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Original Article

Using Causal Attitude Network Model to Analyze the Factors Affecting Public Attitude and Acceptance of COVID-19 and Vaccination in Indonesia

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ABSTRACT

Introduction: Attitudes about COVID-19 relate to cognitions, feelings, and behaviors regarding the pandemic and vaccination, as well as other factors, such as demographic characteristics, and health- related information. This research uses the Causal Attitude Network (CAN) model to measure attitudes and acceptance of COVID-19 vaccination among 1385 Indonesian people from 15 cities.
Methods: Data was obtained from instruments that made in the Netherlands and adapted to the Indonesian language and culture. This research integrates psychometrics with network analysis, an advanced implementation of the field of Statistics to reveal the interaction between psychological factors that shape people's attitudes towards COVID-19 and vaccination in Indonesia. Data analysis used JASP, an open-source statistical analysis software.
Results: From this research, it was found that attitude elements regarding trust in vaccine development and awareness of the importance of vaccines in Indonesian society have a high influence on other attitude elements. Attitude elements regarding the habit of wearing masks and awareness about the importance of the COVID-19 vaccine are the attitude elements that have the highest impact on changing other attitude elements.
Conclusion: Two attitude elements, trust and awareness, most influence other attitude elements. Trust in the development of the COVID-19 vaccine is related to trust in the experts developing it. In other words, increasing public confidence in the development of a science-appropriate COVID-19 vaccine will be in line with increasing public trust in COVID-19 vaccine developers, and vice versa.

Introduction

We have been living in the COVID-19 pandemic for almost three years. In the beginning of the study, based on data obtained from the link made by John Hopkins University, as seen in Figure 1. Indonesia was in the 19th highest position. According to the World Health Organization (WHO), the percentage of deaths from COVID-19 in Indonesia is very high and

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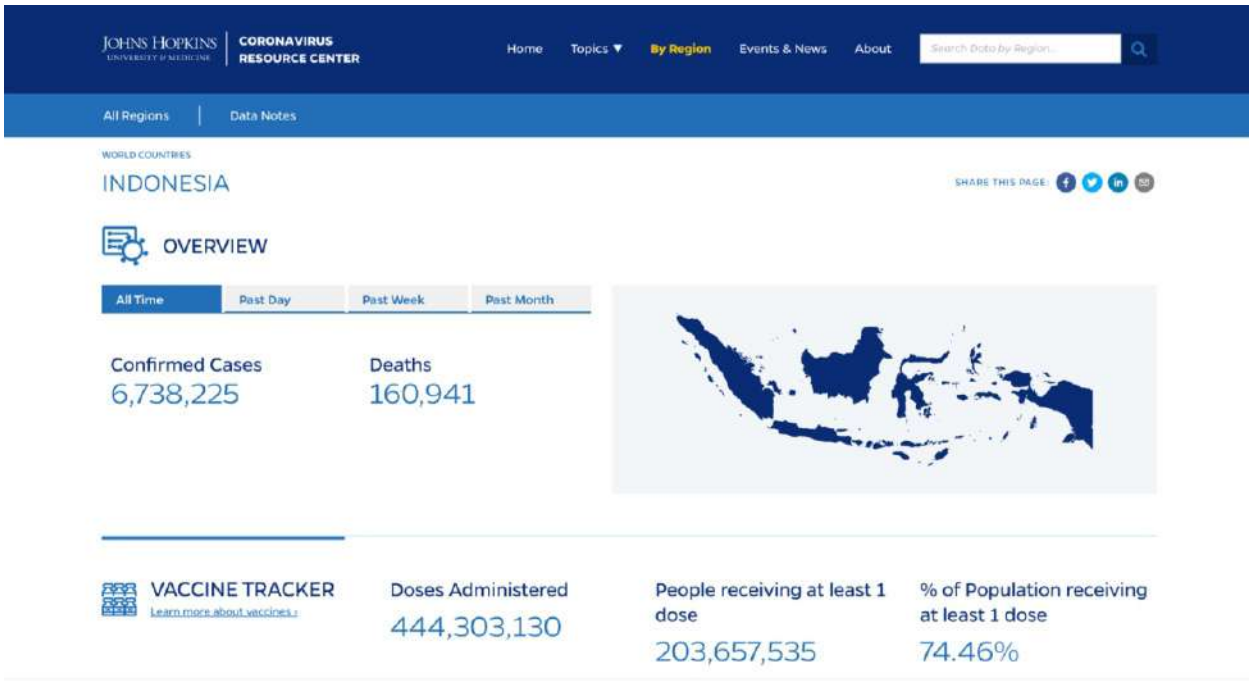

Figure 1. COVID-19 Data for Indonesia (Source: John Hopkins University)

even exceeds the world average. The latest data for Indonesia taken on March 10, 2023, recorded 6,737,225 people were reported to be infected with a total death of 160,941 people.

Many things are suspected to be related to the high number of COVID-19 cases in Indonesia. Among them are the education and literacy process of the Indonesian people about the existence of this disease. Given that Indonesia has a diversity of ethnic, cultural, social, and religious traditions, it is suspected that these things play a role in the education and literacy process. Research conducted by the Center for Digital Society (CfDS) Fisipol UGM confirms this assumption. This study aims to explore the public's perception of the relationship between their views on COVID-19 and circulating sources of information.[1] It was found that almost 40% of the people did not agree with the mandatory vaccine policy rolled out by the government.

In Indonesia, which consists of various ethnic groups, religions, and cultures, understanding the factors that influence people's behavior towards COVID-19 is becoming increasingly important given the challenges of the spread of the various viruses. The CAN model offers an analysis framework that can help identify critical variables that influence people's attitudes and actions, such as knowledge about COVID-19, perceptions of risk, beliefs about the effectiveness of health protocols, and social and cultural factors that influence adherence.

In the context of a pluralistic Indonesian society, the CAN implementation model can provide a more comprehensive view of how local factors influence behavior towards COVID- 19 in various regions. In addition, through analysis of the CAN model, it will be possible to identify groups of people who are vulnerable to a pandemic and potential differences in behavior between groups, thus enabling appropriate and evidence-based interventions to be implemented.

This study aims to find out more about the attitudes of the Indonesian people regarding COVID-19 from time to time, especially after the vaccine program is implemented. Attitudes related to COVID-19 relate to cognitions, feelings, and behaviors regarding the pandemic and vaccination, as well as other factors, such as demographic characteristics, and health-related information. This study focuses on exploration, namely network analysis of the temporal dynamics of attitudes. In this research, scientific integration will also be carried out including Statistics which will play a role in the process of data collection and data processing, as well as in the analysis that will use Network Analysis where this field of science uses Graph Theory in Mathematics as the main basis and Statistics as part of Mathematics to perform data analysis. Next is Psychology used in the preparation of instrument items, namely to make questions in surveys aimed at measuring cognitive, affective, and attitudes as known as the tripartite model of attitudes.[2]

Several previous studies have been conducted on attitudes related to COVID-19 with a focus on examining attitudes towards COVID-19 vaccination. One finding suggests that the biggest barriers to the successful implementation of a COVID-19 vaccine are behavior and attitudes i.e., acceptance of vaccination is hindered by concerns about potential side effects, and mistrust of vaccine safety and benefits.[3] This finding is supported by other findings indicating that the biggest factor hindering the effectiveness of vaccination programs is beliefs and attitudes around COVID-19 vaccination.[4] However, other findings illustrate that acknowledging negative emotions such as fear, as well as highlighting the safety and effectiveness of vaccines can foster trust in vaccines.[5] This study builds on previous research on the COVID-19 pandemic by Chambon, et al.[6]

Methods

Study population and data collection

There are two types of data collections processes. First, a structured survey questionnaire was administered to a diverse sample of individuals from various regions in Indonesia, encompassing psychometric variables such as risk perceptions, health beliefs, trust in healthcare authorities, and attitudes towards vaccination. Second, qualitative interviews were conducted to gain deeper insights into the underlying psychological mechanisms influencing acceptance behaviors.

The sampling technique used in this study is area sampling, namely 15 major cities in Indonesia. Furthermore, several sub-districts in these cities were randomly selected. From the collection of data obtained as many as 1385 respondents became the target of the use of measuring instruments adapted according to the characteristics of the Indonesian people. For offline surveys, the main characteristics of respondents are individuals who are over 40 years old and do not use gadgets. As for online surveys, there is no limit to the criteria for respondents, as long as potential respondents are willing to be survey targets and can access gadgets.

In this study, two different data collection methods were used from the usual sequence, qualitative then quantitative. The first data collection was done quantitatively using a questionnaire. The score results from this quantitative collection were clarified and deepened by collecting qualitative data through interviews. From this process, researchers can

get a better and deeper picture of the respondents' reasons for choosing an attitude.

Instrument

This research process begins with adapting the scale of public attitudes towards COVID-19 and its vaccinations which were compiled by a team from the University of Amsterdam led by Han van der Maas. The instrument adaptation process began with the translation of the original Dutch instrument into English. This was done by the instrument maker, Han LJ van der Maas. After that, the translation into Indonesian involved discussions with the instrument maker. After the language was appropriate, next, a trial (Try Out/TO) was conducted on the measuring instrument so that a psychometric analysis could be carried out to test the feasibility of the measuring instrument that would be used for data collection. From the TO process, it was obtained that for the four aspects of the Pandemic, namely Affective, Cognitive, Behavior, and Other, as well as the four aspects of Vaccination which contain the same sub-aspects as the Pandemic, all were valid. But for the item details, items number 6 and 26 were obtained as invalid. Through discussions with Psychometric experts, these items can still be revised so that they can be valid. Then the items were revised based on the background of the use of language that is more common and easily understood by respondents in Indonesia. For the reliability of the measuring instrument, using the Cronbach Alpha Test, a reliability coefficient of 0.929 was obtained, which is included in the very good category. This means that this measuring instrument is believed to be quite reliable. The instrument that was already in Indonesian produced all the items in the original instrument, all items that were suitable for use.

Data were collected on a scale consisting of 42 items, of which[7] were demographic items and 35 items used the Likert scale. This scale is given a score of 1 to 7 where 1 is Strongly Disagree and 7 is Strongly Agree. In the adaptation process, translation is carried out, and then the addition and subtraction of items according to the characteristics of the Indonesian people, especially the attitude element. The adaptation measurement tool has 10 demographic and attitude items and 35 items for the maintained scale item. The following are the details of the measuring instrument based on the aspects measured.

Table 1. Instrument details

Item	Aspects	Number of items
D1-D7	Demographic Data	7 items
I1 – I3	Pandemic – Affective	3 items
I4 – I6	Pandemic – Cognitive	3 items
I7 – I9	Pandemic - Behaviour	3 items
I10 – I11	Pandemic – Other	2 items
I12 – I18	Vaccination – Affective	7 items
I19– I23	Vaccination – Cognitive	5 items
I24 – I27	Vaccination – Behaviour	4 items
I28 – I35	Vaccination – Other	8 items
D8 – D10	Other Attitude Data (health and politics)	3 items
Total items		45 items

In this Table show the details of the measuring instrument based on the aspects measured.

Instrument detail is shown on Table 1.

Network Analysis

Network Analysis is a concept that is quite old even though it has only been heard and widely used in the last decade. This Network Analysis uses Graph Theory which is a branch of Mathematics to represent relationships in points and lines. Points are also known as nodes/actors that can represent individuals, organizations, or other things that are elements in social science, and lines/edges are known as edges which represent connections or connections between nodes. Network Analysis (NA) is defined as a set of tools or methods used to perform network structure analysis. While the Social Network itself has the meaning of a set of nodes /actors and edges /connections that connect these nodes. Nodes can represent people/ individuals, organizations, or other social entities. Connections between nodes represent interaction or correlation.

The network analysis techniques used are exploration and confirmation. The confirmation part involves the use of a mixture model to identify latent profiles, which are owned to express multimodality. Then, the results found for attitude modality from the assessment using the mixture model will be explained by drawing insights from research on psychological attitude networks. Next, in the exploration part, the focus will shift to a network- based analysis of the temporal dynamics of attitudes.

This study broadly follows the analytical procedure outlined in Dalege, Borsboom, van Harreveld, and van der Maas (2017). In their tutorial paper, they describe a procedure for estimating and analyzing psychological attitude networks with respect to node community, node centrality, network comparability, and network connectivity. Specifically, the Average Shortest Path Length (ASPL) will be used to assess network connectivity where a low ASPL indicates high connectivity, and a high ASPL refers to low connectivity.

To examine the dynamics of the attitude network over time, global and local network structures, and centralities will be explored, and stability checks will be performed. The global network structure is examined to explore network connectivity, while the structure explains which edges are most important in attitude dynamics. Then, a centrality analysis will be performed to gain further insight into which elements are most influential in the attitude network. Finally, the robustness of the edge and centrality estimates will be examined to check the stability of the attitude network parameter estimates.

Causal Attitude Network (CAN) Model

The CAN[2] model asserts that attitudes can be defined as a psychological network of attitudes consisting of attitudinal elements – cognition, emotion, and behavior – that are causally related but can be extended to include other factors that are closely related to the attitude object. The CAN model represents attitudes as a network, where attitude elements are represented as nodes and the relationship between elements as edges. Furthermore, this model is characterized by three assumptions, namely that nodes can be reduced to two value systems, that the interrelationships between nodes are symmetrical, and that nodes tend to be in one of two possible states.[8] The CAN model, in addition to the Learning Ising Model of Attitudes (LIMA), is included in the Attitudinal Entropy (AE) framework.[9] The AE framework formulates a general law, namely

attention and thought to reduce entropy by increasing the dependence of the attitude element, which is based on the CAN model.[10] In particular, a reduction in entropy can follow from sustained attention to the attitude object.
The CAN model conceptualizes attitudes as a network consisting of evaluative reactions and interactions between these reactions. Relevant evaluative reactions include beliefs,
feelings, and behaviors towards the attitude object. The interactions between these reactions arise through direct causal influences and mechanisms that support evaluative consistency between content related to evaluative reactions.[10] In the CAN model, the structure of the attitude network corresponds to a small-world structure in which evaluative reactions that are similar to each other form tight clusters, which are linked by a series of less frequent "shortcuts" between them.
testable predictions for the structures of attitudes and how they develop, remain stable, and change over time.

Attitude

According to Schifman and Kanuk,[11] attitude is an expression of feelings (inner feeling) that reflects whether a person is happy or not happy, likes or dislikes, and agrees or not with an object. According to Rahayuningsih,[12] attitude or attitude has several important points that must be described, including Response-oriented attitude, and attitude is a form of feeling; Attitude oriented to response readiness; Attitude is a constellation or part of cognitive, conative, or affective components that intersect and also interact to be able to feel, understand, and have wise behavior on an object in the environment. Attitude is something that according to Azwar can be measured.[13] has several components, namely cognitive components, affective components, and behavioral or conative components. These components will later become components or aspects of the measuring instrument.

Operationalization

This research consists of two stages: confirmatory, and exploratory. The confirmation phase of the study consisted of, first, mixed modeling analysis, and next, network-based analysis. Mixed modeling analyses were performed before network-based analysis to assess the presence of multimodality in the attitude distribution. After that, in the exploratory stage of research, single on network-based analysis. Attitude characteristics and dynamics over time will be examined using network-based analysis. The strategy adopted in this study was to combine material from previous research on psychological behavioral networks in COVID-19 by Chambon, et al[6] with an augmented vaccination uptake scale. Thus, COVID-19 attitudes will be approached as a network of psychological attitudes consisting of cognitions, emotions, and behaviors related to COVID-
19. Additional factors that are included in the attitude of COVID-19 and vaccination are norms, beliefs, individual characteristics such as demographic data, and self-report according to specified guidelines.

Test

This study uses a survey that draws on the survey used by Chambon, Dalege, Elberse, and van Harreveld (2020) about COVID-19, which is complemented by questions about

attitudes towards COVID-19 vaccination, and demographic characteristics. For attitudes related to COVID-19 and vaccination – there are measuring items that are conceptually contained in attitudes, namely cognition, influence, and behavior, as well as other items, such as those related to beliefs or religious norms. For COVID-19 vaccination attitudes, vaccination items were based on existing vaccine-related scales, such as the Vaccine Conspiracy Belief Scale (VCBS),[14] the Vaccine Hesitancy Scale (VHS),[15] and the vaccine indecision scale. vaccination confidence (VCS).[16]

Stimuli

Target elements in the attitude network of high importance. This message will be a short text arguing for, in favor of, against, or neutral in against COVID-19 vaccination. In conveying this message, the goal is to target nodes that are critical with positive, negative, or neutral information regarding COVID-19 to intervene in the network structure. These messages are congruent, inappropriate, or neutral concerning to the valence of a person's attitude.

Data Analysis

Tools

For data analysis, R-studio which is included in JASP will be used to perform network analysis as described above. JASP stands for Jeffreys's Amazing Statistics Program, which is a free (open-source) statistical analysis software created by the Department of Psychological Methods, University of Amsterdam, The Netherlands.
Data analysis was carried out in several stages. First, a descriptive analysis of the demographic data of the research subjects will be carried out. Then, an analysis of the Causal Attitude Network (CAN) model was carried out using network analysis.
This study uses survey techniques in the data collection process. Data collection is carried out in two stages. First, the survey was conducted by distributing questionnaires to the field (offline). The distribution of this questionnaire was carried out in 15 cities/regencies, namely Bandung, Garut, Jakarta, Bogor, Tangerang, Bekasi, Serang, Lampung, Padang, Pekanbaru, Samarinda, Kutai Kartanegara, Wonosobo, Yogyakarta, and Surabaya. Second, data collection through an online questionnaire using Google Forms. The distribution of this online questionnaire was carried out by distributing the Google form link on several social media. The data obtained were 1385 respondents, of which 747 respondents were the results of the field survey and 638 respondents were the results of the online survey. Several things that will be discussed in this section are descriptive analysis, factor analysis, and analysis with the Causal Attitude Network (CAN).

Descriptive Analysis

Because demographic data consists of various measurement scales, descriptive statistics will be calculated with several measures, including proportions for nominal and ordinal data as well as average and standard deviation for interval/ratio data.

Results

This study uses survey techniques in the data collection process. This data collection was

carried out in two stages. First, the survey was conducted by distributing questionnaires to the field (offline). The questionnaire was distributed in 15 cities/districts. Second, data retrieval through online questionnaires using Google Forms on several social media. The data obtained were 1385 respondents, as many as 747 respondents from field surveys, and as many as 638 respondents from online surveys.

Descriptive Results

The descriptive analysis provides an overview of the condition of the sample based on several variables including the respondent's origin, age, gender, religion, ethnicity, education, vaccination status, history of COVID-19, and health conditions. Here are some of the variables descriptive results.

Respondents by Region

The origin of the respondents in this research is spread throughout the territory of Indonesia. These cities/districts are grouped into provinces in Indonesia which are presented in Figure 1.

Based on Figure 1, respondents in this study were dominated by respondents from West Java Province.

Respondents by Gender

Respondents based on gender in this study are presented in Figure 2. Based on Figure 2, the respondents of this study were dominated by female respondents.

Respondents by Religion

Data on respondents based on religion in this study are presented in Table 2.
Based on Table 2, the respondents of this study were dominated by respondents who were Muslim.

Respondents by Ethnicity

Respondents based on ethnicity in this study are presented in Figure 3.
Based on Figure 3, the respondents of this study were dominated by respondents of Sundanese and Javanese ethnicity.

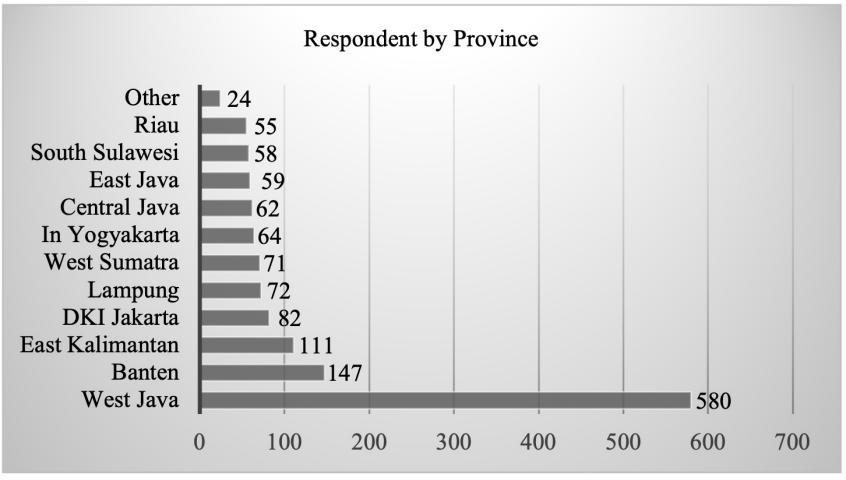

Figure 2. Respondents by provinces

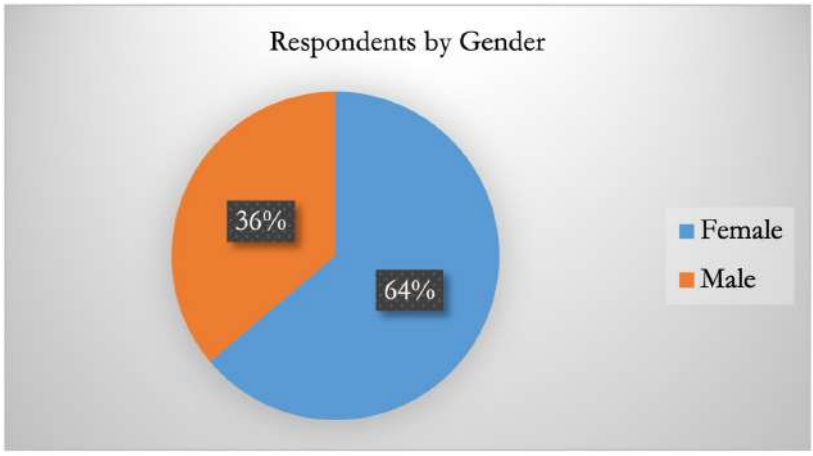

Figure 3. Respondents by Gender

Table 2. Respondents by Religion

Religion	Frequencies	%
Islam	1351	97.5
Christian	20	1.4
Catholic	12	.9
Buddha	1	.1
Hindu	1	.1
Total	1385	100.0

The respondents of this study were dominated by respondents who were Muslim.

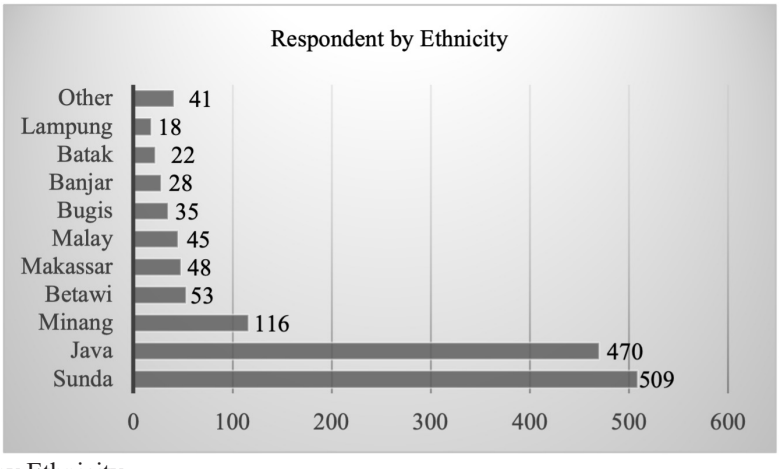

Figure 4. Respondents by Ethnicity

Respondents by Vaccine Status

Respondents based on vaccine status in this study are presented in Figure 4.

Based on Figure 4, the majority of respondents in this study had already been vaccinated against COVID-19.

CAN Model Results

This section describes the results of network analysis for attitude variables related to

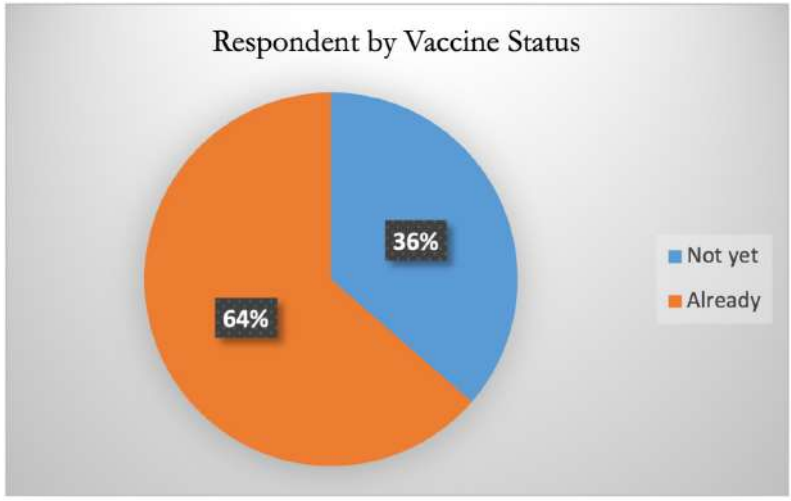

Figure 5. Respondents by Vaccine Status

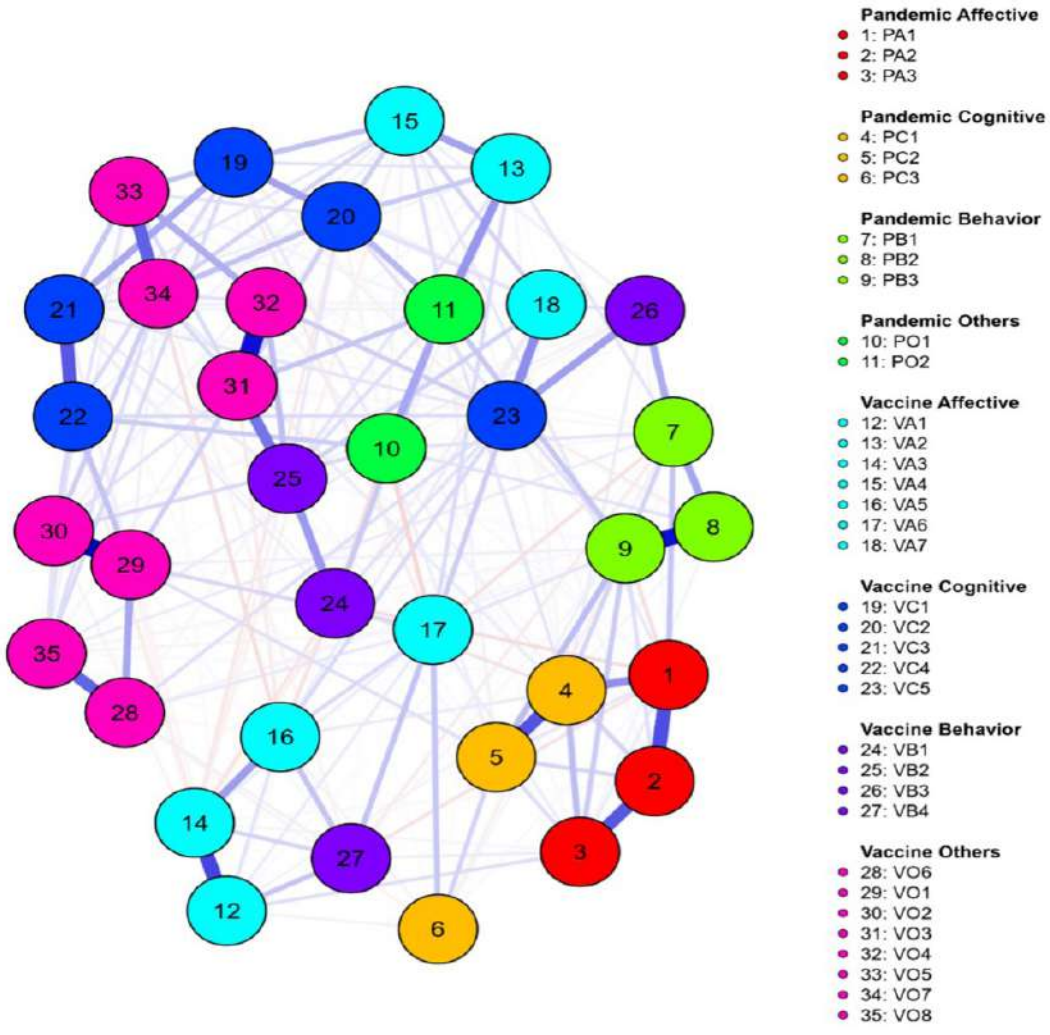

Figure 6. COVID-19 and Vaccination Attitude Network

COVID-19 and its vaccination with aspects that include affective, cognitive, behavioral, and others. This network analysis is processed using JASP software. The results of the CAN Model will be discussed in several sections. First, it will be discussed in general terms. All respondents who come from dozens of cities in Indonesia will be analyzed for their attitude of acceptance towards COVID-19 and towards vaccination, as shown by the Sociogram presented in Figure 5.
In the CAN Model results specifically, there are several results, namely sociograms as seen in the images that show the relationship between aspects of attitudes for each dimension based on the data collection cluster. In addition to the sociogram, there are results in the form of a weight matrix, and centrality. Specifically for this centrality, there are several measures that can be calculated statistically, namely closeness, betweenness, and strength.

Results

also include the expected values that support the hypothesis of this study.
The circles on the sociogram, called Nodes, represent all the items asked in the questionnaire. The color of the differents nodes is adjusted to each aspect being measured. Consider the legend from Figure 5. For example, the light blue node symbolizes the acceptance of the effective aspect of vaccination. Seven items measure this aspect, namely item number 12 to item number.
Edges connecting one node to another are weighted so that each edge connecting each node has a different thickness. The thicker the edges, the closer the relationship between the two connected nodes. So in Figure 6, we will see how the interactions and interrelationships between the question items in the questionnaire will be seen.
In this study, there are 35 nodes which are 35 question items which are divided into 8 groups, namely 3 nodes which are questions about affective related to the COVID-19 pandemic in red, 3 nodes which are questions about cognitive related to the COVID-19 pandemic in orange, 3 nodes which is a question about behavior related to the COVID-19 pandemic in green, 2 nodes which are questions about others related to the COVID-19 pandemic are green, 7 nodes which are questions about affective related to the COVID-19 vaccine are light blue, 5 nodes which are questions about Cognitive related to the COVID-19 vaccine is dark blue, 4 nodes that are questions about behavior related to the COVID-19 vaccine are purple, 8 nodes which are questions about others related to the COVID-19 vaccine are pink. Sparsity is the occurrence of a user-item matrix data void, which is caused by the user rating a small number of the number of items available in the database.

Weight Matrix

The weight matrix shows the strength of the relationship between the question items. The higher the weight value, the stronger the relationship between the 2 question items. The strength of this relationship is also shown by the thickness and density of color edges and density of nodes as shown in Figure 6.
Based on the weight values and the edges in Figure 6, the strongest relationships in this network are VO1 and VO2 (0.552), VO3 and VO4 (0.52), PB2 and PB3 (0.519), and VA1 and VA3 (0.404). The weight matrix states the strength of the relationship between nodes, which in this case are questionnaire items.

The closer the value is to 1, the stronger and more significant the relationship between the items. It's like a correlation index. If the value is above 0.5, then following Guilford's criteria, it is categorized as a fairly strong relationship between the items. Based on these values, we can see that:

1. Trust in the development of the COVID-19 vaccine (VO1) is related to trust in the experts in developing the COVID-19 vaccine (VO2). In other words, increasing public confidence in the development of a science-appropriate COVID-19 vaccine will be in line with increasing public trust in COVID-19 vaccine developers, and vice versa.
2. Awareness about the importance of the COVID-19 vaccine (VO3) in individuals will be related to the need for awareness about the importance of the COVID-19 vaccine that everyone has (VO4). In other words, the increasing public awareness about the importance of getting the COVID-19 vaccine will be in line with the increasing desire for awareness of family and friends about the importance of getting the COVID-19 vaccine.
3. The habit of washing hands (PB2) is related to the habit of wearing masks (PB3). In other words, people who are used to washing their hands properly will automatically get used to wearing masks, and vice versa.
4. Concerns about the COVID-19 vaccine (VA1) relate to convenience regarding the COVID-19 vaccine (VA3). In other words, the increasing public concern about the safety of the COVID-19 vaccine will be in line with the increasing feeling of discomfort about the COVID-19 vaccine, and vice versa.

When viewed from the magnitude of the resulting weight, the correlation between items VA1 and VA3 of 0.404 is the lowest of the four relationships. This means that increasing concerns about vaccine safety will increase feelings of discomfort about vaccines, and vice versa, it is still lower than public trust in vaccine development stated by items V01 and V02.

Centrality

To find out which nodes have the most role or importance in a network, we can use the centrality measure as a parameter that can measure the level of importance or which nodes play the most role. Centrality measures show the predictive value of nodes in the network but do not indicate causality.[6] The measure of centrality consists of betweenness, closeness, strength, and expected influence. The plot of the centrality measure is presented in Figure #6. Closeness Centrality is the importance of nodes based on the average distance to other nodes in the network. The most important node or the most instrumental is the one with the shortest path as indicated by the highest closeness centrality value.[19] In this attitude network, the nodes that have the highest closeness values are VO1(2.65) and PO2 (2.395). This means that the attitude element regarding trust in the development of the COVID-19 vaccine (VO1) and support for the COVID-19 vaccine as a disease prevention effort (PO2) is the element of attitude that has the most important role because it has the closest relationship with other attitude elements. If we look at Figure 6, the attitude element regarding trust in the development of the COVID-19 vaccine (VO1) indicated by node no 29 has the closest relationship with the attitude element regarding trust in the development of the COVID-19 vaccine (VO2) indicated by the node no 30, this can be seen

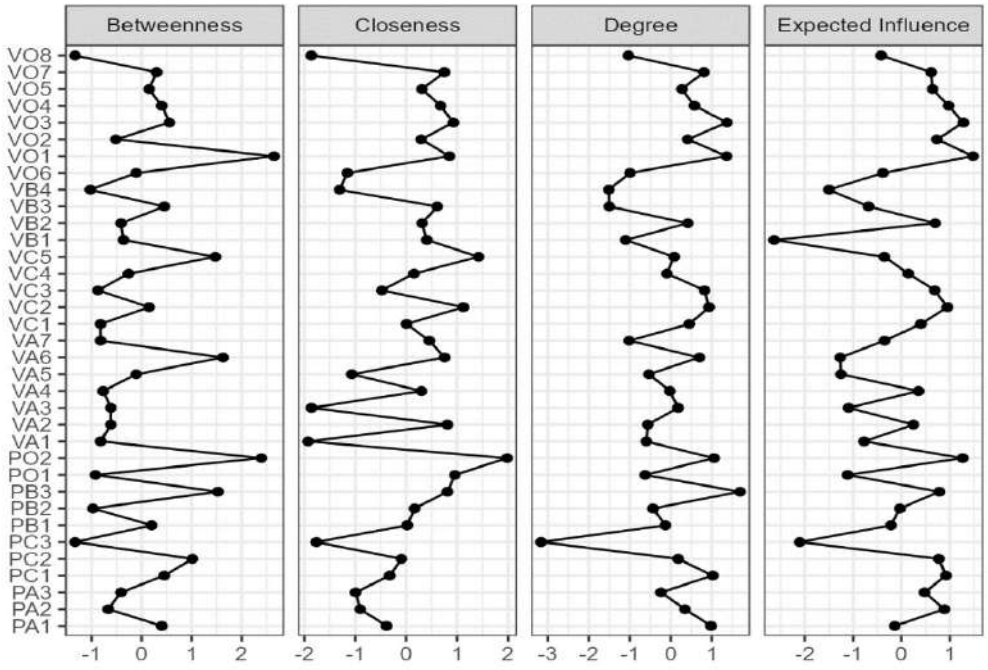

Figure 7. Centrality Measures in SNA

from the edges which are the shortest path.

Betweenness centrality is the level of importance of nodes based on their ability to connect many nodes in the network. The node that has the highest value of betweenness centrality has the most important role because it connects 2 or more different groups.[17] In this attitude network, those with the highest betweenness centrality values are PO2 (1.982) and VC5 (1.425). This means that the attitude element regarding support for the COVID-19 vaccine as an effort to prevent disease (PO2) and the travel ban on people without the COVID-19 vaccine (VC5) are attitude elements that have an important role as a link to several other attitude elements.

Strength centrality is the power level of a node in the network. The node with the highest strength value has the highest impact on changes to other nodes in the network. In other words, these nodes can affect interactions and dependencies in the network because they affect other nodes.[6] In this attitude network, the nodes that have the highest strength values are PB3 (1,686) and VO3 (1,368). That is, the attitude element regarding the habit of wearing masks (PB3) and awareness about the importance of the COVID-19 vaccine (VO3) is the attitude elements that have the highest impact on changes in other attitude elements, or in other words, these two attitude elements (PB3 and VO3) are Attitude elements that most influence other attitude elements.

Expected Influence is the number of connection nodes representing the relative importance of a node in the network. In this attitude network, the nodes with the highest expected influence values are VO1 (1.482) and VO3 (1.284). This means that the attitude element regarding trust in the development of the COVID-19 vaccine (VO1) and awareness about the importance of the COVID-19 vaccine (VO3) is an attitude element that has a high expected effect on other attitude elements.

Discussions

For discussion material, one of the results will be taken based on the islands, namely Sumatra, Java, Kalimantan, and Sulawesi. Based on the weight and edges values, the strongest relationships in the network for Sumatra Island are VO3 and VO4 (0.917), VO5 and VO7 (0.91), VC1 and VC2 (0.823), VO7 and VO3 (0.798) and PC1 and PC2 (0.793).

The strongest relationships in the network for Java Island are VO3 and VO4 (0.833), VO1 and VO2 (0.81), VO3 and VB2 (0.77), VO5 and VO7 (0.75) and VC3 and VC4 (0.702).

The strongest relationships in the network for Kalimantan Island are VO3 and VO4 (0.832), VO1 and VO2 (0.823), VO4 and VO5 (0.814), VO5 and VC3 (0.798) and VO5 and VO7 (0.789). The strongest relationships in the network for Sulawesi Island are VO3 and VO4 (0.799), VO4 and VO5 (0.748), VO1 and VO2 (0.741), VC1 and VC2 (0.736) and VB2 and VB3 (0.685).

Based on these weight values, the interconnectedness of nodes on the four islands is relatively the same. We can see that in general the strongest relationship in the CAN network for the four islands, namely awareness of the importance of the COVID-19 vaccine (VO3) in individuals will be related to the need for awareness of the importance of the COVID-19 vaccine for everyone (VO4). In other words, increasing public awareness of the importance of getting the COVID-19 vaccine will be in line with the increasing desire for awareness of their families and friends about the importance of getting the COVID-19 vaccine. The differences between the four islands can be seen in the edge colors shown in Figures 4.15 to 4.18. Based on the four images, we can see that the Sumatra Island network has the most negative relationships between nodes, in general, this negative relationship or relationship occurs in nodes that have relationships with nodes or attitude items such as VA1, VA3, VA5, VA6, VB4, and PC3.

Conclusion

The following research results will be used to answer the research questions.

1. What is the attitude of the Indonesian people towards the COVID-19 pandemic and its vaccination?

Attitude elements regarding the habit of wearing masks (PB3) and awareness about the importance of the COVID-19 vaccine (VO3) are the attitude elements that have the highest impact on changing other attitude elements, or in other words, these two attitude elements (PB3 and VO3) are attitude elements. that most influence the other attitude elements.

Attitude elements regarding trust in the development of a COVID-19 vaccine (VO1) and awareness about the importance of a COVID-19 vaccine (VO3) are attitude elements that have a high expected effect on other attitude elements.

2. Which attitude element has the strongest relationship with other elements in the CAN model?

The attitude element regarding trust in the development of the COVID-19 vaccine (VO1) and support for the COVID-19 vaccine as a disease prevention effort (PO2) is the attitude element that has the most important role because it has the closest relationship with other attitude elements.

3. Which attitude element has the highest centrality in the CAN model?

The attitude element regarding support for the COVID-19 vaccine as a disease prevention effort (PO2) and the travel ban on people without the COVID-19 vaccine (VC5) are attitude elements that have an important role as a link to several other attitude elements. In addition to the above results, the initial assumption of the research that there will be an influence of an attitude element on other attitude elements, for example, political attitudes will affect acceptance attitudes towards pandemics and vaccinations, is not empirically proven. Thus, in the future, further research regarding the attitude of acceptance of the COVID-19 pandemic and its vaccination does not need to be continued.

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Potencial conflict of interest

All authors declare that we have no conflicts of interest regard the publication of this

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