

Pandemic Fatigue: An Analysis of Twitter Users' Sentiments Against the COVID-19 in Indonesia

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Abstract. Indonesian society is undergoing a shift of behavioral patterns towards the coronavirus (COVID) 19 indicating the symptoms of the pandemic fatigue phenomenon. Pandemic fatigue is defined as a gradual demotivation to adhere to recommended protective behaviors. Pandemic fatigue might reduce the effectiveness of health protocols and accelerate the spread of the virus. This study aims to examine the pandemic fatigue sentiment of Indonesian twitter-users chronologically and the factors causing the development of pandemic fatigue sentiment. The method of this study includes digital ethnographic theory using sentiment analysis based on the Valence Aware Dictionary for Sentiment Reasoning (VADER) algorithm and topic modelling using Latent Dirichlet Allocation (LDA) analysis. The results showed a pattern of sentiment depression towards health protocols indicating the pandemic fatigue phenomenon. The factors causing the sentiment depression were influenced by three themes: (1) public criticism of the government's efforts to handle the spread of COVID-19, (2) experience in implementing health protocols, and (3) statements that against the government's efforts to handle the spread of COVID-19. Based on the results of sentiment analysis and topic modelling, this study presents a public policy design referencing the World Health Organization (WHO) framework for community reinvigoration in the midst of pandemic fatigue that could be used for the government to undertake broader reforms to public health and social care for Indonesian society.

Keywords: pandemic fatigue, sentiment analysis, Twitter.

Adherence to health protocols continues to decline amidst an increasing number of active COVID-19 cases. According to Satuan Tugas Penanganan COVID-19 (2021, 6 January), the adherence to using masks has reduced from 79.5% to 55.2% and the adherence to implement social distancing also reduced from 62.6% to 39.5%. The declining adherence rate to health protocols is one of the indicators of pandemic fatigue phenomenon. In general, the World Health Organization (2020) defined the *pandemic fatigue* phenomenon as fatigue experienced by society during a pandemic. Particularly, Masten and Motti-Stefanidi (2020) explained that pandemic fatigue is a demotivation to follow recommended protective behaviors, emerging gradually over time and affected by a number of emotions, experiences, and perceptions. The protective behaviors in the context of pandemic are efforts to prevent the spread

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of virus (Moussaoui et al., 2020). In the context of COVID-19 in Indonesia, it is implemented in a form of adherence to health protocols policy by the government including wearing masks, maintaining social distance, and washing hands. In this study, '*pandemic*' refers to pandemic COVID-19 and '*fatigue*' is defined in its daily language use instead of clinical and/or diagnostic term.

The health protocol that was once effective became less effective in time (WHO and UNICEF, 2020, 5 May). Demotivation is an expected and natural response to a prolonged public health crisis. In the beginning of the pandemic, people can optimally perform positive adaptive measures both mentally and physically with the objective of surviving in an emergency. However, as the emergency prolonged, people will adopt different coping mechanisms that makes fatigue and demotivation expected (Habersaat et al., 2020). The pandemic fatigue risks serious threat to efforts to control the spread of the virus (World Health Organization, 2020). It negatively affected aspects of quality of life, including a number of Sustainable Development Goals (SDGs), i.e health, eradication of poverty, education, vulnerable and marginalized groups, employment, economic growth, justice, and environmental issues (Morea, 2020).

Previous research explained that pandemic fatigue could cause the wave COVID-19 active case (Rypdal et al., 2020). Ridhwan and Hargreaves (2021) conducted research to understand public perceptions of COVID-19. However, the research did not focus on pandemic fatigue and policy recommendation for decision makers to control the pandemic. Therefore, this study aims to examine the phenomenon of pandemic fatigue experienced by the online community, including the steps to reinvigorating the community support for health protocols. This study contains a deeper analysis on the development of pandemic fatigue sentiment in Indonesia in chronological order (March 2020 - February 2021) and the factors that cause the development of pandemic fatigue sentiment among Twitter users.

From previous research, Ridhwan and Hargreaves (2021) previously published a similar study that attempted to understand Singapore public sentiment regarding COVID-19 using Twitter data. In Indonesian context, study from Machmud et al. (2021) used Twitter data to explain government officials' communication and coordination intensity while dealing the COVID-19 pandemic. From those previous study, it is difficult to find research that understands the pandemic fatigue phenomenon in Indonesia in a more specific way through digital ethnography approach. Futhermore, this study aims to fill the research gaps by analyzing public support for health protocols in Indonesia through digital ethnography approach and developing a public policy design referencing World Health Organization (WHO) framework.

Methods

Procedure

This study adopted sentiment analysis, that is an analysis to classify text data into positive, negative, and neutral clusters for specific keywords (Nasukawa & Yi, 2003). This analysis can be applied to Twitter to examine the tweets pattern from the social expression activities of the community. The

analysis consists of the following steps: data collecting - data pre-processing - data analysis - data visualization. The analysis found some positive and negative words. The greater the number of negative words indicates negative sentiment. On the other hand, the larger the number of positive words represents a positive sentiment (Budiharto & Meiliana, 2018).

This research used a digital ethnographic approach to study society and culture in digital spaces, such as the internet (Magdalena Góralaska, 2020). Digital ethnography is the process of understanding meaning based on data collections and graphics available on digital media (Kaur-Gill & Dutta, 2017). In research on the digital media environment, the research is limited to communication in digital media which encourages ethnographers to make focused and significant observations (by using certain websites, post traffic on social media, descriptive data, and interactions between media users). Digital ethnography allows many data collection methods, including questionnaires and semi-structured interviews. Data collection with this method helps discuss originality and data validity issues (Achmad & Ida, 2018). The results of this study can be referred to as the first step in implementing community reinvigorating amid pandemic fatigue.

The digital space referred to as the source of data is Twitter since previous research found that data collection on Twitter helped understand how people view the COVID-19 pandemic (Rufai & Bunce, 2020). Twitter was also chosen because it is used by the community for microblogging and expressing social aspirations (Budiharto & Meiliana, 2018). In addition, a digital ethnographic perspective is employed to analyze the data with sentiment analysis and topic modeling. According to the research by Boon-Itt and Skunkan (2020), sentiment analysis and topic modeling can produce helpful information regarding the COVID-19 pandemic discussion trend on social media and provide alternative perspectives in investigating the COVID-19 pandemic crisis.

Datasets

The research subject is Twitter users in Indonesia involved in conversations related to health protocols. The sample criteria are conversations that include tweets representing compliance with the health protocols and issues related to the COVID-19 pandemic within one year since the first COVID-19 pandemic case in Indonesia (2 March 2020). In the data mining process, program development is conducted to access the Twitter Application Programming Interface (API) to obtain data about pandemic fatigue. The data criteria are tweets with the following filter: tweets in Indonesian, using keywords related to health protocols: "keep your distance", "wash your hands", and "wear a mask" upload time within one year since the first active case was discovered (March 2020 - March 2021). Before analyzing the data, the datasets went through the data preprocessing stage (data cleaning). In the data preprocessing process, data cleaning is carried out by eliminating mentioned usernames, reducing tweets that appear inorganic (bot engineering), eliminating stopwords--words that have no information value (low-level information, for example: "di", "to", "from"), reducing less relevant tweets, such as "keep your distance from your ex" or "wear a skincare mask". This process obtained minimal residual data, and tweets could be analyzed optimally. After the tweets data was collected, the data was stored in an SQLite-based database for further analysis.

Data analysis

Based on the collected datasets, the data were analyzed using Valence Aware Dictionary and Sentiment Reasoner (VADER), sentiment analysis tool, and topic modeling using a Latent Dirichlet Allocation (LDA) algorithm to determine topics that affect sentiment level movements. According to Ridhwan and Hargreaves (2021), sentiment analysis using the VADER algorithm and topic modeling using the LDA algorithm has helped analyze public opinion on the COVID-19 pandemic.

In sentiment analysis, the data obtained (data tweets about health protocol) were translated into English using Azure Translator Services before being analyzed using VADER. VADER is a lexical algorithm to determine tweet polarity and public sentiment intensity which were then classified based on multiclass sentiment analysis (Ibrahim et al., 2022). The sentiment analysis of the data aimed to reveal the level of public support toward the health protocol in chronological order from March 2020 to March 2021.

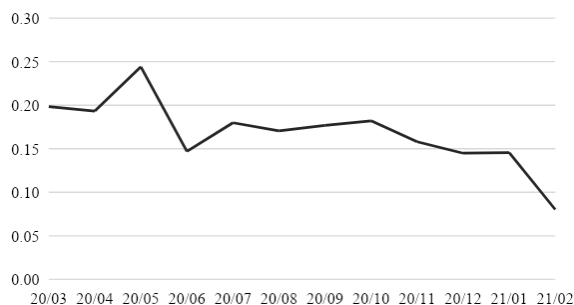
The sentiment analysis results are divided into phases before proceeding to the topic modeling analysis. The division of phases in this study was based on the percentage change in sentiment scores each month obtained from sentiment analysis data. A phase is characterized by a percentage change with a mean score of above 14% (sudden change) or a data set with a percentage change below 14% (stagnant phase). If the average percentage change exceeds that number, the sentiment data has changed from the previous month's data and is categorized as a new phase.

After the phase sentiment was identified, the topic modeling stage proceeded. Topic modeling analysis was conducted using the LDA algorithm to group-specific keywords that often appear together and to find the top topics that affect the public sentiment towards the established health protocol. Data from each phase were analyzed separately to obtain topics and themes in each phase.

Results

Based on sentiment analysis of 28.492 tweets containing the keywords "keep your distance", "wash your hands", and "wear a mask", it was found that the sentiment graph has decreased for 12 months (Figure 1).

Figure 1
Graph of Pandemic Fatigue Sentiment (March 2020 - March 2021)



In March 2020, the sentiment score became the second-highest compared to the following 11 months. These results indicate that the community was eager to implement health protocols in the early period after the first positive cases occurred in Indonesia. Sentiment scores declined in April 2020 and climbed again to the highest peak in May 2020, with a score close to 0.25.

Based on the results of sentiment analysis, a phase division was carried out to determine the factors causing the development of pandemic fatigue sentiment. A new phase is indicated by a month (single) with a percentage change above the mean of 14%, which indicates a significant difference in the data, or a group of months (plural) with a percentage change below 14%, which marks the phase of sentiment stagnation, the results are as follow:

Table 1
Percentage Change of Sentiment

Month	Change(%)
March 2020	0
April 2020	2.59
May 2020	26.34
June 2020	39.81
July 2020	22.40
August 2020	5.14
September 2020	3.66
October 2020	2.94
November 2020	13.22
December 2020	8.30
January 2021	0.42
February 2021	44.86

The analysis of phase division showed the lowest phase change was 0.42%, and the highest change score was 44.86%. March has 0 changing sentiments because it was the beginning of COVID-19 cases in Indonesia, and there has not been a change in sentiment from the previous month. Months showing a change score above 14% are May, June, July, and February. Several months in a row with no change above 14% are August, September, October, November, December, and January. Based on the calculation of the phase change, the following 6 phases were obtained (Table 2):

Table 2
Phases Division Based on Sentiment Changes

Phase	Month
Phase 1	March, April (2020)
Phase 2	May (2020)
Phase 3	June (2020)
Phase 4	July (2020)
Phase 5	August, September, October, November, December (2020), January (2021)
Phase 6	February (2021)

The first phase started in March and April 2020 as the initial months of discovery of COVID-19 positive cases. The second, third, and fourth phases were May, June, and July 2020. In May there was a significant increase, while in June there was a sharp decline. Furthermore, there was a slight increase in July and the sentiment entered the fifth or stagnant phase from August to January. After six months of a stagnation period with a small percentage of change, the change appeared again until it moved to its lowest point in the final phase in February 2021. As the phase division determined, topic modeling analysis using the LDA algorithm was carried out on the tweets data based on each phase to determine topics and themes of community discussion that became factors of the development of sentiment in each phase, as follows (Table 3):

Table 3
Topics and Themes Causing Sentiment Development of Pandemic Fatigue

Phase	Topic	Theme
Phase 1 Starting Point	Early active COVID-19 cases in Indonesia	Theme 1. Urgency to follow health protocol
	Hand washing campaign in a language that is close to the community	Theme 2. Community support toward government effort to control the COVID-19
Phase 2 Graphic Rise	New normal, Health protocols in public areas, extension of public activity restrictions	Theme 2. Community support toward government effort to control the COVID-19
	Response to closing of houses of worship	Theme 3. Public criticism over government's response to COVID-19
Phase 3 Graphics Drop	Eid al-Adha homecoming may spread the virus	Theme 1. Urgency to follow health protocol
Phase 4 Graphic Rise	Active cases hit one million	Theme 1. Urgency to follow health protocol
	Slowly lift the strict health protocol	Theme 3. Public criticism over government's response to COVID-19
	Exposed to COVID-19 (COVID positive) albeit strict adherence to health protocols	Theme 4. Experience of following health protocol
Phase 5 Relatively Stagnant	Parliament member vaccination priorities	Theme 3. Public criticism over government's response to COVID-19
	Effort to follow the health protocol	Theme 4. Experience of following health protocol
	Influencer hoaxes (wearing a mask increases active cases)	Theme 5. Statements against health protocols

Topic modeling analysis (Table 4) resulted in 5 themes consisting of 13 topics as the causal factors for the development of pandemic fatigue sentiment in 6 phases over 12 months. In the first phase, sentiment was influenced by the urgency to implement health protocols (theme 1) and the public support towards government's efforts to handle the spread of COVID-19 (theme 2).

Discussion

The results of this study show that public sentiment has decreased and is relatively stagnant until the next 8 months (January 2021) with a score ranging from 0.15 to 0.20. In February 2021, sentiment was at its lowest point with a score of 0.08. The continuous decline since June 2020 indicates a negative sentiment in the community support towards protective behavior during the pandemic, which indicates the beginning of pandemic fatigue phenomenon or fatigue to implement health protocols. Based on the findings, it is known that pandemic fatigue in Indonesia began to appear in the fourth month after the first COVID-19 case was found. These findings are in accordance with the research of Stavem et al. (2021) which stated that pandemic fatigue occurs around 1.5 - 6 months after the discovery of the first case. In addition, according to a study conducted by Petherick et al. (2021), it explains the health protocols compliance which is dominated by a decrease in support and adherence from March to December 2020.

In theme 1, urgency arises from public knowledge about the emergence of the first case in Indonesia and the rapid transmission of the virus, giving rise to supportive responses of the community and the issuance of recommendations, campaigns, and various new regulations issued to control the spread of the virus. This is in accordance with the research of Halimatunnisa et al. (2021), community support for implementing health protocols in the first phase was quite high because the community perceived that COVID-19 was easily transmitted and hence influenced the implementation of protective behavior.

In the second phase, there was an increase in community support in implementing health protocols by 26.34% which caused the sentiment score to reach its highest. The cause of the increase in support was public support for government policies on preventing the spread of the virus (theme 2). Government measures in the second phase include New Normal COVID-19 policy, the issuance of COVID-19 prevention and control guidelines in offices and industries, and the extension of the Large-Scale Social Restrictions (PSBB) by the Governor of DKI Jakarta. Referring to CNN Indonesia (06/20), in this period Indonesia experienced a surge in positive cases with a total monthly case count of 16,355. This surge in cases is able to encourage the public to support and comply with the government regulations recently issued because of a sense of fear and awareness that COVID-19 is actually real. This is in accordance with Madran (2021) explanation that fear is one of the most powerful factors to persuade people to comply with health-related rules. According to Janis' Fear-Drive Theory (Janis, 1967), there is an inverse u-shaped relationship between fear and attitude change, which means that fear can create motivation to change attitudes. Attitude change in this phase is indicated by an increase in community support for health protocols set by the government.

In the third phase, public support for health protocols regressed significantly by 39.81% from the previous phase. The factor causing the decline in sentiment is the community's response to government policies on closing of houses of worship and prohibition of Friday prayers that have been implemented for two months. As a result, a number of people are opposing government regulations promoting behavior that does not comply with health protocols. At that time, people had been

praying in congregation before the government protocol was lifted. In the same phase afterward, the government began to open places of worship for Friday prayers, giving rise to some negative sentiments in the pro-policy community because some mosques allowed worshippers not to wear masks and not maintain their distance. The phenomenon of divided religious groups in society between pro and contra groups is closely related to group dynamics that create collective behavior patterns (Mansdorf, 2020). In the religious community, there are groups that are open to the emergence of COVID-19 and some are more closed. Closed groups tend to have the perception that "it won't happen to me" or "if it happens to me, then it's God's will". This is supported by research by Echoru et al. (2020) in Uganda which found that most Muslims admitted that it was difficult to implement the health protocol. The difficulty to adhere to health protocols happens because it is not easy for people to separate themselves from religious and worship routines and practices they regularly observe (Mansdorf, 2020).

In the fourth phase, the sentiment score increased from the previous phase. Support for health protocols has increased, which is characterized by the public's understanding that a person can be a carrier of the virus. In this phase, there was a topic widely discussed by the community regarding the government's appeal to not allow people to return home during Eid al-Adha because they could carry the virus and transmit it to their families at home. Proper information delivery can increase community support in complying with appeals and policies that have been made. This is in accordance with Disemadi and Handika (2020) research that compliance with government policies and awareness of emergency conditions are needed by the community to carry out health protocols properly.

In the fifth phase, public sentiment was relatively stagnant (no significant change above 14%) from August 2020 to January 2021. The relatively stagnant sentiment is caused by several factors on the theme of public discussion, including criticism of the government for not being firm in taking action against people who do not implement health protocols. Low trust in the government's ability to overcome the spread of COVID-19 can lead to low public compliance in implementing health protocols (Christian & Sa'id, 2021), causing public support for health protocols to decrease. In addition, there are community discussions on Twitter regarding the experiences of people who have strictly implemented health protocols, but remained exposed to COVID-19. This experience shows a helplessness in the community that creates an attitude of giving up in implementing health protocols or commonly known as learned helplessness. Learned helplessness in COVID-19 pandemic conditions may cause control or optimism in carrying out health protocols to be ignored (Williams et al., 2021). In this phase, there is also an increase in support sentiment caused by public discussion about positive confirmed cases in Indonesia which continues to increase. The increase in positive cases in this phase is able to generate optimal fear in the community, so that expected behaviors such as implementing health protocols can be reinvigorated (Madran, 2021).

In the sixth phase, public support for health protocols decreased by 44.86%, causing the level of public support to reach its lowest point in a 12-month period. Some of the topics of public discussion included criticism of the government for organizing vaccinations for corruptors, influencers' statements that contradicted the government's efforts, and people's experiences in

implementing health protocols. The initial vaccination for corruptors was considered to be poorly targeted by the public. As a result, people do not believe in the regulations made by the government, even though trust in the regulations set by the government is one of the main determinants of obedience (Pagliaro et al., 2021). In addition, there is public discussion about influencer posts stating that the stricter the health protocol, the higher the positive cases will be. This encourages people not to implement health protocols. A study conducted by Greene and Murphy (2021) explains that exposure to fake news can affect individual intentions to act. The study also found that warning about the danger of fake news has no effect on the change of behavior.

In summary, the factors causing the emergence of indications of pandemic fatigue are influenced by public criticism towards measure enacted by the government to control the spread of COVID-19 (theme 3), experience in implementing health protocols (theme 4), and statements that are contrary to efforts to control the spread of COVID-19 (theme 5). The three factors causing the emergence of indications of pandemic fatigue in this study are in line with research conducted by Williams et al. (2021) which found 6 themes causing community disobedience including alert fatigue, inconsistent rules, lack of public trust in the government, learned helplessness, resistance and rebellion, and risk perception from the impact of vaccination. Christian and Sa'id (2021) also explained several factors causing community disobedience to health protocols through the Health Belief Model theory, such as people's perception of their potential to be affected by COVID-19, lack of understanding of the benefits of implementing health protocols, barriers to accessing health facilities, lack of guidance from the government on how to behave safely during the COVID-19 pandemic, and low public confidence in the government's ability to overcome this pandemic. Some of the themes found in the two studies also support and strengthen the three factors causing the decline in public support in implementing health protocols, which indicates the emergence of the phenomenon of pandemic fatigue in Indonesia.

Conclusion

From this study, it can be concluded that the pattern of development of pandemic fatigue sentiment has continued to decline in the community since the discovery of the first case in Indonesia until one year following it. This decrease in sentiment shows an indication of a decrease in compliance to health protocols in the community. Factors causing the development of pandemic fatigue sentiment or decreased public support for health protocols include public criticism of the government's efforts to tackle the spread of COVID-19, people's experience with the pandemic and the implementation of health protocols, and influencer statements that contradict efforts or knowledge published by the government.

Recommendation

Based on the results of sentiment analysis and topic modeling, this research provides suggestions and recommendations with reference to the World Health Organization (WHO) framework. World Health Organization (2020) recommends 4 strategic steps to reinvigorate the community from pandemic

fatigue, including: (1) develop policies based on understanding of the conditions of the community, (2) involve the community to find solutions, (3) free the community to carry out activities with risk limits, and (4) validate and address community unrest. Referring to the 4 strategic steps by WHO, this study presents a solution to accelerate the implementation of community reinvigoration amid the pandemic fatigue phenomenon by applying the first and second strategic steps from WHO, this study helps policy makers to understand the condition of the community (point 1) and involve the community to find solutions (point 2) by presenting community discussion topics that have a direct impact on health protocols, such as: utilizing the momentum of the number of cases, using language close to the community for campaigns or policy delivery related to health protocols, and delivering policies by emphasizing the reasons and urgency of related decisions. In addition, policy makers can anticipate topics of public discussion that reduce support for health protocols, namely: enforcement of health protocols related to religion and worship, enforcement of vaccination program priorities, misinformation related to health protocols, and trust in the effectiveness of health protocols.

Declarations

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Authors Contribution

MNH and ASA collecting the data and analyzed the data. RS analyzed the data. DA and KSSY interpreted the data. RF monitoring the research.

Conflict of Interest Statement

There is no potential conflict of interest reported by researchers.

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