



National Centre for
Infectious Diseases



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NCID, NUS and NTU Studies Highlight the Role of Socio-Behavioural Factors in Managing COVID-19

- *Engage the community to build community resilience against SARS-CoV-2 virus that causes COVID-19.*
 - *Relay key findings of SOCRATEs, a community survey study, which demonstrates that trust in government communications directly impacts the adoption of socially responsible behaviours*
 - *Show that the proliferation of fake news on social media (a dominant source of information) requires misconceptions among the public to be addressed promptly*
 - *Highlight that health-seeking behaviours need to be improved to ensure that this complements Singapore's capacity to test people*
1. The National Centre for Infectious Diseases (NCID), the National University of Singapore (NUS) Saw Swee Hock School of Public Health and Nanyang Technological University, Singapore's (NTU Singapore) Wee Kim Wee School of Communication and Information have embarked on a partnership to jointly study how various social and behavioural factors in our population influences and is shaped by the COVID-19 pandemic.
 2. The inter-relationship between the spread of an infectious disease, such as COVID-19, and the knowledge, risk perception and behaviour towards it is subject to a number of dynamic

feedbacks.¹ The aim of this socio-behavioural research collaboration is to identify these feedback mechanisms, and in turn help to address potential gaps in outbreak management and lead to more effective interventions and outbreak control. Specifically, these studies can support health authorities in Singapore to effectively conduct public communications to maintain trust and support for their recommendations and actions which can directly impact the adoption of socially responsible behaviours. The studies, in addition, can alert authorities to promptly address misconceptions among the public, improve health-seeking behaviours, as well as titrate interventions according to the public's readiness or constraints thereby minimising social disruption.

3. "The COVID-19 pandemic, caused by SARS-CoV-2, with its unique transmission patterns and wide geographical distribution is here to stay. Understanding how the public perceives and behaves during an outbreak and afterwards is a critical component of designing effective prevention strategies, allowing for better community engagement, and building greater resilience. The socio-behavioural studies resulting from the partnership between NCID, NUS and NTU Singapore will provide crucial evidence for better decision-making in countering the COVID-19 pandemic, as well as help us develop greater preparedness for the future," said Professor Leo Yee Sin, Executive Director of NCID.
4. "The successful containment of COVID-19 does not solely depend on effective national measures, but also requires the participation of every citizen to behave in a socially responsible manner. This doesn't just stop at mask-wearing, personal hygiene, and safe distancing, but also includes how one refutes fake news and ceases the onward transmission of such inaccuracies. The studies by NCID, NUS, and NTU Singapore specifically look into how people interpret the multitude of online and digital information around the pandemic, what they choose to do with this information, and whether this behaviour can be influenced in a positive manner. The insights from this study will help shape the communication strategies of the authorities with respect to the COVID-19 outbreak, in order to reduce misconception and misinterpretation by the public," said Professor Teo Yik Ying, Dean, Saw Swee Hock School of Public Health, NUS.

¹ Nine challenges in incorporating the dynamics of behaviour in infectious diseases models, Sebastian Funk, Shweta Bansal, Chris T. Bauch, Ken T.D. Eames, W. John Edmunds, Alison P. Galvani, Petra Klepac - <https://www.sciencedirect.com/science/article/pii/S1755436514000541>

5. Professor Charles T. Salmon, who chairs NTU's Wee Kim Wee School of Communication and Information, said, "How can people make informed health decisions in an information environment characterised by rumour, misinformation, conflicting claims, and disagreement in expert opinion? This timely partnership between NCID, NUS and NTU Singapore can help us answer this question and better understand Singaporeans' reactions to the coronavirus on a near real-time basis."

Studying Public Perceptions about COVID-19 and their Responses to Interventions by Health Authorities

6. In January 2020, NCID launched a cohort-based study in Singapore to assess the population's knowledge, risk perception, and behaviour during the COVID-19 outbreak.
7. This use of a cohort to track the public's perceptions about an infectious disease (in this case, COVID-19) outbreak and their responses to various interventions implemented by health authorities is a *novel* approach. Previously, most studies, both in Singapore and globally, of the public's responses during an outbreak were conducted as cross-sectional analyses *after* the outbreak had ended. In contrast, this cohort approach provides updates, on a *near real-time* basis, on public awareness of current outbreak events and behaviours.
8. The on-going study is part of an NCID research programme called SOCRATEs (**S**trengthening **O**ur **C**ommunity's **R**esilience **A**gainst **T**hreats from **E**merging infections), which was launched in 2019 through a generous donation from the Estate of Ong Tiong Tat and Irene Tan Liang Kheng. "COVID-19 pandemic is a watershed event that has forever changed our world. I would like to express my heartfelt appreciation to the researchers involved in the SOCRATEs study in conducting this timely survey to understand public knowledge, perceptions, and behaviour in a pandemic like this. I believe some preliminary findings on understanding how the population consumes information in a crisis will help decision-makers provide timely updates to battle hysteria, reduce panic-buying, and protect the vulnerable," said Mr HH Tan, Executor of the Estate.
9. 700 participants, aged 16 years and above, have been recruited into and participated in the study, which has involved taking a survey online every two weeks. To date, the cohort has taken eight surveys. Some key findings include how trust in the government's ability to handle the outbreak and in official government communications has remained high. The study also

found that social media is now the dominant source of information for the public and many respondents reported having received information which may be false through such channels (*More detailed results can be found in Annex A*). The first survey was rolled out at the end of January 2020 and the eighth survey was conducted in May 2020 during the circuit breaker period. With each additional survey, new questions are fielded to assess public knowledge and sentiments towards the evolving epidemic and government measures.

10. “The study has provided very useful insights into how behaviours evolve during an outbreak in relation to control strategies. For example, the media recently reported how consultations for respiratory infections and diarrhoea have decreased substantially since the ‘circuit-breaker’.² Illnesses with symptoms like fever, cough, breathlessness, and diarrhoea also decreased in our cohort. But our cohort also showed a drop in the proportion who chose to see a doctor for their symptoms, from a peak of >90% just before the ‘circuit-breaker’ to <60% in our most recent survey. Therefore, even as we increase the capacity to test people, we also need to re-emphasise to members of the public that they should seek medical help if they have these symptoms. Going forward, we will be working with our partners to understand and address why people may not seek medical help in a timely manner, as this will help us detect more cases of COVID-19 earlier, both during, and also after the ‘circuit-breaker’,” said Dr Mark Chen, Head, NCID Research Office and Principal Investigator of the study.
11. NCID aims to expand the size of the SOCRATES cohort to about 2,000 individuals so that it can gain a better understanding of the challenges faced by different sub-groups of individuals, while providing timely feedback to the Ministry of Health. Members of the public who are interested to sign up as a participant in the COVID-19 study can visit <https://www.ncid.sg/For-General-Public/Pages/SOCRATES-Research-Study.aspx>.

Studying the Influence of Mainstream and Social Media on Public Preparedness during a Pandemic

12. NTU Singapore’s Wee Kim Wee School of Communication and Information launched an investigation from January into how the mainstream media and social media have played a role in contributing to public preparedness versus paranoia during infectious disease outbreaks, particularly from the perspective of health messaging and online falsehoods. This

² <https://www.straitstimes.com/singapore/health/coronavirus-doctors-see-huge-drop-in-flu-common-cold-diarrhoea-and-conjunctivitis>

is particularly pertinent given additional findings from SOCRATEs on the tension between official communications and social media.

13. NTU Singapore's study examines the interface between strategic public health communication policy and behaviours in the Singapore population. The analysis involves:

- Examining and analysing COVID-19 sentiments on social media
- Accessing and chronicling mainstream media coverage of the COVID-19 crisis in Singapore to understand the patterns of sharing crisis-related news
- Examining how the media and the government have tackled falsehoods pertaining to the novel disease
- Examining Singaporeans' attitudinal and behavioural responses to online falsehoods and health messaging surrounding the COVID-19 crisis via monitoring social media postings and responses by the Singapore public along the major development timeline of the COVID-19 outbreak
- Human experiments and a public opinion survey of Singapore residents about false media content around COVID-19 issues

14. Preliminary results (based on data collected in collaboration with the Agency for Science, Technology and Research) show the following:

- There has been an unprecedented amount of information received by the public since January 2020 to date across all social media platforms, much of which is inaccurate or false
- Worldwide, strong negative sentiments of fear were detected in the early phases of pandemic but in the past few weeks, these emotions are being replaced by anger
- In Singapore, we found a moderate balance of positive sentiments relating to resilience, civic pride, and celebration of heroic actions/kindness etc.

15. More findings are attached in [Annex B](#).

16. "The role of social media in the current COVID-19 pandemic situation is tremendous and encompasses many facets of sentiments, both positive and negative, and human behaviours. The internet platform with the flood of information (the global infodemic) and the wide-ranging effects on lives and norms beyond COVID-19 needs to be studied in a methodical and scientific manner from multidisciplinary perspectives," said Professor May O. Lwin from NTU

Singapore's Wee Kim Wee School of Communication and Information, and Principal Investigator of the study.

Qualitative Analysis of Patients' Illness Journey and Experience

17. NCID in partnership with NUS' Saw Swee Hock School of Public Health undertook a qualitative study from March this year of confirmed COVID-19 patients' experience of being diagnosed with COVID-19 through in-depth interviews of participants³. Recent calls for patient perspectives in medical research has highlighted the value of knowing the life-world of a disease experience through the patient eyes, going beyond the healthcare practitioner's second hand interpretation of this world.⁴
18. This has direct application in finding ways of reducing distress to isolated inpatients and improving service delivery. It also informs communication, planning, and messaging to the community on health seeking behaviour, which is a key priority given the findings highlighted under paragraph 10.
19. Preliminary findings from the study indicate:
 - Many participants had knowledge of the symptoms of COVID-19 and what to do when they had those symptoms.
 - Since many initially had mild and non-specific symptoms, it was hard for them to decide to seek medical care (in the absence of a fever).
 - It is important to have triggers beyond just symptoms for them to seek medical attention. The triangulation of information and guidelines from various sources such as workplaces, media, the Ministry of Health's (MOH) contact tracing team – prompted them to seek care which could prevent further transmission of the illness.
20. More detailed preliminary findings are attached in *Annex C*.
21. "Understanding the experience and perspectives of people diagnosed with COVID-19 will shed light on their health-seeking behaviours and the impact of diagnosis on their psycho-social well-being during their period of isolation. This study will also inform communication

³ The participants were diagnosed earlier in February or early March and were discharged at the time of their interviews.

⁴ Braun, V., & Clarke, V. (2019). Novel insights into patients' life-worlds: the value of qualitative research. *The Lancet Psychiatry*, 6(9), 720–721. [https://doi.org/10.1016/S2215-0366\(19\)30296-2](https://doi.org/10.1016/S2215-0366(19)30296-2)

and messaging on care seeking as well as address the issues faced during their periods of isolation,” said Dr Ho Lai Peng, Principal Medical Social Worker, Department of Care & Counselling, NCID and Principal Investigator of the study.

Studying the Effect of COVID-19 Mitigation Measures on Social Cohesion and Vice-Versa

22. In May 2020, NUS’ Saw Swee Hock School of Public Health, in collaboration with NCID and NTU’s Wee Kim Wee School of Communication and Information, launched a study to explore both individual and collective perceptions, among different sub-populations, of efforts taken to mitigate community transmission of COVID-19. The data and results from the study will be useful in the planning of strategic communication and in improving social cohesion in Singapore. Preliminary results are slated to be released in August 2020.

23. Given how the outbreak in Singapore has disproportionately affected migrant workers, the research team is already working to establish a series of e-platforms to study migrant workers’ experiences of life under COVID-19 restrictions. This will include the use of online surveys, in-depth interviews, as well as a novel electronic mailbox system, called ‘The Mailbox Project’, where these migrant workers will have a confidential and secure platform to share their lived experiences. Information from these studies will focus on understanding how workers are coping with fear and risk, and examine risk perceptions and views of community transmission mitigation measures. Audience segmentation on perceptions of COVID-19 community interventions will be carried out. The findings will help to better sustain and target COVID-19 prevention and control measures in this sub-population of Singapore.

24. “The value of this planned research relates to guiding us through the significant social changes which will require evidence-based interventions and interdisciplinary efforts to adapt to social distancing and other new realities that the COVID-19 outbreak has created. Studies that seek to understand and relate human experiences to practical steps in the fight against COVID-19 will be our building blocks for forthcoming changes in policy and planning leveraging community mitigation efforts,” said Dr Zoe Hildon, Assistant Professor, Saw Swee Hock School of Public Health, NUS and Principal Investigator of the study.

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About the National Centre for Infectious Diseases

The National Centre for Infectious Diseases (NCID) is a purpose-built facility designed to strengthen Singapore's capabilities in infectious disease management and prevention. NCID houses clinical services, public health, research, training and education and community engagement functions under one overarching structure. In addition to the clinical treatment of infectious diseases and outbreak management, the expanded roles and functional units of NCID include the National Public Health and Epidemiology Unit, the National Public Health Laboratory, the Infectious Disease Research and Training Office, the Antimicrobial Resistance Coordinating Office, and the National Public Health programmes for HIV and Tuberculosis. Benchmarked to international standards and best practices for treatment and safety, NCID will better enhance Singapore's ability to respond effectively to infectious outbreaks.

Visit www.ncid.sg for more information.

About the Saw Swee Hock School of Public Health, National University of Singapore

Building upon decades of experience in research, training and practice in epidemiology and public health, the Saw Swee Hock School of Public Health (SSHSPH), under the National University of Singapore, was established in October 2011 as Singapore's national school of public health. The School is also a member of the National University Health System (NUHS). The School aims to continually foster healthier communities in Singapore and the region, and impact public health programmes and policies through its robust educational programmes and translational cross-disciplinary research work on cohort studies and life course epidemiology, infectious disease research, health technology assessments, health promotion, workplace safety and health, health systems evaluation and health services research. An interdisciplinary approach, augmented by rigorous training, applicable research and regional partnerships, places SSHSPH at the forefront of public health knowledge discovery and practice in Asia.

The School actively collaborates with many partners including the London School of Hygiene & Tropical Medicine, Karolinska Institutet, Harvard School of Public Health and University of Michigan School of Public Health. Its flagship programme, the Master of Public Health (MPH) degree, attracts students from a wide range of disciplines from within Singapore and throughout the region.

Visit sph.nus.edu.sg for more information.

About Nanyang Technological University, Singapore

A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 33,000 undergraduate and postgraduate students in the Engineering, Business, Science, Humanities, Arts, & Social Sciences, and Graduate colleges. It also has a medical school, the Lee Kong Chian School of Medicine, set up jointly with Imperial College London.

NTU is also home to world-class autonomous institutes – the National Institute of Education, S Rajaratnam School of International Studies, Earth Observatory of Singapore, and Singapore Centre for Environmental Life Sciences Engineering – and various leading research centres such as the Nanyang Environment & Water Research Institute (NEWRI) and Energy Research Institute @ NTU (ERI@N).

Ranked 11th in the world, NTU has been placed the world's top young university for the past six years. The University's main campus is frequently listed among the Top 15 most beautiful university campuses in the world and it has 57 Green Mark-certified (equivalent to LEED-certified) building projects, of which 95% are certified Green Mark Platinum. Apart from its main campus, NTU also has a campus in Singapore's healthcare district.

For more information, visit www.ntu.edu.sg.

Annex A

SOCRATES' KEY FINDINGS (SURVEY 1 TO 8)

1. The vast majority (>90%) held communications and information from official government sources in high regard. Respondents with higher levels of trust in the government's outbreak-related communications were more likely to adopt recommended behaviours and practices, like frequent of hand washing and wearing a mask when unwell (before circuit breaker) and wearing a mask when going out (during circuit breaker). These observations validate the idea that the perceived credibility of health authorities is important to reduce the spread of infection and control outbreaks.
2. Social media was cited as the preferred source of information on infectious disease outbreaks, followed by television programmes and websites. The increasing importance of social media as the major preferred source of information contrasts with findings from a previous survey in 2013 on public knowledge about Middle East Respiratory Syndrome coronavirus and influenza A(H7N9) in Singapore, where television and radio programmes were the preferred sources.⁵
3. Findings suggest social media and 'fake news' online can increase people's fears. This in turn can cause adoption of less rational behaviours, thereby necessitating active monitoring and measures by the government and health authorities to counter such misinformation. About 60% of participants noted that they had received false information/fake news on social media.
4. Participants were becoming more worried about being infected with COVID-19, and in the seventh survey, more than 70% agreed that there was a risk they would be infected.⁶
5. Having knowledge on both the mild and severe symptoms of COVID-19 is lower among those aged 60 years and above (20% of respondents) as compared to those aged 59 and under (40% of respondents). This suggests more efforts may be needed to improve awareness, especially in older individuals, so that they can come forward for necessary testing and treatment in a timely manner if infected with the virus.
6. Before the circuit breaker was announced, 64.3% of respondents were in favour of the lockdown measures implemented in other countries. After the announcement of the circuit breaker, 77.1% were supportive of such measures to facilitate safe distancing. About 48.9% felt that the circuit breaker could have been implemented earlier.

⁵ Hou, Yan'an & Tan, Yi-Roe & Lim, Wei & Lee, Vernon & Tan, Linda & Chen, Mark & Yap, Peiling. (2018). Adequacy of public health communications on H7N9 and MERS in Singapore: Insights from a community based cross-sectional study. BMC public health. 18. 436. 10.1186/s12889-018-5340-x.

⁶ This was an increase from the 60% who agreed in the first survey.

7. The circuit breaker has negatively impacted ability to work, care for children and caused financial worries in some respondents. However, older respondents (aged 60 and above) are less affected psychologically than their younger counterparts.

Annex B

ADDITIONAL PRELIMINARY FINDINGS FROM THE ANALYSIS OF MAINSTREAM AND SOCIAL MEDIA DURING COVID-19

1. Across all social media platforms in Singapore, there has been an unprecedented amount of COVID-19 information received by the public since January 2020, much of which is inaccurate or false. On Facebook, more than 107 million public posts about COVID-19 have been published globally, garnering more than 14 billion interactions, in the form of reactions, comments, and shares. Singapore accounts for around 80 thousand original public posts with more than 50 million interactions. On Twitter are over 33 million unique tweets about COVID-19 worldwide, with over 80,000 tweets from Singapore, and many more retweets spreading across the globe. A substantial portion of the original social media posts did not originate from traditional sources such as health authorities and government sources.
2. Global COVID-19 sentiments have shown rapid evolutions just within the span of a few weeks. Worldwide, strong negative sentiments of fear were detected in the early phases of pandemic but in the past few weeks, these emotions are being replaced by anger (figure 1). However, positive sentiments in the form of joy (i.e. resilience, civic pride, and celebration of heroic actions/kindness) are also surfacing.

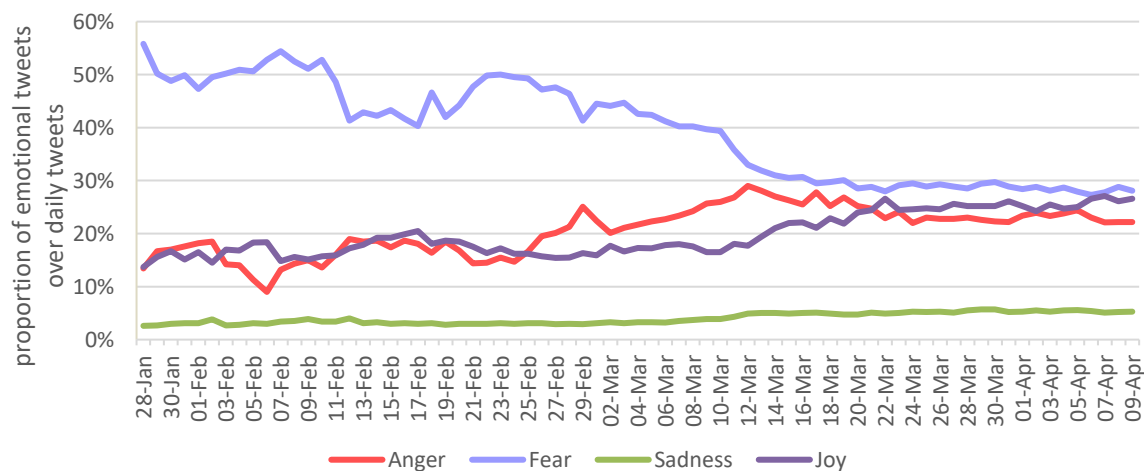


Figure 1: Global emotions trends during the early stages of the COVID-19 pandemic

Ref: Lwin, M., Sheldenkar, A., Lu, J., Schulz, P., Shin, W., Gupta, R., & Yang, Y. (2020) Global sentiments surrounding the COVID-19 pandemic on Twitter. *JMIR Public Health and Surveillance* <https://doi.org/10.2196/preprints.19447>

Annex C

PRELIMINARY FINDINGS FROM QUALITATIVE STUDY OF PATIENT EXPERIENCES IN QUARANTINE

1. **Many described their symptoms as non-specific.**
 - "Sometimes, you will feel it but you cannot describe it. You feel that you're not in your 100%... the symptoms are not clear. I still can breathe and eat."
 - "...had a light cough"
 - "This is really very hard to identify, like whether you have it or not. Because when you have the symptoms which are like the normal sickness. So it's quite scary."
2. **For most, the perception of their risk of getting COVID-19 was low even if they were informed that they were in contact with someone who had tested positive. However, they were compelled to undergo screening due to information they had received from the media or workplaces.**
 - "I was thinking that I wouldn't be so lucky. So like I mean, the XXX [name of venue] is big right, that evening probably a few hundred people, maybe about 100 to 150, probably during that 7 to 10pm time frame so I was thinking it's quite unlikely so was feeling confident that I wouldn't be infected."
 - "So the ambulance guy was also not very sure. So, they were just wondering whether to send me or not then [to the screening centre], I told him because of the two confirmed cases [he could be in contact with], trust me, one way or the other I need to[be screened]. Basically, I'm the unit commander [in charge of preparing for COVID-19 outbreak]. I know I cannot go back to the company until I get the clearance. Okay, so I wanted to go NCID basically to be cleared. I was quite confident that it would be a negative."
3. **Older people and those with chronic conditions may feel more worried as they perceive that they may have more severe symptoms. Although younger people were not as worried for themselves, they were more worried about infecting people around them.**
 - "I was so afraid, I fear that I might not come out alive because I also have chronic illness. I have diabetes, I have high blood pressure, I have high cholesterol. And majority of the news from other countries, those fifties and above with chronic illness are the ones having severe symptoms of COVID." (Female, 54 years old)
 - "I was hoping that it wasn't [COVID-19], that it was just because it was warm, you know, it was hot and I was attributing the causes to other things rather than the COVID. Because you know, it was terrifying, the thought that I might have gotten infected. So, it took a while to kind of like, come around and accept that this could very possibly be COVID. It was mentally, emotionally difficult. ... It can't happen to me, you know, I exercise, you know, should be ok. I was convincing myself that I was feeling ok, even if I wasn't, you know." (Female, 67)

- "a sense of worry or guilt that I might have infected either my family or because I went for a gathering on a Saturday so there was quite a big crowd, it was more a sense of worry that I might have infected anyone...potentially, the older people that I might have come into contact with. Because I know that the statistics are that for young people like us, chances are you'll be fine after a few weeks of battle but not, that's not really the case for older people, or even younger kids with weaker immune system." (Male, 27)
4. **With mild symptoms and low risk perception that they could be infected, their cue to take precautions was because of prompt information released from the venues they went to about confirmed cases there. Other cues to take precautions were workplace guidelines about not going to work when they were unwell. The triangulation of information and guidelines help to influence their behaviour and prevent further transmission of the illness.**
- "I guess I was a bit more conscious because over the weekend, it was made known [through a circular from the venue] that the day we were there, there was a confirmed case and the fact, on Sunday itself, I had a light cough so it was just a matter of playing it safe. And also, I guess there were talks about the office from management and so on that if you are not feeling well, just stay home because our work can be done remotely... I did think there's a chance that if I didn't know that I potentially came into contact with a confirmed case, I might still go into office. But the fact that I knew it, just made me more cautious and wary so that's definitely one thing I would have done differently. If I didn't know, I really might have gone to office on Monday itself."
5. **There was a high level of trust and confidence in the healthcare system.**
- "When I was in this isolation room at Tan Tock Seng, I was relieved that I was in a hospital... that I was in a Singapore hospital. And I know I was going to be very well taken care of. Ehm... I was a bit concerned and a bit afraid ... but I was more, you know, I was more confident that I was going to be receiving the best medical care."