

COVID-19 Vaccine Hesitancy in ASEAN: Insights from a Multi-wave Survey Database from July 2020 to March 2021

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ABSTRACT

Objectives. Early studies on COVID-19 vaccine hesitancy showed varied intensity across countries, which was linked to various factors such as socio-economic conditions, information sources, and issues of trust in government, scientific experts, and the health sector. This study aims to evaluate the determinants of vaccine hesitancy to offer insights into the strategies that may be successful in designing communications campaigns for enhanced vaccination uptake.

Methods. Through logistic regression, this study examines correlates of survey data from five Southeast Asian countries, namely Indonesia (ID), Malaysia (MY), Philippines (PH), Thailand (TH), Vietnam (VN) collected by the Massachusetts Institute of Technology Initiative on Digital Economy and Facebook between July 2020 and March 2021.

Results. Some significant determinants at the 5% or 1% level of significance of COVID-19 vaccine hesitancy in the countries of interest include gender [ID: 1.17 (1.01, 1.15), MY: 1.35 (1.2,1.53), PH: 1.92 (1.68,2.19), VN: 1.28 (1.04,1.58)], age [MY:1.11 (1.06,1.17), PH: 0.92 (0.88, 0.97), TH: 1.17 (1.11, 1.23)], knowing someone who tested positive for COVID-19 [ID: 0.75 (0.65,0.88), MY: 0.82 (0.71,0.95), PH: 0.76 (0.67, 0.87), TH: 0.76 (0.59, 0.99), VN: 0.72 (0.54,0.97)], and perceived effectiveness of mask wearing [ID: 0.83 (0.74, 0.94), MY: 0.86 (0.79, 0.95), TH: 0.88 (0.8,0.98)]. Vaccine hesitancy is particularly strong among women in 3 countries—peaking at 52% in Indonesia, 42% in Malaysia, and 56% in the Philippines.

Conclusion. Results from the survey highlight the significance of a targeted vaccine education and research campaign. This study calls for streamlining of communications campaigns towards messages that promote vaccine uptake in the region, while better targeting those groups most vulnerable guided by the empirical findings herein.

Keywords: COVID-19, health communication, Asia, Southeastern, Vaccine hesitancy

INTRODUCTION

As the first COVID-19 vaccines became available in late 2020, an increasing number of countries are proceeding to vaccinate their health workers and vulnerable populations. Much of the world is headed towards the largest mass vaccination campaign the world has ever embarked on. Issues of vaccine access will soon give way to even deeper issues of vaccine hesitancy—the reluctance or refusal to get vaccinated. Even before the pandemic, vaccine hesitancy was already a challenge in many developing and some industrial countries.¹⁻² Early studies³⁻⁶ on vaccine hesitancy in the context of the COVID-19 pandemic suggest that this phenomenon varied in intensity across countries, and it can be linked to various underlying factors ranging from socio-economic conditions

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to information sources, and issues of trust in government, scientific experts and the health sector.

In the context of the continuing tally of new cases in the ASEAN region, especially in Indonesia, Malaysia, and the Philippines where more than a thousand new cases are still added per day (as of March 11, 2021), there is a need for a baseline understanding of the levels of vaccine hesitancy in the countries, as well as the conditions and factors that drive it. Policy makers may use this information to craft communications strategies towards increasing vaccine confidence in these countries given the aim to increase vaccine inoculation throughout 2021. This study aims to evaluate the correlates of vaccine hesitancy to offer perceptions into the strategies that may be successful in designing communications campaigns for enhanced vaccination uptake in the ASEAN region.

The study aims to assess the correlates of vaccine hesitancy to offer insights into strategies that may be successful in targeting and designing communications and outreach campaigns for enhanced vaccination uptake. Focused on selected Southeast Asian countries (Indonesia, Malaysia, Philippines, Thailand, Vietnam), this empirical study examines a novel database from a large-scale international survey on topics linked to the COVID-19 pandemic. It aims to find evidence on the correlation of vaccine hesitancy with demographic characteristics, knowledge and perceptions around COVID-19, and trust in various information sources among Southeast Asian countries.

METHODS

Between July 7, 2020 and March 29, 2021, the Massachusetts Institute of Technology (MIT) Initiative on Digital Economy with Facebook conducted a large-scale international survey in over 60 countries on topics related to COVID-19 pandemic. The Committee on the Use of Humans as Experimental Subjects review board at MIT approved the ethics review for this study with protocol ID #E-2294. MIT granted permission to use the data through a signed Data Use Agreement between the MIT and the author's institution. The author's institution also approved the ethics review for this study with protocol ID #21_029. The survey was conducted in continuous 2-week waves beginning in early July 2020. By March 29, 2021, 19 survey waves have been completed, and this study examined that dataset. Data collection was done online via the Qualtrics platform, and respondents were collected via Facebook. Because of this data collection method and the different internet and social media (particularly Facebook) access rates in these countries, the survey data was adjusted. Non-response and coverage biases (age, gender, and region of residence) were adjusted using analytic weights to create a survey sample that is generalizable to the population.⁷

We acknowledge the limitations that accompany using online survey data. Given that the respondents were fielded

via Facebook, non-response bias is present for those who have limited to no access to the internet, or non-users of the platform. Sampling bias may tend towards areas with high internet penetration and frequent Facebook users. Nevertheless, we recommend readers proceed with care in interpreting and generalizing the results for entire populations, given the sampling and non-response biases in the sample.^{8,9}

For this study, we focused on respondents from the ASEAN, specifically Indonesia (ID), Malaysia (MY), the Philippines (PH), Thailand (TH), and Vietnam (VN). Respondents from the other five ASEAN member nations were not included because on average, the countries had over 90% less respondents than the five countries included in this study, each of which has over 30,000 respondents. We also only include those reached the end of the entire survey. Some items have less responses than others due to nonresponse to individual questions. Appendix Table 1 features the data used in this study and the survey questions. Statements were measured mostly using Likert scales. The survey also reported the respondents perceived level of trust for the main sources of news and information on COVID-19 using a 3-point scale. We calculated and described the vaccine hesitancy trends among these five countries, and used a logistic regression model to identify possible factors linked to vaccine hesitancy for each country.

To obtain the determinants of vaccine hesitancy, we modelled the likelihood of each respondent answering 'no' or 'don't know' to each vaccine hesitancy question versus the other variables in the survey for each of the five ASEAN countries in the study. This approach measures the links across vaccine hesitancy and facets of the survey such as perceived existence of drugs or vaccines, perceived effectiveness of system delivering the vaccine, perceived risk of disease, perceived effectiveness of means to prevent spread, trust on information mediums/sources, and information volume.¹⁰

We used a logistic regression model to examine the determinants of vaccine hesitancy across the 19 waves. Given the type of data (e.g., the independent variable is a binary variable), we chose to use a survey-weighted generalized linear model with a logistic canonical link function. Generalized linear models are often used for survey data in various fields (including health sciences) to study correlates and risk factors related to with binary variables, such as this study.^{11,12} The variables chosen in the regression model are all the survey questions that have been consistently covered in the 19 waves of the survey. No questions/variables were eliminated so that the readers may freely explore the survey correlates that are possibly related to vaccine hesitancy. The statistical model was implemented in the statistical software R (version 4.0.3) using the 'survey' package (version 4.0).

5% and 1% level of significance was used in the results section below since in survey research, these levels of significance are typically chosen to represent 95% level of confidence and 99% level of confidence respectively.¹³

Due to non-response to individual questions, some rows of the data had to be dropped, thus the lower number of responses used in the regression model compared to the number of total responses in the summary statistics table (Appendix Table 2). The logistic regression model used the provided survey weights by the Facebook and MIT, which was calculated using two-way cross-classification of age brackets and gender that are reflective of each country's adult population.⁸

RESULTS

Demographic profile

All five countries in the sample had predominantly male respondents, except the Philippines (Table 1). For Malaysia,

Table 1. Demographic profile of respondents

Characteristic	Country	N	Statistic	%
Gender	ID	34480	% Female	32%
	MY	38842		46%
	PH	40367		53%
	TH	37886		44%
	VN	36082		41%
Age	ID	34464	Median age group	31–40 y/o
	MY	38820		31–40 y/o
	PH	40352		31–40 y/o
	TH	37869		41–50 y/o
	VN	36068		20–30 y/o

Source: Authors' calculations using the MIT-Facebook database

Philippines, and Thailand, the median age group was 31–40 years. Thailand's median age group was 41–50 years, while Vietnam had the youngest median age group at 21–30 years.

Vaccine Hesitancy Trends in ASEAN

Across the survey waves, we found that vaccine hesitancy (e.g., Those who responded either “No” or “Don't know” to “If a vaccine for COVID-19 becomes available, would you choose to get vaccinated?”) was highest in Indonesia (42%; N = 34,480), closely followed by the Philippines (41%), then Malaysia (27%), Thailand (23%), and Vietnam (17%). The ranking for vaccine hesitancy was similar to the ASEAN rank for COVID-19 cases per million¹⁴ where among the 5 nations: Malaysia ranked 1st, the Philippines 2nd, Indonesia 3rd, Thailand 4th, and Vietnam 5th. During the pandemic, vaccine hesitancy was on the downtrend for Indonesia and Malaysia, while on the upswing for the Philippines and Thailand (Figure 1). It seems that vaccine hesitancy has plateaued in the Philippines after it rose steeply to around half of the population since the fourth wave in mid-to-late August 2020.

On average across all waves, Vietnamese respondents perceived their country's overall response to the crisis the highest (4.29/5), while Filipino respondents had the lowest score (2.69). In terms of rating their community's handling of COVID-19, likewise, Vietnamese respondents gave the highest rating (3.99), while Filipino respondents gave the lowest (3.08).

In terms of news media, the top-rated medium was TV for all countries. For sources of information, scientists, local health workers, and the World Health Organization

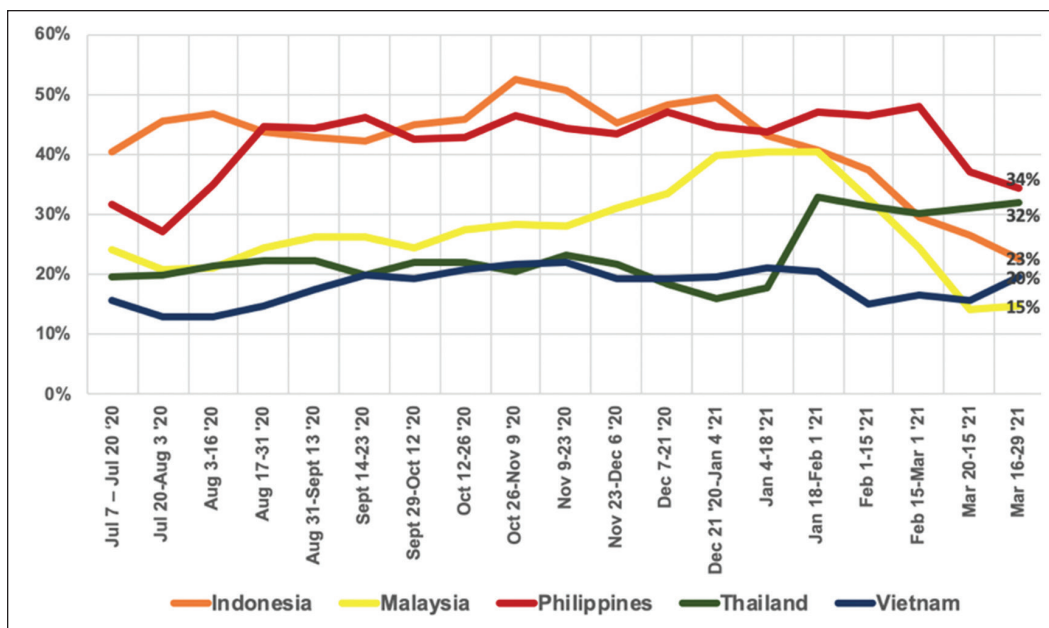


Figure 1. Vaccine hesitancy trends in the ASEAN.

Source: Authors' calculations using the MIT-Facebook database

(WHO) enjoyed consistently high trust ratings for each country, while politicians and people respondents did not personally know had the lowest ratings.

In terms of the level of exposure to COVID-19 news and information, respondents across countries agreed that they consumed between moderate-to-a lot of information on COVID-19, with Filipinos consuming the most (3.48/4). Respondents across all countries were in between wanting more and having just the right amount of information on COVID-19.

The survey also measured perceptions towards common practices in preventing the spread of COVID-19. In general, respondents from these selected ASEAN countries tend to perceive handwashing and facemask wearing as effective (all ratings between 3.8 and 4.4/5).

Determinants of Vaccine Hesitancy

Estimates of determinants showed that women were more likely to be vaccine hesitant using the survey-weighted logistic regression model for four of the five countries (Indonesia, Malaysia, Philippines and Vietnam) in the sample with at least 5% level of significance (OR 1.17, 1.35, 1.92, and 1.28, respectively) (Table 2). The positive link between female respondents and vaccine hesitancy is strongest in the Philippines, with odds ratio 0.57 higher than the next highest country, Malaysia. Older respondents were more likely to be vaccine hesitant in Malaysia (OR 1.11) and Thailand (OR 1.17), while less hesitant in the Philippines (OR 0.92) with a 1% level of significance. Those who personally knew someone who tested positive for COVID-19 were less likely to be vaccine hesitant in all five countries (OR 0.72–0.82) with at least 5% level of significance.

Increased knowledge that a vaccine exists was linked to a decreased likelihood of vaccine hesitancy only in Indonesia (OR 0.48), while the converse was true in Thailand (OR 1.16) with at least 5% level of significance.

There was strong evidence at the 1% level of significance that increased satisfaction in the respondents' country's pandemic response is linked to decreased hesitancy in Malaysia (OR: 0.91), while the opposite is manifest in the Philippines (OR: 1.14).

The increased perceived effectiveness of wearing masks was associated with decreased likelihood of vaccine hesitancy in Indonesia (OR: 0.83), Malaysia (OR: 0.86), and Thailand (OR: 0.88) at least at the 5% level of significance. Handwashing seemed to have weaker evidence than mask-wearing as it was only linked to a decreased likelihood of vaccine hesitancy in the Philippines (OR: 0.75) at the 1% level of significance.

In terms of trust in news sources, there seems to be scattered evidence across five countries linking increased trust in certain information sources with decreased vaccine hesitancy. First, there is consistently strong evidence across 5 countries that increased trust in the WHO is linked to decreased vaccine hesitancy at least at the 5% level of signifi-

cance (OR range, 0.66 to 0.85). Next, trust in government health authorities is linked to decreased vaccine hesitancy in Indonesia (OR 0.71), Malaysia (OR 0.86), and Vietnam (OR 0.73) at least at the 5% level of significance. Nevertheless, trust in scientists was linked to decreased vaccine hesitancy in the Philippines (OR 0.65) at the 1% level of significance. Increased trust in journalists was associated with decreased vaccine hesitancy in Thailand (OR: 0.82) at the 1% level of significance, while trust in local health workers is linked with decreased vaccine hesitancy in Indonesia (OR 0.83) at the 5% level of significance.

Compared to news sources, news mediums have weaker evidence supporting its link to decreased vaccine hesitancy. Increased trust in radio is linked to decreased vaccine hesitancy only in Vietnam (OR: 0.76) at the 5% level of significance. Increased trust in TV was linked with increased vaccine hesitancy in the Philippines (OR 1.20), while linked to decreased vaccine hesitancy in Indonesia (OR 0.82) at the 5% level of significance. It is possible that wide television news coverage of a still ongoing vaccine controversy—linked to the Dengvaxia anti-dengue vaccine—may be partly behind this curious link in the Philippines.¹⁵

Increased trust in messaging applications was associated with decreased likelihood of vaccine hesitancy in Thailand (OR 0.8) at the 1% level of significance. Finally, increased trust in newspapers was linked to decreased vaccine hesitancy only in the Philippines (OR 0.75) at the 1% level of significance.

Evidence was strong on the link between increased information exposure on COVID-19 news and decreased vaccine hesitancy, with results being significant at least at the 5% level in Indonesia (OR 0.91), Malaysia (OR 0.79), Philippines (OR 0.85), and Thailand (OR 0.87). Increased appetite for information on COVID-19 was linked to decreased vaccine hesitancy in Indonesia (OR 0.91) and Vietnam (OR 0.85) at the 1% level of significance.

In the Philippines, vaccine hesitancy was strongly linked with women at the 5% significance level across many survey waves (Appendix Figure 3 and Table 6), especially high in the most recent survey wave (March 16–31, 2021). In Thailand, older respondents were linked to increased vaccine hesitancy across survey waves from Oct 26, 2020 to Jan 18, 2021 (Appendix Figure 4 and Table 7). Finally, vaccine hesitancy was very strong among women in the final wave (March 16–31, 2021) in Thailand, Vietnam, and Philippines (OR > 2.1) with 5% level of significance (Appendix Figures 3 to 5).

DISCUSSION

Survey results showed that the trend for vaccine hesitancy has increased for women in the Philippines and Thailand. Between the survey wave 1 in July 2020 to wave 17 in February 2021, vaccine hesitancy in women increased from 36% to 56% in the Philippines – while in Indonesia and Malaysia, vaccine hesitancy in women peaked at 52% and 42% respectively in late December 2020 to January 2021.

Table 2. Determinants of vaccine hesitancy per country using logistic regression model (Odds ratio [OR], 95% CI)

	Dependent variable: Vaccine Hesitancy				
	ID	MY	PH	TH	VN
<i>Age (per bracket)</i>	1.00 (0.94, 1.07)	1.11 [‡] (1.06, 1.17)	0.92 [‡] (0.88, 0.97)	1.17 [‡] (1.11, 1.23)	1.07 (0.97, 1.18)
<i>Sex (Women)</i>	1.17 [†] (1.01, 1.35)	1.35 [‡] (1.20, 1.53)	1.92 [‡] (1.68, 2.19)	1.11 (0.97, 1.26)	1.28 [†] (1.04, 1.58)
<i>Agrees that COVID-19 drug exists</i>	1.15 (0.96, 1.39)	0.91 (0.73, 1.12)	0.86 (0.71, 1.05)	0.97 (0.78, 1.20)	0.90 (0.60, 1.35)
<i>Agrees that COVID-19 vaccine exists</i>	0.48 [‡] (0.41, 0.55)	0.89 [•] (0.79, 1.01)	0.99 (0.87, 1.13)	1.16 [†] (1.02, 1.33)	1.02 (0.83, 1.25)
<i>Country management</i>	0.91 [•] (0.82, 1.01)	0.84 [‡] (0.78, 0.90)	1.14 [‡] (1.05, 1.24)	0.94 (0.86, 1.03)	0.96 (0.79, 1.17)
<i>Community management</i>	1.13 [†] (1.01, 1.26)	1.01 (0.93, 1.09)	1.01 (0.93, 1.10)	1.10 [•] (0.99, 1.21)	1.01 (0.84, 1.23)
<i>News medium – Trust radio</i>	1.08 (0.89, 1.30)	0.88 (0.74, 1.05)	0.99 (0.82, 1.20)	0.97 (0.81, 1.16)	0.76 [†] (0.60, 0.97)
<i>News medium – Trust TV</i>	0.82 [†] (0.70, 0.97)	1.08 (0.90, 1.29)	1.20 [†] (1.00, 1.43)	1.02 (0.87, 1.19)	0.99 (0.74, 1.33)
<i>News medium – Trust messaging apps</i>	0.93 (0.82, 1.05)	1.04 (0.94, 1.16)	0.94 (0.84, 1.06)	0.80 [‡] (0.71, 0.90)	0.96 (0.79, 1.18)
<i>News medium – Trust newspapers</i>	0.88 (0.73, 1.07)	0.98 (0.83, 1.15)	0.75 [‡] (0.63, 0.89)	0.98 (0.82, 1.17)	0.89 (0.67, 1.19)
<i>News medium – Trust online sources</i>	1.07 (0.91, 1.26)	1.09 (0.95, 1.24)	0.88 [•] (0.76, 1.02)	0.91 (0.80, 1.05)	1.01 (0.80, 1.27)
<i>News source – Trust local health workers</i>	0.83 [†] (0.70, 0.97)	0.93 (0.80, 1.08)	0.93 (0.80, 1.08)	0.93 (0.80, 1.08)	1.07 (0.85, 1.34)
<i>News source – Trust scientists</i>	0.91 (0.76, 1.07)	0.91 (0.79, 1.05)	0.65 [‡] (0.55, 0.78)	0.87 [•] (0.75, 1.00)	1.00 (0.78, 1.27)
<i>News source – Trust government health authorities</i>	0.71 [‡] (0.61, 0.82)	0.86 [†] (0.75, 1.00)	1.09 (0.96, 1.24)	0.97 (0.85, 1.11)	0.73 [†] (0.58, 0.93)
<i>News source – Trust politicians</i>	0.98 (0.86, 1.12)	0.93 (0.83, 1.03)	0.89 [•] (0.78, 1.01)	0.96 (0.85, 1.09)	0.93 (0.79, 1.10)
<i>News source – Trust World Health Organization</i>	0.66 [‡] (0.57, 0.76)	0.61 [‡] (0.54, 0.70)	0.66 [‡] (0.57, 0.76)	0.85 [†] (0.74, 0.96)	0.71 [‡] (0.60, 0.84)
<i>News source – Trust people I don't know personally</i>	1.06 (0.93, 1.21)	1.09 (0.97, 1.22)	1.07 (0.94, 1.23)	1.07 (0.95, 1.21)	0.88 (0.72, 1.09)
<i>News source – Trust people I know personally</i>	1.06 (0.94, 1.21)	1.04 (0.93, 1.17)	1.08 (0.96, 1.23)	1.12 [•] (0.98, 1.28)	1.29 [†] (1.01, 1.65)
<i>News source – Trust journalists</i>	0.98 (0.84, 1.15)	0.90 (0.80, 1.02)	1.12 (0.98, 1.29)	0.82 [‡] (0.71, 0.94)	1.10 (0.88, 1.36)
<i>Know positive case (Yes)</i>	0.75 [‡] (0.65, 0.88)	0.82 [‡] (0.71, 0.95)	0.76 [‡] (0.67, 0.87)	0.76 [†] (0.59, 0.99)	0.72 [†] (0.54, 0.97)
<i>Perception of mask</i>	0.83 [‡] (0.74, 0.94)	0.86 [†] (0.79, 0.95)	0.91 (0.82, 1.02)	0.88 [†] (0.80, 0.98)	0.86 [•] (0.74, 1.01)
<i>Perception of handwashing</i>	1.06 (0.94, 1.20)	0.94 (0.85, 1.03)	0.75 [‡] (0.68, 0.84)	1.01 (0.91, 1.11)	0.88 (0.76, 1.03)
<i>Info exposure past week</i>	0.91 [†] (0.83, 0.99)	0.79 [‡] (0.73, 0.87)	0.85 [‡] (0.77, 0.93)	0.87 [‡] (0.79, 0.95)	0.97 (0.85, 1.11)
<i>Info exposure appetite</i>	0.91 [‡] (0.86, 0.97)	0.98 (0.91, 1.04)	0.97 (0.91, 1.04)	0.95 (0.88, 1.03)	0.85 [‡] (0.77, 0.94)
<i>Constant</i>	15.26 [‡] (9.31, 25.01)	10.54 [‡] (6.43, 17.29)	30.46 [‡] (17.56, 52.82)	1.19 (0.71, 1.99)	4.03 [‡] (1.81, 8.96)
<i>Observations</i>	8,034	10,681	11,421	9,730	8,580
<i>Log Likelihood</i>	-4,384.11	-5,944.37	-6,307.37	-4,791.49	-3,241.70
<i>Akaike Inf. Crit.</i>	8,818.22	11,938.74	12,664.75	9,632.97	6,533.40

*Significant at p<0.1; †Significant at p<0.05; ‡Significant at p<0.01

Source: Authors' calculations using the MIT-Facebook database

While vaccine hesitancy among women has been observed in other countries such as France, Australia and the US, this is still contrary to the global trend, where men are more strongly linked to lower vaccine uptake.¹⁶⁻¹⁸ More investigation is needed to determine the root causes for distrust among women. However, there is a possible connection through women's networks — and possibly among mothers — as the growing global anti-vaccine movement has been found to be composed mostly of women.¹⁹ Communications campaigns for vaccine uptake in these ASEAN countries must keep this gender difference in mind, devising campaigns that specifically target women since they appear to be at higher risk for vaccine hesitancy.

Other significant determinants also highlight the influence of effective communication and accurate news in decreasing vaccine hesitancy. With increased trust in the WHO while government health authorities were linked to decreased vaccine hesitancy, it is imperative to reinforce trust in these sources among the population to increase vaccine acceptance. Since more exposure to COVID-19 information was also linked to decreased vaccine hesitancy, it would be beneficial to expand the reach and increase the frequency of exposure to these trusted sources.

The content of COVID-19 vaccination communication campaigns can also be streamlined around messages that have been linked to decreased vaccine hesitancy. For instance, in this study, it appears that communications campaigns to promote mask wearing was effective in promoting positive attitudes towards vaccination. Knowing a positive case has also been linked to decreased hesitancy, which may be attributed to an increased perceived risk of COVID-19 when a close contact has been infected. Perceived risk has been found to be a significant predictor of COVID-19 vaccination intention.²⁰⁻²² Accordingly, communicating the risk of COVID-19 can be helpful in vaccination communication efforts. In localized communication campaigns that may use social media platforms, testimonies by community members who have recovered from COVID-19 or have already been vaccinated may be helpful in convincing more vaccinations.

CONCLUSION

It is critical to consider the following key strategic points for engagement. First, during crisis, the national government can bring together selected (trusted) media practitioners to level off the basic science of pandemics so that reporting can be accurate without unnecessarily editorializing the content, which if done improperly, either makes public alarmed or complacent. In addition, government listening posts should be quick to address any budding misinformation circulating. Understandably they cannot do this alone and must work with the private sector and other health governance stakeholders to help (e.g. academia, local civil society groups, religious groups).

Second, the government has to learn how to apply marketing principles—better understanding consumer needs to determine what level of information that the public will need or demand. This is to fine tune information content and delivery according to segmentation. This also means that government must embrace working with private sector more closely during crisis periods. This underscores trust-building among stakeholders with government. Industry on the other hand must consider their critical role at these times and be called out to cooperate and not compete with each other. The pharmaceutical industry and non-health sector industry leaders have an implicit and tacit obligation to engage the public and their organization employees to help strengthen vaccine literacy. They can do this whether the government calls for it or not.

Lastly, health scientists, while most trusted, may not always agree on details of science and interpretation thereof. They have an important duty to help non-scientists and decision makers to appreciate how to make risk benefit decisions. Scientists can erode their reputational capital when they argue in public—and notably in informal contexts such as through social media—often poorly appreciating the consequence of their actions. The public can be confused with evolving and inconsistent messaging of science. Over time, the public can lose trust in these experts, if the way they settle differences in opinion and interpretation of evidence exposes deep differences rather than broad and unified support for certain health actions.

Statement of Authorship

All authors contributed equally in the conceptualization of work, drafting and revising and approved the final version submitted. Author Jurel Yap was primarily in charge of the acquisition and statistical analysis of the data.

Author Disclosure

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Supplemental Data

Appendix figures and tables are available upon request from the corresponding author.

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