Retweeting for COVID-19: Consensus building, information sharing, dissent, and lockdown life

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Public attitudes towards COVID-19 and social distancing are critical in reducing its spread. It is therefore important to understand public reactions, information dissemination and consensus building in all major forms, including on social media. This study analyses the most retweeted posts on Twitter during 20 days in March to give insights into the issues that resonate with the public, and the role Twitter may play in social distancing campaigns. It reports a thematic analysis of English-language tweets March 10-29, 2020, mentioning COVID-19 or coronavirus and with over 100,000 retweets. These were extracted from a collection of 12 million. The main themes identified for the 87 qualifying tweets accounting for 14 million retweets were: lockdown life; attitude towards social restrictions; politics; safety messages; people with COVID-19; support for key workers; work; and COVID-19 facts/news. The results suggest that Twitter played many positive roles, mainly through unofficial tweets. For this, users shared social distancing information, helped build support for social distancing, criticised government responses, expressed support for key workers, and helped each other to cope with social isolation. Nevertheless, a few popular tweets not supporting social distancing show that government messages were not universally successful. Public health campaigns in future may consider encouraging grass roots social web activity to support campaign goals.

Introduction

In the current COVID-19 crisis, it is vital that we tackle the immediate threat and learn lessons for the next time (Gates, 2020). The social sciences have a particularly important part to play in this disease because a core part of public health strategies defence is social distancing (e.g., Tian, Liu, Li, et al., 2020). This relies on communicating the necessary behaviour effectively to the population and engaging their consent and will to comply fully with the rules. Because of this, effective public communication is the key issue and public reactions to events need to be assessed to understand the mediums in which information and consensus spreads effectively. The public perspective is therefore more central for this than for most other major public health threats in the past century, except perhaps HIV/AIDS. Information about public behaviours or attitudes may also help understand the epidemiology of the disease, which is important to help control it (Lipsitch, Swerdlow, & Finelli, 2020).

Twitter is an important source of breaking news for a minority of people in some Western countries (e.g., at one US college: Tandoc & Johnson, 2016). It can also be an important vehicle for disseminating new public health information (Liang, Fung, Tse, et al., 2019), although it usually relies on users retweeting to attract a large audience (Steele & Dumbrell, 2012). During a crisis, members of the public can be expected to tweet about their own situation and emotional reactions (Lachlan, Spence, Lin, Najarian, & Del Greco, 2016). These tweets can be exploited to help public health or safety officials to understand the situation on the ground. For example, tweets related to the Zika virus have been analysed to identify the main public concerns (Glowacki, Lazard, Wilcox, Mackert, & Bernhardt, 2016), and which messages were retweeted to the largest audience (Stefanidis, Vraga, Lamprianidis,

et al., 2017). Perhaps surprisingly, preventative measure information is not always the most widely retweeted (Vijaykumar, Nowak, Himelboim, & Jin, 2018). An early investigation of gender differences in English-language tweeting about COVID-19 during March 10 to 23, 2020 found that females were more likely to discuss social distancing and males were more likely to tweet about sport cancellations (Thelwall & Thelwall, 2020). Another early study found misinformation and valid information to spread in similar ways (Cinelli, Quattrociocchi, Galeazzi et al., 2020).

Retweeting is an important aspect of the social media information ecology (Alhabash & McAlister, 2015). Retweeting has previously been used to gain insights into public attitudes (e.g., Dare-Edwards, 2014; Gabarron, Makhlysheva, & Marco, 2015; McNeil, Brna, & Gordon, 2012) or social movements, as evidence of the effectiveness of official information dissemination strategies (e.g., for Hurricane Sandy: Wang & Zhuang, 2017), or as evidence of the importance of the retweeted content (e.g., Hermida, 2013). For example, successful tweets from participants in the Egyptian uprising 2011 enabled activists to engage with a wider audience (Starbird & Palen, 2012). For a non-political issue, there were many tweets about Supertyphoon Haiyan, centered on the Philippines, from citizens surviving the event, but media, celebrity and disaster relief organisation tweets were common amongst the most retweeted (David, Ong, & Legara, 2016). During the Japanese earthquake of 2012, tweets from people in the affected area were retweeted by those outside to share first-hand information quickly (Miyabe, Miura, & Aramaki, 2012). These examples both illustrate that tweets from citizens (rather than politicians, experts, or celebrities) can reach large audiences during crises, especially when they have first-hand accounts or information to share.

Studies of political retweeting give some insights into factors influencing success. Official sources are not always the most successful (Sanjari & Khazraee, 2014; Segesten, & Bossetta, 2017), there may be geopolitical differences in the types of tweets that are most retweeted, humour seems to drive much retweeting (Driscoll, Ananny, Bar, et al., 2013) and bots can be problematic (Stewart, Arif, & Starbird, 2018). In normal times, a tweet is more likely to be retweeted if it contains a URL or hashtag, and if the tweeter has many followers and follows many people (Suh, Hong, Pirolli, & Chi, 2010).

This article investigates highly retweeted tweets during March 2020 about COVID-19 for insights into public reactions to the pandemic and the role of Twitter in information spreading and consensus building. As the above brief review suggests, there is no expected type of tweet that may become highly retweeted, but the set is likely to include citizen tweets.

Interpretation of retweet counts

This article analyses tweets that have been retweeted at least 100,000 times. Ignoring the presumably low percentage of retweets by bots (since this is not a primarily political topic), each retweet represents a person wanting to share the tweet with their followers on Twitter or to promote the tweet algorithmically through retweets. There are many reasons why a person might want to share to followers/others, depending on the nature of the tweet and reliability of the original tweeter and the interests of the tweeter's followers (Engelmann, Kloss, Neuberger, & Brockmann, 2019; Metaxas, Mustafaraj, Wong, Zeng, O'Keefe, & Finn, 2015; Rudat, Buder, & Hesse, 2014), but they are known to include at least the following topic-related factors (Boyd, Golder, & Lotan, 2010; Lee, Kim, & Kim, 2015; Metaxas et al., 2015).

- A belief that the information will be:
  - Interesting or important background information (e.g., news).

- o Useful to work or home life (e.g., recipes, travel advice, announcements, health or medical information).
- o Entertaining (e.g., jokes)
- To persuade about (e.g.):
  - o Politics
  - o Health behaviours
- To associate with the message, such as by showing agreement or a good sense of humour.
- To reward the tweeter for positive content.
- To be a visible part of a conversation.
- To save the tweet for reference.
- In the hope of reciprocal retweets.

The exact mix of reasons for retweeting varies based on the issue concerned and may be non-intuitive. For example, an analysis of Breast Cancer Awareness Month tweets found that the most retweeted were promoting the Month or fundraising rather than educational (Chung, 2017). In contrast, highly retweeted tweets about Hurricane Irma were likely to contain pictures, safety instructions or information (Lachlan, Xu, Hutter, Adam, & Spence, 2019).

There are multiple reasons for using Twitter, including information-centred, social and entertainment motivations (Alhabash & McAlister, 2015; Liu, Cheung, & Lee, 2010). Since these varying motivations presumably extend to retweeting, there are multiple corresponding causes of high retweet counts. In addition, a tweet needs enough early retweets to become viral because spreading is typically slow initially through friend networks but then can continue until a large audience is reached (Lerman & Ghosh, 2010). Thus, tweets that do not become highly retweeted are not necessarily less in tune with public attitudes since they may fail at the initial step of breaking out of initial friend networks. Nevertheless, a highly retweeted tweet reflects an issue that has engaged mass attention in the highly competitive environment of Twitter. Each highly retweeted tweet therefore potentially gives an insight into an issue that resonates with the public. For a useful insight, the reason for the tweet must be inferred from its texts and context, which entails a qualitative judgement unless retweeters are asked about their motivations. Some of these reasons will be largely irrelevant (e.g., pure humour), obvious or well known, but the remainder might convey new information or ideas as outcomes of this study. Thus, a multi-stage approach is needed to extract useful meaning from retweets.

1. **Collection**: Collect a relevant collection of tweets and identify a subset that is highly retweeted.
2. **Typology**: Make a subjective judgement about the type of information contained or the reason for retweeting in each case.
3. **Insights**: Match the types/reasons identified for highly retweeted tweets with what is known about the issue and identify those that represent new insights into the issue.

Although the insights gained are from a quantitative source (high retweet counts) and may be from a large sample size (many retweeters) they are unlike much quantitative research in that two stages require subjective judgements and, at least as framed above, there is no hypothesis testing element, so the overall approach is exploratory (i.e., discovery-based). In this regard, the above approach is like typical qualitative research. Its findings therefore have the status of evidence-based insights rather than tested hypotheses or proven assumptions. This is particularly useful for examining phenomena that are relatively new. In comparison to typical qualitative research, the retweet analysis approach is also valuable when quick insights

are needed. Qualitative research is time-consuming because it entails detailed and repeated analyses of large sets of texts (or other data) from small samples. Retweet analysis has the additional advantage of its large sample support for each individual retweet, reducing the risk that findings apply to only a small group involved in a typical qualitative case study.

In terms of limitations, highly retweeted tweets provide biased insights into public reactions since a minority of people tweet and tweets from users with many followers are more likely to be successful. Moreover, Twitter is one part of the information ecology of society and information may not spread on Twitter if other outlets spread it instead. Since many people get news primarily from social media (at least 20% in the USA: Shearer, 2018), the tweets do not necessarily reflect issues that are not well covered by the mainstream media, but it seems likely that such issues would resonate more easily on social media.

Regarding COVID-19, there are specific sources of bias on Twitter. In the UK, a government team is targeting fake news on social media, such as modifications of its core messages, "GOV.UK CORONAVIRUS ALERT New rules are in force: you must stay at home. More info & exceptions at gov.uk/coronavirus Stay at home. Protect the NHS. Save lives." (BBC, 2020). This message was texted across the UK and tweeted by the UK prime minister as a picture message on March 24 but had been retweeted only three thousand times by 30 March, 2020[1]. From March 16, Twitter had also been removing misleading advice that might have fatal consequences, in consultation with governments and other relevant organisations (Twitter, 2020). Thus, any set of highly retweeted tweets is censored, excluding widely believed but misleading posts. For example, scams, alternative medicine and religious messages advocating unsafe practices or ineffective cures could expect to be taken down.

Methods

Collection: A topical collection of tweets was collected from the Twitter API (Applications Programming Interface) using the free software Mozdeh between 10 and 29 March 2020 with the following queries: coronavirus; COVID-19; COVID19; "corona virus". The first three queries match the term irrespective of whether it is a hashtag. Testing with Twitter online and pilot testing with the API suggested that these would capture a substantial number of relevant tweets. Specific hashtags, such as #socialdistancing, would have produced extra matches but at the start of the period this set seemed to be adequate. For consistency, the set of search terms was not updated during the period.

The queries produced 23,603,317 matching tweets. This set was processed to identify all tweets with a retweet count of at least 100,000, as reported by the API, which were separated for analysis and ranked in descending order. Duplicate tweets (one a truncated version of the other) were deleted, as were tweets originally posted before March 10, 2020.

Typology: Each of the top tweets was located on Twitter.com and read within the site to identify the full tweet (the API truncates long retweets) and check any embedded links or images. Using a thematic analysis approach (Braun & Clarke, 2006), the tweets were tagged with one or more descriptions, then repeatedly clustered and re-classified to generate a set of consistently applied tags reflecting the main purposes of each tweet. This process was conducted independently by both authors, then combining the themes and subthemes to produce a shared final set. This is a qualitative and subjective approach. The typology is reported in the Results section.

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[1] https://twitter.com/10DowningStreet/status/1242412113127190531

Many tweets involved humour. Although there are many current psychological theories of humour, two prominent ones emphasise the social context of a joke as central to it being considered funny. Reversal theory (Apter, 1989) argues that a joke's context must increase physiological arousal in either positive or negative ways and then diminish it. The seriousness of COVID-19 might be one such context. For example, a joke centring on the threat of the virus would not be funny and therefore not retweeted by people that were not alarmed by COVID-19, so high retweets would be evidence of public perception of COVID-19 as threatening. Similarly, benign violation theory (McGraw & Warren, 2010) argues that humour arises when something is simultaneously threatening and non-threatening. For example, a threat expressed by paraphrasing a song lyric could be funny due to the song lyric playing the non-threatening role. A joke related to COVID-19 being funny therefore implies that an aspect of the joke was perceived to be threatening. Thus, when relevant to COVID-19, jokes were classified according to the underlying message rather than primarily as a joke.

Insights: Insights were identified in three stages. First, each theme and, when necessary, each tweet was evaluated for information relevant to COVID-19 that could be inferred from the high retweet status. This entailed judging the likely common motivation for retweeting. Second, motivations not directly relevant to COVID-19 as a public health issue were discarded (e.g., humour in one case). Third, the remaining motivations were assessed in the context of prior research and assessed for (a) confirming expected patterns or (b) new insights. The insights are reported in the Discussion section.

Ethics: Tweets are not private but are fully in the public domain and therefore do not need ethical approval to research at the University of Wolverhampton, although informed consent is needed before including quotes because these might generate unwanted publicity (Eysenbach & Till, 2001; Golder, Ahmed, Norman, & Booth, 2017; Wilkinson & Thelwall, 2011). Informed consent may not be needed when public figures are mentioned or quoted, however. In the current study, although all tweets have been seen by at least 100,000 tweeters, some were personal stories about the death of a family member, and many were tweeted by people without many followers. Thus, no exact quotes were included for the tweets and no list of tweets or Twitter IDs is included. Heavily modified pseudo-quotes are included in brackets (rather than quotes) and subheadings to give a flavour of the results, instead. This situation is not helpful for reproducibility, but seems unavoidable.

Results

After merging duplicates, 87 different English-language tweets posted on or after March 10, 2010 and containing coronavirus, COVID-19, COVID19, or "corona virus" had received at least 100,000 retweets by March 29, 2020. Collectively, they accounted for 14 million retweets and probably about twice as many Likes. The themes and subthemes identified are reported below in descending order of the total number of retweets.

Lockdown life: Penguins loose in the Chicago aquarium

Twenty-eight tweets (4.2 million retweets) discussed various aspects of life under self-isolation, lockdown or social distancing rules. Six (1.2m) discussed the situation of **toddlers or animals** during the lockdown, using cute videos or jokes (a penguin release story was apparently real: Guardian, 2020). Four (0.6m) discussed **community-focused lockdown activities,** such as community singing or helping people that could not afford to pay rent, one of which was humorous, and one (0.1m) tweeted a humorous picture of innovative solo timewasting. Three (0.3m) discussed what people might do **after the lockdown** ends (will we

be as hygienic?). Two (0.3m) discussed **event cancellations** with crowds, both with humour. For example, one tweeted that a fictional race had been cancelled, the hyperbole presumably working on the realisation that everything had been cancelled. Three tweets (0.3m) were jokes about the **virus dominating all news and conversation** (when will we talk about me instead?) and three (0.5m) joked that **extreme social distancing measures might be necessary** (e.g., dogs fetching shopping).

The remaining tweets discussed different topics: wanting the lockdown to **last at least two months** (0.2m), fear of panic buying (033m), joking that some people were getting their core **information from friends** (0.1m), **missing friends** (0.1m, cute video), **fear of testing** joke (0.1m), and a **tasteless joke** about old people dying (0.1m, from March 12).

Attitude: COVID-19 jokes are funny but I'm still frightened

Eighteen tweets (2.6 million retweets) primarily expressed an attitude towards the COVID-19 pandemic restrictions. Eight tweets (1.2m) emphasised the **threat or seriousness** of the pandemic, all in the form of jokes or humour (e.g., a graphic of a city with a wall around it proposed as a solution). In contrast, three tweets (0.4m), one in the form of a joke, inferred **dissent** about the need for social distancing (e.g., I won't let it stop me going on holiday because COVID-19 is in every country). Between these two, five tweets expressed **hope** about personal protection (2 tweets, 0.4m), both jokes (e.g., the drugs already in my system will beat it), or for an end of pandemic (3 tweets, 0.3m), one joke (K-pop fans will cure it if it infects their idol), and one religious (e.g., I believe Jesus will end it soon). Finally, two tweets (0.3m) expressed **dismay** at the lockdown restrictions (e.g., all my plans are cancelled).

It is evident that partly conflicting opinions were expressed on Twitter and that the apparently dominant attitude of fear was primarily expressed through humour, whereas the opposite was mainly expressed seriously. More sceptical tweets tended to be early (March 10-14), although the same was true for the threat tweets (exception: March 18). One of the dissent tweets had been removed at the time of testing, perhaps by the owner receiving negative feedback or as a Twitter.com safety action.

Political: Katie Porter wins free coronavirus testing

Fifteen tweets (2.2 million retweets) discussed political issues, primarily focusing on the USA, and none containing humour. Five tweets (0.9m) praised or criticised **politicians' actions**, two accusing President Trump of mismanagement, two praising or announcing Representative Katie Porter getting a free coronavirus testing promise from the US administration, and one attacking Senator Richard Burr for putting profits first. Five tweets (0.7m) **attacked (mainly US) government policy** (before the outbreak) about healthcare, human rights, and spending, based on COVID-19-related events. Three tweets (0.4m) **accused business of greed or dishonesty** before the virus (not allowing workers to stay at home) or during it (putting profits before lives). Two other political tweets praised **Cuba** for helping Italy or accused people of **racism** for calling COVID-19 a Chinese virus.

Safety messages: Stupid will kill us

Eleven tweets (1.9 million retweets) gave safety information, such as the need for social distancing or obeying government lockdown rules. Eight (1.3m) were straightforward and relatively serious **exhortations to follow social distancing guidelines**. These tweets did not include or explain the guidelines but attempted to persuade that they were important (if you childishly don't follow instructions, we'll all suffer). An additional three (0.6m) embedded

specific **social distancing advice** in humour in the form of a comic video message (featuring Mel Brooks) and two song lyrics rewritten for social distancing advice (Queen's Bohemian Rhapsody; Dua Lipa's Don't Start Now). These did not give comprehensive social distancing instructions but implicitly or explicitly highlighted the need for it, as well as mentioning its nature.

People with COVID-19: It was like this for me

Eight tweets (1.5 million retweets) discussed individuals who had caught the disease. Three reported **celebrities testing positive** (0.6m), two as personal announcements (Boris Johnson, Idris Elba), and one in the form of a joke. Three further tweets reported in detail (Twitter threads) the **experience of COVID-19 symptoms** for the tweeter, who had just recovered (0.6m). Two (0.3m) reported the **impact of a COVID-19 death** (of a parent) on the tweeter, combining it with an exhortation to follow social distancing rules.

Support key workers: Nurses, doctors, cleaners, shopworkers are the vital people

Four tweets (0.5 million retweets) were **messages of support for all key workers** during the crisis (two tweets, 0.3m) or **messages of support for medics** (2 tweets, 0.2m). These seemed to be partly expressing appreciation and partly making a political point (not bankers or traders, it's the nurses and cleaners that are saving us).

Work: Meetings by email

Three of the most retweeted tweets (0.5 million retweets) discussed separate work-related issues: the discovery that meetings can take place by email (0.2m), an ineffective workplace preventative measure against COVID-19 (0.1m, possibly a joke) and a criticism of social media influencers that were shaming people for working despite the restrictions, since they might need the money to live (0.1m).

COVID-19: Daily symptoms

Only two of the most retweeted tweets (0.3 million retweets) focused on the virus. One described the **symptoms** day by day with an animation showing the impact of the virus on the body (0.3m) and the other was a **news** story about a fast COVID-19 test (a genuine news story but false). There seemed to be relatively little interest in the virus itself or medical news about it.

Discussion

In addition to the limitations discussed above, this study focuses on information rather than behaviour. It is possible, for example, that people widely retweet public safety information and then ignore it. This seems unlikely, however, and one previous study of Zika virus concerns has shown a connection between public attitudes and the volume of tweets about Zika (Farhadloo, Winneg, Chan, Jamieson, & Albarracin, 2018), supporting the claim that Twitter can influence public health behaviour. The study is also limited in its focus on highly retweeted tweets. Other issues may well have been more extensively discussed on Twitter than some reported below but lacking individual highly retweeted tweets. The analysis also makes inferences about the purpose or impact of the tweets, which may not be correct. In particular, memetic qualities of jokes may have been missed, with the resulting associations changing their meaning (Shifman, Levy, & Thelwall, 2014).

In terms of cross-cutting themes, the prominence of joke tweets reflects the common use of Twitter for entertainment (Alhabash & McAlister, 2015; Liu et al., 2010). Humour almost always accompanied a COVID-19 message, although it is difficult to judge whether the message played a subordinate role in the retweeting. Humour seems likely to boost the audience of a tweet by making it more likely to be shared, however. Other cross-cutting themes include human interest stories and political points (including outside the politics theme).

Lockdown life

The 4.2 million retweets about quarantine, lockdown or social distancing rules reflect a rapid and substantial change in daily lives. The jokes and humorous videos may help people to come to terms with changes in their lives. Presumably the changes resulted in many sources of uncertainty and stress, which humour could partially alleviate, at least in the short term (Martin & Ford, 2018). The absence of tweets about real sports cancellations, in contrast to an earlier study of typical tweets (Thelwall & Thelwall, 2020), suggests that mass cancellations were more important than individual events.

Attitude

It is unsurprising that 2.6 million retweets expressed an attitude towards the COVID-19 restrictions, given their substantial negative impact on many lives. The tweets reveal substantial support for different opinions. Although accepting the issue as a serious threat was the dominant attitude (also evident in the safety message retweeting), this attitude was only conveyed with humour. It is possible that those taking the outbreak most seriously tended to retweet a more proactive tweet, such as a safety message

Popular tweets expressing dissent confirm that the population was divided about the issue and that **initial government safety messages were not universally persuasive**. As a practical implication, tracking Twitter might help governments to assess the level of credibility of their public health messages, as they presumably already do, in order to target advertising or campaign messages.

Political

The 2.2 million retweets focusing on political issues were all anti-establishment in the sense of being critical of the current national government. This might reflect the demographics of Twitter users rather than broader society, however. It seems likely that it is more used as an alternative news or politics channel by people that disagree with the mainstream media, for example. These tweets might play the important democratic function of holding the government to account and creating pressure on the government to carry out specific actions, or keep to its promises (e.g., on free testing in the USA).

Safety messages

The 1.9 million retweets for non-official messages offering direct exhortation or indirect encouragement to follow safety rules represent a **substantial free resource to spread information about social restrictions** and, perhaps more importantly, to **create community support** for following them. The latter may be more important in the US and UK, for example, with the safety advice having been given by politicians (Trump, Johnson) that are distrusted by at least a substantial minority of the population. This support presumably helped to build

compliance with the otherwise draconian measures. Support message seem likely to have been most effective when the message was purely serious since there would be little possibility to misinterpret it as entertainment.

The humour-related messages also reached a wide audience and their role may have been more informational for the reasons above. Celebrity endorsements (e.g., Mel Brooks) may well allow them to contain a persuasive element, through parasocial connections, respect or shared community membership. Humorous messages may also reach a different audience, those using Twitter primarily for entertainment rather than other purposes, such as news.

As a caveat, retweeting a safety message does not necessarily mean that the retweeter followed the advice or that their friends were persuaded by it. Moreover, even if someone felt persuaded then this would not necessarily transfer into behaviour changes (Cugelman, Thelwall, & Dawes, 2011). Thus, overall, safety messages were widely shared informally on Twitter, reaching a large audience quickly with a personal connection, and retweeting serious and celebrity-endorsed humorous messages seems likely to have **helped build community-wide support for compliance**.

People with COVID-19

The 1.5 million retweets about individuals who had caught the disease represent substantial human interest, perhaps partly due to concern for the celebrities testing positive and partly due to fear of the disease, leading to a desire for information and reassurance about the symptoms. Detailed reports of survivor experiences seem likely to have been reassuring to those who might become infected, and informational to help them self-diagnose. Together with the reports of individual family member deaths, they seem likely to have served as safety messages, illustrating that anyone can be infected. The detailed experience reports included careful disclaimers that other people's experiences, symptoms and prognoses might be different. Thus, the personal stories seem to have been useful additions to the information ecology for COVID-19 for **safety messages** and **public health information**.

Support key workers

The 0.5 million retweeted messages of support for all key workers or health professionals echoed public displays of gratitude in many countries (e.g., clapping on a pre-defined day and time). Both presumably helped to **boost the morale of key workers** (often low paid) performing critical and dangerous jobs.

Work: Meetings by email

The 0.5 million retweets for work-related issues reflect the conflict created by the tension between needing to work (as an employee or employer) and public safety. They seem to **highlight the lack of clear guidelines for who should work and how** at some stages of the pandemic. There were no highly retweeted tweets with work-advice or working from home stories, although some lockdown life stories may apply to people working from home.

COVID-19

There seemed to be relatively **little interest in detailed technical information about COVID-19** or testing technology (0.3 million retweets). It is surprising that stories by individuals were less retweeted than detailed explanations of the full range of symptoms that could be

experienced, which seems to be more useful information. This is a tentative conclusion, since the detailed technical information might have been shared in an earlier tweet or in multiple similar tweets, each with lower retweet counts. It seems more likely, however, that people needing detailed information would seek it in official government websites rather than social media.

Conclusions

For people following COVID-19 on Twitter, the above themes may not be surprising, but the thematic analysis here adds structure and creates a long-term record of the initial COVID-19 reaction in English in this important social media site. The results suggest that Twitter made a positive impact on COVID-19 in terms of sharing information, encouraging support for social distancing guidelines and helping people to cope emotionally with the changes. The results also suggest that more fundamental political conclusions were being drawn from government reactions, or that government opponents found many reasons to believe that their criticisms were vindicated or highlighted by COVID-19. It also seems possible from the support for tweets opposing government restrictions that a lack of trust in government contributed to some ignoring social distancing restrictions, especially in the early stages of the pandemic.

Some suggestions for pandemic public information campaigns can be made, based on the above. These are evidence-based suggestions, in the sense of being derived from data, but are not proven or evidence-based conclusions because the data includes no ties to behaviour. Thus, the suggestions are insights for consideration by experts and, if possible, more systematic evaluation with different methods in future research.

- Twitter, and other social media, should be considered in government information strategies since they can reach millions (at least). Arguably the most effective messages were serious tweets from citizens (rather than politicians) in support of the restrictions. Celebrity humorous support messages could also be effective. Future campaigns might consider how it is possible to ensure that such messages might spread early, such as by encouraging frontline health workers to report their experiences (if this did not already happen). Unofficial messages seemed to be more retweeted than official messages, although more people may have seen official messages.
- The presence of some widely retweeted messages undermining social distancing restrictions might be used as an indicator that they are not fully effective. Moreover, perhaps (if ethical) Twitter might consider targeting retweeters of these with additional encouragement to comply or encouraging people to persuade friends that disagree. This is in addition to Twitter banning misleading information.
- Twitter does not seem to be effective for spreading factual information about viruses, so campaigns to do this should focus elsewhere, or develop different Twitter-based strategies.
- Given the likely substantial psychological impact of the lockdown restrictions, social media might be recommended by health professionals as a way for people to partly overcome social isolation and, through humour, cope psychologically with their new situation.

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