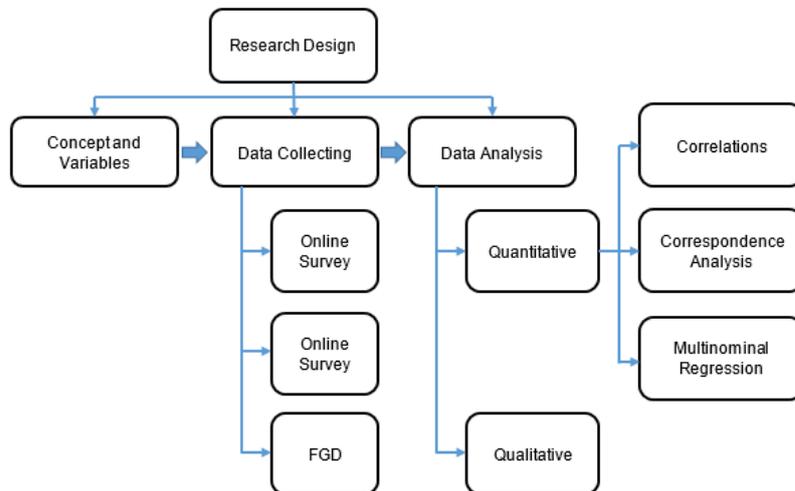
The conditional probabilities for each category generated based on the two logit functions as follows.

$$\Pr(y = 1 | x) = p_1 = \frac{1}{1 + \exp(\mathbf{X}\vec{\beta}_1) + \exp(\mathbf{X}\vec{\beta}_2)}$$

$$\Pr(y = 2 | x) = p_2 = \frac{\exp(\mathbf{X}\vec{\beta}_1)}{1 + \exp(\mathbf{X}\vec{\beta}_1) + \exp(\mathbf{X}\vec{\beta}_2)}$$

$$\Pr(y = 3 | x) = p_3 = \frac{\exp(\mathbf{X}\vec{\beta}_2)}{1 + \exp(\mathbf{X}\vec{\beta}_1) + \exp(\mathbf{X}\vec{\beta}_2)}$$

In general, the stages of the research can be described by a scheme as described in Figure 1 below.



**Figure 1:** Research Stages

**Data Collecting**

The data collecting methods used are online surveys, offline surveys and FGDs. The followings are explanations for each method.

**Online Survey**

Online survey is a method of collecting data by distributing online questionnaire links throughout the provinces. The online survey was conducted in all provinces in Indonesia with the target of 5,000 respondents.

Offline Survey

Offline survey is a method of collecting data with direct interviews with respondents in 13 selected provinces. The survey area was determined by selecting 13 provinces spread across western Indonesia, Java and eastern Indonesia as described in Figure 2.



**Figure 2:** Offline Survey Targets

In each targeted province, 2 to 5 regencies/cities were selected which are areas that have a high number of Covid-19 cases. Furthermore, 4 districts were selected in each selected regency/city based on the largest population. In each of the selected districts, a survey was conducted at 6 location points which are the locations of formal routine crowds (public service offices, schools, etc.) and informal routine crowds (markets, places of worship, tourist sites, food stalls, etc.). The number of offline survey samples can be seen in Table 1.

**Table 1:** Dependency Analysis Variables

No	Aspect	Variable
1	Compliance	3M health protocols compliance
2	Demographic	Last education Income
3	Knowledge	3M Health Protocols knowledge. Categorized as: a. Know b. Don't Know
4	Confidence in the Effectiveness of Health Protocols (3M)	Wearing masks Washing hands Keeping distances Categorized as: c. Ineffective d. Effective e. Very effective
5	Willingness to Implement Health Protocols (3M)	Wearing masks Washing hands Keeping distances Categorized as: f. unwilling g. willing h. eager

Descriptive analysis of the surveyed variables was followed by analysis of the relationship between variables using the dependency test (chi-square test), correlation, and correspondence analysis using the formulas 1), 2) and 3). Furthermore, multinomial regression analysis was conducted to determine the factors that affect people's compliance to the implementation of health protocols by applying formulas 4) and 5) which are described in the literature review section.

In this research, qualitative analysis was focused on analyzing the data obtained from three types of data collection methods used in this study, namely open-ended question questionnaires, observations, and Focus Group Discussion (FGD) data collection methods. The qualitative data analysis strategy used is using content analysis. Content analysis is a systematic analysis of content (eg, who says what, to whom, why, to what extent and with what effect) in quantitative or qualitative planning (12).

## Result and Discussion

The results of data analysis obtained from online and offline surveys and Focus Group Discussions (FGD). The results of the analysis are presented for the national region and each province surveyed covering aspects of knowledge, compliance, confidence, and willingness to apply the 3M health protocols.

### Respondent Characteristics

The majority of respondents of the online survey are students, aged 17-25 years, unmarried, with the last education of high school/equivalent and female. Meanwhile, the majority of offline survey respondents are self-employed, aged 26-40 years, are married, have a high school education / equivalent and male.

In 3 regions, namely Java, West Indonesia, and East Indonesia, the majority of respondents from the online survey are students, female, and unmarried. Meanwhile, the majority of offline survey respondents are male, work as entrepreneurs, and are married. In Java and Eastern Indonesia, the majority of online survey respondents are 17-25 years old and have the latest high school education / equivalent, while the majority of offline survey respondents are 25-40 years old and have high school education / equivalent. In Western Indonesia, the majority of online survey respondents have a bachelor's degree, while the majority of offline survey respondents have high school education / equivalent and in that area the majority of respondents are 17-25 years old, the table of respondent characteristics can be seen in Appendix 1.

The main observation points surveyed are the locations of non-formal activities, namely the market (22.3%) with the intensity of the crowd categorized as "crowded". Other locations surveyed were cafes/coffee shops/hangouts (16%), offices (11.5%), city parks/town square (8.1%) and mosques (8.5%).

**Table 2:** Characteristics of Observation Locations in 3 Regions

No	Regions	Type of Location	Crowd Intensity
<b>Non formal</b>			
1	Java	Markets, cafes, hangouts, town square,	Crowded (61%)
2	West Indonesia	mosques, restaurants etc.	Crowded (55%)
3	East Indonesia		Crowded (58%)
<b>Formal</b>			
1	Java	Post Office,	Crowded (56%)
2	West Indonesia	Banks, Public Health Center, Hospitals	Crowded (55%)
3	East Indonesia	etc.	Crowded (56%)

Based on Table 2, it can be seen that about 50% of the observed non-formal activity locations are crowded. This also applies to the 3 observed regions, namely Java, West Indonesia, and East Indonesia.

### Knowledge About 3M Health Protocol and Confidence in its Effectiveness

From the survey results, the majority of the community already knows about the 3M health protocol as described in Table 3. Results Sources of information about health protocols were obtained mainly from social media, TV, and online media (the 3 biggest sources of information). There is a slight difference in the western part of Indonesia, where places of worship ranked third. Meanwhile, based on an offline survey, the media that are always in the top three for getting information about the implementation of health protocols are TV, social media, and posters/banners/billboards.

**Table 3:** Observation Results of Knowledge of 3M Protocols in 3 Regions

Region	Knowledge of 3M Protocols	
	Online	offline
Java	Know (99,13%)	Know (97,87%)
West Indonesia	Know (99,05%)	Know (98,24%)
East Indonesia	Know (97,22%)	Know (97,94%)

Approximately 70% of the public believes that the implementation of the health protocols (keep your distance, avoid crowds, avoid shaking hands, wash your hands for 20 seconds with soap, using hand sanitizer / disinfectant, and wear a mask) is effective in the covid-19 prevention.

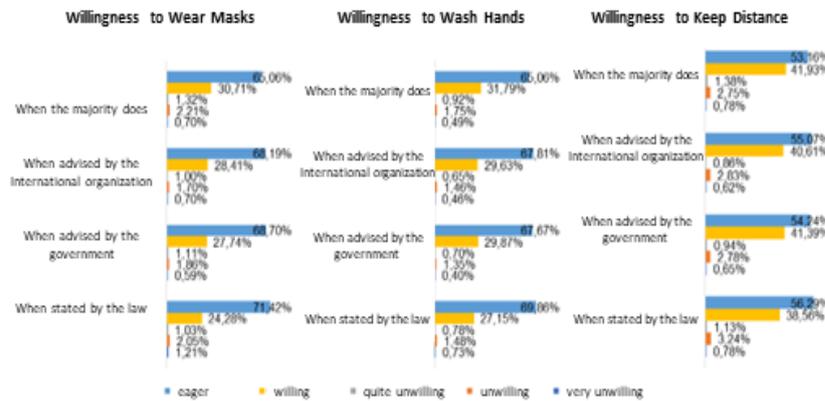
**Table 4:** Confidence in Effectiveness

Region	Confidence in 3M's Effectiveness	
	Online	Offline
<b>National</b>	Sure (76,75%)	Sure (74,00%)
<b>Java</b>	Sure (77,42%)	Sure (75,10%)
<b>West Indonesia</b>	Sure (80,55%)	Sure (76,20%)
<b>East Indonesia</b>	Sure (74,65%)	Sure (73,00%)

As many as 30% of respondents think that health protocols are ineffective in preventing the spread of covid-19, the majority are students, aged 17-25 years, unmarried, with high school education/equivalent and male.

**Compliance in Implementing 3M Health Protocols**

The level of compliance in the implementation of health protocols nationally and by region (Java, East Indonesia, West Indonesia) shows similarities where the highest compliance in the implementation of the protocols is wearing masks. While the level of compliance is low in the implementation of the protocols to keep the distance (see Figure 3).



**Figure 3:** Willingness to Implement 3M

The majority of respondents are eager to apply the 3M health protocols for the following reasons: 1) if a lot of people do it; 2) suggested by international organizations; 3) required by the government; and 4) if there are legal sanctions. Respondents who stated that they were eager to keep their distance had a lower percentage compared to the percentage who were eager to wear masks or wash their hands.

The most difficult thing to comply with is avoiding crowds. The results of the correspondence analysis to determine the form of the relationship between locations indicated by the location of crowding can be seen in Figure 4. It can be seen that there are still many people gather in markets and shopping places, which is marked by a line that coincides between the clustered category and the market/ shopping place category.

Similar conditions throughout the study areas, many people congregate in means of transportation / public transportation and do not congregate in places to eat and places of work / school / campus. In the western part of Indonesia, many people adhere to the protocol for washing hands in places to eat.

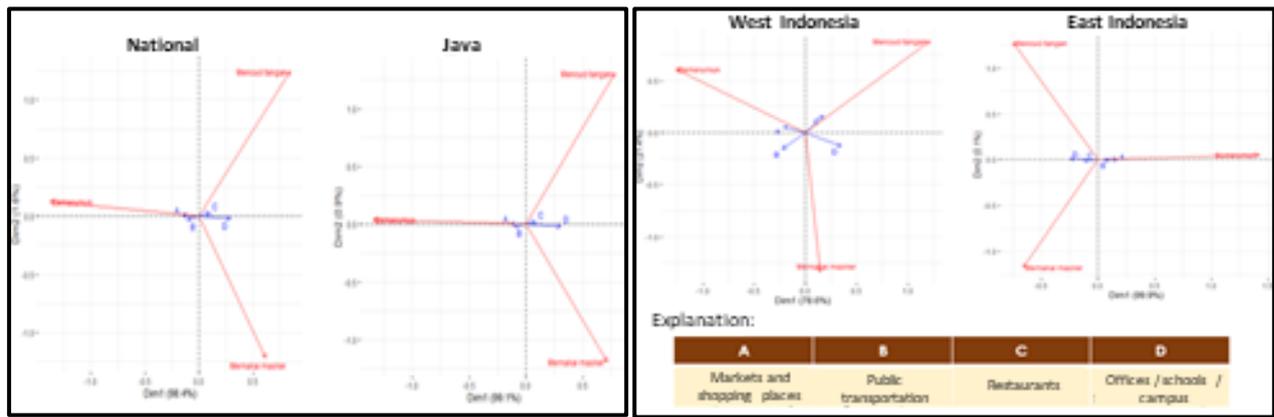


Figure 4: Correspondence Analysis

What should be done so that the community adheres to the health protocols? Based on the survey, the majority of respondents stated that the most influential/effective sanction for violators of the 3M health protocol is the fine imposed. In addition to fines, the other 2 most respondent’s answers regarding sanctions that are considered influential/effective in online surveys are sanctions for being prohibited from entering/using vehicles and going home, while in offline surveys are physical sanctions and being given a warning.

Role models who are considered influential on compliance with the health protocols in the family are the head of the family, mother or father, community/customary leaders, the head of the neighborhood association is a role model in the village environment, and friends and office leaders as role models in the work environment, colleagues as role models in the social environment, visualization can be seen in Table 6 below

Table 5: Percentage of Role Models

Region	Survey Method	Role Model			
		Family Stage	Village Environment	Office Environment	Social Environment
Java	Online	Mother (72,87%)	head of the neighborhood (46,83%)	Colleagues (66,05%)	-
	Offline	Father (30%)	head of the neighborhood (40%)	Working partners (29%)	Friends/pals (52%)
West Indonesia	Online	Mother (74,05%)	community/customary leaders (56,19%)	Office leaders (63,57%)	-
	Offline	Father (32%)	head of the neighborhood (40%)	Office leaders (27%)	Friends/pals (50%)
East Indonesia	Online	Mother (71,37%)	community/customary leaders (58,23%)	Colleagues (53,79%)	-
	Offline	Father (33%)	head of the neighborhood (36%)	Office leaders (29%)	Friends/pals (50%)

Focus Group Discussion (FGD) Results

The summary of the FGD’s results in all provinces in the region obtained proposed solutions related to changes in community behavior as follows.

- i. Affirmation of strict and harmonized regulations/laws from the center to the regions, legal sanctions and rewards.
- ii. Socialization through online media or directly to the public in the disclosure about the health impacts of covid-19, the exposure about the consequences of the risk, which is a clear and straightforward visualization, as well as the proper use of language.
- iii. Socializing things about germs, viruses, and hygiene as early as possible. Massive socialization and continuous collaboration with role models (society, religion, custom, community).
- iv. Packaging the 3M protocol into a non-coercive action.
- v. Government officials or leaders must be role models in implementing health protocols and behavior change.
- vi. Efforts to increase compliance must be accompanied by the addition of health protocol equipment facilities.
- vii. Minimize false news or hoaxes.

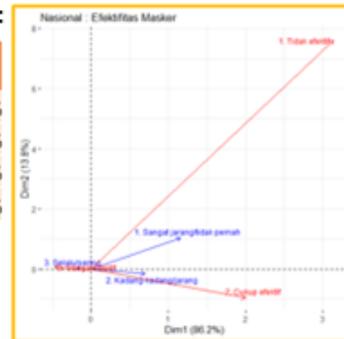
**Analysis of the Relationship between Compliance with Demographic Variables, Knowledge, Confidence on the Effectiveness of 3M, and Willingness to Do 3M**

Based on the chi-square test result, it can be seen that in all regions, the confidence in the effectiveness of 3M has a significant relationship with compliance. The following is a contingency table (in percent) for confidence in 3M's effectiveness and compliance. Figure 5 below shows a contingency table for confidence in the 3M's effectiveness and compliance.

**Confidence in the Effectiveness of Wearing Masks:**

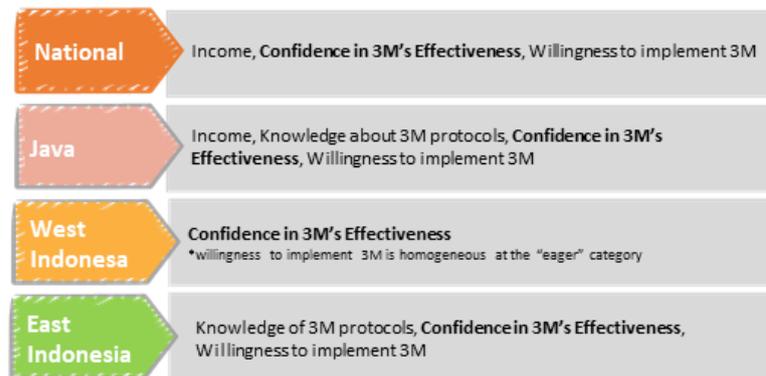
Compliance	Effective	Quite Effective	Very Effective	Total
Very seldom/never	0,32%	0,70%	0,76%	1,78%
Sometimes/seldom	0,57%	8,07%	10,20%	18,83%
Always/often	0,57%	8,09%	70,72%	79,38%
Total	1,46%	16,86%	81,68%	100,00%

**Chi-square test: significant with p.value ≈ 0,000**  
 There is a relationship between the confidence in the effectiveness of wearing masks with the compliance level in implementing 3M protocols



**Figure 5 :** Chi-Square Test on Confidence towards 3M's Effectiveness

The following are variables that have a significant relationship with compliance in each region.

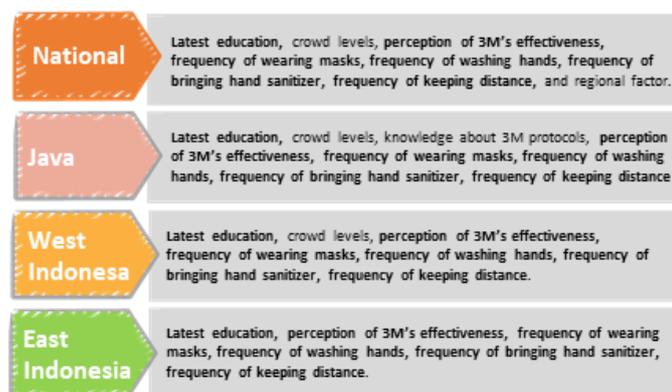


**Figure 6:** Significant Variables Associated with Compliance

The crowd level variable is taken from the results of an offline survey. Because the process of combining the results of this survey takes time, this study uses data that has been successfully combined, namely a number of 1560 observations.

The method used to determine the relationship between 2 categorical variables is a variable dependency test using the chi-square test ( $\alpha=10\%$ ). The following are the results of the chi-square test in each region.

Therefore, the variables that have a significant relationship with the level of compliance (perception level of 3M's importance) in each region are as follows.



**Figure 7:** Variables that are Significantly Associated with Compliance from Offline survey data

Based on the results of the chi-square test, it can be seen that in all regions, last education, perception in effectiveness of 3M, frequency of wearing masks, frequency of washing hands, frequency of carrying hand sanitizer, and frequency of keeping a distance have a significant relationship with the level of compliance (perception in the importance of 3M). In addition, there are also found dependencies between other predictor variables. Although the variables influence each other, the correlation between the variables is not strong because the correlation coefficient is less than 0.5.

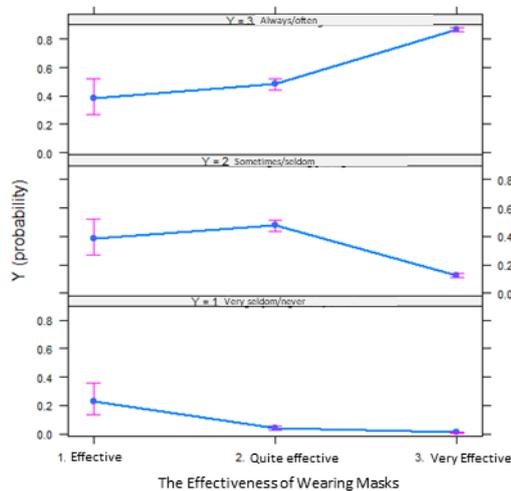
**Multinomial Regression: Analysis of Factors Affecting Compliance**

Furthermore, multinomial regression analysis was carried out in stages to determine the factors that affect compliance. By using formulas 4 and 5, the multinomial regression results are obtained as summarized in Table 6, the details of which can be seen in Appendix 2. The variables that affect compliance for the 4 regions are as follows.

**Table 6:** Variables that Affect Compliance

	National	Java	West Indonesia	East Indonesia
<b>Knowledge in 3M health protocols</b>	v	v	v	
<b>Confidence in Effectiveness</b>				
<b>i. 3M health protocols</b>	v	v	v	
<b>j. Washing hands</b>	v	v		
<b>k. Keeping distance</b>	v	v		
<b>l. Wearing mask</b>		v	v	v
<b>Willingness to wash hands</b>	v			
<b>Willingness to keep distance</b>	v			

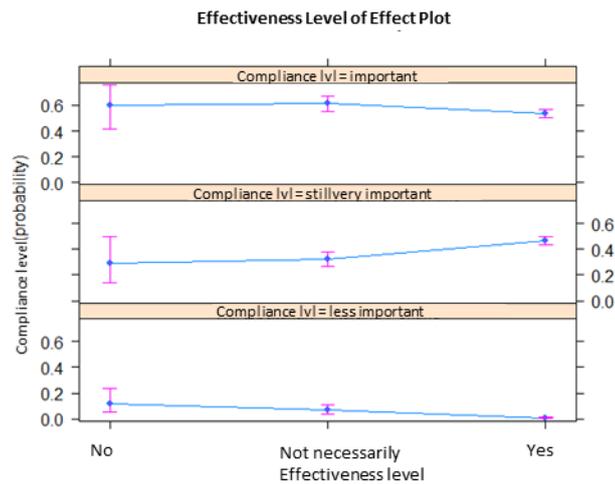
Based on the table above, it can be seen that for all regions, the confidence in the effectiveness of wearing masks is also significant and directly affects compliance of 3M. This is also in accordance with the results of the dependency test using chi-square. Furthermore, analysis of the effect plot and odds ratio of the model formed is performed.



**Figure 8:** Effect Plot of Model Formed

In general, the higher the perception of the confidence in the effectiveness of 3M, the more compliant it will be to run the 3M protocol. This applies to national, as well as in Java, West Indonesia, and East Indonesia.

Based on the odds ratio calculation, it can be seen that nationally, people who think masks are very effective in preventing covid have a tendency to always obey 53.49 times greater than people who think masks are not effective in preventing covid. For the Java area it was 54.72 times, in the West Indonesia area it was 69.41 times and in the East Indonesia it was 51.08 times higher compared to people who considered masks to be ineffective in preventing covid.



**Figure 9:** *Effect Plot of Model Formed (Offline Survey)*

While the regression model to find out the variables that have a significant effect on the belief that the health protocols are important to implement is the perception of the effectiveness level of the 3M program and the frequency of wearing masks. The interpretation of the model is:

- i. People who consider the 3M health protocols to be effective have a 20 times greater belief that 3M is important to implement compared to those who consider the 3M to be less effective in preventing COVID-19
- ii. People who consider the 3M health protocols to be effective in preventing COVID-19 have 37 times greater belief that the 3M is important to implement compared to people who consider the 3M to be less important.
- iii. People who always wear masks have 27 times greater belief that 3M health protocols are important to implement compared to people who consider 3M to be less important.
- iv. People who always wear masks have 66 times greater belief that the 3M health protocol is still important to implement than people who consider the 3M program to be less important.

In the same way, the multinomial regression model was also applied to data analysis for each study area, Java, Western Indonesia and Eastern Indonesia. In Java, education is very influential on the belief that health protocol is important. People with higher education are 996 times more likely to believe that the 3M health protocol is important to implement compared to people who did not graduate from elementary school. People who live in crowded places have a tendency to comply with the 3M program 14.6 times greater than people who live in quiet places. Completely presented in Appendix 2.

## Conclusions

Based on the analysis of the data of two types of surveys, it was found that the online and offline surveys gave consistent results, namely:

There is a very significant relationship between knowledge of the health protocols, the level of confidence in the effectiveness of 3M, and compliance with the 3M health protocols.

- a. The higher the confidence in the effectiveness of 3M protocols, the higher the willingness to implement the 3M protocols. People who consider the 3M health protocols to be effective have a 20 times greater belief that 3M health protocol is important to implement compared to those who think that the 3M is less effective in preventing COVID-19. People who think that the 3M health protocol is effective in preventing COVID-19 have 37 times greater belief that the 3M protocols are important to implement compared to people who consider the 3M protocol less important.
- b. The higher the willingness to implement the 3M protocols, the more compliance to implement 3M. People who always wear masks have 27 times greater belief that 3M health protocols are important to implement compared to people who consider 3M protocols to be less important.
- c. People who always wear masks have 66 times greater belief that the 3M protocols are still important to implement than people who consider the 3M protocols to be less important.

Social media, TV, and online media are in the top three as media to get information about the importance of implementing health protocols. However, in Western Indonesia, places of worship ranked third.

Crowds occur in markets, shopping areas, and public transportation. Hand washing compliance is subject to the availability of hand washing facilities. Obstacle in wearing mask is because they find it difficult to breathe.

The FGD results show that there is local wisdom regarding changes in behavior in compliance with the 3M protocols, community leaders, government officials are people who are always proposed to be role models.

This study recommends that:

- i. The strategy to increase public compliance so that they want to implement the health protocols should start from providing massive knowledge to the entire community about COVID-19 and the 3M Health protocol. Next is to convince the whole community, especially those who are not sure about the effectiveness of implementing the health protocols to break the chain of spread of covid-19. It should be noted that the group of people who do not believe in the effectiveness of 3M, which is dominated by male respondents, aged between 17-40 years, with the latest education being high school/equivalent, married, and working as an entrepreneur.
- ii. Increasing confidence in the effectiveness of the 3M health protocols is carried out by providing correct information and in accordance with the characteristics of community groups according to the media that is often accessed.
- iii. In order to improve compliance to implement 3M with an increase in crowd control by the officer or manager of a location / public facilities and the imposition of the fines.
- iv. Local wisdom becomes a major factor for increasing the willingness and compliance to implement 3M in the region.
- v. The availability of hand washing facilities is very important so that people obedient to wash hands.
- vi. Continuous monitoring and social control are needed to monitor and enforce public compliance in implementing health protocols.

## References

- A. R. Center (2020). Tahun yang Mengubah Arah Peradaban Manusia. Desember 2020. (Online). Available: <http://alvara-strategic.com/wp-content/uploads/2020/12/Catatan-Akhir-Tahun-Alvara-2020.pdf>.
- Agresti, A. (2002) *Categorical Data Analysis*. 2nd Edition, John Wiley & Sons, Inc., New York, 320-332. <http://dx.doi.org/10.1002/0471249688>
- Azen, R., & Walker, C. M. (2011). *Categorical data analysis for the behavioral and social sciences*. In *Categorical Data Analysis for the Behavioral and Social Sciences*. <https://doi.org/10.4324/9780203843611>
- Berry, K.J., Johnston, J.E., & Mielke, P.W. (2018). The Measurement of Association: A Permutation Statistical Approach.
- Christensen, R. (1997). Log-Linear Models and Logistic Regression. *Technometrics*, 40(3). <https://doi.org/10.2307/1271206>
- Johnson, R. A., & Wichern, D. W. (2007). *Applied multivariate statistical analysis*. Upper Saddle River, N.J: Pearson Prentice Hall.
- K. K. R. Indonesia, (2020). Kesiapsiagaan menghadapi Infeksi COVID-19, 2020. (Online). Available: <https://www.kemkes.go.id/article/view/20012900002/Kesiapsiagaan-menghadapi-Infeksi-Novel-Coronavirus.html>. (Accessed September 2020).
- Lim, V. W., Lim, R. L., Tan, Y. R., Soh, A. S. E., Tan, M. X., Othman, N. B., Dickens, S. B., Thein, T. L., Lwin, M. O., Ong, R. T. H., Leo, Y. S., Lee, V. J., & Chen, M. I. C. (2021). Government trust, perceptions of covid-19 and behaviour change: Cohort surveys, singapore. *Bulletin of the World Health Organization*, 99(2). <https://doi.org/10.2471/BLT.20.269142>
- Pan, Y., Darzi, A., Kabiri, A., Zhao, G., Luo, W., Xiong, C., & Zhang, L. (2020). Quantifying human mobility behaviour changes during the COVID-19 outbreak in the United States. *Scientific Reports*, 10(1), 20742. <https://doi.org/10.1038/s41598-020-77751-2>
- Rawat, D., Dixit, V., Gulati, S., Gulati, S., & Gulati, A. (2021). Impact of COVID-19 outbreak on lifestyle behaviour: A review of studies published in India. *Diabetes & metabolic syndrome*, 15(1), 331–336. <https://doi.org/10.1016/j.dsx.2020.12.038>
- S. Covid-19 (2020). covid.19.go.id, 2020. (Online). Available: <https://covid19.go.id/peta-sebaran>. (Accessed 22 September 2020).
- Satuan Tugas Penanganan Covid-19, Pedoman Perubahan Perilaku Penanganan Covid-19, Jakarta, 2020.
- Scott, A. J., Hosmer, D. W., & Lemeshow, S. (2013). *Applied Logistic Regression*. *Biometrics*, 47(4). <https://doi.org/10.2307/2532419>
- T. N. Company( 2020). Berpacu dengan Covid-19 : Melihat Lebih dalam Bagaimana Kondisi Indonesia Bereaksi terhadap Virus, The Nielsen Company, April 2020. (Online). Available: <https://www.nielsen.com/id/id/insights/article/2020/berpacu-dengan-covid-19-melihat-lebih-dalam-bagaimana-konsumen-indonesia-bereaksi-terhadap-sang-virus/>.

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**Appendix 1:** Characteristics of Respondents 3 Regions

Regions	Gender	Age	Last Education		Profession	Married Status
<b>Java</b>	Female (58,15%)	1-25 (65,40%)	High (47,54%)	School	Student (51,60%)	Not married (73,31%)
	Male (59,80%)	25-40 (35,16%)	High (56,68%)	School	Entrepreneur (30%)	Married (60,72%)
<b>West Indonesia</b>	Female (52,38%)	17-25 (43,10%)	Sarjana (48,57%)		Student (31,19%)	Not married (58,81%)
	Male (61,1%)	17-25 (33,87%)	High (59,68%)	School	Entrepreneur (31%)	Married (61%)
<b>East Indonesia</b>	Female (61,64%)	17-25 (76,51%)	High (64,14%)	School	Student (64,14%)	Not married (80,82%)
	Male (59,5%)	25-40 (35,38%)	High (54,83%)	School	Entrepreneur (30%)	Married (58,43%)

**Appendix 2:** Multinomial Regression Results

*Multinomial Regression Models National (Offline Surveys)*

Tingkat Kepentingan		Koefisien	Exp (Koefisien)	P-Value	Keputusan ( $\alpha=10\%$ )
Penting	<i>Intercept</i>	-4,797	0,008		
	Tingkat Efektifitas: Belum tentu	0,633	1,882	0,281	Tidak ada hubungan
	<b>Tingkat Efektifitas: Iya</b>	<b>3,619</b>	<b>37,288</b>	<b>0,000</b>	<b>Ada hubungan</b>
	Masker: Sangat jarang	0,600	1,823	0,678	Tidak ada hubungan
	<b>Masker: Kadang-kadang</b>	<b>2,576</b>	<b>13,142</b>	<b>0,071</b>	<b>Ada hubungan</b>
	<b>Masker:Selalu</b>	<b>4,191</b>	<b>66,120</b>	<b>0,004</b>	<b>Ada hubungan</b>
	Cuci: Kadang-kadang	1,234	3,434	0,223	Tidak ada hubungan
	Cuci: Sering	1,663	5,276	0,115	Tidak ada hubungan
	Handsanitizer: kadang-kadang	0,101	1,106	0,774	Tidak ada hubungan
	Handsanitizer: selalu	0,860	2,364	0,158	Tidak ada hubungan
	Jarak: kadang-kadang	0,089	1,093	0,857	Tidak ada hubungan
	Jarak: selalu	0,938	2,556	0,178	Tidak ada hubungan
	Wilayah: timur	0,303	1,353	0,635	Tidak ada hubungan
	Wilayah: barat	-0,127	0,881	0,700	Tidak ada hubungan
Kurang Penting	<i>Intercept</i>	-0,929	0,395		
	Tingkat Efektifitas: Belum tentu	0,539	1,715	0,218	Tidak ada hubungan
	<b>Tingkat Efektifitas: Iya</b>	<b>3,020</b>	<b>20,482</b>	<b>0,000</b>	<b>Ada hubungan</b>
	Masker: Sangat jarang	0,710	2,034	0,401	Tidak ada hubungan
	<b>Masker: Kadang-kadang</b>	<b>2,156</b>	<b>8,636</b>	<b>0,015</b>	<b>Ada hubungan</b>

*Multinomial Regression Models National (Offline Surveys)*

Tingkat Kepentingan		Koefisien	Exp (Koefisien)	P-Value	Keputusan ( $\alpha=10\%$ )
Penting	<b>Masker:Selalu</b>	<b>3,317</b>	<b>27,574</b>	<b>0,000</b>	<b>Ada hubungan</b>
	Cuci: Kadang-kadang	-0,432	0,649	0,535	Tidak ada hubungan
	Cuci: Sering	-0,430	0,650	0,571	Tidak ada hubungan
	Handsanitizer: kadang-kadang	0,215	1,240	0,525	Tidak ada hubungan
	Handsanitizer: selalu	0,34	1,405	0,573	Tidak ada hubungan
	Jarak: kadang-kadang	0,046	1,047	0,914	Tidak ada hubungan
	Jarak: selalu	0,371	1,449	0,574	Tidak ada hubungan
	Wilayah: timur	0,063	1,065	0,92	Tidak ada hubungan
	Wilayah: barat	-0,509	0,601	0,108	Tidak ada hubungan

*Multinomial Regression Models Java (Offline Surveys)*

	Tingkat Kepentingan	Koefisien	Exp (Koefisien)	P-Value	Keputusan ( $\alpha=10\%$ )
Masih Penting	Intercept	-13,412	0,000		
	Pendidikan: SD/SMP	-2,260	0,104	0,170	Tidak ada hubungan
	Pendidikan: SMU/ sederajat	-0,612	0,542	0,706	Tidak ada hubungan
	Pendidikan: sarjana	0,136	1,146	0,944	Tidak ada hubungan
	Pendidikan: Pascasarjana	6,904	996,222	0,000	<b>Ada hubungan</b>
	Tingkat Keramaian: ramai	1,462	4,314	0,338	Tidak ada hubungan
	Tingkat keramaian: sangat ramai	<b>1,853</b>	6,376	0,242	Tidak ada hubungan
	Tingkat Efektifitas: Belum tentu	0,235	1,266	0,824	Tidak ada hubungan

Multinomial Regression Models Java (Offline Surveys)

	Tingkat Kepentingan	Koefisien	Exp (Koefisien)	P-Value	Keputusan ( $\alpha=10\%$ )
Masih Penting	<b>Tingkat Efektifitas: Iya</b>	<b>5,619</b>	<b>275,724</b>	<b>0,001</b>	<b>Ada hubungan</b>
	Masker: Sangat jarang	<b>-24,695</b>	0,000	0,000	
	<b>Masker: Kadang-kadang</b>	<b>11,148</b>	$6,943 \times 10^4$	<b>0,000</b>	<b>Ada hubungan</b>
	<b>Masker:Selalu</b>	12,659	$3,147 \times 10^5$	<b>0,000</b>	<b>Ada hubungan</b>
	Handsantizer: kadang-kadang	-0,520	0,594	0,371	Tidak ada hubungan
	Handsantizer: selalu	16,902	$2,190 \times 10^7$	0,000	
	Jarak: kadang-kadang	0,627	1,872	0,584	Tidak ada hubungan
	Jarak: selalu	21,495	$2,164 \times 10^9$	0,000	<b>Ada hubungan</b>
Penting	Intercept	-21,238	0,000		
	Pendidikan: SD/SMP	-0,601	0,548	0,681	Tidak ada hubungan
	Pendidikan: SMU/ sederajat	0,585	1,795	0,685	Tidak ada hubungan
	Pendidikan: sarjana	0,957	1,605	0,592	Tidak ada hubungan
	Pendidikan: Pascasarjana	-11,871	0,000	0,000	<b>Ada hubungan</b>
	Tingkat Keramaian: ramai	2,683	14,636	0,076	<b>Ada hubungan</b>
	Tingkat keramaian: sangat ramai	2,828	16,914	0,071	<b>Ada hubungan</b>
	Tingkat Efektifitas: Belum tentu	0,305	1,357	0,665	Tidak ada hubungan
	<b>Tingkat Efektifitas: Iya</b>	<b>4,515</b>	<b>91,379</b>	<b>0,003</b>	<b>Ada hubungan</b>
	Masker: Sangat jarang	18,232	$8,283 \times 10^7$	0,000	<b>Ada hubungan</b>
	<b>Masker: Kadang-kadang</b>	<b>19,854</b>	$4,193 \times 10^8$	<b>0,000</b>	<b>Ada hubungan</b>
	<b>Masker:Selalu</b>	<b>20,733</b>	$1,01 \times 10^9$	<b>0,000</b>	<b>Ada hubungan</b>
	Handsantizer: kadang-kadang	-0,469	0,626	0,379	Tidak ada hubungan
	Handsantizer: selalu	16,292	$1,189 \times 10^7$	0,000	
	Jarak: kadang-kadang	-0,287	0,750	0,723	Tidak ada hubungan
	Jarak: selalu	19,774	$3,869 \times 10^8$	0,000	<b>Ada hubungan</b>

Multinomial Regression Models West Indonesia (Offline Surveys)

Persepsi Tingkat Kepentingan 3M	Masih Penting		Penting	
Variabel Prediktor	Koefisien	P-Value	Koefisien	P-Value
<i>Intercept</i>	-381,958		898,420	
<b>Usia: 17-25</b>	-624,698	0	-626,185	0
<b>Usia: 26-40</b>	-170,713	0	-171,227	0
<b>Usia: &gt;40</b>	271,575	0	270,763	0
<b>Pendidikan: SD/SMP</b>	42,963	0	41,211	0
<b>Pendidikan: SMU/ sederajat</b>	337,185	0	335,388	0
<b>Pendidikan: sarjana</b>	-183,681	0	-185,936	0
<b>Pendidikan: Pascasarjana</b>	-284,540	0	254,639	0
<b>Protokol 3M: Ya</b>	-2045,877	0	-2044,211	0
<b>Tingkat Efektifitas: Belum tentu</b>	742,986	0	608,146	0
<b>Tingkat Efektifitas: Iya</b>	1092,794	0	957,410	0
<b>Masker: Sangat jarang</b>	1509,344	0	1510,527	0
<b>Masker: Kadang-kadang</b>	1120,387	0	1120,115	0
<b>Masker:Selalu</b>	996,355	0	995,619	0
<b>Cuci: kadang-kadang</b>	899,355	0	-243,227	0
<b>Cuci: sering</b>	515,561	0	-627,489	0

*Multinomial Regression Models West Indonesia (Offline Surveys)*

Persepsi Tingkat Kepentingan 3M	Masih Penting		Penting	
Variabel Prediktor	Koefisien	P-Value	Koefisien	P-Value
<b>Hand sanitizer: kadang-kadang</b>	68,424	0	68,081	0
<b>Hand sanitizer: selalu</b>	555,748	0	555,033	0
<b>Jarak: kadang-kadang</b>	457,944	0	458,114	0
<b>Jarak: selalu</b>	194,463	0	193,688	0

*Multinomial Regression Models East Indonesia (Offline Surveys)*

Tingkat Kepentingan	Koefisien	Exp (Koefisien)	P-Value	Keputusan ( $\alpha=10\%$ )
<i>Intercept</i>	-12,219	0,000		
Protokol 3M: Ya	-1,814	0,163	0,215	Tidak ada hubungan
Tingkat Efektifitas: Belum tentu	1,257	0,3515	0,123	Tidak ada hubungan
<b>Tingkat Efektifitas: Iya</b>	<b>3,538</b>	<b>34,387</b>	<b>0,000</b>	<b>Ada hubungan</b>
<b>Masker: Sangat jarang</b>	<b>11,892</b>	<b>146076,010</b>	<b>0,000</b>	<b>Ada hubungan</b>
<b>Masker: Kadang-kadang</b>	<b>13,489</b>	<b>721116,830</b>	<b>0,000</b>	<b>Ada hubungan</b>
<b>Masker:Selalu</b>	<b>15,356</b>	<b>4665236,326</b>	<b>0,000</b>	<b>Ada hubungan</b>
Cuci: Kadang-kadang	-0,763	0,0466	0,637	Tidak ada hubungan
Cuci: Sering	-0,331	0,718	0,843	Tidak ada hubungan
Hand sanitizer: kadang-kadang	0,763	2,146	0,165	Tidak ada hubungan
Hand sanitizer: selalu	0,309	1,362	0,654	Tidak ada hubungan
<i>Intercept</i>	-0,046	0,955		
<b>Protokol 3M: Ya</b>	<b>-2,609</b>	<b>0,074</b>	<b>0,065</b>	<b>Ada hubungan</b>
<b>Tingkat Efektifitas: Belum tentu</b>	<b>1,611</b>	<b>5,010</b>	<b>0,036</b>	<b>Ada hubungan</b>
<b>Tingkat Efektifitas: Iya</b>	<b>3,813</b>	<b>45,284</b>	<b>0,000</b>	<b>Ada hubungan</b>
Masker: Sangat jarang	1,901	6,693	0,293	Tidak ada hubungan
<b>Masker: Kadang-kadang</b>	<b>3,622</b>	<b>37,407</b>	<b>0,048</b>	<b>Ada hubungan</b>
<b>Masker:Selalu</b>	<b>5,070</b>	<b>159,176</b>	<b>0,007</b>	<b>Ada hubungan</b>
Cuci: Kadang-kadang	-1,849	0,157	0,215	Tidak ada hubungan
Cuci: Sering	-2,362	0,094	0,127	Tidak ada hubungan

*Multinomial Regression Models East Indonesia (Offline Surveys)*

	<b>Tingkat Kepentingan</b>	<b>Koefisien</b>	<b>Exp (Koefisien)</b>	<b>P-Value</b>	<b>Keputusan (<math>\alpha=10\%</math>)</b>
<b>Penting</b>	<b>Hand sanitizer: kadang-kadang</b>	<b>1,056</b>	<b>2,876</b>	<b>0,051</b>	<b>Ada hubungan</b>
	Hand sanitizer: selalu	0,073	1,075	0,917	Tidak ada hubungan