THE INFODEMIC: AN APRU RESPONSE

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1. Understanding the Infodemic: A Proposal for APRU Engagement

The Covid-19 pandemic has presented challenges and insights that must be used to ensure the world is better prepared for future pandemics and similar global challenges. APRU has a significant role to play in providing evidence, analysis and insights from across the Asia-Pacific region to improve understanding of these challenges and the effectiveness of responses.

One of the most prominent but least understood factors at play throughout the Covid-19 pandemic has been the impact of misinformation. During the early days of the Covid-19 pandemic in 2020, the World Health Organisation (WHO) warned of the 'infodemic' that was occurring alongside the pandemic. This was defined as the circulation of too much information, including false or misleading information, in digital and physical environments during the outbreak. It caused confusion and risk-taking behaviours and contributed to mistrust in health authorities.

With the increasing digitisation of our societies and the associated expansion of social media and internet use, information spreads more rapidly. This is a double-edged sword, allowing for the quick dissemination of useful information but also enabling the amplification of harmful messages. The 2019 Christchurch terrorist attack on two mosques, which was live streamed on social media, is an example of this amplification. In the case of the Covid-19 pandemic, a feature of the infodemic has been an increase in false and misleading information about vaccine safety and effectiveness, as well as other public health measures such as mask wearing.

While there are multiple factors that contribute to individual decisions around vaccinations or other positive health measures, there is reason to believe that misinformation is a significant factor in dissuading people from making choices that could help keep them, their families and fellow citizens healthy. Vaccine misinformation has potentially contributed to lower vaccination rates, with all associated harmful impacts on individual health, mortality, and effectiveness of the health system that this entails.

The corrosion of trust in health authorities and reduced vaccination uptake also has potentially major implications for the global economy and APRU member economies. United Nations Development Programme (UNDP) analysis suggests that the pandemic economic recovery rate is predicted to

be faster for countries with higher vaccination rates, with an approximate US$7.93 billion increase in global GDP for every million people vaccinated.

Given the potentially wide ranging and harmful effects of the infodemic, it is essential to improve understanding of the dynamics and impacts of misinformation on the effectiveness of public health responses. This will enable economies to prepare for future pandemics and associated infodemics. This understanding must be informed by evidence and underpinned by data and research. Further, we must understand the efficacy (and downsides) of policy interventions intended to address the problem of misinformation, to assess whether they deliver as intended or create more problems.

APRU is well placed to take a leading role in building a stronger framework for understanding the infodemic and its impacts. To illustrate the potential, we have undertaken preliminary modelling analysis that is (as far as we know) unique in drawing on existing evidence of social media penetration, trust in science and policy interventions to derive an index for national vulnerability to the infodemic. This has then been correlated with national vaccination uptakes.

While the model is a first iteration and requires testing and refinement, the results of this first model are both intriguing and promising. This work helps to illustrate what is possible by bringing an evidence and data led approach to this problem – and also what might be at stake if we fail to take such an approach.

Our call to the APRU membership is for a shared investment to enable a 'deep dive' cross-country research and modelling project. Findings, with a robust case for government research support, would be presented to APEC leaders at the November Bangkok meeting. For governments, the challenge is to join with peers in a joint approach to international pandemic and infodemic readiness. APRU is a powerful collective of research-intensive universities with the capability and willingness to meet this challenge.

2. Preliminary Modelling – Analysis and Insights

In conducting our illustrative modelling project, we wanted to test whether it was possible to develop a meaningful indicator of 'infodemic vulnerability' at a national level – and if so, whether comparison with a key measure of success in combating the Covid-19 pandemic (in this case, the Covid-19 vaccination uptakes) may provide insight into the impact of the infodemic.

Even in this 'first iteration' guise, we believe the modelling and comparison work has generated new insights and provides a glimpse into what may be possible with additional time, collaboration and investment.

One of the challenges of the infodemic as opposed to the pandemic is that the impacts are psychological and behavioural, as opposed to physiological – you cannot directly test for the presence of misinformation in a population in the same way that you can test for pathogens.

However, enough is known about the dynamics of misinformation and the infodemic to be able to identify suitable proxies for measuring likely exposure to harmful infodemic effects and the vulnerability or resilience to them. In this first model, we used available data at the national level on social media penetration (*P*), trust in science (*S*) and legislative and policy steps taken (*L*) to develop a 'misinformation vulnerability index' (*MIS*) – in other words, a score that could represent the overall likely exposure of a population to misinformation (including vaccine misinformation), and its overall vulnerability (or resistance) to it. Specifically, the *MIS* index is calculated as:

$$MIS_{InCovid} = S_{PreCovid} + L_{PreCovid} - P_{InCovid}$$

where:

- $MIS_{InCovid}$ is our constructed misinformation vulnerability index during the Covid-19 pandemic.
- $S_{PreCovid}$ is the Wellcome Global Monitor 2018 Trust in Scientists Index (see Page 51 of the Report) based on the average score of individual who were asked to rate how much they trust different aspects of scientists (e.g. scientists' advice, intention, openness and honesty). The Index is adjusted by people's preference between religious beliefs and science when the two conflict. This is a proxy to measure the resilience of individuals to misinformation.
- $L_{PreCovid}$ is a weighted score based on Poynter's 2018/19 guide on governments' anti-misinformation actions. It comprises four sub-categories: (i) an 'Action' score ranging from 1-3 depending on the seriousness of the action (e.g. law, bill, or investigation); (ii) an 'Application' score of 1 or 2 depending on whether the action is at the national or sub-national level; (iii) an 'Target' score of 1 or 2 depending on whether the action is pertinent to misinformation; and (iv) an 'Orientation' score ranging from 1-3 depending on the focus of the action (e.g. sanction, monitoring, or awareness raising). This weighted score captures the extent to which protective measures were in place before the Covid-19 pandemic to combat misinformation.
- $P_{InCovid}$ is the average time per day spent by online users on social media in 4th quarter 2020, based on GWI's online research among internet users aged 16-64. While misinformation is not at all strictly limited to digital information and social media, available research indicates that misinformation travels more rapidly on social media and is more frequently encountered there (and is prevalent in more extreme forms) than on other information networks, such as traditional broadcast news channels.

The trust in science (S) and the legislative and policy (P) variables predate the Covid-19 pandemic. This strengthens the causal inference between the pre-Covid conditions and people's vaccination decisions during the Covid pandemic. On the other hand, the social media penetration (P) proxy is timed to align with the Covid outbreak as it was people's social media usage pattern during this time that affected their behaviours and decisions the most.

All three variables are normalised by z-scoring before they were aggregated into the $MIS_{InCovid}$ index.

We then correlated the misinformation vulnerability index to the known vaccination uptakes in the respective countries. In this analysis, we used Covid-19 vaccine doses administered per 100 people, as per Bloomberg's Covid vaccine tracker as of 25 May 2022.

Among a number of commonly used measures of Covid resilience (e.g., infection, lockdown, mortality), we believe the measure of vaccination serves the purpose of our misinformation study the best as, in most cases, it reflects people's confidence and trust in science, the government and expert advice, and the (mis)information available to them at the time for making the decisions.

The results are shown in Figure 1 below. Note that only countries with data available to construct the misinformation vulnerability index are included in the analysis.

Given the multiple other influences in play affecting vaccination uptakes at a national level (such as availability), the correlation between the misinformation vulnerability index and the vaccination uptake is striking.

A high value in the Misinformation Vulnerability Index suggests high resilience to misinformation. Of the Top 10 countries with the highest overall resilience (i.e., Spain, France, Ireland, Italy, Belgium, Denmark, China, Germany, Saudi Arabia, and Singapore), nine have more than two vaccine does per person on average, with Saudi Arabia as the only exception.

Conversely lower scores (and therefore higher degrees of vulnerability) were strongly correlated with lower vaccination uptakes – with Nigeria for example showing both the highest vulnerability to misinformation, and the lowest vaccination uptakes.

The R^2 of 0.44 is moderate and suggests that approximately 44% of the country-level variability in vaccine doses can be explained by the misinformation vulnerability index.

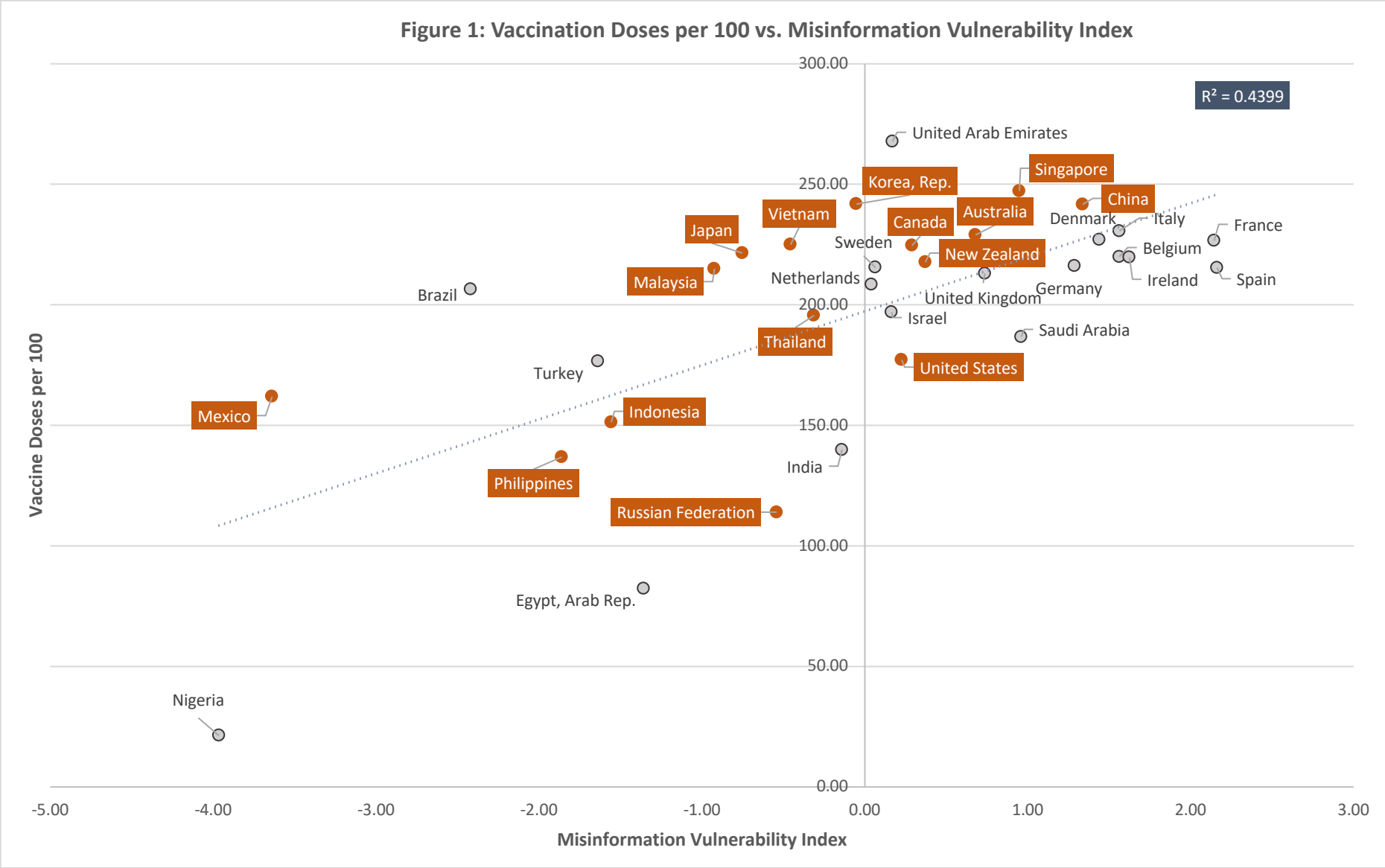
Figure 1: Vaccination Doses per 100 vs. Misinformation Vulnerability Index
R² = 0.4399
Vaccine Doses per 100
Misinformation Vulnerability Index
300.00
250.00
200.00
150.00
100.00
50.00
0.00
-5.00
-4.00
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
United Arab Emirates
Singapore
Korea, Rep.
China
Vietnam
Australia
Canada
Japan
Denmark
Italy
France
Sweden
New Zealand
Belgium
Malaysia
Netherlands
Ireland
Spain
Brazil
Germany
United Kingdom
Israel
Thailand
Saudi Arabia
United States
Turkey
Mexico
Indonesia
India
Philippines
Russian Federation
Egypt, Arab Rep.
Nigeria

Table 1 reports the results of a regression analysis of vaccine uptake against the three misinformation proxies. The positive coefficients of the trust in science (12.43) and the legislation and policy (25.63) variables suggest positive impacts of these two variables on vaccine doses taken. The negative coefficient of the social media penetration (-31.47) variable suggests an adverse impact. The P-values suggest very high statistical significance of the results for the social media penetration (0.00) and legislation and policy (0.00) variables, and relatively high statistical significance for the trust in science (0.12) variable.

Table 1 Regression Statistics of Vaccine Doses per 100 against the three misinformation proxies

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	197.52	6.68	29.58	0.00	183.86	211.18
Social Media Penetration ($P_{InCovid}$)	-31.47	7.64	-4.12	0.00	-47.09	-15.84
Trust in Science ($S_{PreCovid}$)	12.43	7.74	1.60	0.12	-3.41	28.27
Legislation and Policy ($L_{PreCovid}$)	25.63	7.41	3.46	0.00	10.48	40.77

3. Modelling Caveats

We would again emphasise that this is a 'first iteration' model which will be subject to significant improvement and refinement, and there are multiple other factors contributing to the overall vaccination uptake (some of which may be able to be factored into future modelling).

For example, research and analysis on the actual prevalence of misinformation on commonly used social media and internet channels are being undertaken in several places, which could provide a more accurate measure of actual exposure, at least on a national basis. Similarly, work on digital literacy and source checking behaviours could very likely enhance the resilience measure.

The metric for protective measures is potentially the area that is currently the most difficult to model and the one that will be most improved with additional research and analysis. Currently, it is difficult to assume that legislative protective measures are actually effective in practice, and many

measures adopted by some countries have attracted criticism on human rights and freedom of speech grounds. In some cases, legislative or enforcement measures taken in this area might be effective in reducing some forms of misinformation, but this could be at the expense of human rights in other areas. This is an important area where care must be taken.

However, even with these provisos, this initial work suggests that the infodemic and misinformation are very significant factors for vaccination uptake. We welcome feedback and engagement with input and contributions from APRU members essential to test and refine the model for our next phase.

4. Responses to the Infodemic

Misinformation and the infodemic are extremely complex, multi-factorial problems and as such, there is no 'silver bullet' direct and simple solution to them. This complexity, allied with the human rights and freedom of speech issues referenced above, can mean that misinformation is put in the 'too hard' basket.

We think that misinformation is a complex problem, but not an insoluble one.

Useful frameworks for mitigating the impact of misinformation have already been developed, for example, the World Health Organisation has proposed an 'Infodemic management' framework, relying on the systematic use of risk- and evidence-based analysis and approaches, and enabling good health practices through four types of activities:

- Listening to community concerns and questions
- Promoting understanding of risk and health expert advice
- Building resilience to misinformation
- Engaging and empowering communities to take positive action

We would agree that these activities are useful and important in thinking through what practical steps can be taken to limit harm and improve resilience. There is scope here though to be more ambitious. In our view, future infodemics may not only be associated with pandemics. For example, it is not difficult to imagine that as social policy and economic impacts flow from the unfolding global climate crisis, that a 'climate infodemic' could be created, which could in turn seriously hinder policy moves intended to address the crisis.

Against that background, and taking into account the lessons from the current infodemic and the indications from our modelling, we think there is a significant case for a serious and sustained investment in science and media literacy, at multiple levels throughout our communities. Engaging with communities to determine what will support them best (as indicated in the WHO framework) will be important.

Current policy thinking emerging from the EU and elsewhere indicates that education and empowerment of communities, while necessary and desirable, may not be sufficient. Proposed regulation of social media companies such as the Digital Services Act in the EU reflects a belief that digital companies themselves need to play a greater role in managing the reach and negative impacts of misinformation. Evidence is emerging that algorithmic amplification may play a role in the rapid dissemination of misinformation, and that misinformation can be treated as 'high engagement material'.

While the ultimate effectiveness of such regulatory proposals cannot be predicted, it seems clear that there will be a need for good analysis and evidence-based approaches in order to measure their effectiveness. In other words, the emergence of new regulatory measures around the world also suggests that it is important for APRU to move now on establishing research baselines and evidence on the impacts and dynamics of the infodemic. These evidence and baselines may be invaluable for evaluating the effectiveness of new measures; analysing collateral effects (such as impacts on human rights); and informing further policies or amendments.

5. Next Steps

Our analysis and modelling has laid the foundations for further research to be undertaken across APRU over the next two months as we prepare a paper for presentation to APEC leaders. There is potential for our paper to drive an APEC-wide research project. To advance this work the next steps are:

- APRU support
- Develop country case studies with APRU partner universities
- University of Auckland coordinates country-specific baseline data and evidence (from APRU members) on impacts and dynamics of the infodemic to evaluate new measures, analyse collateral effects and inform further policies/amendments
- Explore applications to future infodemics (e.g. climate infodemic)
- Present to APEC leaders in November 2022.

6. About

This APRU pandemic and misinformation workstream is led by University of Auckland Vice-Chancellor Professor Dawn Freshwater.

Dr Jingwen Mu is the Strategic Planning Manager and the Senior Global Strategy Advisor to the Vice-Chancellor at the University of Auckland. She is a university rankings expert, leads the University's Sustainable Development Goals (SDGs) mapping initiative, and represents the University on advisory boards, partnerships and conferences related to rankings and the SDGs. She has been consulting for the World Bank on the Sub-Saharan Africa Benchmarking Initiative since 2015. Prior to joining the University, Jingwen headed the consulting team at Shanghai Ranking Consultancy.

David Shanks, Executive Director of RDC Group, was New Zealand's Chief Censor from May 2017 to May 2022. In this role, he led the office of Film and Literature Classification (Classification Office). The Classification Office is an independent Crown entity with a crucial role in reducing the harm some content presents to New Zealanders while protecting freedom of expression. David led the Classification Office's national survey on misinformation in New Zealand in 2021 "*The Edge of the Infodemic*".

We also appreciate the support of Professor Robert MacCulloch and Dr Alexandre Dmitriev from the University of Auckland Business School for their advice and guidance in developing the modelling work.

7. Contacts

For full modelling details (including source data, assumptions, and calculations), case study development and baseline data collection, and interest in this project please contact Jingwen Mu and Leigh Pearson.

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