RATIONAL ANXIETY?

PUBLIC REACTIONS TO COVID19 INFORMATION IN SIGNAPORE

OLIVIA JENSEN[1,3] CHRISTIAN VON DER WETH[2] CATHERINE WONG[1]
[1]LRF INSTITUTE FOR THE PUBLIC UNDERSTANDING OF RISK, NUS
[2]SCHOOL OF COMPUTING, NUS
[3]PI: CENTRE FOR TRUSTED INTERNET AND COMMUNITY

MOTIVATION

"There is no need to panic. We are not locking down the city or confining everybody to stay at home. We have ample supplies, so there is no need to stock up with instant noodles, tinned food, or toilet paper, as some people did yesterday." [Lee Hsien Loong, 8 Feb].

"What caused all that panic buying over that fateful weekend, which had left some quarters fuming - and embarrassed - over the behaviour of "ugly Singaporeans", and others to question whatever happened to decades of efforts aimed at building a resilient society?" [CNA, 15 Feb]

During a time of high uncertainty and a rapidly evolving risk environment relating to COVID19, social media activity is perceived as having increased public anxiety and negative emotions and contributed to sub-optimal behaviours like hoarding.

During this period, Government actors have used communications interventions through social and traditional media to provide information and guidance to the public to allow them to assess risks and take appropriate actions and to provide reassurance or reduce unnecessary anxiety.

This study uses social media data to gauge concern about COVID19 within the Singaporean public in the month following the identification of the first case in the state and its correlation with information from different sources. This deck presents the preliminary results of the study and indicates our plans for further research.

RESEARCH QUESTIONS

- How has the level of engagement with COVID19 on social media varied over time?
- Which risk objects linked to COVID19 receive most attention on social media?
- What is the impact of new information provided by government directly and via traditional media on attention to COVID19 and related risk objects?

The findings may be used to calibrate communications interventions as the COVID19 situation develops in Singapore and globally.

APPROACH

Analysis of traditional and social media activity relating to COVID19 using data from the Risk Pulse Monitor project (IPUR Grant #LRFI_FY2018_RES_01_KAN; PI: Prof. Mohan Kankanhalli, SoC):

1. "Bottom up" data from Twitter
    - Tweets from 29 Jan-28 Feb using virus-related hashtags (3.47 million Tweets retrieved from global accounts worldwide)
    - Hashtags used: #coronavirus, #COVID19, #COVID2019, #19NCoV, #wuhanvirus, #wuhancoronavirus
    - Identification of Tweets from Singaporeans and Singapore residents
    - Identification strategy: accounts which follow at least 1 of 59 Singapore government or media Twitter accounts): 1,888,894 accounts.
    - Total of 200,002 Tweets matching the criteria are employed for the analysis.
    - Tweet text analysed for frequency of 38 keywords and their variants (e.g. mask, masks) relating to specific issues (quarantine, panic-buying); emotional valence markers, truth claim markers.
2. "Top down" data from media websites on Facebook LSCs (Likes, Shares, Comments) of individual articles for the period 21 Jan-2 Mar.
    - Top 100 articles by LSC from Straits Times, CNA, Mothership (top 3 media sources by # of readers)
    - Total of 4,854,265 LSCs relating to 300 articles.
    - Articles coded by predominant information type. 6 codes:
        - RISK: information relevant to risk assessment from general sources;
        - RESPONSE: information on governments' responses to virus;
        - AFFECT: affective (emotional) stories;
        - OPINION: guidance or opinion of an individual;
        - SCIENCE: information from scientific experts/academic studies;
        - OTHER: information on impact of the virus and other related issues.

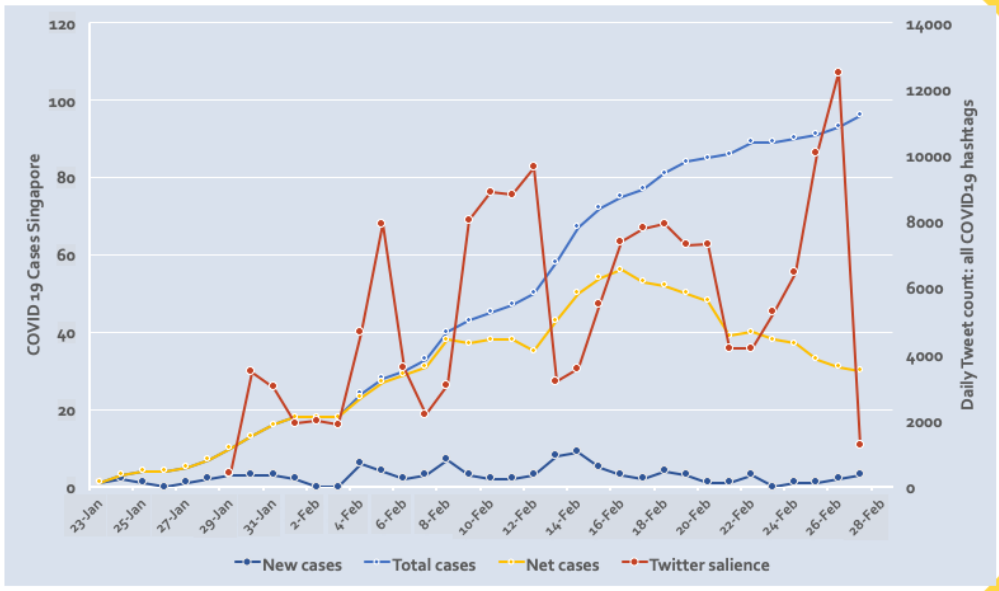


Figure 1: Twitter salience of COVID 19 and local virus prevalence

Figure 1 plots the daily counts of Tweets using COVID19 hashtags (6 hashtags) against the number of cases in Singapore, using three measures: the number of confirmed new cases announced on that day, the cumulative total number of confirmed cases, and the net number of cases (confirmed cases – cases in which the patient has been discharged from hospital). Cases discharged from hospital are sometimes referred to as 'recovered' in the media, but the possibility remains of incomplete recovery or relapse.

The plot shows a high level of volatility in Twitter attention to COVID19 with daily rises and falls in Tweet numbers of more than 100% on some days. The level of activity does not appear to be correlated with overall prevalence of the coronavirus in Singapore or with the number of hospitalised cases. A first reading of this could be that social media attention to the issue is being driven by other factors such as mood or false rumours, or by the level of attention to the issue in traditional media or government announcements.

We extend the analysis within the constraints of the data available to consider whether these factors appear to be correlated with social media salience.

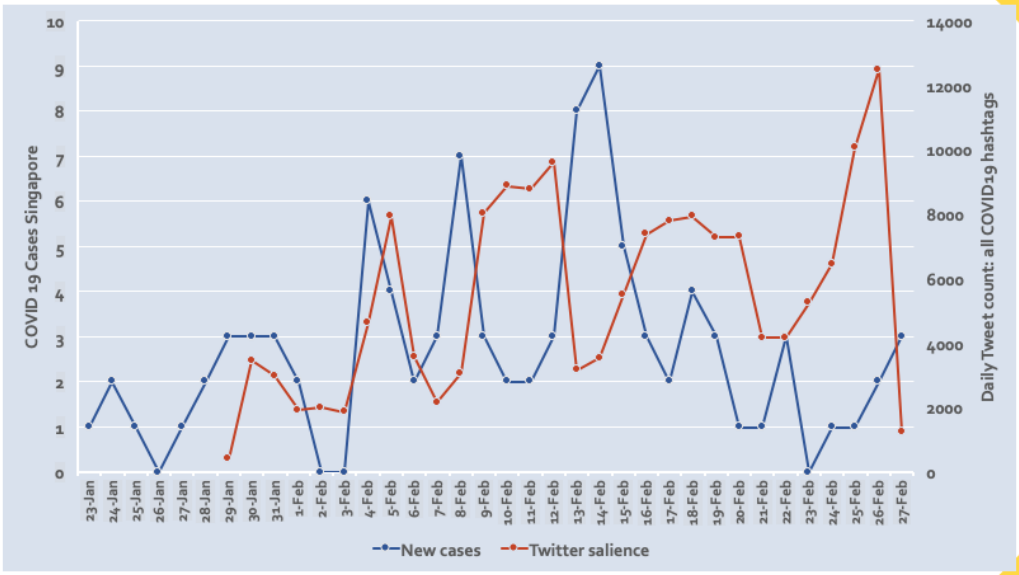


Figure 2: Twitter salience of COVID 19 and new virus cases

Figure 2 plots Twitter salience against the number of new cases. Here we see a strong correlation between the number of new cases announced and the level of Twitter salience on the following day. This relationship appears to weaken at the end of the period under study. This may be due to the rapid globalisation of the spread of the virus at this time, which might increase the influence of international virus prevalence information on salience over local virus prevalence.

This strong relationship between salience and number of new cases is consistent with the emphasis given to the number of new cases as a key indicator in government announcements and in traditional media reporting on COVID19. We examine this relationship further below using the Facebook LSC data.

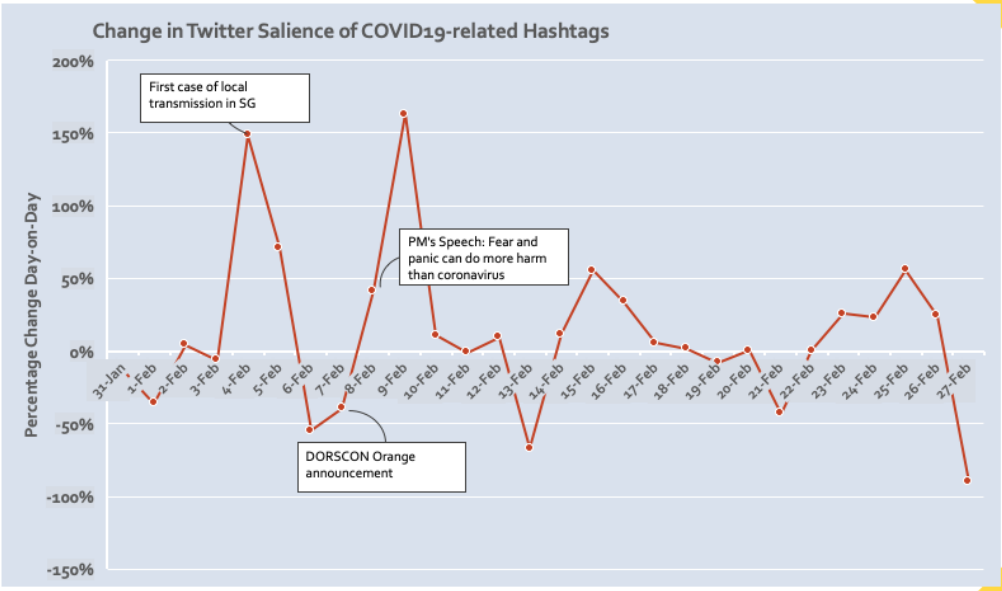


Figure 3: Changes in Twitter salience of COVID 19 and government announcements

Figure 3 shows the volatility of Twitter attention to COVID19. Two particular peaks in attention can be noted, on the 4-Feb, when the number of Tweets rose 148% and on 9-Feb when they rose 163%. The first peak coincides with reporting of the first case of local transmission in Singapore and follow the Prime Minister's speech and the announcement of 7 new cases on 8-Feb. The announcement of DORSCON Orange on 7-Feb and the panic-buying on the evening of 7-Feb did not immediately trigger very high levels of activity. Number of Tweets fell 39% on 7-Feb and rose 41% on 8-Feb.

In the period studied, Twitter salience does not appear to be self-sustaining. Increases in salience are sustained for a maximum of two days before declining and there is only one instance in which the increase in salience is higher than on the previous day (7-9 Feb), which would indicate issue salience momentum. The rapid fall in issue salience on 10-Feb after the PM's speech was widely reported could be interpreted as showing the effectiveness of this intervention in reducing public anxiety. However, given the large number of factors influencing Twitter activity and the limitations of the data available, we should be cautious in the interpretation of these findings.

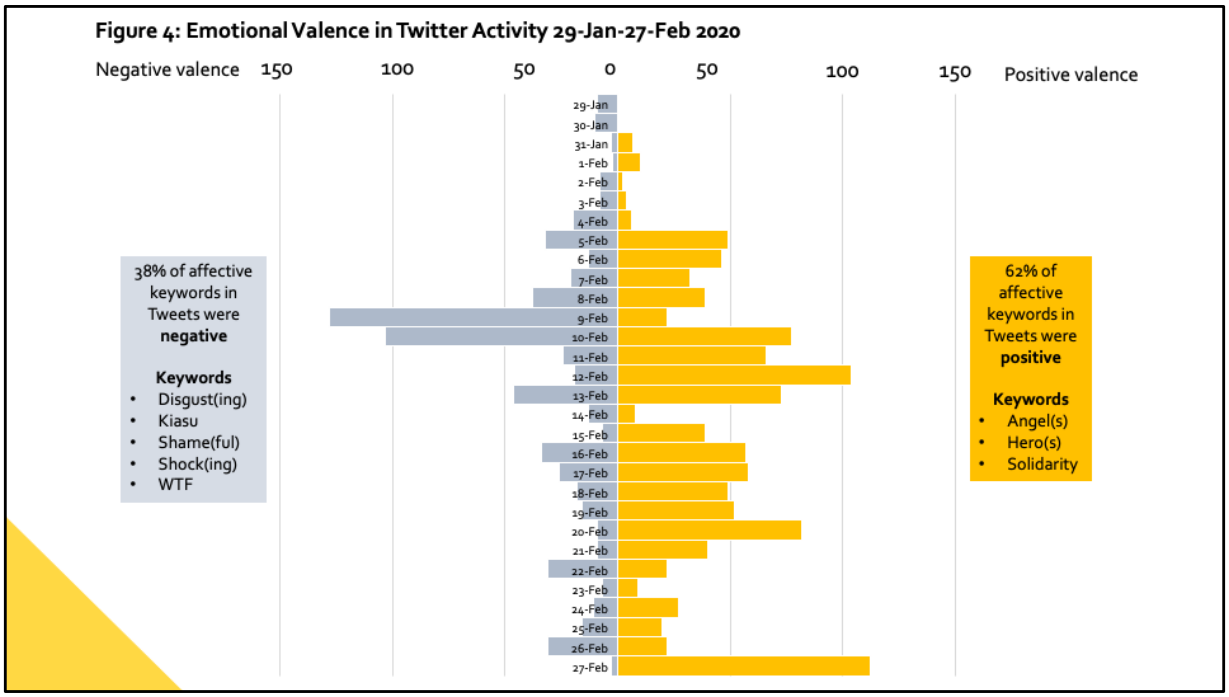


Figure 4 shows the predominance of keywords evoking negative and positive emotional valence in virus-hashtag Tweets in the study period.

Note that a larger set of keywords were used; only those which had an occurrence rate of >5 over the period were included.

A key finding is that there are more positive emotion markers than negative ones (62% compared to 38%). This gives a preliminary indication that social media users may seek to encourage and cheer their network members during a period of high uncertainty as much if not more than to draw attention by sharing shocking or fear-inducing stories. This would be consistent with a tendency to seek and provide support in direct personal interactions in periods in which external risks are perceived to be high.

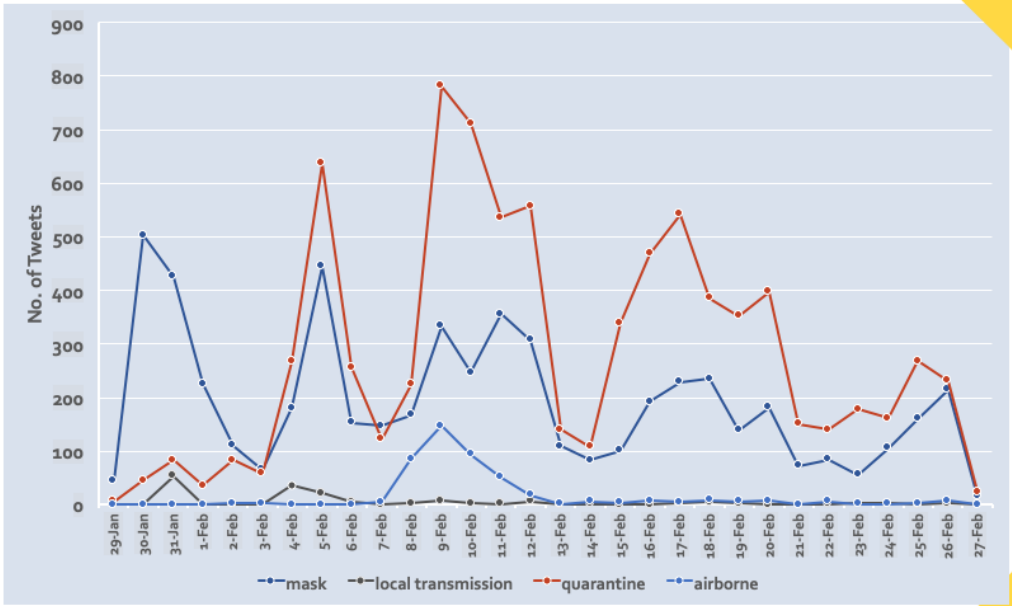


Figure 5: Issue Transience in Twitter Activity

We turn next to the the attention paid to particular issues relating to the virus.

Masks: The issue of mask availability, hoarding and the appropriate use of masks has been widely discussed and reported on since the outbreak of COVID19. In Singapore, a surge in demand led to a shortage of masks in retail outlets in late January. The government then announced on 30-Jan that it would distribute 5.2 million face masks, providing 4 masks per household at no charge and stated that there was no shortage of masks in Singapore, given appropriate use. At the same time, various government agencies were advising the public that masks were not necessary unless one was sick. Medical experts in the media also highlighted the limitations of masks to prevent contracting the virus and recommended other complementary practices of good hygiene. The Twitter data suggests that masks are still a salient issue for the public, although attention to the issue fell after the government's announcement about direct distribution, mentioned in more than 200 Tweets in just below half the days in the period of data collection. Quarantine, similarly, is an issue that has attracted continued attention, even though quarantine directly affects only a very small proportion of the overall population.

"Local transmission" and "airborne": These two issues have not attracted much

attention on Twitter. They both show a single, low peak, and minimal or no attention in the second half of the period studied. We included these keywords as they were the subject of misleading/false social media rumours that were countered by government, either through POFMA or on gov.sg. While these interventions may have helped to reverse the momentum of these rumours, the overall reach of the rumours on Twitter appears to have been low in any case.

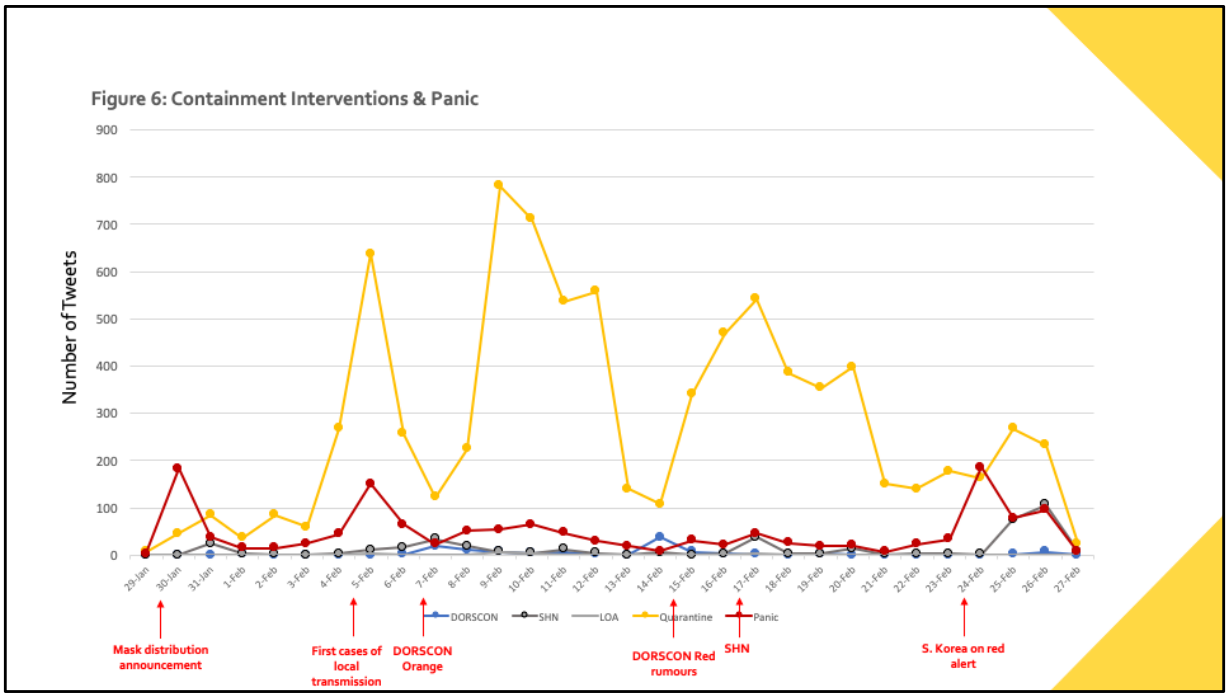


Figure 6 examines in more detail the relationship between anxiety and communications interventions by government to contain or counter falsehoods or unnecessary panic. We use the keyword 'panic' and its variants as a proxy for anxiety. It is important to note the limitations of this approach in attempting to assess anxiety levels, which generates both Type 1 and Type 2 erros. On the one hand, the keyword approach captures statements evoking a calming message like "no need to panic." On the other hand, it excludes a wide variety of other terms and indicators (e.g. emojis) of people's anxiety levels. Bearing in mind these limitations, which we hope to address in future work, we can see that 'panic' has peaked on three occasions: at the time of the mask shortage, when the government announced its intention to provide a limited number of masks directly to households, on the first cases of local transmission and at the end of the period under study when information on the rapid spread of the virus in S. Korea became available. The announcement of DORSCON Orange, rumours of DORSCON red and their correction, had little apparent positive or negative impact on anxiety levels, as measured by the keyword 'panic.'

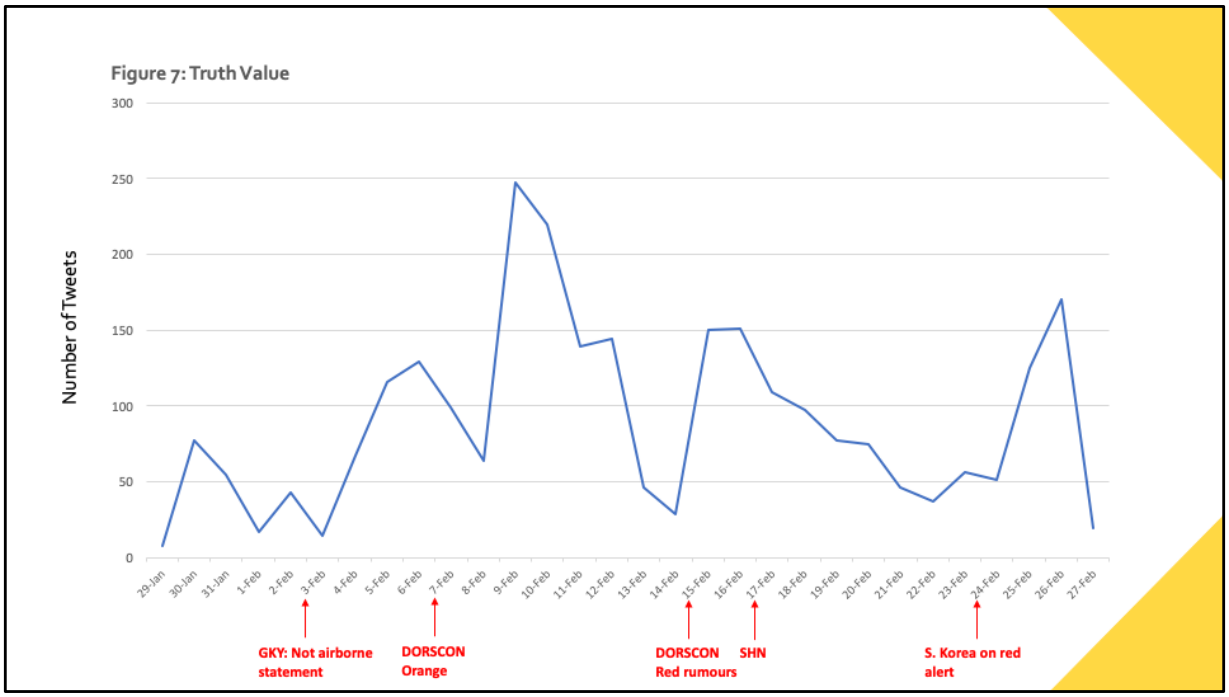


Figure 7 reports findings on the number of Tweets containing keywords relating to truth value: “Truth”, “True”, “Lie”, “Fake”. In order to avoid Type 1 errors where Tweets may include statements like “not true” or “not fake”, we instead focused on the overall engagement with truth claims on Twitter – “truth value”. We did this by aggregating all tweets with the aforementioned keywords as an indication of the level of engagement with fake news, rumours and counter-information to fake news and rumours.

The data shows increases in Tweets relating to truth value at points when the question of whether the virus is airborne was an issue, and during DORSCON related announcements and rumours. It is interesting to note the low engagement on Twitter with truth value tweets even at points when fake news was at its height: POFMA 1 (SGP out of masks), POFMA 2 (local transmission) and POFMA 3 (Woodlands MRT closed for disinfection) between 28-30 Jan.

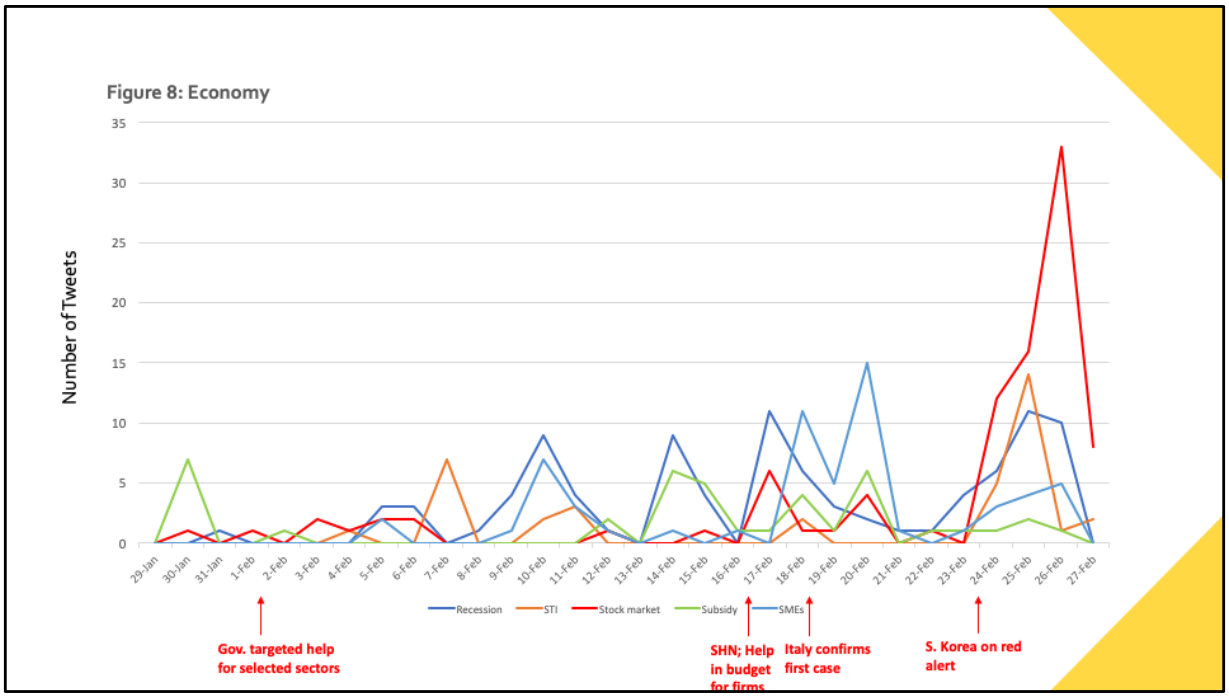


Figure 8 plots Twitter activity with economy-related keywords. It shows an increasing trend towards the end of the period under study, with more activity after reports of significant numbers of cases in S.Korea, followed by the spread to Italy and the US. The trend in "Stock market" Tweets increases very rapidly after COVID-19 cases were reported in Europe. Government announcements about financial aid to local businesses were not widely picked up in Twitter activity. Overall, we note that the total number of Tweets using these keywords is low throughout the period.

Links between traditional and social media

Source	SLC count	Date	Headline
CNA	181862	23/1/20	Singapore confirms first case of Wuhan virus
ST	105245	23/1/20	Singapore confirms first case of Wuhan virus; second case likely
CNA	101432	27/1/20	Cambodia confirms first case of Wuhan virus: Health minister
ST	84139	7/2/20	S'pore ups coronavirus outbreak alert to orange as more cases surface with no known links
CNA	76785	25/1/20	Doctor dies from Wuhan virus at Hubei hospital
CNA	69824	7/2/20	Coronavirus outbreak: Singapore raises DORSCON level to Orange
CNA	64809	28/1/20	Fifth confirmed case of Wuhan virus in Singapore: MOH
ST	62015	22/1/20	Wuhan virus: Rats and live wolf pups on the menu at China food market linked to virus outbreak
CNA	58601	24/1/20	Two more people test positive for Wuhan virus in Singapore; total of 3 confirmed cases: MOH
CNA	53371	31/1/20	WHO declares international emergency over Wuhan virus

Table 1: Top 10 most shared/liked/commented (SLC) articles including "virus" on Facebook from Straits Times, CNA and Mothership 23-Jan-2-Mar

We turn next to examine which types of articles from traditional media people are most likely to share with their network of contacts. This provides an indication of whether "sharing is caring" or "sharing is scaring."

We posit that people may share stories in order to provide their network with objective facts relevant to personal risk assessment (coded as RISK, yellow); stories about actions taken by government in response to the evolving situation (coded as RESPONSE, orange); primarily affective (emotional) stories of admirable behaviour or triumph, or conversely of deplorable behaviour or tragedy (coded as AFFECT, blue); articles providing guidance from experts/figures of authority (OPINION); stories referring specifically to academic studies (SCIENCE). Stories not falling into these categories are coded as OTHER, green – they include articles on the effects of the virus on the economy, responses of the public to the virus such as protests, online petitions or panic-buying and general interest stories.

The table presents the top 10 articles by SLC in the period under study to illustrate the range of stories that are shared and the coding process. Stories about the number of cases, like the top 3 stories in the table are coded as RISK: they provide potentially useful information on risks which could be used by individuals to update their

assessment of their individual risk from COVID19.

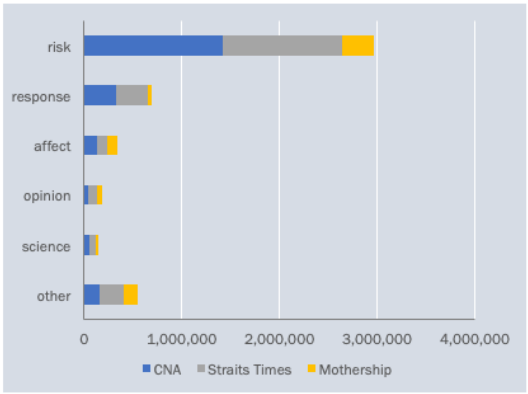
Stories 4 & 6 are concerned with the government response to the crisis (RESPONSE). From the data available, we are not able to distinguish between stories that are Liked and those that are shared but not commended by the user and so once again we must be cautious in the interpretation.

Story 5 is concerned with the death of a doctor “at the frontline” of the outbreak in China. As it is concerned with an individual, we code it as AFFECT.

Story 8 is related to the virus and provides some insight into the potential origin of the virus, but is not directly useful for risk assessment. It is coded as OTHER.

The results are shown in Table 2 and Figure 9.

Figure 9: Facebook SLC Activity by Article Type



Note: analysis of 100 articles with highest number of shares, likes and comments (STC) from 3 news sites (Straits Times, CNA, Mothership), 23 Jan-2 Mar 2020.
Total: 300 articles; 4,854,265 STCs

Table 2: Comparison of ST Front page & SLC Activity

Code	Straits Times Front-page	Facebook Bandwidth
Risk	28%	61%
Response	48%	14%
Affect		7%
Opinion	20%	4%
Science	4%	3%
Other		11%

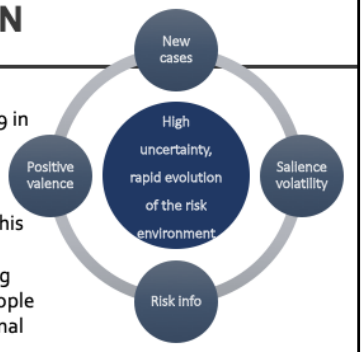
Note: analysis of Facebook bandwidth juxtaposed to content analysis of ST front page headlines from 27 Jan-2 Mar 2020.

Figure 9 shows the count of SLCs (referred to as 'Facebook bandwidth') by article type following the codes described above. It shows that the vast majority of articles (61%) receiving attention on Facebook are those that primarily provide factual information relevant to risk assessment. We compare the predominance of risk-related articles with those given most prominence in traditional media. For this, we recorded the Straits Times top front-page headline for each day of the period under study. In contrast to social media activity, we find that the majority of headlines relate to responses. This suggests that the articles people choose to share are not only or primarily driven by the articles that media outlets give most prominence but may be driven by other factors, including those that they feel are most relevant to their own risk exposure. It would be interesting to explore these relationships further with additional data.

PUBLIC REACTIONS TO COVID19 INFORMATION

This analysis of the examination of social media activity since the first local case of COVID19 in Singapore offers some preliminary findings and implications for communications interventions:

- The 'new cases' indicator appears to be the most salient indicator of risk for the Singaporean public. The government's approach of reporting regularly and in detail on this indicator may reinforce this. While this indicator may be a reasonable risk assessment heuristic for the public, government agencies and media outlets could consider providing additional information or giving more prominence to information on the numbers of people in severe condition and their characteristics in order to help people estimate their personal risk more accurately.
- Among mainstream media reports by domestic media outlets, people are mostly sharing information-related articles compared to other article types. This underlines the need for careful presentation and prioritisation of facts in information-articles as these may be shared more widely than articles providing guidance from experts or authorities.
- Attention to COVID19 is volatile and falls off quickly, usually 2 days after both positive and negative announcements.
- The majority of social media activity was associated with positive emotional valence. Overall, the findings suggest that we need to be careful not to overestimate the extent of public panic just by looking at sharing patterns of individual stories or images rather than the broad base of social media activity.



DIRECTIONS FOR FUTURE RESEARCH

We plan to build upon these initial findings to :

- Examine momentum in social media activity: how fast popular stories are re-Tweeted/shared on Facebook;
- Identify relevant Twitter data using specific sets of keywords (not limited to Tweets using hashtags) relating to issues (e.g. panic-buying), scams and rumours;
- Compare Facebook/Instagram SLCs of traditional media stories with stories from other sources (depending on the possibility to access Facebook data);
- Analyse the impact of risk information from outside Singapore on SG social media users;
- Refine the geographical targeting of social media users;
- Monitor medium-term trends in issue salience.