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Lighthouse in the Mist:
State Governors' Crisis Communication on Twitter During the Early Stage of the COVID-19 Pandemic

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ABSTRACT

Previous research has explored the interactions between public leaders and citizens through social media channels. However, there is a gap in our understanding regarding the communication of limited information to the public during times of crisis. This study focuses on the initial phase of the COVID-19 pandemic as a crisis scenario and investigates how state governors utilized Twitter to communicate with the public, as well as the subsequent impact on citizens' responses. Employing computational social science techniques, this research analyzes a dataset comprising 47,831 tweets posted by U.S. state governors during the first six months of the COVID-19 pandemic, spanning from March to August 2020. The results affirm the crucial role of social media in crisis communication and offer insights into effective social media strategies for public communication.

KEYWORDS

Computational Analysis, COVID-19, Crisis Communication, Political Engagement, Social Media, State Governor, Twitter

INTRODUCTION

The pivotal role of social media platforms in disseminating crisis-related information has garnered considerable scholarly attention. Prior research has illuminated how these digital channels influence citizens' behavioral responses, opinions, and attitudes across various social and economic dimensions (Boukes, 2019; Eberl et al., 2020). Furthermore, the salience of social media in the realm of political discourse is well-documented (Heiss, Schmuck, & Matthes, 2019). Within the context of crisis communication, social media approaches have been delineated in cases ranging from the Boston Marathon bombing to Hurricane Sandy and the outbreak of the Zika virus (Sutton et al., 2016; Hughes et al., 2014; Philip et al., 2019). These approaches often emphasize the development of enduring trust

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and reciprocal relationships while enhancing citizen engagement (Song & Lee, 2016). However, the significance of social media during crises varies depending on the nature of the crisis. As Chew and Eysenbach (2010) note in their study of tweets about the H1N1 crisis, Twitter is a valuable research tool because, unlike survey methods and other traditional methods, it captures real-time information and can gauge public opinion and engagement as it happens. However, it also poses unique challenges.

Since its onset in December 2019, the COVID-19 pandemic has had a pervasive impact on global communities. The initial wave spanning March to August 2020 in the United States was particularly detrimental (Ryan, 2021). Within this period, political representatives bore a critical responsibility to provide cogent directives that both clarified the gravity of the situation and encouraged compliance with preventative measures. Their influence was particularly pronounced during these early stages when the data landscape was less certain (Grossman et al., 2020). The federal structure of the U.S. allows state governors to enact swift responses, often more rapidly than federal agencies (Fowler, 2020). With the escalating spread of cases in March, social media platforms, particularly Twitter, emerged as instrumental conduits for crisis communication between governors and the public (Tsao et al., 2021). However, most research on successful social media communication revolves around cultivating long-term trust and encouraging citizen interaction (Song & Lee, 2016; Panagiotopoulos et al., 2016). Yet, if these social media influences were not established prior to COVID-19, the effectiveness of such communication strategies would be uncertain.

In light of these considerations, the current study aims to scrutinize the early phase of the pandemic, focusing specifically on how state governors leveraged Twitter (now rebranded as X) for crisis communication and the ensuing impact on citizen engagement. Examining how public leaders communicated in the early phases of a crisis could offer insights not only into agency digital branding but also into communication styles and content tailored to the type and stage of crisis development. Thus, we explore two research questions: How did state governors utilize Twitter to communicate with the public, and how did citizens respond to the state governors on Twitter during the early stages of the COVID-19 pandemic?

To study these questions, we employed computational methods to analyze 47,831 tweets from all U.S. state governors issued between March and August 2020. Our analysis underscores the indispensable role that social media channels played in mediating governor-citizen interactions during this critical juncture, offering valuable insights for refining both social media strategy and crisis communication.

LITERATURE REVIEW

Social Media Usage During Crisis

In the complex and dynamic milieu of contemporary governance, social media platforms have ascended as indispensable instruments for fostering citizen engagement and disseminating information (Goncalves et al., 2015; Skoric et al., 2016). Increasingly, academic discourse posits social media as supplanting traditional media channels in crisis communication, effectively becoming the primary conduit for the exchange of news and information (Strekalova, 2016; Dwyer & Martin, 2017; Rosengard, Tucker-McLaughlin, and Brown, 2014). One of the most salient features of social media lies in its capacity for synchronous communication, allowing for the real-time evaluation of public sentiment (Bratu, 2016). Additionally, the expansive reach of social media platforms serves to engage a wide-ranging and heterogeneous audience. Such engagement is particularly crucial for facilitating trust and establishing relationships among diverse constituents, including digitally native younger citizens who are habitual social media users (Popescu & Preduscu, 2016). Consequently, political actors are increasingly cognizant of the imperative to elevate their visibility among their constituencies by utilizing these interactive digital tools (Karlsen, 2011).

Another noteworthy aspect is the proactive capacity of social media in crisis management. Emerging scholarship highlights that digital platforms enable organizations to swiftly disseminate corrective measures, thereby mitigating the adverse impacts of a crisis (Eriksson, 2018; Veil et al., 2011). Politicians and government agencies have, accordingly, shifted towards using social media as a mechanism for mobilizing public sentiment and actions. Empirical studies affirm that social media can serve as a catalyst, inspiring online interactions to translate into real-world activities and advocacy (Enjolars et al., 2012; Nielsen, 2011).

Given this participatory milieu, there is a mounting expectation for government agencies and public officials to be conspicuously active on these platforms (Jaeger & Bertot, 2010; Wukich, 2021; Zavattaro & Sementelli, 2014). This expectation is further nuanced by the symbiotic relationship between the frequency of public officials' posts—or 'tweets'—and the public's reactive behaviors, such as liking or retweeting, thereby making the platforms an indispensable aspect of both crisis communication and broader public relations strategies (Stieglitz & Dang-Xuan, 2013; Haro-de-Rosario, Sáez-Martín & del Carmen Caba-Pérez, 2018; Mergel, 2013). Hence, understanding the intricacies and effectiveness of social media interactivity becomes pivotal for optimizing not only crisis communication strategies but also the public relations endeavors of government agencies.

Especially, in this study, we focus on the early stage of the crisis to examine the question. The early stage of a pandemic constitutes a critical juncture for governmental intervention and public response, making it an essential focal point for scholarly inquiry. Communication during this phase is intrinsically time-sensitive, as rapid dissemination of accurate and coherent information is vital for mitigating adverse impacts on public health and social stability (Weick & Sutcliffe, 2007). In the nascent phase of a crisis, public officials must balance the challenge of conveying urgent yet potentially incomplete or evolving information (Seeger, 2006). Moreover, early-stage communication disproportionately influences public perception and behavior, often shaping the trajectory of compliance with preventive measures (Grossman et al., 2020). Investigating this stage offers a unique vantage point to assess the efficacy of crisis communication strategies in engendering public trust and fostering engagement, especially in complex federal systems where state-level actors may respond more nimbly than their federal counterparts (Doonan, 2013). Thus, scrutinizing the early stage of the COVID-19 pandemic provides indispensable insights into the effectiveness of crisis communication, informing both scholarly discourse and practical applications for future crises.

Relevance of Twitter

The efficacy of crisis communication is contingent upon several factors: the target audience's reception, attention, and comprehension of the disseminated information (Ripberger et al., 2014). In this context, Twitter emerges as a distinctive platform for facilitating prompt, succinct communication—restricted to the number of characters per tweet—and fostering an interactive, bidirectional dialogue with its audience (Taylor & Perry, 2005; Seltzer & Mitrook, 2007). The brevity of tweets not only enables conciseness but also engenders immediate, near real-time responses, an asset of particular import during crises.

Considering the unique utility of Twitter in crisis communication, it is instructive in its features compared to other prominent social media. Platforms such as Facebook and Instagram, while also vital in digital communication, differ significantly in their structural and communicative features. Facebook, for instance, tends to foster interactions within established social networks, making it a platform more suited for sustained dialogue and community building (Ellison, Steinfield, & Lampe, 2007). Instagram, with its visual-centric approach, excels in creating impactful, image-driven narratives but may lack the immediacy and textual detail that characterizes Twitter's communication (Highfield & Leaver, 2015). Though beneficial in their own right, these platforms do not match the immediacy and brevity that Twitter offers—features crucial in crises where timely and concise information dissemination is paramount. Therefore, while Facebook and Instagram contribute to the broader

spectrum of online social interaction, Twitter's distinct format and user engagement dynamics make it especially efficacious for rapid information dissemination and feedback during crises.

The existing literature also underscores Twitter's unique position in the realm of crisis communication, yet there remains an evident gap in comprehensive research on its optimal utilization in such contexts. Wukich and Mergel (2015) highlight the pivotal role of Twitter in bridging the communication gap between citizens and government, underscoring its potential to disseminate critical information swiftly and engagingly. Similarly, Martinez-Rojas, Pardo-Ferreira, and Rubio-Romero (2018) affirm the platform's significance in managing and analyzing emergencies, providing a systematic overview of Twitter's application in various crisis scenarios. Park, Reber, and Chon (2016) elaborate further on Twitter's role in health communication, specifically examining how health organizations leverage the platform for public engagement and health promotion. This body of work suggests Twitter's unparalleled capacity for immediate, widespread communication, which is essential in times of crisis. Moreover, Panagiotopoulos et al. (2016) delve into the nuances of Twitter as a tool for risk communication, emphasizing its effectiveness in reaching a broad audience quickly and efficiently. This research complements the existing scholarship by shedding light on Twitter's capacity to communicate risks and urgent updates to the public, a critical element in emergency management.

Collectively, these studies illustrate Twitter's multifaceted utility in crisis situations, ranging from health communication to risk management. However, despite these insights, a comprehensive exploration of Twitter's diverse tools and their optimal use in different phases of crisis communication remains underexplored. The platform's ability to rapidly disseminate information, coupled with its interactive nature, offers untapped potential for effective crisis management. Future research should, therefore, focus on systematically examining the strategic use of Twitter's various features, such as hashtags, threads, and direct messaging, in maximizing its efficacy during different stages of a crisis. Such an inquiry would not only enrich the academic discourse on digital crisis communication but also provide practical guidelines for public officials and agencies to effectively harness this powerful tool in times of emergency.

While the current scholarship extensively explores Twitter's diverse audience and its implications for general communication (Su et al., 2017; Spencer et al., 2015), there still is a scarcity of in-depth research focusing on the platform's specific effectiveness and utility in managing recent pandemics, particularly at the level of U.S. state governance. This oversight is critical considering the unique challenges and opportunities that arise in such contexts. The existing studies, while insightful, do not sufficiently address how state governors in the U.S. have utilized Twitter's various tools during the early stages of a pandemic. This gap is particularly significant given the immediacy and severity of such crises, where rapid and clear communication is essential.

Engagement on Social Media

Engagement on online platforms is generally defined as "a consumer's intrinsic motivation to interact and cooperate with community members" (Algesheimer et al., 2005, p. 21). Applying to the social media realm, it can be measured with a range of interactions, including sharing, liking the content, and writing comments below the content. The features of sharing a reaction to the content allow the audience to interact with the content via mouse clicks and enhance their ownership over the issues discussed in the content (Kietzmann et al., 2011; Justinussen, 2015; Bene, 2017; Lilleker et al., 2011). By engaging with the content interactively, users can even form a strong psychological affinity toward the politicians (Sundar & Kim, 2005). Accordingly, if public officials actively share information on the salient issues, they will likely receive more likes and shares as a sign of popularity. We argue that this can be perceived as an effective way to demonstrate their ability to communicate and mobilize their audience by interacting with them. A higher engagement by the public can imply that public officials are well-performing when it comes to having a strategy for effective communication (Peeters et al., 2022).

In the context of social media, public engagement is viewed in ways that record public reactions to an individual or organization's social media activity. The public can proactively react, share, and/or respond to the activity and thus show engagement in different ways, with the potential to continue two-way communication (Wang & Yang, 2020). The posting frequency of a Twitter account will also impact the engagement (likes and retweets) among the audience (Araujo & Kollat, 2018; Thomases, 2010).

The literature concerning crisis communication style and content also highlights its significant impact on audience engagement. Effective communication during crises not only involves the transmission of vital information but also requires consideration of the style and tone used to ensure messages are well-received and compelling (Coombs, 2007; Seeger, 2006). The content must be clear, concise, and authoritative, yet empathetic, to foster trust and encourage public engagement (Austin, Liu, & Jin, 2012). This alignment of style and substance in messaging significantly influences how the audience interacts with the content on social media, affecting behaviors such as liking, sharing, and commenting (Veil, Buehner, & Palenchar, 2011). Tailoring the message to the audience's needs and preferences, particularly in a crisis, enhances the likelihood of engagement, as individuals are more inclined to interact with content that resonates with their concerns and understanding (Heath, 2012; Liu, Austin, & Jin, 2011).

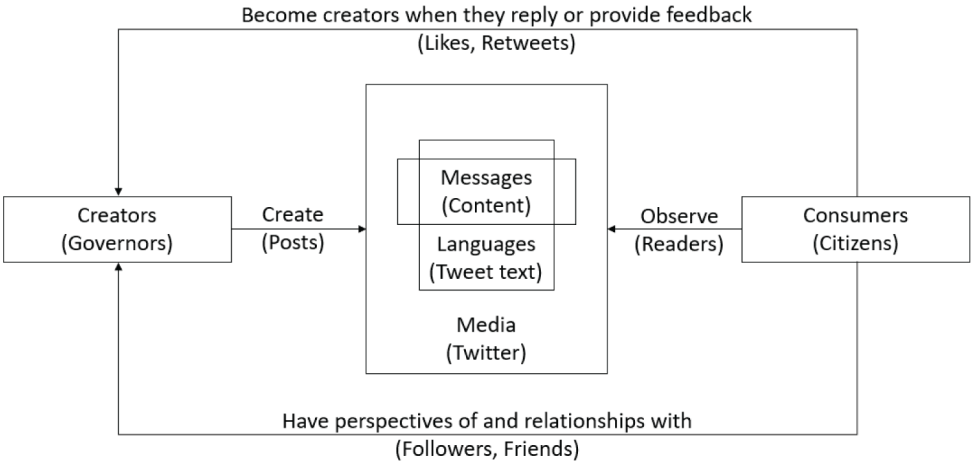
As such, we asked the second research question: How did citizens respond to the state governors on Twitter during the early stages of the COVID-19 pandemic? We distinguish the level of engagement by measuring both 'likes' and 'retweets.' We argue that the number of likes a tweet receives measures the level of endorsement the governor's tweets receive from citizens. The *like* function indicates how the Twitter audience receives and appreciates the specific tweet (Muñoz-Expósito, Oviedo-García & Castellanos-Verdugo, 2017). Previous works on social media and politics suggest that the "likes" on Twitter can be a direct signal of appreciation from the public (Henríquez, Sabat, & Sullivan, 2023). Thus, we developed the first hypothesis:

Hypothesis 1: The more active the governor is on Twitter during the COVID-19 crisis, the higher the level of endorsement his/her tweets will receive.

On Twitter, the process of creating a post to share a tweet is generally known as 'retweeting.' In the context of social networks, information diffusion is broadly defined as a process by which information passes from one user node to another (Ma, 2013). In other words, retweeting can be considered a form of information diffusion between individuals (Dinh & Parulian, 2020). Retweeting can distribute the information from a tweet to more users and improve the original tweet's impression. When citizens retweet a governor's tweet, they agree with the information and want to spread it to more people. The more retweets the tweet receives, the more information diffusion possible (Firdaus, Ding & Sadeghian 2018). Thus, the number of retweets measures information diffusion of the governors' crisis communication. More specifically, the dynamic process of re-tweeting can also help uncover communication patterns between different types of individuals and potentially launch a form of collective sense-making (Fan, Jiang, & Mostafavi, 2020).

Given that the surge of information diffusion networks started as a crowdsourcing potential platform by emergency responders and their audience, the function of 're-tweets' has expanded as a form of engagement through diffusion with the members of the public and relevant officials (Nepali et al., 2016). Similar to emergency response, the act of re-tweeting during the COVID-19 pandemic contributed to situational awareness among the public. However, such useful information is validated more when coming from a credible source. Given this case, it is essential to test the factors of the user (in our case, state governors) who posted the information in the first place. This leads to the second hypothesis:

Figure 1. Theoretical Framework



Hypothesis 2: The more active the governor is on Twitter during the COVID-19 crisis, the wider his/her tweets will be diffused.

Theoretical Framework

For the foundation of this study, we combined Foulger's (2004) ecological model of communication with Mergel's (2013) framework for public sector interaction, illustrated in Figure 1. This theoretical framework provides a comprehensive lens through which we analyze the intricate dynamics of communication within the public sector, particularly focusing on the utilization of social media platforms.

The ecological model of communication, as proposed by Foulger (2004), asserts that communication unfolds within the convergence of four pivotal components. These components intricately involve interactions among individuals, encompassing both creators and consumers. Communication is facilitated by creators through messages, which are meticulously crafted using language across various media channels. These messages, disseminated through media sources, are then received and interpreted by consumers.

Drawing from Mergel's (2013) framework, the application of social media platforms within the public sector serves to amplify government transparency, encourage active citizen participation, and foster collaboration. Mergel's framework also advocates for the measurement of social media interactions to gauge effectiveness.

In the context of this study, the creators in the communication model are represented by the governors, who generate messages on Twitter by posting tweets. On the other side, citizens take on the role of consumers, reading these messages. However, a notable dynamic emerges when citizens engage with these messages – by liking or retweeting, citizens transition into creators within the communication model.

Furthermore, citizens not only consume the messages but also hold perspectives on the governors. This dual role is reflected in their relationships with the governors, established through followership or friendship on social media platforms. In essence, citizens play a multifaceted role as both consumers and creators, contributing to the complexity of the communication model in the realm of social media and public governance.

Within the scope of this research, our primary emphasis centers on the intricacies of communication, specifically delving into the nuances of the message (content) itself. We closely examine the governors' dynamic involvement in the creation of messages, often manifested through their posts on social media platforms. The objective is to understand the influence wielded by these governors' messages on citizens' responses, particularly in terms of engagement metrics such as likes and retweets.

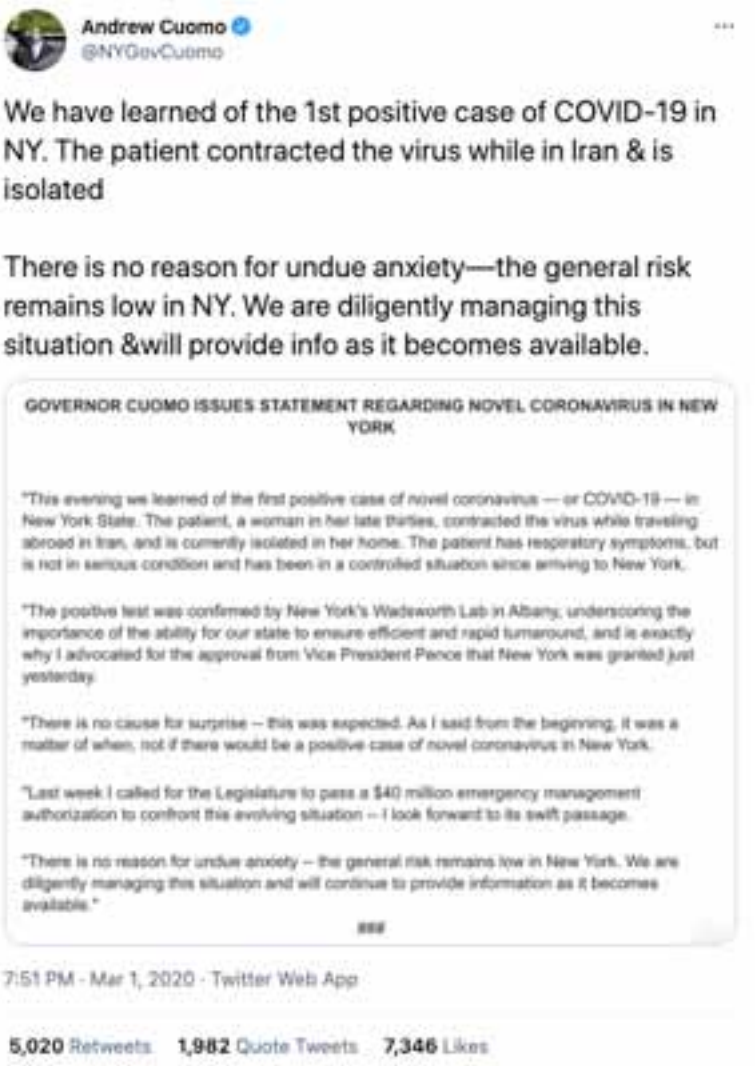
METHODOLOGY

To examine how citizens have responded to the state governor's usage of Twitter during the early stage of COVID-19, we used Twitter API and scrapped postings on Twitter of governors from all 50 states in the United States from March 1st, 2020, to August 31st, 2020. During the six months, there were 47,831 tweets or postings from the state governors in total. Then, over the observed timeframe, there were some outstanding topics on social media besides COVID-19, for example, protests following the death of George Floyd, the U.S. presidential election campaigns, etc. To narrow down the focus on governors' communication about COVID-19, we filtered a subsample of tweets. Specifically, we used computational automated dictionary analysis to identify tweets that were related to the pandemic. The dictionary-based approach is widely used in categorizing text content into a particular group or bracket (Grimmer & Stewart, 2013; Simchon, Brady, & Bavel, 2022; Rooduijn & Pauwels, 2011). In this study, to broadly identify the COVID-related tweets, we manually develop a dictionary with around 100 COVID-related keywords, such as 'COVID-19', 'coronavirus,' 'pandemic,' 'lockdown,' 'spread,' 'sanitizer,' 'mask,' 'quarantine,' 'vaccine,' 'symptom,' and so on (See more on Appendix B). Open-ended dictionary analysis is a qualitative research method used to examine and interpret text data by categorizing and organizing the content based on a predefined set of categories or criteria. Unlike closed-ended dictionary analysis, which uses a fixed and predefined dictionary or list of keywords, open-ended dictionary analysis allows for a more flexible and exploratory approach (Banks et al., 2018). In open-ended dictionary analysis, researchers often develop or adapt a dictionary of terms or concepts based on their research objectives and then use this dictionary to code and categorize the text data. This method allows for a more nuanced understanding of the content and enables researchers to capture unexpected insights and emerging themes within the data.

Given the large size of the observations, we use the machine learning technique to identify the tweets that include one or more of these keywords. Among the 47,831 tweets posted by governors, 30,036 (62.8%) of them are COVID-related and contain at least one of the dictionary keywords. To validate the effectiveness of the machine learning technique, we randomly sampled 100 tweets and manually coded whether they were COVID-related or not. Among these 100 sampled tweets, 61 of them were coded as related to COVID by machine, and 73 of them were coded COVID-related manually. Inaccuracy of the machine occurred when context was needed to understand the tweet, when the tweet was posted in a non-English language, or when typos or specific symbols appeared in the keywords. The accuracy of the dictionary-based approach is 88%. Details about the dictionary-based approach validation is available in Appendix C.

To answer the first research question, we ran a content analysis on governors' tweets with text-mining techniques to identify common themes and communication patterns. Text analysis originates from communication and public relations research to derive quantitative information from a body of open-ended qualitative data by analyzing the frequency of ideas or codes (Wang & Zhuang, 2017). Specifically, we used a frequency-based approach. Word frequency counts are meant to extract meaning from texts. It assumes that each word has one and only one meaning. Using frequency analysis, this study presents the number of times each word appears in the governors' tweets. While word frequency analysis efficiently offers valuable insights about the major topics, it also has some limitations, for example, lack of context understanding, semantic ambiguity, dependency on predefined dictionaries,

Figure 2. Example of a Tweet in the Dataset



challenge with polysemy, etc. To overcome these limitations, we conduct additional qualitative analysis using a small subsample (n=100) of top-endorsed tweet text.

Besides the qualitative text body in a tweet, we also collected the quantitative matrix of tweets using Twitter API. Figure 2 shows an example of a tweet unit from the New York state governor, Andrew Cuomo, posted on March 1st, 2020. It received 7,346 likes and 5,020 retweets. 'Like' refers to the number of users that liked the specific tweet (Twitter Help Center, 2021). A 'retweet' is a reposting of another tweet and helps users quickly share that tweet with all of their followers (Twitter Help Center, 2021). There are two types of retweets on Twitter. The first type is retweeting without any modification or comments and is marked as "RT" to indicate it was initially generated by other users (Twitter Help Center, 2021). The second type of retweet is quoted retweet, where retweeted adds comments to the original tweet when retweeting. Only the first type of retweet text will be utilized in the analysis for this study because the quoted retweet does not reflect whether the user agrees or disagrees with the tweeted content.

The quantitative matrix is analyzed to answer the second research question about how the public responds to governors' Twitter activities. Rapid and accurate sharing of information is vital for public health and social stability (Weick & Sutcliffe, 2007). Nowadays, people expect government agencies and officials to be active on social media (Jaeger & Bertot, 2010; Zavattaro & Sementelli, 2014). This is because the more officials post on social media, the more people react by liking or retweeting. Social media has become crucial for handling crises and managing public relations (Stieglitz & Dang-Xuan, 2013; Haro-de-Rosario, Sáez-Martín & del Carmen Caba-Pérez, 2018; Mergel, 2013). Thus, we used Ordinary Least Square (OLS) regression analysis to explore the correlation between the state governor's level of activeness on Twitter and citizens' level of endorsement and diffusion of governors' tweets. The unit of analysis utilized for the regression analysis is the individual governor's Twitter account.

The two dependent variables are citizen endorsement and information diffusion. First, citizen endorsement is measured by the average number of "likes" a governor received among all his or her Twitter posts during the six months. The number of likes in one tweet reflects how much the citizens agree with the specific information the governors communicate with the public in a tweet. The average number of likes of all postings shows the general endorsement the governors receive from the public. The second dependent variable, information diffusion, is measured by the average number of "retweets" a governor receives among all his or her tweets. The retweeting behavior of the citizens helps to spread the information the governors communicate with the public. As mentioned earlier, to ensure positive information diffusion, only direct retweets, excluding quote retweets, are counted in this measurement. We disregarded quote retweets as we wanted to accurately measure the impact of the original tweet in order to assess the user's capacity to effectively engage their audience (Baqir et al., 2023). The average number of retweets measures the extent to which citizens diffuse the information from the governors' COVID-related tweets.

We utilize three independent variables to indicate the governor's level of activeness on Twitter. First, the frequency of tweeting is measured by the total number of tweets he or she posted during the six months. Second, maintaining a transparent crisis communication platform would lead to a more significant impact on information sharing among the audience (Gruber, Smerek, Thomas-Hunt & James, 2015). Thus, we also collected the number of followers from the governors' account page. The larger the number of followers, the wider the audience the governor reached. Third, we included the number of friends of the governor. Friends are defined as the users the account is following. The larger the number of friends, the more extensive the Twitter network of the governors.

Among the control variables, the population of the state is included as it affects the size of the audience of the governor's Twitter account. Second, the governor's age is controlled. It is commonly agreed that Twitter, as a social media platform, is more widely used among the younger generation. Thus, governors' age may affect social media activities. The third control variable is partisanship. Recent research finds that Democratic politicians emphasize more on the severity of pandemics compared to Republican politicians (Beauchamp, 2020; Coppins, 2020; McCarthy, 2020). Grossman et al. (2020) showed how Democratic governors have been more active on social media and more robust in adapting COVID-19 preventive measures, thus ensuring citizens' response to the messages is proactive. Similarly, Panda et al. (2020) found that Democrats tweeted more regularly every week and have more frequently mentioned COVID-19 than Republicans. More specifically, Republicans tend to focus on the economic consequences of the crisis, especially its impact on small businesses. Democrats were more likely to have tweets that mentioned 'public health,' 'health care,' and 'pandemic. This is important as citizens also tend to evaluate the government responses distinctly by partisan ideology, and government officials also tend to share information differently, indicating an influence of partisanship on the same (Gadarian, Goodman, and Pepinsky 2021; Green et al., 2020; Calvo & Ventura, 2021).

Table 1. Samples in each analysis

Analysis	Sample	# of tweets
Machine-automated text analysis	All tweets posted by governors during the studied timeframe	47,831
Manual text analysis	Top-endorsed tweets	100
Descriptive analysis	Machine detected COVID-related tweets through the dictionary-based approach	30,036
Regression analysis	Machine detected COVID-related tweets through the dictionary-based approach	30,036

ANALYSIS AND RESULTS

As previously discussed, our research methodology involved three distinct sets of analyses to address our research inquiries. First, a comprehensive text analysis was employed to uncover the predominant topics during the initial six months of the COVID-19 pandemic. This involved utilizing machine-based methods to identify key topic keywords within the entirety of governors' tweets. Simultaneously, a manual review was conducted to discern common themes and communication styles prevalent in the top-endorsed tweets. This text analysis focused on understanding the content and language used in governor-citizen communication on social media, as depicted in Figure 1 of our theoretical framework. In the second phase, we narrowed our focus to COVID-related tweets identified through a dictionary-based approach. We then conducted descriptive analyses to measure the level of activity exhibited by governors on Twitter. This descriptive analysis quantified how governors create and share information on social media and how citizens engage with it (Figure 1). Moving to the third set of analyses, we delved into the relationship between governors' social media activeness, citizen endorsement, and information diffusion in crisis communication, utilizing the subset of COVID-related tweets. It is crucial to note that different samples were utilized in each analysis, and the specific number of tweets within each sample is detailed in Table 1.

Text Analysis

First, we conducted text analysis to identify the major topics among all governors' postings during the early stage of the pandemic. Figure 3 shows the word cloud produced with pooled text in governors' tweets. Word cloud visualizes the frequency of every single word in the text. The larger the font, the more frequently the word appears. The text analysis shows that COVID-19 is the central topic among all the governors' tweets from March 2020 to August 2020. Words such as 'COVID-19', 'test,' 'health,' 'live,' 'stay,' and 'home' are the most frequent words in the word cloud. Exploring the word frequency further, Figure 4 displays a frequency bar chart, indicating the number of times each of the top 50 words appears in the tweet text. The results from the bar chart also point towards COVID-19-related words being frequently used (more than 2000 times) among the state governor's tweets. More specifically, we noticed that the words most frequently used (>2500) were directly related to public health issues such as wearing masks, testing, and spreading COVID-19. Words (<2500) focused more on government policies around re-opening for work. This gives us an idea of the type of information being prioritized by governors in the early stages of communicating about the COVID-19 crisis.

Beyond the analysis of topics, we also found interesting findings about communication styles through qualitative analysis. As the timeframe in this study is the early stage of the pandemic, the tweets are naturally timely and relevant to current issues. Additionally, common characteristics emerged from the top-endorsed tweets. Firstly, a notable presence of calls to action was identified, wherein governors urged the public to undertake specific actions. For example, Washington Governor

Figure 3. Word Cloud of All Governors' Tweets Text

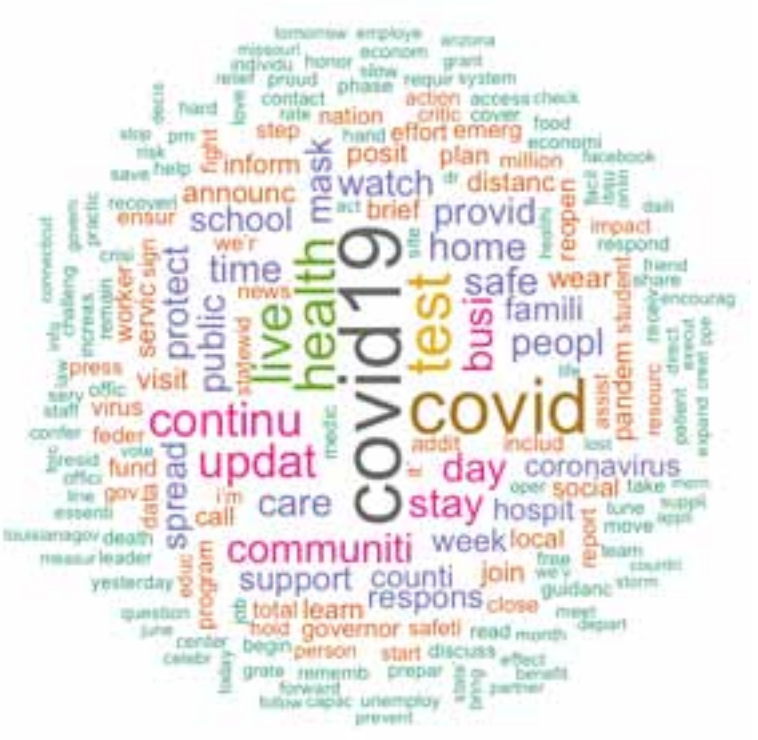
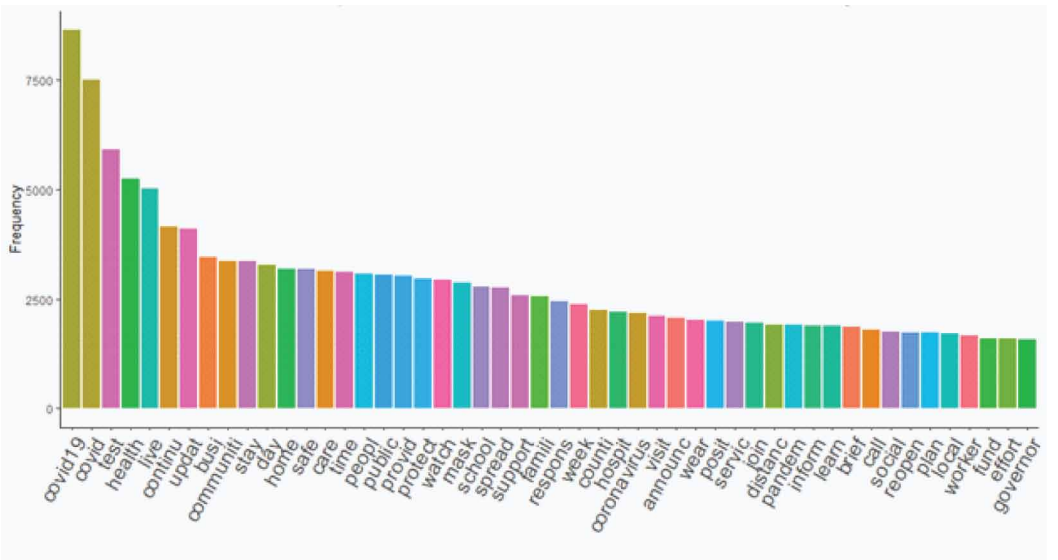


Figure 4. Most Frequent 50 Words in All Governors' Tweets from Mar. 2020 to Aug. 2020



Inslee posted, "Most Washingtonians are helping slow COVID-19's spread by practicing strong social distancing. To those of you that can be but are choosing not to: Your actions could kill someone. Stop it." Secondly, many governors employed a strong and assertive communication style on social media, which captures attention and mobilizes supporters. For instance, Michigan Governor Gretchen Whitmer's top-endorsed tweet said, "…I've asked repeatedly and respectfully for help. We need it. No more political attacks, just PPEs, ventilators, N95 masks, test kits. You said you stand with Michigan, prove it." Thirdly, tweets announcing policy decisions often garner attention and likes from the public. For example, Ohio Governor Mike DeWine's most-liked tweet wrote, "Beginning tomorrow at 6:00 pm, citizens in all Ohio counties will be under a mandatory mask order while out in public." Lastly, a noteworthy observation was that most top-ranked tweets were original postings, not retweets. This underscores the public's expectation of governors as proactive communicators on social media, rather than merely responsive ones. Overall, these qualitative insights offer a nuanced understanding of the dynamics shaping the engagement levels of politicians on social media during the early phases of the pandemic.

Descriptive Analysis

The descriptive data provides empirical evidence for the essential role of social media in crisis communication and public agenda setting. During the first month of the COVID-19 outbreak, the 50 state governors tweeted COVID-related issues 5,879 times in total, which is almost 4 postings per day on average. More than 2.8 million citizens retweeted a state governor's COVID-related tweet nationwide, while the 50 state governors received more than 8.6 million total likes on COVID-related tweets. Among the most active states on social media, such as California, citizens reacted (like or retweet) to the governor's Twitter posting 5.6 million times in six months. Given the total population of 39 million, 1 in 7 people engaged with state governors on Twitter on average. Figure 5 shows the trends of governor tweeting frequency, citizen endorsement, and information diffusion from March to August. The black line is the total number of tweets. The green line is the total number of retweets, adding up the number of retweets in each tweet. The yellow line is the total number of likes. March and April are the peak time for governors' Twitter activities as well as citizen engagement. Citizen engagement cools down in May and June, experiencing a slight increase in July, followed by a significant decrease in August, which is in conjunction with the change witnessed in the COVID-19

Figure 5. COVID-related Tweets Overtime

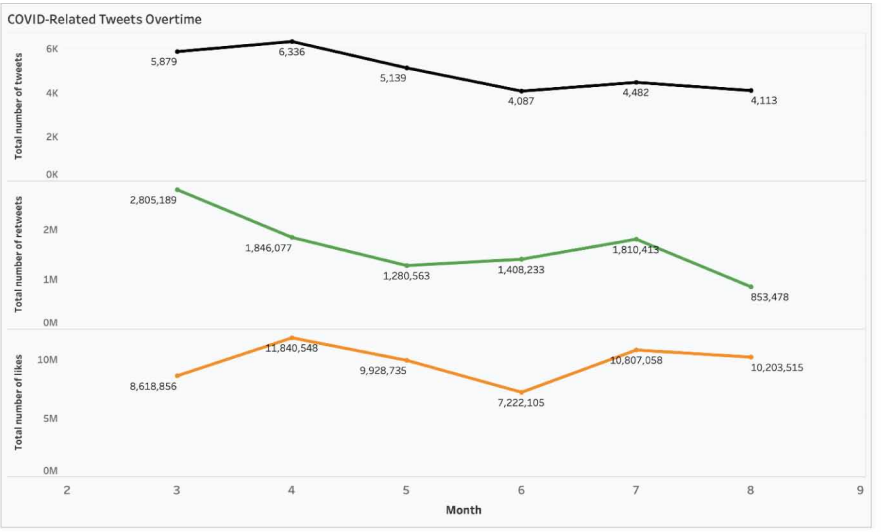
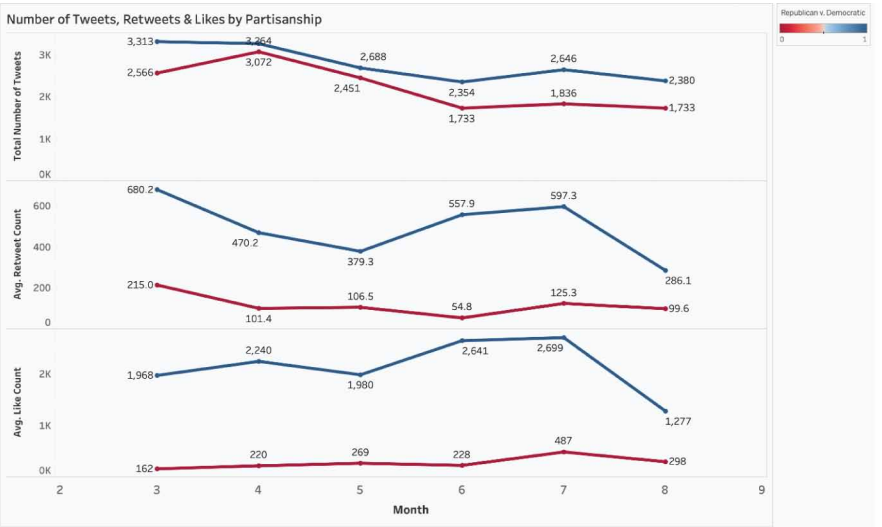


Figure 6. COVID-related Tweets by Partisanship



cases over the first six months of the outbreak (Center for Disease Control and Prevention, 2023). Figure 6 visualized the difference by partisanship. Democratic governors communicate with citizens more actively on Twitter during the early stage of the COVID-19 crisis. In response, citizens engage more actively in COVID-related tweets with Democratic governors. This finding is corroborated by other research indicating a steadfast response from Democratic governors, compared to Republican governors, regarding information about COVID-19 (Grossman et al., 2020; Calvo & Ventura, 2021). This finding also indicates a correlation between partisanship and social media activeness and supports the rationale of including partisanship in the control variables of the regression model.

In addition, Figure 7 visualizes a spatial variation of the extent of COVID-19 tweets and citizen endorsement and diffusion of state governor's tweets. The first map is the number of COVID-related tweets by state. The second map is the average number of retweets by state. The third map is the average number of likes by state. The larger the size of the dots, the higher the number is. As seen in the figure, the blue dots represent states led by Democratic governors, while the red dots represent Republican states. We find that citizen engagement, reflected in an average number of likes and retweets, is significantly more active in Democratic states such as New York, California, Michigan, Washington, etc.

The descriptive analyses respond to the first research question: How did state governors communicate this crisis to the public on Twitter? Not surprisingly, in the early stage of the pandemic, COVID-19 was the overwhelming majority topic in all the communications between state governors and citizens. The activeness of communication on Twitter is parallel with the trend of the severity of the pandemic during the six months. There are obviously variances in state governors' activities on Twitter, with Democrats being more active on Twitter and engaging citizens better.

Regression Analysis

Following the exploratory analysis, an observed connection indicates heightened citizen engagement with state governors exhibiting increased Twitter activity. To empirically investigate our research question, we conducted regression analyses after restructuring the data. First, we summarized essential metrics from each governor's Twitter account, encompassing the total count of COVID-related tweets, aggregate retweets and likes, as well as follower and friend counts. Appendix A provides a comprehensive overview of these metrics for all 50 governors during the March to August

Figure 7. COVID-related Tweets by State (3 maps)

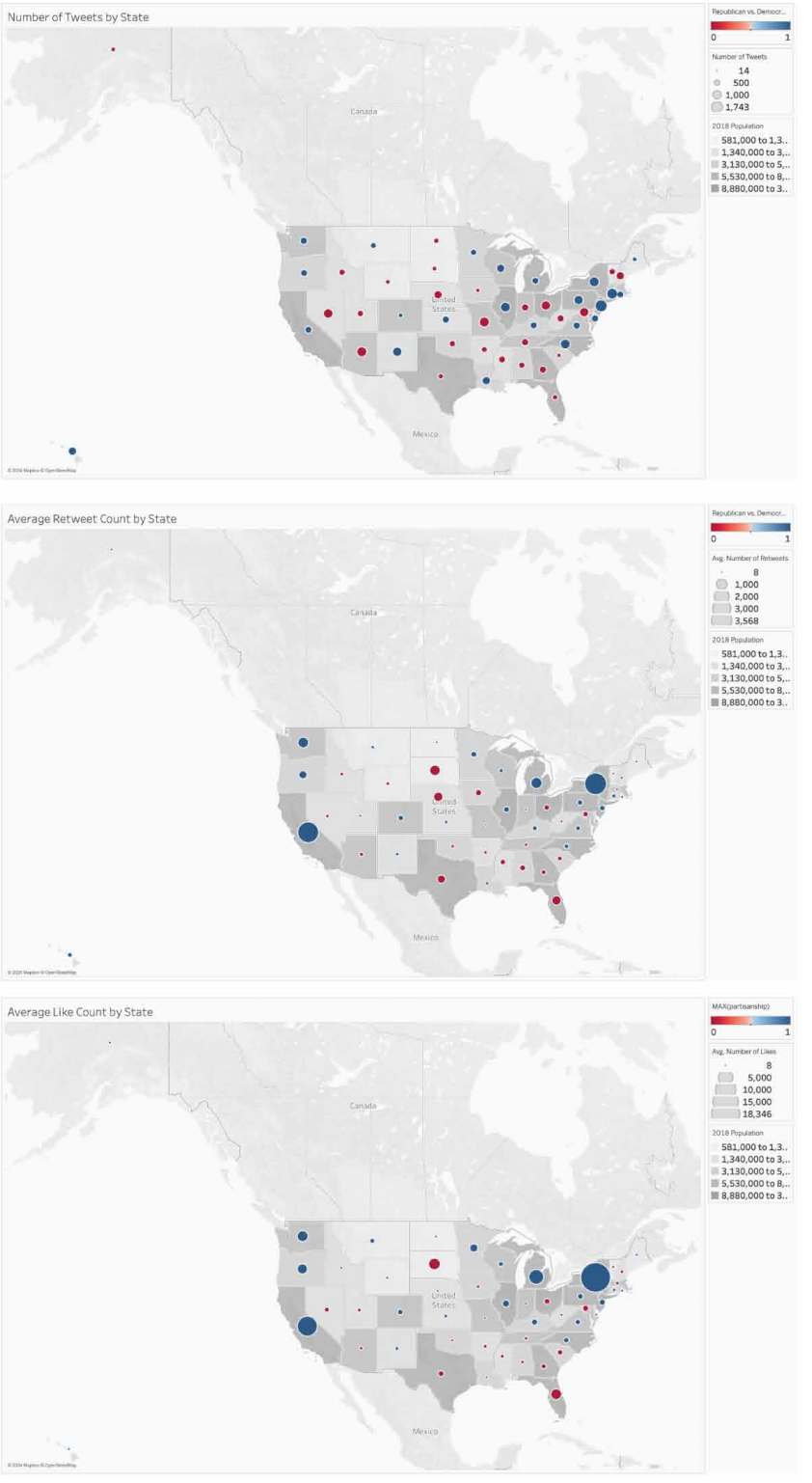


Table 2. OSL Regression Models

	All States	
	Model 1	**Model 2**
	Avg. Likes	**Avg. Retweets**
No. of Tweets	-0.442 (0.225)	-0.110 (0.066)
No. of Followers (thousand)	7.701*** (0.256)	1.536*** (0.075)
No. of Friends	-0.164*** (0.030)	0.023* (0.009)
State Population (thousand)	-0.067*** (0.016)	-0.008 (0.005)
Governor's Age	-8.089 (8.847)	-0.223 (2.604)
Democratic	172.119 (164.963)	-10.172 (48.563)
(Intercept)	675.257 (554.027)	60.067 (163.010)
R2	0.9693	0.9533
N	50	50

*** $p \leq 0.001$; ** $p \leq 0.01$; *$p \leq 0.05$

period, along with supplementary details such as the governor's age, state population, and political partisanship (coded as 0 for Republican and 1 for Democratic). The analysis comprises a sample size of 50, with each individual governor's Twitter account serving as the unit of analysis. We use the Ordinary Least Squares (OLS) model in the regression analysis. Given the small number of observations, OLS is straightforward. The variance inflation factor was checked in both regression models to avoid multicollinearity issues.

Table 2 presents the results of the regression models. These results reveal that the activeness of the governor's Twitter account, measured by the total number of tweets in six months, the number of followers, and the number of friends, have a mixed influence on the average number of retweets and the average number of likes the governors received in their COVID-related tweets. Specifically, Model 1 shows the mixed influence of account activeness on the average number of likes, which measures the citizen endorsement of the governor's tweet. The number of followers has a statistically significant positive effect on the number of likes. However, the number of friends unexpectedly exhibits a statistically negative effect on the average likes. Additionally, while not statistically significant, the number of tweets negatively influences the tweet's likability. Furthermore, the state population demonstrates a statistically significant negative effect on the average number of likes. In Model 2, the results indicate that both the number of followers and the number of friends significantly contribute to the average number of retweets a governor receives for their COVID-related tweets during the initial six months of the pandemic. However, mirroring Model 1, the number of tweets surprisingly shows a negative impact on the average number of retweets, albeit not reaching statistical significance. In both models, the age and partisanship of the governors exhibit no statistically significant impact. In summary, our findings only partially support both hypotheses. Contrary to expectations, tweeting frequency exhibits a surprisingly negative impact on citizen endorsement and information diffusion. Conversely, as reflected in the number of followers, the governor's account activity positively influences citizen endorsement and information diffusion. The number of friends positively impacts

information diffusion but negatively influences citizen endorsement. These results underscore the complexity of social media dynamics during crisis communication.

DISCUSSION AND IMPLICATION

This study furnishes exploratory evidence concerning the modalities by which elected representatives leverage social media platforms to engage with constituents, circulate imperative public health advisories, and employ social media as a sophisticated instrument for policy-related communication. Regression analyses substantiate that the maintenance of a robust social media presence is advantageous for governors, particularly in times of crisis. The magnitude of an account's following demonstrates a positive correlation with constructive outcomes in social media interactions, encompassing citizen endorsement and information dissemination. Therefore, governors and their administrative agencies should allocate strategic resources toward the enhancement of digital communication efficacy.

Interestingly, the study's findings diverge from extant literature in social media marketing, indicating that higher social media activity does not invariably yield positive results regarding citizen engagement. Factors such as the frequency of posts and the multitude of accounts followed by a governor could potentially generate adverse outcomes in digital interactions. An information overload may deter engagement, thereby diminishing the marginal efficacy of communication. This underscores the primacy of information quality over sheer volume in the context of political social media strategies. Furthermore, the qualitative exploratory analysis sheds light on the communication style utilized for messaging. For example, the most recognized tweets were original posts by the Governors and involved either a call to action or information on policy decisions. Given the initial phase of the pandemic, citizen interaction might have been limited, with more emphasis on one-way communication aimed at providing timely and critical information. This has been in the form of advisories, critical information, or policy details. Similar trends have been observed in other studies (Wukich & Mergel, 2015; Malik et al., 2021), reinforcing some of the divergent findings identified in our research.

Interestingly, the regression analyses further indicate that political affiliation exerts a negligible influence on citizens' reactions to gubernatorial Twitter activities. While Democratic governors accrued greater levels of endorsement, they witnessed diminished information dissemination. One plausible explanation for this apparent non-effect could be the scarcity of alternative digital platforms offering public health information during the crisis's nascent phase, thus diminishing the salience of partisanship in influencing citizen engagement.

The present study has several constraints related to the broader use of social media for reliable information gathering and responses and, more specifically, to the scope of Twitter used for analysis. Given that the study has only examined the social media usage of one type of elected official, it is impossible to generalize how citizens perceive information shared by different officials or government agencies. This limits our findings to the specific agency/official context only. Second, this study intended to study how state governors communicated their official messages via Twitter. However, this limited the authors from examining shifts in citizen engagement during subsequent phases of the COVID-19 crisis and scrutinizing the reasons behind the observed decline in citizen endorsement as tweet frequency increases. Understanding the inflection point where citizen engagement wanes will be pivotal for effective public communication strategies, and we hope to pursue it in future studies. Third, while a myriad of meaningful indicators exist to gauge public engagement on social media, our analysis, due to data limitations, focuses primarily on the variables currently at hand. Recognizing this, we acknowledge the importance of other engagement forms, such as comments and mentions, in capturing nuanced facets of public sentiment. These forms of interaction provide valuable insights, often revealing more intricate details of public discourse and reaction than likes and retweets alone. However, due to the constraints in our data, our analysis is centered on two main variables: citizen endorsement and information diffusion. Admittedly, offline factors also play a role

in shaping engagement, while our data is limited in observing offline behaviors. Nevertheless, it is worth noting that during the initial phases of the COVID-19 pandemic, offline activities were notably reduced, diminishing the significance of their impact. In addition, the archival-restricted data from Twitter did not provide data on citizen characteristics (such as age, region, and partisanship), which could also provide more insights into citizens' reactions (likes, reposts) to the governor's tweets.

However, the investigation has identified a nuanced network effect on citizen engagement metrics such as likes and retweets. The number of friends positively impacts the average number of likes but adversely affects the average number of retweets. This raises subsequent inquiries about the semantics of 'likes' and 'retweets' within the ambit of citizen participation and further probes the underlying mechanisms steering such behaviors.

The findings also furnish insights into the choice of communication tools and approaches that can augment public approval of elected officials across similar platforms. The research is particularly salient in the contemporary milieu, offering a nuanced understanding of the communicative strategies employed by public officials, including keyword preferences for citizen engagement. It provides a snapshot of how elected officials have communicated with the public, including the differential preferences in choosing keywords to engage with citizens. As a result, elected officials and their agencies face a new and complex reality where research and more evidence are required in building communication strategies for crisis management, including different types and at different points of crises. Given the policy context, the public administration discipline has an opportunity to study and build on a call to action for developing communication strategies, which may also help in managing initial expectations and uncertainties faced by citizens looking for more credible information. Lastly, this form of call of action would percolate into other aspects of public administration, including human resources and emergency management, by building a reference tool or framework to help elected officials communicate steadfastly and effectively with all relevant stakeholders.

The study's insights also contribute an overarching perspective to the discourse on public relations practices in political campaigns and elections. Still, additional inquiry is warranted to comprehend how information should be optimally channeled from authorities during emergencies for efficient crisis management.

Similar to other crises, the dynamic nature of COVID-19 indicates close coordination between multiple agencies and departments in coordinating their messages on different channels, including social media. By studying the governor's tweets in the early stage of the pandemic, we analyzed the reactions to public officials' tweets in the early stage of a crisis. This has clear implications for communication styles and language principles for emergency risk management and public relations. Second, by exploring the citizen's reactions in the early stages, government agencies can better strategize and prepare for social media messaging, especially with the higher chances of fear and misinformation mid-crisis to post-crisis. Third, as seen in other crises, early-stage messaging has widely been initiated at the state or federal level, with local agencies geared towards policy implementation. Thus, studying the governor's tweets in the early stages is relevant, as they would be one of the state-level offices in the loop for real-time information and policy changes. Thus, while the study is exploratory, it holds implications for the corpus of public relations and communication studies.

CONFLICTS OF INTEREST

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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REFERENCES

Algesheimer, R., Dholakia, U. M., & Herrmann, A. (2005). The social influence of brand community: Evidence from European car clubs. *Journal of Marketing*, *69*(3), 19–34. doi:10.1509/jmkg.69.3.19.66363

Araujo, T., & Kollat, J. (2018). Communicating effectively about CSR on Twitter: The power of engaging strategies and storytelling elements. *Internet Research*, *28*(2), 419–431. doi:10.1108/IntR-04-2017-0172

Austin, L., Liu, B. F., & Jin, Y. (2012). How audiences seek out crisis information: Exploring the social-mediated crisis communication model. *Journal of Applied Communication Research*, *40*(2), 188–207. doi:10.1080/00909882.2012.654498

Banks, G. C., Woznyj, H. M., Wesslen, R. S., & Ross, R. L. (2018). A review of best practice recommendations for text analysis in R (and a user-friendly app). *Journal of Business and Psychology*, *33*(4), 445–459. doi:10.1007/s10869-017-9528-3

Beauchamp, Z. (2020). The stunning contrast between Biden and Trump on coronavirus. Vox.com. https://www.vox.com/policy-and-politics/2020/3/12/21177135/coronavirus-COVID-19-pandemic-trumpbiden-speeches

Bene, M. (2017). Go viral on Facebook! Interactions between candidates and followers on Facebook during the Hungarian general election campaign of 2014. *Information Communication and Society*, *20*(4), 513–529. doi:10.1080/1369118X.2016.1198411

Boukes, M. (2019). Social network sites and acquiring current affairs knowledge: The impact of Twitter and Facebook usage on learning about the news. *Journal of Information Technology & Politics*, *16*(1), 36–51. doi:10.1080/19331681.2019.1572568

Bratu, S. (2016). The Critical Role of Social Media in Crisis Communication. *Linguistic and Philosophical Investigations.*, *15*, 232–238.

Calvo, E., & Ventura, T. (2021). Will I get COVID-19? Partisanship, social media frames, and perceptions of health risk in Brazil. *Latin American Politics and Society*, *63*(1), 1–26. doi:10.1017/lap.2020.30

Centers for Disease Control and Prevention. (2023). CDC Museum COVID-19 Timeline. Retrieved from https://www.cdc.gov/museum/timeline/covid19.html#Early-2020

Coombs, W. T. (2007). *Ongoing crisis communication: Planning, managing, and responding*. Sage Publications.

Coppins, M. (2020). Trump's Dangerously Effective Coronavirus Propaganda. TheAtlantic.com. https://www.theatlantic.com/politics/archive/2020/03/trump-coronavirus-threat/607825/

Dinh, L., & Parulian, N. (2020). COVID-19 pandemic and information diffusion analysis on Twitter. *Proceedings of the Association for Information Science and Technology*, *57*(1), e252. doi:10.1002/pra2.252 PMID:33173813

Doonan, M. (2013). *American Federalism in Practice: The Formulation and Implementation of Contemporary Health Policy*. Brookings Institution Press.

Dwyer, T., & Martin, F. (2017). Sharing news online: Social media news analytics and their implications for media pluralism policies. *Digital Journalism (Abingdon, England)*, *5*(8), 1080–1100. doi:10.1080/21670811.2017.1338527

Eberl, J. M., Tolochko, P., Jost, P., Heidenreich, T., & Boomgaarden, H. G. (2020). What's in a post? How sentiment and issue salience affect users' emotional reactions on Facebook. *Journal of Information Technology & Politics*, *17*(1), 48–65. doi:10.1080/19331681.2019.1710318

Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "friends:" Social capital and college students' use of online social network sites. *Journal of Computer-Mediated Communication*, *12*(4), 1143–1168. doi:10.1111/j.1083-6101.2007.00367.x

Enli, G. S., & Skogerbø, E. (2013). Personalized campaigns in party-centered politics: Twitter and Facebook as arenas for political communication. *Information Communication and Society*, *16*(5), 757–774. doi:10.1080/1369118X.2013.782330

Eriksson, M. (2018). Lessons for Crisis Communication on Social Media: A Systematic Review of What Research Tells the Practice. *International Journal of Strategic Communication*, *12*(5), 526–551. doi:10.1080/1553118X.2018.1510405

Evans, H. K., Cordova, V., & Sipole, S. (2014). Twitter style: An analysis of how house candidates used Twitter in their 2012 campaigns. *PS, Political Science & Politics*, *47*(2), 454–462. doi:10.1017/S1049096514000389

Fan, C., Jiang, Y., & Mostafavi, A. (2020). Emergent social cohesion for coping with community disruptions in disasters. *Journal of the Royal Society, Interface*, *17*(164), 20190778. doi:10.1098/rsif.2019.0778 PMID:32126194

Firdaus, S. N., Ding, C., & Sadeghian, A. (2018). Retweet: A Popular Information Diffusion Mechanism–A Survey Paper. *Online Social Networks and Media*, *6*, 26–40. doi:10.1016/j.osnem.2018.04.001

Foulger, D. (2004). *Models of the communication process*.

Fowler, L., Kettler, J. J., & Witt, S. L. (2021). Pandemics and partisanship: Following old paths into uncharted territory. *American Politics Research*, *49*(1), 3–16. doi:10.1177/1532673X20961024

Gadarian, S. K., Goodman, S. W., & Pepinsky, T. (2021). Partisan endorsement experiments do not affect mass opinion on COVID-19. *Journal of Elections, Public Opinion and Parties,* 31(sup1), 122–131.

Goncalves, J., Liu, Y., Xiao, B., Chaudhry, S., Hosio, S., & Kostakos, V. (2015). Increasing the Reach of Government Social Media: A Case Study in Modeling Government–Citizen Interaction on Facebook. *Policy and Internet*, *7*(1), 80–102. doi:10.1002/poi3.81

Graham, T., Jackson, D., & Broersma, M. (2018). *The personal in the political on Twitter: Towards a typology of politicians' personalized Tweeting behaviours*. Springer International Publishing.

Green, J., Edgerton, J., Naftel, D., Shoub, K., & Cranmer, S. J. (2020). Elusive consensus: Polarization in elite communication on the COVID-19 pandemic. *Science Advances*, *6*(28), eabc2717. doi:10.1126/sciadv.abc2717 PMID:32923600

Grimmer, J., & Stewart, B. (2013). Text as Data: The Promise and Pitfalls of Automatic Content Analysis Methods for Political Texts. *Political Analysis*, *21*(3), 267–297. doi:10.1093/pan/mps028

Grossman, G., Kim, S., Rexer, J. M., & Thirumurthy, H. (2020). Political partisanship influences behavioral responses to governors' recommendations for COVID-19 prevention in the United States. *Proceedings of the National Academy of Sciences of the United States of America*, *117*(39), 24144–24153. doi:10.1073/pnas.2007835117 PMID:32934147

Gruber, D. A., Smerek, R. E., Thomas-Hunt, M. C., & James, E. H. (2015). The Real-Time Power of Twitter: Crisis Management and Leadership in an Age of Social Media. *Business Horizons*, *58*(2), 163–172. doi:10.1016/j.bushor.2014.10.006

Haro-de-Rosario, A., Sáez-Martín, A., & del Carmen Caba-Pérez, M. (2018). Using Social Media to Enhance Citizen Engagement with Local Government: Twitter or Facebook? *New Media & Society*, *20*(1), 29–49. doi:10.1177/1461444816645652

Heath, R. L. (2012). *Crisis communication: Theory and practice*. M.E. Sharpe.

Heiss, R., Schmuck, D., & Matthes, J. (2019). What drives interaction in political actors' Facebook posts? Profile and content predictors of user engagement and political actors' reactions. *Information Communication and Society*, *22*(10), 1497–1513. doi:10.1080/1369118X.2018.1445273

Henríquez, P. A., Sabat, J., & Sullivan, J. P. (2023). Politicians' willingness to agree: Evidence from the interactions in Twitter of Chilean deputies. *Journal of Information Technology & Politics*, *20*(1), 92–111. doi:10.1080/19331681.2022.2056278

Highfield, T., & Leaver, T. (2016). Instagrammatics and digital methods: Studying visual social media, from selfies and GIFs to memes and emoji. Communication research and practice, 2(1), 47–62.

Hosch-Dayican, B., Amrit, C., Aarts, K., & Dassen, A. (2014). How Do Online Citizens Persuade Fellow Voters? Using Twitter During the 2012 Dutch Parliamentary Election Campaign. *Social Science Computer Review* (Online First).

Hughes, A. L., St. Denis, L. A., Palen, L., & Anderson, K. M. (2014, April). Online Public Communications by Police and fire Services during the 2012 Hurricane Sandy. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 1505–1514). doi:10.1145/2556288.2557227

Jaeger, P. T., & Bertot, J. C. (2010). Transparency and Technological Change: Ensuring Equal and Sustained Public Access to Government Information. *Government Information Quarterly*, *27*(4), 371–376. doi:10.1016/j.giq.2010.05.003

Karlsen, R. (2011). A platform for individualized campaigning? Social media and parliamentary candidates in the 2009 Norwegian election campaign. *Policy and Internet*, *3*(4), 1–25. doi:10.2202/1944-2866.1137

Kietzmann, J. H., Hermkens, K., McCarthy, I. P., & Silvestre, B. S. (2011). Social media? Get serious! Understanding the functional building blocks of social media. *Business Horizons*, *54*(3), 241–251. doi:10.1016/j.bushor.2011.01.005

Lilleker, D. G., Koc-Michalska, K., Schweitzer, E. J., Jacunski, M., Jackson, N., & Vedel, T. (2011). Informing, engaging, mobilizing or interacting: Searching for a European model of web campaigning. *European Journal of Communication*, *26*(3), 195–213. doi:10.1177/0267323111416182

Liu, B. F., Austin, L., & Jin, Y. (2011). How publics respond to crisis communication strategies: The interplay of information form and source. *Public Relations Review*, *37*(4), 345–353. doi:10.1016/j.pubrev.2011.08.004

Ma, L. (2013). The Diffusion of Government Microblogging: Evidence from Chinese Municipal Police Bureaus. *Public Management Review*, *15*(2), 288–309. doi:10.1080/14719037.2012.691010

Macnamara, J., & Kenning, G. (2011). E-electioneering 2010: Trends in social media use in Australian political communication. *Media International Australia, Incorporating Culture & Policy*, *139*(1), 7–22. doi:10.1177/1329878X1113900104

Malik, A., Khan, M. L., & Quan-Haase, A. (2021). Public health agencies outreach through Instagram during the COVID-19 pandemic: Crisis and Emergency Risk Communication perspective. *International Journal of Disaster Risk Reduction*, *61*, 102346. doi:10.1016/j.ijdrr.2021.102346 PMID:36337987

Martínez-Rojas, M., del Carmen Pardo-Ferreira, M., & Rubio-Romero, J. C. (2018). Twitter as a tool for the management and analysis of emergency situations: A systematic literature review. *International Journal of Information Management*, *43*, 196–208. doi:10.1016/j.ijinfomgt.2018.07.008

Mergel, I. (2013). A framework for interpreting social media interactions in the public sector. *Government Information Quarterly*, *30*(4), 327–334. doi:10.1016/j.giq.2013.05.015

Muñoz-Expósito, M., Oviedo-García, M. Á., & Castellanos-Verdugo, M. (2017). How to Measure Engagement in Twitter: Advancing a Metric. *Internet Research*, *27*(5), 1122–1148. doi:10.1108/IntR-06-2016-0170

Nielsen, R. K. (2011). Mundane internet tools, mobilizing practices, and the coproduction of citizenship in political campaigns. *New Media & Society*, *13*(5), 755–771. doi:10.1177/1461444810380863

Panagiotopoulos, P., Barnett, J., Bigdeli, A. Z., & Sams, S. (2016). Social media in emergency management: Twitter as a tool for communicating risks to the public. *Technological Forecasting and Social Change*, *111*, 86–96. doi:10.1016/j.techfore.2016.06.010

Park, H., Reber, B. H., & Chon, M. G. (2016). Tweeting as health communication: Health organizations' use of Twitter for health promotion and public engagement. *Journal of Health Communication*, *21*(2), 188–198. doi:10.1080/10810730.2015.1058435 PMID:26716546

Peeters, J., Opgenhaffen, M., Kreutz, T., & Van Aelst, P. (2022). Understanding the online relationship between politicians and citizens. A study on the user engagement of politicians' Facebook posts in election and routine periods. *Journal of Information Technology & Politics*, *20*(1), 44–59. doi:10.1080/19331681.2022.2029791

Popescu, G. H. (2016). Gender, Work, and Wages: Patterns of Female Participation in the Labor Market. *Journal of Self-Governance and Management Economics*, *4*(1), 128–134.

Ripberger, J. T., Jenkins-Smith, H. C., Silva, C. L., Carlson, D. E., & Henderson, M. (2014). Social media and severe weather: Do tweets provide a valid indicator of public attention to severe weather risk communication? *Weather, Climate, and Society*, *6*(4), 520–530. doi:10.1175/WCAS-D-13-00028.1

Rooduijn, M., & Pauwels, T. (2011). Measuring populism: Comparing two methods of content analysis. *West European Politics*, *34*(6), 1272–1283. doi:10.1080/01402382.2011.616665

Rosengard, D., Tucker-McLaughlin, M., & Brown, T. (2014). Students and Social News: How College Students Share News Through Social Media. *Electronic News*, *8*(2), 120–137. doi:10.1177/1931243114546448

Ryan, J. M. (2021). Covid-19: Volume I: Global pandemic, societal responses, ideological solutions: Covid-19: Volume II: Social consequences and cultural adaptations. COVID-19: Two Volume Set, 1–605.

Seeger, M. W. (2006). Best practices in crisis communication: An expert panel process. *Journal of Applied Communication Research*, *34*(3), 232–244. doi:10.1080/00909880600769944

Seltzer, T., & Mitrook, M. (2007). The Dialogic Potential of Weblogs in Relationship Building. *Public Relations Review*, *33*(2), 227–229. doi:10.1016/j.pubrev.2007.02.011

Simchon, A., Brady, W. J., & Van Bavel, J. J. (2022). Troll and divide: The language of online polarization. *PNAS Nexus*, *1*(1), pgac019. doi:10.1093/pnasnexus/pgac019 PMID:36712799

Skoric, M. M., Zhu, Q., Goh, D., & Pang, N. (2016). Social Media and Citizen Engagement: A Meta-Analytic Review. *New Media & Society*, *18*(9), 1817–1839. doi:10.1177/1461444815616221

Spence, P. R., Lachlan, K. A., Lin, X., & del Greco, M. (2015). Variability in Twitter Content across the Stages of a Natural Disaster: Implications for Crisis Communication. *Communication Quarterly*, *63*(2), 171–186. doi :10.1080/01463373.2015.1012219

Stieglitz, S., & Dang-Xuan, L. (2013). Emotions and Information Diffusion in Social Media Sentiment of Microblogs and Sharing Behavior. *Journal of Management Information Systems*, *29*(4), 217–247. doi:10.2753/MIS0742-1222290408

Sundar, S. S., & Kim, J. (2005). Interactivity and persuasion: Influencing attitudes with information and involvement. *Journal of Interactive Advertising*, *5*(2), 5–18. doi:10.1080/15252019.2005.10722097

Sutton, J. C., Gibson, B., Spiro, E., League, C., Fitzhugh, S., & Butts, C. (2016). What It Takes to Get Passed on: Message Content, Style, and Structure as Predictors of Retransmission in the Boston Marathon Bombing Response. In *Effective Communication During Disasters* (pp. 217–248). Apple Academic Press.

Taylor, M., & Perry, D. (2005). Diffusion of Traditional and New Media Tactics in Crisis Communication. *Public Relations Review*, *31*(2), 209–217. doi:10.1016/j.pubrev.2005.02.018

Thomases, H. (2010). *Twitter Marketing: An Hour a Day*. John Wiley & Sons.

Tsao, S. F., Chen, H., Tisseverasinghe, T., Yang, Y., Li, L., & Butt, Z. A. (2021). What social media told us in the time of COVID-19: A scoping review. *The Lancet. Digital Health*, *3*(3), e175–e194. doi:10.1016/S2589-7500(20)30315-0 PMID:33518503

Twitter Help Center. (2021). Using Twitter. Retrieved from https://help.Twitter.com/en/using-Twitter#tweets

Veil, S. R., Buehner, T., & Palenchar, M. J. (2011). A work-in-process literature review: Incorporating social media in risk and crisis communication. *Journal of Contingencies and Crisis Management*, *19*(2), 110–122. doi:10.1111/j.1468-5973.2011.00639.x

Veil, S. R., Tara, B., & Michael, J. P. (2011). A Work-in-Process Literature Review: Incorporating Social Media in Risk and Crisis Communication. *Journal of Contingencies and Crisis Management*, *19*(2), 110–122. doi:10.1111/j.1468-5973.2011.00639.x

Vergeer, M., & Hermans, L. (2013). Campaigning on Twitter: Microblogging and online social networking as campaign tools in the 2010 general elections in the Netherlands. *Journal of Computer-Mediated Communication*, *18*(4), 399–419. doi:10.1111/jcc4.12023

Wang, B., & Zhuang, J. (2017). Crisis Information Distribution on Twitter: A Content Analysis of Tweets during Hurricane Sandy. *Natural Hazards*, *89*(1), 89. doi:10.1007/s11069-017-2960-x

Wang, Y., & Yang, Y. (2020). Dialogic communication on social media: How organizations use Twitter to build dialogic relationships with their public. *Computers in Human Behavior*, *104*, 106183. doi:10.1016/j.chb.2019.106183

Weick, K. E., & Sutcliffe, K. M. (2007). *Managing the unexpected: Resilient performance in an age of uncertainty*. Jossey-Bass.

Wukich, C. (2021). Government social media engagement strategies and public roles. *Public Performance & Management Review*, *44*(1), 187–215. doi:10.1080/15309576.2020.1851266

Wukich, C., & Mergel, I. (2015). Closing the citizen-government communication gap: Content, audience, and network analysis of government tweets. *Journal of Homeland Security and Emergency Management*, *12*(3), 707–735. doi:10.1515/jhsem-2014-0074

Zavattaro, S. M., & Sementelli, A. J. (2014). A Critical Examination of Social Media Adoption in Government: Introducing Omnipresence. *Government Information Quarterly*, *31*(2), 257–264. doi:10.1016/j.giq.2013.10.007

APPENDIX A

Table 3. Summary Statistics of Governor's COVID-related Tweets from March to August 2020

State	No. of Tweets	Total Retweets	Avg. Retweets	Total Likes	Avg. Likes	No. of Followers	No. of Friends
Alabama	377	69407	184	50566	134	64516	1217
Alaska	213	2223	10	7582	36	6921	26
Arizona	1239	88107	71	182321	147	141456	1833
Arkansas	282	12102	43	64895	230	89109	626
California	491	1600316	3259	3970443	8086	1908508	22979
Colorado	211	32716	155	88319	419	107990	1213
Connecticut	1346	106165	79	173992	129	71143	708
Delaware	529	9794	19	28334	54	35317	1233
Florida	266	132000	496	554158	2083	564191	1317
Georgia	561	57257	102	185123	330	98152	136
Hawaii	738	82491	112	5812	8	20772	757
Idaho	395	20977	53	22945	58	17342	373
Illinois	1192	203506	171	971270	815	193353	140
Indiana	600	4929	8	4812	8	10984	924
Iowa	135	29556	219	20368	151	33408	549
Kansas	529	29560	56	125573	237	40247	87
Kentucky	513	56034	109	308907	602	125480	137
Louisiana	814	41402	51	44862	55	97790	6015
Maine	182	3182	17	16490	91	17216	126
Maryland	912	127294	140	539654	592	234058	1005
Massachusetts	14	510	36	1846	132	94112	1945
Michigan	462	394902	855	1970773	4266	449495	475
Minnesota	421	79138	188	474134	1126	168924	972
Mississippi	492	61461	125	95351	194	49755	1787
Missouri	1135	14711	13	45848	40	45794	69
Montana	329	14862	45	83850	255	196178	708
Nebraska	798	449778	564	16384	21	34428	1211
Nevada	1020	61480	60	301110	295	81817	115
New Hampshire	736	23321	32	96589	131	42682	180
New Jersey	1743	265750	152	992546	569	337868	161
New Mexico	950	55610	59	198313	209	46269	165
New York	1230	4388115	3568	22566123	18346	2490106	619
North Carolina	1117	112961	101	381015	341	158947	18
North Dakota	258	3863	15	14009	54	18354	393

continued on following page

Table 3. Continued

State	No. of Tweets	Total Retweets	Avg. Retweets	Total Likes	Avg. Likes	No. of Followers	No. of Friends
Ohio	907	124646	137	493732	544	411073	899
Oklahoma	417	21570	52	41033	98	34852	63
Oregon	507	207917	410	930742	1836	226546	167
Pennsylvania	969	154141	159	508066	524	264803	1104
Rhode Island	483	11381	24	51023	106	92623	8175
South Carolina	155	16798	108	61672	398	57456	609
South Dakota	168	121959	726	408363	2431	402487	484
Tennessee	545	22950	42	79167	145	75296	121
Texas	259	110825	428	128174	495	305723	4295
Utah	397	13250	33	68079	171	68973	469
Vermont	384	6941	18	25552	67	26505	486
Virginia	612	68804	112	259448	424	232274	405
Washington	533	403698	757	1152508	2162	345904	742
West Virginia	533	13631	26	37814	71	64967	168
Wisconsin	744	59581	80	247570	333	75405	241
Wyoming	193	10381	54	11634	60	6716	216

APPENDIX B

Dictionary on COVID-19

"covid", "covid-19", "corona", "coronavirus", "epidemic", "pandemic", "virus", "lockdown", "shelter", "stayathome", "shelterinplace", "test", "testing", "hospital","spread", "sanitizer", "stay", "home", "health", "cases", "public", "protect", "reopen" ,"reopening", "quarantine", "social distance", "social", "distance", "mask", "covid19","safe","recovery", "vaccine", "cdc", "essential", "workers", "crisis", "briefing","wear","daily", "screening", "symptomatic", "asymptomatic", "ventilator", "incubation", "schools", "closing", "newnormal", "fatalities", "death", "infection", "infected", "mers", "china", "wuhan", "respiratory","cough", "fever", "breath", "breathing", "novel", "frontline", "distancing", "fauci", "isolation", "outbreak", "mandatory", "cluster", "curfew", "transmission", "order", "curve", "flatten", "flattening", "hygiene", "ppe", "n95", "n-95", "federal", "funding", "relief", "package", "unemployment", "claims", "doctor", "dhs", "department", "contagious"

APPENDIX C

Table 4. Dictionary-Based Approach Validation with 100 Random Sample

status_id	Tweet text	Computer Coded as COVID-related	Human Coded as COVID-related
xx1300522020250107905	Hey Baltimore! Looking to get a #free COVID-19 test this week? Our schedule has been updated and is now online at https://t.co/PRD4IYmeyA visit there for a full list of locations, or to make an appointment! #coronavirus #coronavirusbalt https://t.co/lKCKWiOD1l	1	1
xx1255592027074572289	During the COVID-19 pandemic, many individuals and businesses have taken on new tasks to fight the virus. Kansans' dedication to finding innovative ways to help others is one of many reasons I am proud to be governor of this great state. https://t.co/HGLxppQ5zc	1	1
xx1254786878408032259	New Moms: please visit https://t.co/TqqhKwM9Nf to access information on postpartum health and wellness â€“ including information related to COVID-19. @PCANC #BeAConnection during #COVID19NC. https://t.co/r0msVmQOS9	1	1
xx1242849067383873543	If your business is already considered a critical infrastructure sector under federal and state guidelines, you do not need to fill out a form. Read the federal guidelines here: https://t.co/RxckOrXlBa. Read the state guidelines here: https://t.co/Ugq4psi51y	1	1
xx1240318022935441408	#VoteEarlyIdaho Protect yourself. Protect your neighbors. Voting Absentee is as easy as 1,2, 3! REQUEST your ballot â€“ the sooner the better. WAIT for it to arrive. VOTE & RETURN your absentee ballot to the clerk by no later than closing of the polls on election day!	1	1
xx1251514388588216320	Day 9 of 21 Days to #StayHome and Stay Healthy! Remember to follow the SIX RULES TO KEEP NEBRASKA HEALTHY: 1. Stay home. No non-essential errands and no social gatherings. Respect the ten-person limit. https://t.co/NKB441YPL4	1	1
xx1280596448266969088	As Governor and a former law enforcement officer for 22 years, protecting the citizens of our state is of utmost importance to my administration. We all want our communities to be safe, and we worry when we see violent criminals threaten our neighborhoods. https://t.co/ymXex8buyU	1	1
xx1284850626321616898	After a record 28,899 #COVID19 tests reported in the past 24 hours, Marylandâ€™s daily positivity is 3.83% with a seven-day average of 4.46%. There are 449 current total hospitalizations. https://t.co/I2Od1KUQCW	1	1
xx1256040177232994305	.@GovParsonMO on Missouri's reopen strategy https://t.co/2LcMjUs7AM	1	1
xx1250387567213674498	Este virus estÃ¡ poniendo todo al revÃ©s, pero si tomamos en serio la regla de "Permanecer en casa", estaremos del lado mejÃ³r muy pronto. Connecticut va a vencer a este virus. MantengÃ¡monos unidos y sigamos las reglas. #ProtgeteQuÃ©dateEnCasa https://t.co/ISjVqJyN39	1	1
xx1293594688755302400	An hour ago, the New Jersey Supreme Court rendered its unanimous decision allowing us to move forward to borrow the funds we need to protect the vital jobs and programs that are critical to our ongoing response to this pandemic, and will play a huge role in our overall recovery.	1	1
xx1296606465021616129	The Wisconsin Department of Natural Resources is accepting nominations for the 2020 Recycling Excellence Awards until Sept. 15. Communities, business and more are eligible. Apply for recognition of outstanding recycling or waste minimization initiatives. https://t.co/Ay9pyntnfQ https://t.co/lNIA1nwfrn	0	0
xx1266838447743995904	We are now live. â¬‡ https://t.co/0tzcS3eaRO	0	0
xx1244704180113215494	There will be no activation fee, no usage fee, and no overage fee. You can turn on the hot spot and use it without charge until May 13.	0	0

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Table 4. Continued

status_id	Tweet text	Computer Coded as COVID-related	Human Coded as COVID-related
xx1265761592223784961	Gov. @DougDucey announced $441M in direct, flexible funding to cities, towns and counties that did not receive direct #AZCARES funding. The Chandler City Council has been strong a advocate for financial support for our community thru this pandemic. More details to come. https://t.co/vU77Rf3Aqt	1	1
xx1283141016590209031	Having a home is foundational to Minnesotans' health and safety â€“ thatâ€™s never been more true than during this pandemic. Today we announced $100 million in support for Minnesotans struggling with their housing bills due to this pandemic. Everyone deserves a place to call home. https://t.co/DPLYkXiNIu	1	1
xx1293580597781303297	We are incredibly grateful for Commissioner Fransâ€™ service to our state. Because of his leadership, Minnesota is in a stronger position to weather the fiscal consequences of this pandemic, and we wish him well in his new position at @UMNews.	1	1
xx1247177623366766596	If you don't NEED to go out, stay home. ðŸ https://t.co/KcVHqDNqsy	1	1
xx1297970526745329664	MEMA ALERT: Severe Thunderstorm Warning for Frederick and Washington County in MD until 3:30pm. #mdwx	0	0
xx1253036366490992641	Residents of Tennessee's long-term care facilities are some of the most vulnerable populations to #COVID19. Our Unified-Command is working closely with facilities across the state to ensure the safety of residents and staff. Learn more: https://t.co/XogV4a74Qq	1	1
xx1237695974698561536	Isolation and quarantine help protect the public by preventing exposure to people who may have a contagious disease. Pennsylvanians should know that we are taking every precaution to keep our communities safe. https://t.co/Cn9xoxa68O	1	1
xx1266040979556937728	From @ALEC_states: â€œ... Arizona can expect to see additional economic growth and an increasingly vibrant state economy at the expense of its high-tax neighbors.â€ MORE âž¡ï¸ https://t.co/CjUCRStShM4/4	0	0
xx1262453544482791425	As a result, more Maine people will have access to testing and we can begin to implement spot-check testing protocols being developed by the Maine CDC. My Administration will continue to work to expand testing capacity in the coming weeks. 3/3 Learn more: https://t.co/ELoLdN7uw7	1	1
xx1244738721154547717	Today I issued an Executive Order directing anyone traveling into West Virginia from a high risk area to quarantine for 14 days. I also made the decision to close state park campgrounds. We must be vigilant in our efforts to slow the spread of #COVID19. https://t.co/eXkc8ssBZo	1	1
xx1268671763463811072	Today I announced the Montana Meat Processing Infrastructure Grant program, available immediately to help small and medium-sized meat processors respond to COVID-19 supply distributions and boost processing and storage capacity. https://t.co/QcPUEYUVig	0	1
xx1239573568658247680	âž¡ï¸Bars, nightclubs and restaurants are required to close to in-person patrons and may provide take-out and delivery services through the end of March.	0	1
xx1279874920671932416	Sunday read: A look back at our 2017 profile of Rudolfo Anaya as he talks about "Bless Me, Ultima" and the new stories to come. https://t.co/S7Wkuf0MXz	0	0
xx1241100277572349954	Businesses, volunteers give back to community during COVID-19 pandemic https://t.co/tzaR5wUJhR	1	1
xx1292584649814872066	It stands in vast contrast with the arcane rules available to us now, written long ago and not with this pandemic in mind, which are hard and fast enforcement laws that can cripple businesses and destroy livelihoods.	1	1

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Table 4. Continued

status_id	Tweet text	Computer Coded as COVID-related	Human Coded as COVID-related
xx1262794166460956672	LOOK: â˜‘ï¸Number of patients reported in either critical or intensive care fell to 977 â€“ FIRST TIME this number has FALLEN BELOW 1,000 in a very long time â˜‘ï¸Ventilator use dropped to 789 â˜‘ï¸173 new #COVID19 hospitalizations yesterday â˜‘ï¸161 discharges yesterday https://t.co/Ejqa7PJDvP	1	1
xx1297939042793861122	We continue to strategically deploy buses and key assets such as PPE, MREs and water throughout the state to #ProtectWhatMatters the citizens of Louisiana. #Laura https://t.co/6DmHdoZvxo	0	1
xx1273006240491282438	To further meet the needs of small businesses, @SBAgov reopened the Economic Injury Disaster Loan (EIDL) to all eligible applicants experiencing economic impacts due to COVID-19. To learn more about the program, please visit https://t.co/XnIgt7q9ed https://t.co/mXXXMqPiR4	1	1
xx1243360041907830785	Gov. Ricketts Issues Executive Order Allowing Takeout for Mixed Drinks with Lids https://t.co/LpRrS4HP2O	0	0
xx1287862968877641730	Everyone can take small actions to slow the spread in your community âž¡ Wear a mask whenever you cannot social distance âž¡ Practice good hygiene âž¡ Stay home if you feel sick, and get tested if you have symptoms âž¡ Avoid large gatherings where social distancing is challenging	1	1
xx1276321602653872128	Hemos visto lo que sucediÃ³ en otros estados que han permitido que la polÃtica o el pensamiento corto influye decisiones. Muchos estados ahora estÃ¡n viendo aumentos en los casos y hospitalizaciones, y son obligados a retroceder y quedarse en casa, esa no es el caso en Illinois.	1	1
xx1287749168908378113	27 de julio: Estas son las novedades semanales sobre el coronavirus en Delaware. Para obtener mÃ¡s informaciÃ³n, ingrese en https://t.co/ljwwQYsJFW https://t.co/4a9yE82vm4	1	1
xx1295415067551334401	Although this news is certainly disappointing for Falcons and Atlanta United fans, we appreciate the organizationsâ€™ leadership in prioritizing the health of players, coaches, staff, and fans. https://t.co/wyraVlSsh5	1	1
xx1291789791399260160	Counties have the option to allow mail ballot election and expand early voting for the general election. Montanans will be able to vote by mail, vote early, or cast their ballot on election day in person, if they so choose. https://t.co/KOdNBqVKwg	0	0
xx1237451410943488001	#ICYMI The Adjutant General joined @GovRicketts and leaders of other Nebraska state agencies yesterday to provide an update on recovery and preparedness. https://t.co/ra9oTsoHbf https://t.co/HglAyQiqBS	1	1
xx1239951905469710336	In light of the Centers for Disease Control and Preventionâ€™s guidance released on Sunday, March 15, 2020, E.O. #20-04 follows the CDCâ€™s recommendation to limit group gatherings to no more than 50 individuals in a single area. (2/5)	0	1
xx1264262539527020546	LIVE: Governor Hutchinson Provides COVID-19 Update (5.23.20): https://t.co/v9g85XYwtO	0	1
xx1246782728311377920	Looking forward to talking about the incredible work of our Arkansas health care professionals on Meet the Press. https://t.co/En1LMIuvSE	1	1
xx1245403148883308547	Staying on top of whatâ€™s going on across the nation on a call with my fellow governors. We continue to provide each other with updates, tips and suggestions to mitigate the spread of #COVID19. Weâ€™re all #InThisTogether. #TogetherAL #alpolitics @NatlGovsAssoc https://t.co/Lj27JWibhm	1	1
xx1255986689941667841	As of today, North Carolina has 10,509 lab-confirmed cases, 546 people in the hospital, and 378 deaths due to COVID-19.	1	1

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Table 4. Continued

status_id	Tweet text	Computer Coded as COVID-related	Human Coded as COVID-related
xx1260992860373090305	Testing is available for all Georgians, regardless of whether you have #coronavirus symptoms. Call your local @GaDPH department to get scheduled for testing: https://t.co/LnheijdQZb. You can also download the @AUG_University ExpressCare app or call (706) 721-1852.	1	1
xx1251982618918137857	These are difficult and frustrating times. I understand the urgency of this crisis. However, this is not the time to halt the progress we have made. I encourage everyone in our state to stay home, stay healthy and, if you need to go out, practice adequate physical distancing.	1	1
xx1240621836729290755	This morning we can sadly confirm reports that a 2nd person in Connecticut has died due to complications from #COVID19. The man is a 91-year-old resident of New Canaan who was being treated at @NorwalkHospital. Our hearts are with his family and friends at this difficult time.	0	1
xx1284207780010876929	ICYMI: â¬‡ï¸ Hereâ€™s my interview on @realtalk995 from this morning. Itâ€™s always a pleasure to talk to Matt & Aunie! We need all of our people to take personal responsibility & wear a mask. ðŸ˜· #MaskUpAL #TogetherAL https://t.co/iREEaVydie	1	1
xx1271480602374688768	Today we'll release #COVID19 guidance for personal care businesses â€“ which may reopen on 6/22: âœ‚ï¸Beauty salons ðŸ’ˆBarber shops ðŸ’„Cosmetology shops ðŸ§¼Day & medical spas âš¡Electrology facilities ðŸ’©ðŸ¿â€Hair braiding shops ðŸ’†â€â™€ï¸Massage parlors ðŸ’…Nail salons ðŸ’¡Tanning salons ðŸ¦‹Tattoo parlors https://t.co/WgbvXl5zUN	1	1
xx1262505992870170637	Grateful for the support of @POTUS @realDonaldTrump, @FLOTUS & @VP in responding to #COVID19, including First Lady Melania Trumpâ€™s priority of mental health & safety of children. We also discussed responsibly reopening, and @TWSemiconâ€™s selection of #AZ for its new plant. https://t.co/KDYZnl7Y0D	1	1
xx1272666907523637249	Visit https://t.co/n7homY7tSv to watch today's full update. https://t.co/Dl9viDT0Cn https://t.co/nrhVMrvCwM	0	0
xx1264973365741334528	WATCH NOW: I am giving a COVID-19 briefing with Jamie Mack, Chief of Health Systems Protection in the Delaware Division of Public Health. âž¡ï¸ View the livestream here: https://t.co/D8UwmXrvpA	1	1
xx1262847067799486464	NEW: CA has 81,795 confirmed cases of #COVID19: +1.7% from yesterday. 3,073 of those are in hospitals: +1.2%. 1,076 of those are in the ICU: +0.0%.	1	1
xx1257117086263857152	ICYMI: The @OHSUNews Key to Oregon research study will enroll 100,000 randomly selected Oregonians to voluntarily join a study that will help us better understand COVID-19's infection patterns, helping us more safely reopen Oregon. https://t.co/TXLsnJ4Q5t	1	1
xx1240754820786634753	ðŸ“ƒ READ MY ORDER: https://t.co/7RYsgvakUu ðŸ¢ Non-life-sustaining vs. life-sustaining businesses: https://t.co/XWk6d1bKny	0	1
xx1240812205844467712	The mayors understand the unique needs of their communities &are putting in place restrictions and guidance that best meet those needs. Their efforts align with CDC guidelines and the direction provided by the State Department of Health & the HawaiÊ»i Emergency Management Agency.	0	1

continued on following page

Table 4. Continued

status_id	Tweet text	Computer Coded as COVID-related	Human Coded as COVID-related
xx1299192913709076480	Legendary basketball coach. Mentor. Leader. National Champion. Arizonan. #RIP Lute Olson #BearDown https://t.co/K4VzR0H6oT	0	0
xx1247296526436581376	Our veterans chose to raise their hand to serve our country â€“ they deserve our unwavering support during this challenging time. I encourage all veterans struggling during the COVID-19 pandemic to apply for our newly available @MNVeteran relief grants. https://t.co/dDeQLilBZy https://t.co/oXnchVWcH0	1	1
xx1235978373337362434	UPDATE: There are now 33 confirmed cases of #Coronavirus in NYS â€” 11 new positive tests since yesterday. All new cases are connected to the original New Rochelle case. As we do more tests, the number of positive cases will rise, as we are seeing.	1	1
xx1236986226391027713	ðŸ—³ PA Primary Election Deadlines: April 13: last day to register to vote âž¡ï¸ https://t.co/OKYXQgcPb6 April 21: mail ballot applications are due by 5 p.m. âž¡ï¸ https://t.co/GXS4KooGNb April 28 (Election Day): voted mail ballots are due by 8 p.m. âž¡ï¸ https://t.co/CRc8MSxkJ6 https://t.co/930l4gFYh8	0	0
xx1252364192360722445	En caso de que se haya perdido la conferencia de prensa #COVID19 del 20 de abril con @SecNorman y @GovLauraKelly y Mike Beam, Secretario del Departamento de Agricultura de Kansas, vea los subtÃtulos en espaÃ±ol en Vimeo: https://t.co/zwufvm4dhA https://t.co/1dmym6gQxf	0	1
xx1248255401415639040	Statewide COVID-19 assessment sites are quickly becoming available for Tennesseans to safely pursue testing without taking unnecessary risks. Before heading to an assessment site, Tennesseans should first call their usual source of care. https://t.co/Nw1AAmjJXf https://t.co/WsFbxrTCto	1	1
xx1239573511284416515	âž¡ï¸State agencies already are developing remote work plans for employees and will continue to implement them while maintaining necessary state services. Employees who work outdoors are encouraged to practice social distancing.	1	1
xx1261321096927670272	“The facility will use TSMCâ€™s 5-nanometer technology for semiconductor wafer fabrication and have the capacity to produce 20,000 wafers per month.” https://t.co/iPK0ZGmvrA @azcentral @TWSemicon @azcommerce	0	0
xx1252718576894500866	1/3 I want to extend my condolences to the Northern Arapaho Tribe and to the families of the four individuals that passed away last night due to COVID-19. These deaths highlight the insidious nature of the illness,	1	1
xx1256246346098462720	.@ArizonaDES offers information on employment and education resources for Arizonans including job opportunities, interview training, financial literacy and more. Details: https://t.co/sfbOOtMu0j5/	0	0
xx1244301336822325250	You can get yours here (20% of the proceeds go to the Detroit Small Business Stabilization Fund!) âž¡ï¸ https://t.co/4YKlOvhMhV https://t.co/kOMf0PswcB	0	0
xx1258514989721088001	(2/3) Dr. Nate Smith spoke with CDC Director Redfield, who commended AR for keeping our numbers low & for a continued decrease without shutting down the state. We have taken measured steps to preserve the health & safety of Arkansans while also working to protect our industries.	1	1
xx1251592084559183872	This means all employees of customer-facing businesses, office-based businesses, manufacturers, nonprofits, and construction workers must wear cloth face coverings when they are at work.	1	1

continued on following page

Table 4. Continued

status_id	Tweet text	Computer Coded as COVID-related	Human Coded as COVID-related
xx1287776752417288192	ðŸš¨ FUNDING: The 2nd application window for the #COVID19 small business grant prgm will be opening in August. See what application items you will need: https://t.co/RaCuMLlpw8 âœ”ï¸Photo ID âœ”ï¸Business Financial Info âœ”ï¸Proof of Business Registration âœ”ï¸Bank Account Info https://t.co/mTfriWgBWH	0	1
xx1286593492701999104	#Douglas is a Category 4 #hurricane Moving: WNW at 18 mph Min pressure: 954 mb Max sustained: 130 mph https://t.co/w8NyhRW3Lm	0	0
xx1244276949394100225	The virus is going to dictate the time frame, and weâ€™re going to follow the advice of the scientists and doctors. On @FoxNewsSunday, I told Chris Wallace that cases in the National Capital Region have quadrupled in the past week and we see that continuing to grow exponentially. https://t.co/Z0R59W0Wgz	1	1
xx1260995795832016897	@ChaSolitude Grand County requested to remain in orange for the time being.	0	0
xx1240811150499028993	My heart goes out to those affected by this virus. Sarah & I continue to pray for our fellow Oklahomans as we get through this together. My administration continued to take some proactive steps today to help our people respond to #COVID19:	1	1
xx1288172551793975298	This morning, I had the opportunity to meet with both parents and school administrators. We discussed what back to school will look like, and everyone was on the same page that our kids need to be back in classrooms. https://t.co/Tev4kknyCe	0	1
xx1268958994074386434	â€¢ Mercer: 499 â€¢ Middlesex: 1,025 â€¢ Monmouth: 630 â€¢ Morris: 625 â€¢ Ocean: 765 â€¢ Passaic: 957 â€¢ Salem: 49 â€¢ Somerset: 424 â€¢ Sussex: 149 â€¢ Union: 1,092 â€¢ Warren: 132	1	1
xx1237902038693318656	Para proteger a los residentes de Washington, hemos tomado medidas para reducir la propagaciÃ³n de COVID-19. https://t.co/5TiRHCnTF2	0	1
xx1256375863249195011	By staying home, we are reducing the risk of infecting others, including our loved ones. We need to stay the course. What we are doing is working. We are flattening the curve. Thank you to everyone who has been staying home. We canâ€™t let up yet. Who do you #StayHomeDE for? https://t.co/M4FKti7KD6	1	1
xx1265786282623463424	Effective Friday, May 29 at 5 p.m., restaurants and social organizations will be able to begin safely reopening for outdoor dining, following strict public health requirements consistent with the CDC, FDA, and the National Restaurant Association.	1	1
xx1293316697839951872	As your Governor, I knew it was my job to do everything in my power - working with businesses, workers, and elected leaders - to find solutions. Unprecedented times call for extraordinary measures....	1	1
xx1259864828467982342	On behalf of a grateful state, Iâ€™d like to sincerely thank @CocaColaCo, @CokeCCBCC, @MDBiz, @MDMEMA, MakersRespond, and K&W Finishing, Inc. for partnering to manufacture and deliver 25,000 face shields for healthcare heroes at local hospitals & health departments. #MarylandUnites https://t.co/4Nv7TRcCld	1	1

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Table 4. Continued

status_id	Tweet text	Computer Coded as COVID-related	Human Coded as COVID-related
xx1263107055449247744	.@StevenStackMD and I have shared the symptoms of PMIS in children during our daily #COVID19 updates. Parents, caregivers and clinicians may call the Kentucky Pediatric Hotline at 800-722-5725 with questions. #TogetherKy #TeamKentucky https://t.co/EdxLGzmAh7	1	1
xx1276215734511849474	Today's #COVID19 briefing is live now at https://t.co/90BcIYqI19. Today's tie: @FranklinU ðŸ'" https://t.co/884rRyiLed	1	1
xx1259489623220289538	Wishing a restful and joy-filled #MothersDay to my mom, Ann, and all the wonderful mothers across Tennessee! https://t.co/s1m4LRRPcZ	0	0
xx1286731870906933248	Yesterday, @PSCWisconsin voted to extend the moratorium on utility shutoffs until Sept. 1. If you are struggling to make payments or need help identifying your options, check out the brochure available here: https://t.co/swlGTfAy9y https://t.co/EEdVb64pGA	0	0
xx1276955755334135809	MantÃ©n distanciamiento fÃsico, lÃ¡vate las manos y #UsaCubrebocas. Hace la diferencia. https://t.co/L32kLzLvJ2	0	0
xx1242137003061391366	. @NC_Governor: I know many of them are already working on this, and I appreciate that spirit.	0	0
xx1244663189540933633	As we continue to fight the #coronavirus, Hoosiers across the state have been stepping up to manufacture face masks for their local hospitals. In difficult times, Hoosiers have always answered the call to help each other. We're all in this together. https://t.co/nMF8rIiiqF	1	1
xx1268643133346271245	My administration is committed to eliminating disparities. We will keep listening. We will continue to work with communities all across our state to address systemic injustice.	0	0
xx1253135692160544768	.@NYGovCuomo joins Trevor for his first late-night interview tonight at 11/10c on Comedy Central https://t.co/61ZnbLKfda	0	0
xx1256689922477633537	ICYMI: This week, Dr. Piercey and I joined @WKRN for a statewide town hall meeting on the #COVID19 pandemic. Watch here: https://t.co/44RY632Yar	1	1
xx1260229023856197634	This afternoon, I will give another COVID-19 update on Facebook LIVE at 3pm. Today's briefing will detail what economic recovery might look like across Missouri. Joining me: â€¢ Director Rob Dixon, @MoEcoDevo â€¢ Director Dr. Randall Williams, @HealthyLivingMo https://t.co/h8K0yLym33	1	1
xx1296844263335112706	Statement on pipeline explosion in Corpus Christi: https://t.co/Uy9TG9D2Or	0	0
xx1287946692424171520	I was honored to attend the opening ceremony of the Remembering Our Fallen War Memorial, which honors our countryâ€™s fallen from the War on Terror. Gold Star mother Megan Schafer delivered a poignant tribute to her son, Cpl. Jason Corbett, who died in Iraq in 2007. https://t.co/nGxMnLbVv5	0	0
xx1241414469017722880	- The @NHCCNM's YouTube channel features artist interviews, performances, & lectures - The Museum of Space History has Launch Pad Lectures about stars, planets & galaxies available on its YouTube channel - @NMDGF has an online curriculum with lessons about New Mexico wildlife	0	0
xx1270128783631286279	Great news! Manhattan Mechanical Services is investing $2.5 million into its new East Chicago facility. This investment will create up to 83 new, high-wage jobs for Hoosiers! Find out more here: https://t.co/MBQCN8lgX4	0	0

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Table 4. Continued

status_id	Tweet text	Computer Coded as COVID-related	Human Coded as COVID-related
xx1242608418243870721	Now is a moment of service for all of us. Itâ€™s our turn to face a once-in-a-century challenge. But I know Vermonters are up for it. We are #VermontStrong We will get through this, and weâ€™ll do it, together. #vtpoli https://t.co/hR45GEEoAv	0	0
xx1291458111753072650	.@LouisianaGov is doing his coronavirus briefing, a couple hours after a judge sided with him in a lawsuit challenging covid restrictions. #lalege #lagov	1	1
xx1272983375612006400	Today Iâ€™m hosting the 2020 Wildfire Season Briefing. While this yearâ€™s briefing looks a lot different via Zoom than in-person, we will continue to work to protect lives and communities across Montana, and our mission now includes protecting firefighters against COVID-19. https://t.co/xtUESFBibt	1	1
xx1242155048743964672	We need folks to stay home. The more seriously we all take this now, the sooner we can get to the other side of this. Your actions affect your neighbors, and theirs affect you. We can do this. But we need your help. Stay safe. Stay home. https://t.co/ljwwQYsJFW https://t.co/lxVBqqt0ZJ	1	1
Total Tweets	100	61	73

Hanjin Mao is an Assistant Professor of Nonprofit Management at University of Houston - Downtown. Her research interests include nonprofit management, information technology and social equity.

Meril Antony is a Robert Curvin Post-doctoral research associate with the Joseph C. Cornwall Center for Metropolitan Studies, Rutgers University-Newark. Her research agenda focuses broadly on public management, social equity, urban education policy, and citizen-state interactions.

Yujin J. Jung is set to join Mount St. Mary's University as an Assistant Professor of Political Science in the fall of 2024. Her research interests are centered around democracy and political behavior, with a significant emphasis on text analysis methodologies. Jung is currently a doctoral candidate at the Harry S. Truman School of Government & Public Affairs, University of Missouri, with her Ph.D. expected to be completed by May 2024. She also holds a Master of International Politics and a Bachelor's degree in Policy Studies, attained with Summa Cum Laude honors from Hanyang University.