Mixed Sentiment Upon Globally Praised Concept of One Health: Gauging Responses using Twitter

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Abstract. The concept of One Health, which has been prioritized and integrated into national strategies in developed countries as part of their sustainable development goals (SDGs), is often overlooked in developing countries, leading to unpreparedness for outbreaks. To understand global responses to One Health, we evaluated Twitter data, a microblogging social media platform with over 50 million users worldwide. Our analysis revealed that the top most tweeted words related to One Health were "onthealth", "fordnation", and "celliottability", which showed an association with Canada-based institutions and individuals, indicating Canada's leading role in implementing One Health strategies. We also found that One Health was linked to positive, negative, and neutral sentiments on Twitter. Overall, our results demonstrate that One Health triggers sentiment-polarized responses, and Twitter provides a valuable tool for gauging public sentiment and considering it in shaping One Health norms in society.

1 Introduction

Despite gigantic adverse impacts it carried since it was initially announced as a global pandemic, COVID-19 has brought us into a realization of what have been our shortcomings which were not seriously addressed [1]. Although every nation was at first struggling to overcome this never-before pandemic where the carrier is human, the recovery rate is apparently far different. Developing countries are seen to be steps behind developed countries in handling the pandemic. Not only do they have long-sustained research and its supporting facilities, they also far ahead develop their One Health platform where health in human, animal and environment are inherently placed into a paramount priority. One Heath is an approach focusing on emergent infectious diseases in human, animal and environment [2].While in developed countries One Health has been their national strategies, which is implicated by active involvements of government and nongovernment or private sectors, in developing countries it is often overlooked and not adequately supported by policies [3]. As a consequence, they are left unprepared when an outbreak strikes and this not seldom cost lives. Indonesia, unfortunately, is one of these developing countries where One Health approach has not received proper attentions yet from the level of research to the field actualization.

Globally, One Health is recognized as health security efforts in regards with its probability in contributing to the prevention of infectious diseases, early detection to recovery (Ruckert, A. et al, 2020). A multisectoral One Health Approach demands an integrated and collaborative process to bring together capacity and information [4]. One of the pivotal aspects regarding the control of pathogenic spread in human, animal and environment interface is to build management policies that appreciates transboundary regulations in a science-based fashion [5]. This enables emergence of preventive One Health that provide a useful approach to equitably benefit health for human and its livelihoods [6].

Top three challenges in the implementation of One Health are gap of understandings, sectoral power relations and priorities which is clearly reflected in, among many other, the fact that reduced pathogenic-caused mortality and morbidity is not necessarily balanced with the improved environmental quality [7]. The gap of understanding affects interpretation which further define expectation of future outcome. This underlies the need of predictive models within which expectation is one of predictor variable and when this is combined with heuristic approach the models generated will be more reliable [8].

However, the aforementioned above is that seen with countries where awareness on One Health is well-planted. That is literally great examples. But one nation, Indonesia is no exception, should understand groundedly as to conditions and situations it currently faces in regard with One Health Conception and Progression in order to formulate or re-formulate the platform with much more involvement of its people.

The world should learn from the current outbreak of COVID-19. While some of other Asian countries be that Singapore, South Korea and China are leading in

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pandemic management and monitoring because they utilized multidisciplinary big data, artificial intelligence and open science, Indonesia was seen to have very limited action to manage its crisis [9].

The most logical concept to address this global pandemic is One Health [10]; [6], [11]. Adopting this concept contribute crucial control over the SARS-Cov-2 outbreak help reduce the fatality rates. In Africa, One Health is implemented via control strategies based on the physicochemical and biological properties of the coronaviruses and strategies of minimizing human-human interaction [12].

One Health represents a broad range of synergistic field and publications in this respect has grown in average 14.6% annually since the past 25 years. Notwithstanding, its concept remains unclear due to unsystematic delineation of its internal relationship among its list of myriad components [13].

OH-SMART ™ was reported to be successfully piloted in West Sumatra, Indonesia which resulted in the strengthened communication, joint investigation and institutional partnership. But this required sufficient number of trainers and facilitators [14] which suggest that the concept has not reached some level of individual awareness yet. But rather, it is trainer/facilitator-dependent.

We, in this present study, evaluated responses related to One Health via microblogging media namely Twitter. This is important to measure how far this platform is understood by people (in this case is Twitter users) that subsequently escort the platform into a universal need with lots of existing/current misunderstanding being much suppressed. Twitter is used by over 500 million people worldwide to express their insights and discuss diverse topics, including their health conditions and public health events. It is evident to be a substantial source health-related information on the Internet [15]. Thereof, we see the importance of this as one fine concept is not necessarily popular and known by many which result in apathetic responses of people. This is as well a tool to gauge how One Health is discerned by Twitter users which represent myriad diversity in all aspects.

2 Materials and Methods

This project only focuses on information from online social media, especially Twitter in which news and articles are entirely written in English and, to some extent, include information about one health topic. The online social media used in this project provide local news, comments and opinions in English and thus extracted tonal words are valuable information that can indicate market sentiment and may influence the market movement. Figure 1 shows our research flow that applied in this topic.
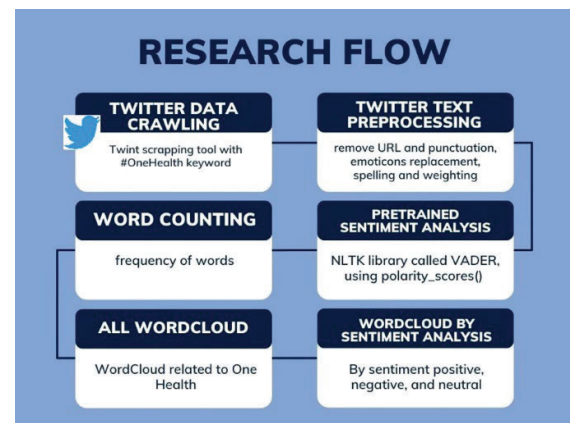

Fig. 1. Research Flow

2.1 Twitter Data Crawling

We analyzed every tweet about One Health in 5 years started from May 26th 2016 as a part of a comprehensive content analysis. The total number of tweets was 154,455. Post duplicate tweet removal, the number of tweets reduced up to 146,975. In order to collect relevant tweets related to One Health news, trends, and issues, #OneHealth is used, all in English.

2.2 Twitter Text Pre-processing

According to the characteristics and terminologies of Twitter, we prepared a transaction file with opinion indicators, such as adjectives, adverbs, and verbs, as well as emoticons. Particularly for emoticons, we took a sample set of them then manually assigned opinion strength to them. Next, we identified the percentage of tweets in caps, the length of repeated sequences, and the number of exclamation marks as emotional intensifiers. All tweets we crawled were pre-processed following steps as below:
1. All URLs (e.g. www.example.com), hash tags (e.g. #topic), targets (@username), and special Twitter words ("e.g. RT") are removed
2. Spelling and weighting are correct; repeated characters were assigned weight to distinguish regular tweets from emphasized usage of a word.
3. Sentiment polarity was in place of all emoticons.
4. All punctuation was removed after post determination of number of exclamation points

2.3 Pretrained Sentiment Analysis

The NLTK library was used to perform sentiment analysis. This library provides a number of functions that we can call with no or few arguments also a number of utilities for prepping data for advanced analysis. We used a built-in sentiment analyzer in NLTK called VADER. Tweets classification into negative, positive and neutral was conducted using polarity_scores()

inside the Valence Aware Dictionary and sEntiment Reasoner (VADER).

2.4 Sentence mapping Using Worldcloud

A word cloud shows the frequency of words that appear in a piece of text. It is possible to gain an understanding of the common structure of frequently occurring words by understanding how they relate to the main topics and themes in a text, and to determine the author's main opinions and standpoints.

3 Results and Discussion

3.1 Gauging top 5 most tweeted word in the context of One Health

One Health is an integrated concept to ensure sustainability and balanced health among three determinants in life namely health in human, health in animals and health in environment. While the concept has already in a strong and continuous implementation in developed countries, developing countries, in majority—with Indonesia as no exception, still lack of awareness. What the most superficial consequence of not having an integrated One Health system literally is least preparedness of unexpected outbreak. Our current global outbreak may be a great start point to observe evidences related to whether or not understanding level on One Health determine how speedy a nation to overcome it. With this in minds we conducted a study where we collect data by crawling from twitter. Twitter so far is a microblogging platform where its followers are facilitated to speak up their minds through 140 words top and real-time. Twitter carries huge supply and demans. The later mentioned is partially precipitated by the bulking body of social media analytics application that using Twitter [16].

The Twitter API is intended to stream real-time or at least a week-old tweet, making it impossible to use this API for this research. The issue is recording historical tweets. Thus, an alternative method of crawling was developed called Twint. The Twint Twitter scraper is a Python-based yet advanced Twitter scraper for scraping Tweets without using Twitter's API. The tool allows you scrape Tweets from specific users, sort Tweets based on topics, hashtags & trends, or remove sensitive information like email addresses from Tweets. In addition, Twint is capable of querying Twitter in a special way, allowing you to fetch followers, likes, and follows of a particular Twitter user without the need for authentication, API access, or Selenium testing. This scraping tool generates a JSON file as its output. From this Twitter-API based data crawling, top 14 most tweeted appear as shown in Figure 2.
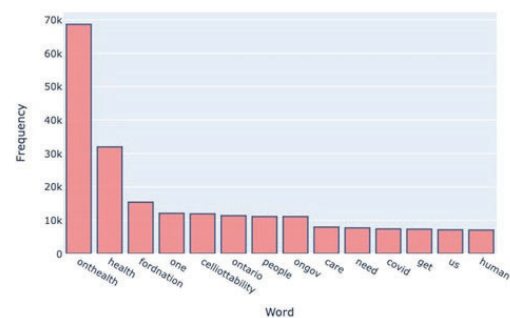

Fig. 2. The frequency of word-utter regarding One Health Concept on Twitter

In descending order, the top 5 highest frequencies words being tweeted are:
1. Onthealth
2. Health
3. Fordnation
4. One
5. Celliottability

Of those, the last three words have extremely small difference suggesting that they have similar level of importance. There are eye-catching terminologies emerge from this analysis namely fordnation, celliottability and onthealth. Celliottability is an official twitter account owned by Canada's Health Minister where health-related information is tweeted. The word of Celliottability is tweeted more than 10k times (Figure 1.). This suggest that to any possible causes Celliottability is tweeted in a considerably high frequency. In somewhat similar frequency is a word of Fordnation tweeted. Interestingly, Fordnation, is one of television shows in Canada hosted by Ford brothers. Onthealth is twitter account managed by Ministry of Health, Canada. In this aspect alone we can highlight that One Health is most tweeted by health-associated individuals as well as institutions in Canada, which represents a developed country.

3.2 Sentiment Analysis of One Health-carrying Tweet

VADER enabled us to see how the tweets polarize into particular sentiments [17]. It is a lexicon as well as rule-based sentiment analysis that is able to probe abbreviations, slang words, emoticons, words even emojis in social media. A vector of sentiment scores with negative, neutral, positive and compound polarities is produced by every single text. The sentiments are then normalized to be between 0 and 1 while the compound polarities are normalized between -1 (negative) and 1 (positive) [18].

Upon incorporation into sentiment, One Health emerges as positive sentiment-triggering aspect which dominate responses (53.2%). This suggests that One Health is thought or accepted as a good concept that might benefit or favour respondents. There are 22.3% of respondents thought negatively about One Health and the rest are neutral which indicates either they are not

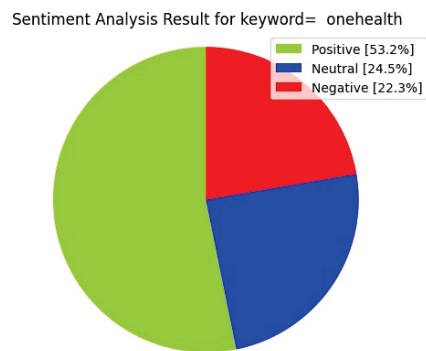updated about One Health per definition or they do not care.

Fig. 3. Sentiment Analysis Result by Using One Word Keyword: One Health

3.3 Wordcloud Sentiment Analysis

We also performed comparison of wordclouds generated from different texts in order to quickly distinguish between the different ideas contained in these texts. We developed wordclouds based on the groups of sentiment analysis. In general, social networks use three major word clouds distinguished by their algorithms instead of appearance. The number of keywords appearing in the collection is reflected in the size of the font for the frequency type. In addition, text mining uses frequency types to analyze textual data which result in font size differences. The bigger the font is the higher the frequency is.

As a phrase but without being linked with sentiments, One Health is tweeted in relation with top 5 words including: ongov, onthealth, one health approach, fordnation, and celliottability (Figure 3). Three words that appears as the top most tweeted in Figure 1. also surface in this analysis being that onthealth, fordnation and celliottability, suggesting that not only are they known or appreciated in Twitter but also trigger emotional responses regardless the direction.
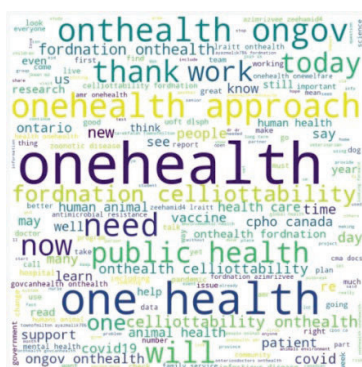

Fig. 4. Word cloud all discussion related to One Health

We went further with linking a phrase of One Health to positive sentiment. As seen in Figure 4, we observed some common happy expressions be that excited,

happy, supporting and good. But obviously "excited" outnumbered other words.

Fig. 5. Word Cloud with Positive Mouths

Although One Health as a concept is undeniably set to promote simultaneous health status in human, animal and environment and for that it receives positive attentions as shown in Figure 3. However, if we associate this with the fact that there are gaps of understandings [7] that, to some extent, hinder the proper implementation of the concept, we reckoned that even One Health would trigger negative response. This is supported by our sentiment analysis that showed about 22.3% tweets were negative-sentiment-carrying (Figure 2).

Our wordcloud analysis demonstrate some words such tb (tuberculosis), concerns, restricted, behind and variants surface when we incorporated One Health to negative sentiments as visualized in Figure 5.
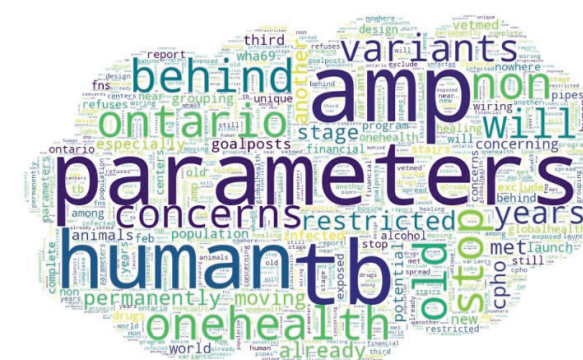

Fig. 6. Word Cloud with Negative Sentiment

This is interesting profile as "tb" emerges in the biggest font word which implies the word is most tweeted when One Health is viewed in a toward-negative perception. It is explicable as tb (tuberculosis) stays unresolved regardless how vast and world-wide level research undergone in order to eradicate the disease [19]. These tweets tend to represent self-expression of disappointment toward global burden which has yet to reach safe and terminal answer. Same goes to "concern" and "restricted" which, if are projected to the current circumstances, both might be pointing at disagreement on policies related to covid-19. If we look at whether the words are commonly used in

daily life, the answer is (strongly) no. "tb", "concern" and "restricted" are hardly heard in semi- to fully private conversation, suggesting that even though Twitter can be harnessed as expression-gauging device, but it is less proper to capture private or personal conversation. [20] described those emotional experiences shared through private forms of communications such as WhatsApp while the expression of negative emotions was rated more in Twitter. Compared to Facebook and Instagram, Twitter is less perceived appropriateness hence it is less suitable for share positive emotions [20]. As for duration, due to its brief duration, Twitter is more suitable to mediate unprecedented communication which related to unexpected events such as disaster in order to channel negative emotions including sorrow, grief, and fear from the users [21].
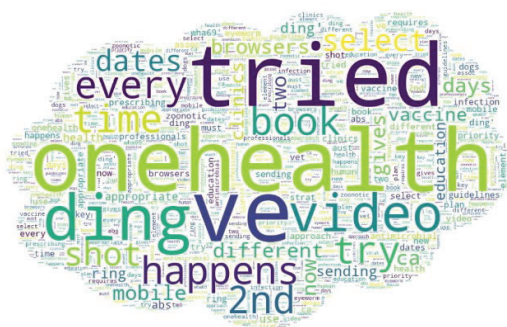

Fig. 7. Word Cloud Results with Neutral Sentiments

Now, we are moving to non-polarized sentiment or neutral. What we obtained from this analysis are in the forms of nouns and verb without loading emotional propensity as we can see from the words of "tried", "video", "book", "happens" and "time". It is troublesome to drag the words with any sentiment. This plausibly explains about the tool and the occurrence and the Twitter users take them as mere information hence their emotion, or sense of belonging are not triggered. [21] further elaborated that neutral tweets spread less wider than positive tweets as do the negative ones. In contrary, positive tweets spread wider and catch more attentions hence collected more favorite.

In short, sentiments speed up spread of the tweets but the range depends whether the sentiment loaded onto are positive or negative [21]. As to One Health as a concept, we clearly see that it receives mixed sentiment-loaded perceptions which implies that it indeed is gaps of understanding among Twitter users exist. This hints to the need of more evidence-based success story in the global implementation of One Health so skew uneasy memories of failures of the platform to reach the intentions upon which it is intended to be and to do from the start.

Taken all these together, it is clear that Twitter is a feasible tool to measure mixed sentiments on a platform that has been echoed universally: One Health. This demonstrates the level of understanding on One Health of a nation which further hints, indirectly, its preparedness or resilience against unexpected disease outbreaks. Although our study was not yet comprehensive, the results suggest a connecting line between sentiment-carrying tweets and health resilience.

4 Conclusion

Twitter is a microblogging media which hitherto has beyond 500 million users across the globe. With this huge number of users, it is often thought to be utilized to diffuse or disseminate particular information. In the context of most recent implementation of One Health, Twitter is a plausible tool to assess how it is discerned by people. As our data crawling showed top words being tweeted in relation with One Health, our sentiment analysis generated words being tweeted when polarize sentiments are loaded onto the word of One Health. Some intriguing profile surfaces from our analysis. Onthealth, fordnation, and celliottability are the top 3 most tweeted words that are Canada-origin. This is strengthened by our wordcloud analysis where the 3 words also appeared as the biggest font too. Despite an excellent aim set in the development of One Health from the start, One Health receives mixed sentiments. Positive sentiments are in the form of words "excited", "happy" and "supporting" which suggest positive feelings of the Twitter users whereas the negative ones are represented by words "tb", "restricted" and "concerns" which imply uneasy collective memories about some aspects where One Health is deemed to be unsuccessful. As for neutral sentiments, the expressions are delivered by the words "tried", "video" and "book", suggesting One Health is taken into account as a mere information hence personal sentiments are not triggered in any polarization. Altogether, these results show that Twitter is a feasible tool to measure acceptance or level of discernment of its users upon particular issue.

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