**COVID-19 ‘Infodemic’: The Twitter Response of Four Federal Entities**

**Abstract**

Risk communication during a public health emergency is vital to providing trusted, timely information to individuals who may be at imminent risk from a health threat, such as COVID-19. Twitter became a platform for COVID-19 information-sharing with the public, specifically from government agencies directly involved in prevention and mitigation efforts. The goal of this research was to compare and categorize these tweets that detail the U.S. response to the COVID-19 pandemic and demonstrate the type of messaging provided to the public during this “infodemic.” Tweets were curated from the official Twitter accounts of the Centers for Disease Control and Prevention, Department of Health and Human Services, U.S. Surgeon General, and the White House between March 18-April 3. A total of 148 tweets related to social distancing, hygiene, and face masks were individually dual-coded for key messaging features and frames. The tone of most tweets was either strictly informative (n=72) or argumentative (n=61). Most tweets had a gain frame (n=90), but many utilized a loss frame (n=26), and some that had both gain and loss frames within the same tweet (n=15). The most common emotional appeals were empathy (n=23), hope (n=19), guilt (n=15), gratitude (n=10), fear (n=6) and pride (n=4).The responses from each entity were not consistent nor coordinated. Different messaging styles and framing, different utilization of hashtags and tagging, and at times contradictory messaging occurred during this period.

**Keywords**: social media, mhealth, COVID-19, health education

**Impact statement**: Health communication, in particular its effects on key audience segments, is imperative to best promoting health and saving lives during this current public health emergency. The four entities highlighted may benefit from reviewing guidance on risk and crisis communication from previous public health emergencies and engage communication professionals in the construction of appropriate Twitter content so that lessons learned can inform a consistent and coordinated response moving forward.

**Introduction**

On January 21, Washington state declared its first official case of the novel coronavirus (SARS-CoV2), thus starting a series of governmental and public health efforts to understand, trace, and mitigate a U.S.-based COVID-19 outbreak that was already circulating the world (Chalfant & Samuels, 2020; Taylor, 2020). Shortly thereafter, President Donald Trump directed Vice President Mike Pence to form a Coronavirus Response Task Force. Several prominent individuals, including Dr. Deborah Birx as Response Coordinator, Dr. Anthony Fauci from the National Institute of Allergy and Infectious Diseases, Secretary of Health and Human Services (HHS) Alex Azar, Dr. Robert Redfield from the Center for Disease Control and Prevention (CDC), and Surgeon General Dr. Jerome Adams, created guidelines for Americans to follow during the outbreak as part of this Task Force (White House, 2020a). These guidelines were widely shared with the American people via social media and news outlets, including the individual and organizational Twitter accounts of the Task Force individuals listed above.

On March 11, 2020, COVID-19 was officially declared a pandemic by the World Health Organization (WHO) (WHO, 2020a). Two days later a national emergency was declared(Trump, 2020), and by March 15 the CDC was issuing guidance to limit gatherings to 50 people or fewer (CDC, 2020). Just a day later on March 16, the White House and its Task Force issued its first set of guidelines restricting gatherings to 10 or fewer and encouraging less congregating outside the home (White House, 2020b).

As these events quickly unfolded, Americans turned to social media for news coverage and updates in a rapidly changing context (Iwai, 2020), in what the WHO termed an “infodemic” (WHO, 2020b). Risk and crisis communication during a public health emergency are vital to providing trusted, timely information to individuals who may be at imminent risk from a health threat such as COVID-19 (WHO, 2020c). Key recommendations from the WHO related to risk communication specific to public health emergencies (such as COVID-19) include generating trust with the community by accurately communicating uncertainty and demonstrating transparency of related risks, all while engaging the community in a meaningful way (WHO, 2020c). Social media is one of many communication channels that should be integrated into an emergency response plan in advance of and throughout the emergency, punctuated by clear, consistent and actionable messaging (WHO, 2020c).

The Pew Research Center reports that during a period of 10 days from mid-to-late March, members of Congress, collectively, were using more than half of their Twitter platform to discuss COVID-19 (Hughes et al., 2020). In the two months between January and March 2020, a total of 27,000 Congressional tweets were related to COVID-19 specifically (Hughes et al., 2020).Twitter became a platform for discussing COVID-19 and information-sharing with the public, specifically from government agencies directly involved in the prevention and mitigation efforts. The authors decided to follow the Twitter accounts of four federal organizations actively involved in the COVID-19 response and to systematically code the content of each tweet during a critical period from mid-March to early-April to elucidate themes and messaging features. The goal of this research was to compare and categorize these tweets that detail the U.S. response to the COVID-19 pandemic and demonstrate the type of messaging provided to the public during this “infodemic.”

**Methods**

Tweets were curated from the official Twitter accounts from the CDC, HHS, the U.S. Surgeon General, and the White House between March 18-April 3 in order to capture a critical time period for the unfolding COVID-19 events and the start to many new federal guidelines and mandates related to virus control. During this time period, there were a total of 513 tweets across the four accounts (97 from the CDC, 50 from HHS, 97 from the Surgeon General and 269 from the White House). The federal organization account, rather than individual accounts were selected to allow for a more representative sample of tweets from the organization (rather than individual opinions). The tweets from these four accounts were then categorized into three main themes related to the behaviors of social distancing, hygiene (hand washing, avoiding touching the face, covering sneezes/coughs, disinfecting surfaces etc.), and face masks/coverings based on the preliminary guidance from the White House documented in the President’s Coronavirus Guidelines for America, “Do Your Part to Slow the Spread of the Coronavirus” (White House, 2020b). Of the original subset of 513 tweets, a total of 148 were extracted on these three themes. Of note, not all 513 tweets were specifically related to the pandemic, although all the White House tweets were pandemic related during this time period. White House tweets specifically focusing on the production of masks or personal protective equipment (PPE) for health care workers or general press conference reminders and announcements were excluded. Any tweets that captioned or illustrated the aforementioned guidelines on “Slowing the Spread” were included from all accounts. In total, 48 Tweets from the White House were included for further review. During this time period the CDC had five non-COVID tweets (one on TB, one on sepsis, one on a food recall and two on smoking). The CDC Twitter account also highlighted many travel advisories and blood shortages, which were excluded from this review. In total, 40 tweets were included from the CDC for further review. The Surgeon General’s account also had several tweets related to blood donations, or health care workers that were excluded. Posts from the Surgeon General related to media appearances were also excluded unless they specifically related to one of the three noted themes. In total, 50 tweets from the Surgeon General were included for further review, the highest percentage of tweets from any of the accounts relevant to the three themes (51.5%). Finally, the HHS account had many tweets unrelated to COVID-19 directly and often relating to prevention week and month themes (colonoscopy, HIV/AIDS, reptile bites, child abuse prevention, suicide, opioid recovery, food recalls, organ donation, autism, insulin, bipolar disorder, etc.). A total of 10 HHS tweets related to the three themes were included for further review. See Figure 1 for an image depicting the number of tweets included from each of the above organizations.

Two independent coders confirmed the inclusion of all the relevant tweets and any necessary additions were added prior to further coding. Next, each coder systematically reviewed the content of each tweet for two organizations and then the coders switched to independently confirm the accuracy of the dual-coders’ work. In total there was a high level of agreement between the two coders (> 95%). All discrepancies were revisited and reconciled based on the codebook definitions.

Each tweet was individually coded for the following elements: organization (HHS, CDC, Surgeon General or White House), date of tweet, any visuals included, any external links to content included, whether the tweet was original or a retweet, whether anyone was tagged in the post or any hashtags associated with the post. Next, the behavior of the message theme was included (social distancing, hygiene or face masks) and whether the tweet was supportive or unsupportive of the behavior. Next, in line with Hatchard et al. (2019) research on public health policy tweets in the UK, tweets were coded as informative (i.e., providing information related to COVID-19 response), argumentative (making a case for a specific mandate or guideline such as, you should hand wash, social distance, wear a mask etc.), critical (toward a policy or course of action), discursive (a question of whether a certain guideline will work) or unclear. Then each tweet was coded as related to prevention, mitigation, treatment or a specific risk factor. Subsequently, in line with historical communication work done by Kahneman & Tversky (1979; 1982) and Tversky & Kahneman (1981), gain or loss frame of each tweet was included. A gain frame was coded if the tweet implied something to be gained, and a loss frame if there was something to be lost due to certain actions or inactions. The general sentiment of the tweet (positive, negative, or neutral) was also captured. If the message was purely informational about COVID-19 (data, facts, etc.) this was coded as cognitive; otherwise each tweet was coded for an emotional appeal (for the tone and possibility of evoking fear, guilt, hope, empathy, pride or gratitude, not mutually exclusive) based on previous health communication work (Aaker & Williams, 1998; Nabi, 2002; Schindler-Ruwisch et al., 2018; Turner et al., 2013; Turner et al., 2017; Turner, 2018; Underhill, 2012; Witte & Allen, 2000). If an evidence-based recommendation was included, that was also noted. Finally, in line with the Pew Research on Congressional tweets (Hughes et al., 2020), a particular audience target for the message (i.e., American public, small businesses, older adults, youth, essential workers, etc.) was also coded.

**Results**

Of the 148 included tweets that were reviewed and coded, most covered multiple themes (i.e., hygiene plus social distancing or face masks plus social distancing). However, when looking at tweets that met one theme exclusively, the majority of the tweets were related to social distancing (n=51), followed by hygiene (n=16) and face masks (n=15).

Essentially all the tweets were in support of the three key behaviors (i.e., White House tweeted on 3/25/20: “The more aggressively we commit to social distancing, the more lives we can save, and the sooner Americans can go back to work, back to school, and back to normal”), with the exception of a handful of tweets related to face masks/coverings. For example, on 3/28/20, the Surgeon General tweeted, “WHO CDCgov & my office have consistently recommended against the general public wearing masks as there is scant or conflicting evidence they benefit individual wearers in a meaningful way, but real concerns about pulling from the healthcare worker supply…” The most divisive theme was related to contradictory information on face masks, particularly from the Surgeon General’s Twitter account, where within a few day time period, the guidance for Americans on wearing a face mask changed dramatically (as depicted in Table 1).

Overall, most tweets had an accompanying visual (video, image, or emoticon), although several images were redundant (i.e., flattening the curve figure, 15 or 30 Days to Slow the Spread recommendations, hand washing video). Many images included videos from press conferences or one of the Coronavirus Task Force Members giving brief information on a topic, via video. Beyond embedded images and videos, a large number of tweets, most from CDC, included external links for additional information or context. Few of the tweets were retweets, but those that were typically included unique text commenting on the retweet, or a retweet from the same account with further commentary (most commonly done by the Surgeon General, commenting on news and high-profile people discussing COVID-19 diagnoses and initiatives). Many of the HHS tweets were repeats (but not retweets). Several tweets tagged others, but this was relatively infrequent. The White House occasionally tagged throughout this period: “Mike\_Pence,” “realDonaldTrump,” “Surgeon\_General,” and “CDCgov.” The Surgeon General most frequently tagged others in his tweets, including “CDCgov,” “WHO,” “SecAzar,” “VP,” “POTUS.” The CDC only tagged “CDCMMWR” and “Surgeon\_General.” Most of the HHS tweets were tagged with “Surgeon\_General,” “WhiteHouse” and “CDCgov.” Hashtags were used sparingly by the White House, but commonly by the Surgeon General. However, hashtags used were inconsistent at times (especially among the Surgeon General and HHS), even from the same account: “coronavirus,” “COVID19,” and “COVID-19.” Several common hashtags were also used (albeit sparingly) including, “TogetherApart,” “StayHomeStayStrong,” and “SlowtheSpread” to reinforce key messages related to social distancing. CDC consistently used the “COVID19” hashtag, but also “FlattenTheCurve,” “PhysicalDistance” and “SocialDistancing.” “SlowtheSpread” and “SafeHandsChallenge” or “SafeHands” were also utilized by HHS and the Surgeon General. See Table 2 for overall tweet characteristics by Twitter Account and frequency.

The tone of most of the tweets were either strictly informative (n=72) or argumentative (n=61). An example of an informative tweet on hygiene was from the Surgeon General on 3/25/20, “One of the most important things you can do to help prevent the spread of COVID19 is wash your hands- thoroughly and frequently. Here's a refresher on the 5 things you need to know for it to be most effective,” while an example of a tweet with an argument from the White House on 4/2/20 related to social distancing was, “DON'T gather in large groups! Every person who is out and about is another person who can spread disease.” Essentially all the selected tweets fell into the categories of prevention or mitigation, many falling into both categories. In terms of evidence-based recommendations, many of the White House tweets included videos of Dr. Birx, Dr. Fauci or related press conference videos. The Surgeon General, CDC and HHS often referred to specific CDC recommendations (i.e., hand washing for 20 seconds), but other specific evidence was limited. Most of the tweets were not targeted to any specific group, but written to “Americans” or “the American people.” However, a handful were specific to millennials/Gen Z or younger individuals (n=8), families/parents (n= 6), or the sick/caregivers (which sometimes included the elderly; n=6).

Each tweet was coded for gain and loss fame, as well as general sentiment (positive/negative), particularly if a frame was not evident and an emotional appeal (or cognitive- lack of emotional appeal). Most of the tweets had a gain frame (n=90), but there were also a sizable portion with a loss frame (n=26) and some that had both gain and loss frames within the same tweet (mixed frame; n=15). Many of these messages begin with a loss frame and then are followed by a gain frame. The remainder of the tweets had no clear framing. Examples of gain and loss framed messages are included in Table 1. These tweets also clearly elicit many emotional appeals. Many messages had a cognitive appeal (informational, no emotional appeal, n=42) and some messages had mixed appeals (n=29). The most common emotional appeals were empathy (n=23), hope (n=19), guilt (n=15), gratitude (n=10), fear (n=6) and pride (n=4). See Table 3 for examples of each emotional appeal.

**Discussion**

In public health emergencies like the COVID-19 pandemic, crisis or risk communication needs to be disseminated through social media channels such as Twitter in a timely manner. While crisis communication can take many forms, messaging will include an “expressive component,” which needs to directly communicate key information (Quinn, 2018). The WHO further emphasizes the importance of risk communication integrated into a planned and coordinated approach to communicate in an efficient, effective, and transparent manner (WHO, 2020c). While the four federal entities selected for this content analysis had social media channels with relatively large followings at the onset of this pandemic, the responses from each account were not always consistent or coordinated. The included tweets on three key areas highlighted by the White House Task Force and the guidelines that governed American society for months in the immediate aftermath of the pandemic were inconsistent in several ways. Different messaging styles and framing, different utilization of hashtags and tagging, and at times contradictory messaging were present within the 16-day period of study. This occurred during a critical time at the beginning of the pandemic where individuals were looking to establish trust and understand their risks in a clear and relatable way. While several main ideas were re-iterated across the Twitter accounts (hand washing, staying home, protecting others), there was an overall lack of utilization of key Twitter features that are designed to engage audiences and would be ideal for a social media response intended to be relatable with the target audience. The Surgeon General seemed most adept at tagging others and utilizing celebrity models and challenges (i.e., Safe Hands Challenge) to engage the audience, but even across this account, messaging was often muddled and confusing (particularly related to face masks). While many of the tweets across all accounts were informative, a sizable portion were argumentative, telling Americans what they “must do,” sometimes in a polarizing way that could limit their effectiveness, particularly in a climate where many every-day freedoms were already being limited. Further, while many tweets had gain-framed messaging that inspired hope and were empathetic in their appeal, many had messaging that instilled guilt and fear, or had mixed appeals that were meant to scare followers and then empathize or give hope second. Theory based evidence in line with the Extended Parallel Process Model suggests from other health emergencies that messages explaining the threat (inducing fear) without providing actionable steps and establishing efficacy to take these actions are limited in their overall effectiveness (Turner et al., 2013). Further evidence on the effectiveness of gain versus loss-framed messages and emotional appeals often depends on the audience, the behavior, the level of certainty of outcome and level of cognitive processing (Wansink & Pope, 2014). Gain frame messages are typically more effective when an audience has lower involvement and when the outcome of a particular behavior is more certain. Since most people are not highly knowledgeable about COVID-19, loss frame messages may not be as effective. With COVID-19, some health behaviors (such as hand washing) can more clearly reduce risk (i.e., high certainty), but many other behaviors have varying certainty (i.e., face masks, test effectiveness) complicating the type of message which is more effective in this context. Individual risk-aversion can also influence the effectiveness of certain appeals and whether the public will heed such health messaging (i.e., social distancing). Finally, whether someone processes the information with high-level cognition versus more automatically can affect the utility of a gain or loss-framed message. Those with higher level cognitive processing of the health messages (more common for a health audience less familiar with this type of information) may benefit more from gain framed messages that do not induce fear and other negative emotional appeals (Wansink & Pope, 2014). Further, the (perceived) motive of an emotional appeal, like a guilt appeal, can have opposing impacts based on the source origin (Turner et al., 2017). Other research on empathy and pride appeals also found cultural differences in persuasiveness, based on collectivist versus individualist cultures and perspectives (Aaker & Williams, 1998). Recent research specific to COVID-19 health communication has encouraged health professional to avoid fear appeals due to the potential harmful and unintended consequences (Stolow et al., 2020). Finally, compared to negative or fear appeals, hope appeals improved cognitive processing and generated more support (versus countering) for the recommendation and message (Underhill, 2012).

While it is not completely clear which type of messaging may best benefit the general public (rather than specific audiences), the variety of messaging utilized may not have had the intended or planned effect from these Twitter accounts. Although a few specific audiences were directly targeted (youth, families, elderly), it is not clear that message communication was tailored to best meet the diverse needs of these varying audiences. Most messages were directed towards the general population at large, in which case it may be challenging to frame the message in a way that is effective for everyone. Additionally, Twitter has the unique advantage of short, concise messaging. This can help with the comprehension of simple messages, when articulated well. The high frequency of messaging typical of this social media channel allowed for the re-iteration of key health messages, but also left more room for error and inconsistencies.

While the tweets analyzed herein only included a small subset of the total tweets from each of these accounts and only a sample of all the groups involved in the pandemic response (on a variety of media channels and platforms), the content does begin to illustrate both the benefits and problems of Twitter-based COVID-19 risk communication. The time period reviewed is only a brief snapshot of the events during the past several months, but a focus on early response efforts is informative for future communication in this ongoing pandemic. The analysis of tweets included here was also strictly limited to text-based responses and did not include analysis of any additional messaging content that may be communicated through visuals, media or links associated with the messages, which may be an area for future research.

As the world struggles to discern the best next steps in the COVID-19 response, it is the duty of our nation’s leaders, particularly those involved in our public health and emergency responses to provide the public with clear, direct and effective communication to better understand risks and protect our lives and our health. However, in a rapidly evolving context marked with uncertainty, it is understandable that risk communication takes on an additional level of complexity. The four organizations highlighted may benefit from reviewing guidance on risk and crisis communication from previous public health emergencies and engage communication professionals in the construction of appropriate Twitter content so that lessons learned can inform a consistent and coordinated response moving forward. The analysis herein reveals many layers of framing, audience-targeting, emotional appeals and messaging tones that may not be readily apparent to the leaders informing the American people of their COVID-related risks and related essential health information. Studying health communication, and in particular its effects on key audience segments, is imperative to best promoting health and saving lives during this current public health emergency. Future research should continue to review health messaging and share results related to communication efficacy and message effectiveness with leaders who disseminate this critical information to the population at large in order to ensure everyone has equitable access to critical risk and health information.

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**Table 1**. Selected Tweets on Face Coverings from Surgeon General’s Twitter Account

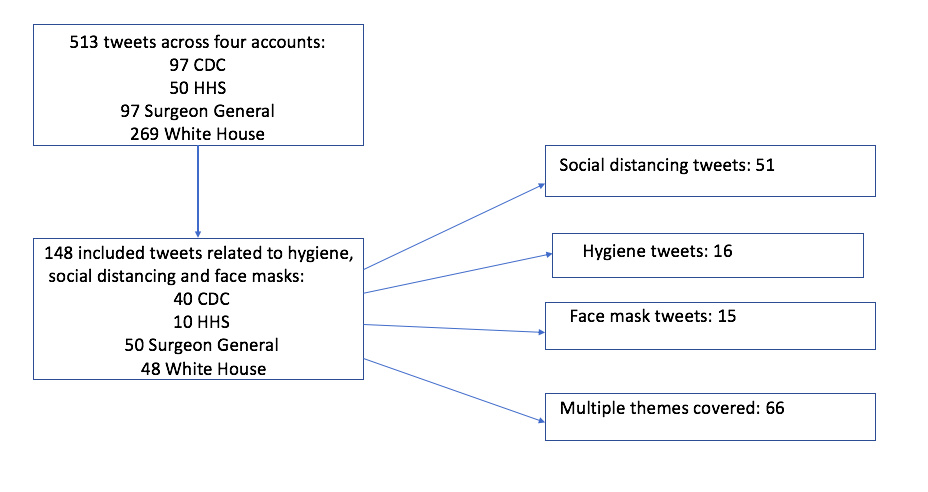
|  |  |  |
| --- | --- | --- |
| **Tweet** | **Date** | **Frame** |
| "If you have coronavirus or are caring for someone with COVID19, both CDCgov and WHO advise you to wear a mask around others, so YOU don't spread disease to THEM. There may be other recommendations for wearing masks at the discretion of your health provider or employer." | 3/28/20 | Loss Frame |
| "My office, CDCgov, and WHO constantly review emerging data and studies regarding COVID19, and will adjust recommendations according to new data as the evidence warrants. CDC does not have new guidance scheduled to come out on this topic at this time." | 3/28/20 | NA |
| “WHO CDCgov & my office have consistently recommended against the general public wearing masks as there is scant or conflicting evidence they benefit individual wearers in a meaningful way, but real concerns about pulling from the healthcare worker supply…" | 3/28/20 | Loss Frame |
| "WHO stands by recommendation to not wear masks if you are not sick or not caring for someone who is sick-CNN" | 3/30/20 | Loss Frame |
| "IF you choose to wear a face covering: wash your hands well before and after, & don't touch your face while wearing please save the N95 masks for healthcare/ frontline workers, remember it is not a replacement for social distancing. Your best bet is still to stay home." | 4/2/20 | Loss Frame |
| "There remains scant evidence wearing a mask- especially improperly-provides much benefit to a healthy wearer. However, emerging data suggests facial coverings may prevent asymptomatic disease transmission to others. We always follow and react to the data CDCgov is studying" | 4/2/20 | Mixed  Loss frame- first sentence  Gain Frame-second sentence |
| "In light of new evidence, CDCgov recommends wearing cloth face coverings in public settings where social distancing measures are difficult to maintain (grocery stores, pharmacies etc) especially in areas of significant community-based transmission" | 4/3/20 | NA |
| "As myself and other members of POTUS's COVID19 Task Force have said in the past, our response is data driven and we will continue to update our response and guidance based on the data." | 4/3/20 | NA |

**Table 2.** Overall Tweet Characteristics and Account Specific Frequency

|  |  |
| --- | --- |
| **Tweet Characteristic** | **%(N) from each Twitter Account** |
| Included Visuals | White House: 97.5% (47)  Surgeon General: 86% (43)  CDC: 95% (38)  HHS: 100% (10) |
| External Links | White House: 25% (12)  Surgeon General: 44% (22)  CDC: 85% (34)  HHS: 10% (1) |
| Retweets | White House: 0% (0)  Surgeon General: 16% (8)  CDC: 0% (0)  HHS: 0% (0) |
| Tagged | White House: 22.9% (11)  Surgeon General: 50% (25)  CDC: 12.5% (5)  HHS: 90% (9) |
| Hashtags | White House: 2.1% (1)  Surgeon General: 68% (34)  CDC: 95% (38)  HHS: 90% (9) |

**Table 3.**Emotional Appeal Examples

|  |  |  |  |
| --- | --- | --- | --- |
| **Appeal** | **Account** | **Date** | **Tweet** |
| Empathy (n=23) | CDC | 3/29/20 | “While #socialdistancing for #COVID19, take the time to check in on your friends and family to see how they are doing. Set up a daily phone or video call to touch base and share the best and most challenging parts of the day. #togetherapart bit.ly2Qj4ing |
| Hope (n=19) | HHS | 3/18/20, 3/19/20, 3/23/20, 3/27/20, 4/1/20 | “Together, we can stop the spread of #COVID19. Here are the most recent guidelines for Americans from the @whitehouse and @cdcgov. #coronavirus” |
| Guilt (n=15) | Surgeon General | 4/2/20 | “Even if you are young, or otherwise healthy, you are at risk and your activities can increase the risk of others. It is critical that you do your part to slow the spread of COVID19.” |
| Gratitude (n=10) | CDC | 3/19/20 | “Are you isolating at home because you have #covid19? Thank you for helping to stop the spread of the virus and protect others! See when you can stop home isolation: bit.ly/2wf7sS7” |
| Fear (n=6) | White House | 3/29/20 | “The peak of this virus' death rate is likely to hit in two weeks. We MUST stay the course and keep following the guidelines. Nothing would be worse than declaring victory before the victory is won.” |
| Pride (n=4) | White House | 4/3/20 | “In this time of need, I know that every American will do their patriotic duty and help us to achieve a total victory, President Trump says.” |



**Figure 1.**Inclusion Criteria for Included Tweets by Account and Theme