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Insights to Action

An Analysis of the COVID-19 Pulse Survey

Australia & New Zealand School Of Government

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Insights to Action: An Analysis of the COVID-19 Pulse Survey

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Australia and New Zealand School of Government

ABOUT MSDI Monash Sustainable Development Institute (MSDI) is a world leading institute bringing about change all over the world through pioneering research, education and innovation. Part of Monash University, we have 200+ academic and professional staff and draw on expertise across 10 faculties to respond to some of the biggest environmental, economic and social issues, to build a healthier, stronger, and more sustainable world. MSDI works with policymakers, philanthropists and practitioners to devise practical solutions to some of the most pressing problems faced by Australia and its region. Leveraging our expertise in systems and behavioural change, we shape policy, build capacity, and develop strategies that unpack complex issues, test innovative solutions, and support systems transformations for sustainable development.

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Executive Summary

As the COVID-19 pandemic unfolded, the significant role of Public Opinion Data (POD) in shaping government responses became increasingly evident. This report, commissioned by the Australia and New Zealand School of Government in partnership with the Australian Public Service Commission, presents a retrospective analysis of the national Prime Minister and Cabinet (PM&C) COVID-19 Pulse Survey conducted from March 2021 to March 2022. The survey collected nationwide data on public attitudes, offering insights into the public's response to the pandemic.

This analysis focuses on two main areas: First, it delves into the collected data to assess the evolution of vaccine hesitancy across various demographics over time, demonstrating the inherent value of POD in informing government responses. Second, it explores how the insights from the Pulse Survey influenced policymaking by examining the survey's design process and its role in informing decisions or shaping policy responses.

Through a descriptive and multilevel regression analysis of the Pulse Survey data we illustrate the crucial role of POD as a dynamic feedback mechanism during periods of rapidly shifting public opinions. Our analysis suggests the two most prevalent types of vaccine hesitancy in Australia were hesitancy due to confidence and convenience. Demographic factors such as gender, age and socioeconomic status are associated with vaccine hesitancy and shifted over time at different pace. Geographical differences also emerged, highlighting the influence of local contexts on public attitudes towards vaccination. We also found a statistically significant association between state stringency measures and vaccine hesitancy, which likely reflects the influence of government’s measures or heightened perceived risks on public attitudes.

Moreover, in our assessment of the survey’s usefulness for decision-making, interviewees indicated that the survey was aimed to rapidly provide information on public attitudes to a diversity of stakeholders without a specific policy focus. The process of designing, implementing, and disseminating the survey illustrates an anticipatory and agile approach to gather information in response to the crisis context. These approaches may conflict with methodological approaches to POD. The Pulse Survey illustrates this tension. While business-as-usual methods emphasise meticulous design, problem definition, and consistency, the urgent demands of the COVID-19 pandemic required swift, adaptable strategies.

Understanding the impact of the survey was challenging, as the team responsible for the survey lacked visibility into how the data was being utilised. Additional interviews revealed that while the data provided benchmarking information against other states, especially those lacking POD capabilities, it was not representative of their communities in order to shape health responses. Given our limited sample size, we were unable to establish a clear link of the survey’s influence and contribution to policies or strategies.

Despite this limitation, our findings suggest that effectively leveraging POD in crisis contexts requires a balance between agile and innovative approaches, and deliberate and methodical processes. The inherent tensions between standard practices and the unique demands of a crisis were evident in every phase of the survey's implementation. This analysis encourages further discussion among practitioners and policymakers on ways to bridge these gaps and enhance the use of POD in future crises. Key areas for further discussion include:

- Establishing robust feedback mechanisms: Ensuring that POD is aligned with decision-makers' needs during crises.
- Balancing methodical and agile approaches: Maintaining credibility and reliability in data collection while being responsive to urgent needs for actionable insights.
- Strengthening relationships between researchers and policymakers:
- Facilitating collaborative partnerships that leverage evidence for effective problem-solving.

Background

As reflections on the COVID-19 response surface, there is a growing demand for greater transparency and understanding of how evidence shapes policymaking. For example, the conclusions drawn in the Fault Lines review (Shergold et al., 2022) of Australia's response to the COVID-19 pandemic, highlighted issues such as the lack of transparency surrounding decision-making processes and ambiguities regarding the evidence used to justify government interventions.

Recognising this, the Australia and New Zealand School of Government, in partnership with the Australian Public Service Commission, commissioned the Monash Sustainable Development Institute to explore how public opinion data (POD) is used to inform policy development. This initiative titled '*Bridging Public Opinion and Policy: A Mixed-Methods Analysis*' aimed to pinpoint best practices for leveraging Australian public opinions, sentiments, attitudes, and behaviours into policymaking.

Bridging Public Opinion and Policy was structured around four key research activities, each designed to assess the impact, strengths, and limitations of POD in decision-making:

1. **Rapid Evidence Review:** This systematic review examined existing literature to understand how POD was used to inform policy responses during the COVID-19 pandemic.
2. **Analysis of the COVID-19 Prime Minister and Cabinet Pulse Survey:** The analysis, which is the focus of this report, aimed to understand the relevance of POD during the pandemic and its influence on decision-making, using the Pulse Survey as a case study.
3. **Practice Review:** This review explored broader practices in Australia regarding the use and impact of POD in both crisis (COVID-19) and 'business as usual' contexts.
4. **Deliberative Dialogue:** Informed by the insights from the previous components, this final stage aimed to collaboratively identify and establish best practices for effectively leveraging the use of POD.

Together, these activities form a comprehensive approach to understanding and enhancing the application of POD in policymaking. Initially, the project was designed to focus on the use of POD in crisis contexts, with the COVID-19 period providing a rich backdrop for exploration. However, insights from these initial activities (1 & 2) prompted a decision to broaden the scope to include 'business as usual' contexts. This shift reflects an acknowledgment of the need to understand how POD is used in a wider range of policy making scenarios, not just in response to crises. Accordingly, this expanded focus was incorporated into Activities 3 and 4.

For more detailed information on the project and its findings, please visit: https://anzsog.edu.au/news/public-opinion-data-and-policy/.

Introduction

As the COVID-19 pandemic unfolded, the role of Public Opinion Data (POD) in informing government responses became more evident in the aftermath, underscoring its potential influence on policy during times of crisis. POD purportedly provided a foundation for governments to dynamically respond to the pandemic, adjusting to the evolving attitudes, opinions, and behaviours of the population amidst global uncertainty. However, the extent of POD's actual utilisation and level of influence in decision-making processes remains subjects for thorough investigation.

The long standing exploration of POD's impact on policy making by social scientists (Burstein, 2003) has gained particular relevance during these times. While the integration of POD into policy processes has revealed a complex landscape of influence – often indirect and nuanced – an evidence review highlighted the challenges in directly linking POD to specific policy outcomes during the pandemic (Bragge et al., 2024), particularly due to the lack of transparency or documentation on how evidence inputs are used in decision-making.

Nonetheless, it is broadly acknowledged that POD was – at the very least – used to inform the global response to the pandemic. For example, our research uncovered at least 150 studies published from March 2020 to March 2022, focusing on understanding vaccination attitudes worldwide, primarily funded by academic institutions. The extent of collaboration between researchers and governmental bodies remains unclear. In Australia, several public initiatives were undertaken, such as the Federal Government's Pulse Survey, Victoria's Survey of COVID-19 Responses to Understand Behaviour (SCRUB), and comparable efforts in New South Wales, suggesting that POD played an important role in shaping public health strategies.

This report delves into a retrospective analysis of the PM&C Pulse Survey to examine one instance of POD usage during the pandemic. The Pulse Survey, a repeated cross-sectional survey that collected nationwide data on public attitudes and behaviours from March 2021 to March 2022, was established to provide timely information on public sentiment during the pandemic. By assessing how insights from the Pulse Survey informed and influenced policy decisions, particularly concerning vaccine hesitancy, this analysis seeks to uncover the usefulness, strengths, and weaknesses of POD in decision-making in a crisis context.

The retrospective analysis is twofold: firstly, it analyses how attitudes towards vaccination evolved across different demographics over time, providing a comprehensive view of the shifts in public sentiment and highlighting the relevance of using POD to inform the government response. Secondly, it explores how the Pulse Survey's findings influenced and shaped policy formulation by examining its purpose, process, and impact.

To this end, we explore three research questions:

1. How does COVID-19 vaccine hesitancy in Australia, measured in different dimensions, vary across socio demographic groups?
2. How did vaccine hesitancy change over time within specific demographic groups and geographical locations?
3. How did insights gathered by the Pulse Survey influence policymaking?
    - What were the strengths and limitations of the survey in informing decision-making?
    - What were the strengths and weaknesses of the survey design, data collection and reporting processes?

To address these questions, we employed a mixed-method approach, combining data analytics with qualitative insights from semi-structured interviews with public servants involved in the survey's implementation.[1]

Our findings reveal that vaccine hesitancy was dynamic and varied across different demographic groups and geographic locations, with its decline not being uniform but varying in pace. This highlights the usefulness of POD in shaping communication campaigns and other policy responses. Moreover, our study sheds light on the complexities of directly linking POD to policy decisions and the intricacies involved in translating POD insights into actionable strategies. Finally, it proposes three areas for further discussion with practitioners to better leverage POD in future crises.

The report is structured into four sections:

- Section I: Provides an overview of the Pulse Survey.
- Section II: Details the findings from the quantitative analysis of the Pulse Survey.
- Section III: Presents key insights from our interviews, exploring the purpose, process, and impact of the Pulse Survey.
- Section IV: Summarises our reflections in reflective discussions, drawing on both the analytical findings and insights from our semi-structured interviews. The aim is to stimulate further dialogue on enhancing the efficacy of POD in informing policy decisions, especially in times of crisis.

[1] Ethics approval for this study was granted by the Monash University Human Research Ethics Committee (ID: 30009).

I. Overview of the Pulse Survey

The COVID-19 Pulse Survey, initiated by the Department of the Prime Minister and Cabinet (PM&C), was designed to track public attitudes on pivotal issues including vaccination, consumer confidence, and wellbeing on a monthly basis. Over its course, thirteen waves of data collection were conducted, capturing shifts in public sentiment from March 2021 to March 2022. The initial phases, from March to December 2021, saw an average participation of 5,173 individuals per wave. However, from January 2022 to March 2022, the sample size was notably reduced to approximately 2,500 respondents per wave. In total, 59,361 individuals responded to the survey.

The survey was conducted in partnership with a survey panel provider, Octopus Group, and used an online panel of Australian adults designed to achieve demographic representativeness through quota sampling based on state, age and gender. Investigation of the demographic representativeness found that the Pulse Survey overrepresented respondents from Western Australia, South Australia, Tasmania, the Australian Capital Territory (ACT), and the Northern Territory compared to the 2021 Australian Census. Insights from our interviews suggest that these regions may have been strategically emphasised due to their comparative lack of state-level data collection initiatives, and to improve the accuracy of cross-state/territory comparisons.

This sampling decision meant that the Pulse Survey underrepresented respondents from New South Wales, Victoria, and Queensland. For age groups, the total Pulse Survey slightly overrepresented respondents in 20–29, 30–39, and 60–69 age groups compared to the 2021 Australian Census. For gender, the total Pulse Survey slightly overrepresented women compared to the 2021 Australian Census.

In addition, 71% of the responses originated from major city or metropolitan areas, with the remaining 29% coming from non-metropolitan regions. It is noteworthy that in the Northern Territory, a significant portion of the data – over 50% – was collected using Computer-Assisted Telephone Interviewing (CATI) aiming to enhance inclusivity and reach.

The survey content was dynamic, with items evolving to reflect the changing landscape of the pandemic and the shifting priorities and information needs. Annex I provides a detailed description of the survey items that were captured across different waves. Survey items that were captured consistently throughout the period include:

- Demographic characteristics such as age, gender, state/territory, employment status, country of birth, Aboriginal or Torres Strait Islander origin, parental status, among others.
- Attitudes, sentiments and behaviours related to COVID-19 vaccination, such as likelihood to get vaccinated, reasons for getting/not getting vaccinated and uptake of the vaccine.
- Consumer confidence
- Life satisfaction

Based on the method for data collection, insights from the quantitative analysis presented below should be interpreted with caution. The panel's recruitment reliance on internet access and self-selection may exclude certain demographics, while quota sampling might not fully account for diversity beyond age and gender, possibly skewing insights.

II. Quantitative Analysis of The Pulse Survey

Due to the rapid pace of change during COVID-19, contemporaneous reporting for each monthly round of the Pulse Survey focused on providing timely, relevant insights and tracking month-to-month changes in key indicators, such as vaccine uptake. The cumulative rounds of the survey have generated a rich dataset, facilitating additional analyses that were not possible during the height of the COVID-19 period. One consistently measured construct throughout the survey was the willingness of Australians to receive the COVID-19 vaccine. Therefore, this section explores two research questions:

1. How does COVID-19 vaccine hesitancy in Australia, measured in different dimensions, vary across socio demographic groups?
2. How did vaccine hesitancy change over time within specific demographic groups and geographical locations?

Delving into the dataset not only allows us to get interesting insights on how attitudes unfolded throughout the pandemic, but also complements our exploration of the usefulness of the data for decision-making by providing a better understanding of the nature of the data and its insights.

Methods

We first conducted a quick literature review to inform our methodological approach focusing on how COVID-19 vaccination attitudes have been explored in other studies. We specifically reviewed studies conducted between 2020 and 2023, focusing our search to those assessing drivers of vaccine hesitancy at the population level using longitudinal or repeated cross-sectional data. This review provided an overview of the concept of vaccine hesitancy, identified common factors contributing to it, and explored various analytical approaches used in previous research. This knowledge was instrumental in designing our study, allowing us to frame our analysis within the broader context of existing findings and methodologies.

Descriptive analysis

To answer our research questions, we conducted a descriptive analysis and a regression analysis of the Pulse Survey data. The descriptive analysis summarises the relevant variables explored and identifies basic patterns and trends in vaccine hesitancy, using graphical representations to illustrate how it varied among different demographic groups. This analysis includes weights to account for the overrepresentation of certain states and territories.

Relationships between factors and vaccine hesitancy

To assess the relationship between demographic and contextual variables and vaccine hesitancy, we conducted a multilevel mixed-effects logistic regression. This method allows us to estimate the relationship between factors –such as gender, age, location, and income level– on vaccine hesitancy while accounting for the fact that these data are grouped at different levels, for example, individuals within states/territories. We included random effects for state/territory, to allow each state to have its baseline level of vaccine hesitancy, recognising that states may differ from one another based on factors not measured in our survey. The 'random intercepts' provide a way to model these inherent differences, offering a unique starting point for each state in our analysis. By incorporating these state-level variations, we can make more accurate estimates of how individual factors influence vaccine hesitancy, taking into account the context provided by the state each respondent resides in. We also included fixed effects for each wave of data collection to control for any

trends or events affecting all states at the same time, such as national health campaigns or changes in public health guidelines.

To understand how different factors may affect people's vaccination hesitancy differently over time we conducted a second set of multilevel mixed-effect logistic regressions with interaction terms between time (wave) and the sociodemographic factors. For example, this analysis would reveal if, perhaps, younger people tend to be more hesitant than older people, but this gap reduces over time. The results tables only report on main effects and interaction effects. For simplicity, all control variables at the individual and state level were included in the models but not reported.

Insights from the analysis should be interpreted with caution. During the analytical process, we attempted several times to incorporate weighting into the multilevel models to address the overrepresentation of certain states and territories, but these models failed to converge, indicating technical limitations within this modelling framework. Therefore, our regression models are unweighted. Despite this, we simplified our model and found no significant differences when comparing weighted and unweighted versions. Furthermore, some studies, such as Carle (2009), suggest that unweighted multilevel models often produce estimates similar to those of weighted models, indicating that multilevel models can still be reliable without weighting.

Moreover, the panel's recruitment reliance on internet access and self-selection may exclude certain demographics, while quota sampling might not fully account for diversity beyond age and gender, possibly skewing insights. In addition, measures for vaccine hesitancy were devised after the survey was conducted, introducing the potential for measurement bias. Interpretations of the regression analysis should be understood as associations between demographic variables and vaccine hesitancy, it should not be interpreted as causality.

Vaccine hesitancy measures

To understand vaccination attitudes, we centred our analysis on vaccine hesitancy. The World Health Organization's Strategic Advisory Group of Experts (SAGE) on Immunisation referred to vaccine hesitancy as a "delay in acceptance or refusal of safe vaccines despite availability of vaccination services" (MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015).[2]

After comparing the survey items with different theoretical models to measure vaccine hesitancy and its determinants, we chose to adopt the '3Cs' framework as our foundational analytical lens. This approach allowed for a systematic analysis of the rich data, ensuring alignment with well-established methodologies in the field.

The 3Cs framework developed by SAGE Working Group on Vaccine Hesitancy, provides a structured approach for understanding the factors that contribute to vaccine hesitancy. This framework identifies three core dimensions: Confidence, Complacency, and Convenience (MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015).

[2] *This definition has been recently updated by the World Health Organization (WHO) Behavioral and Social Drivers of Vaccination (BeSD) Working Group in 2022 and is now defined as "a motivational state of being conflicted about, or opposed to, getting vaccinated; this includes intentions and willingness"*

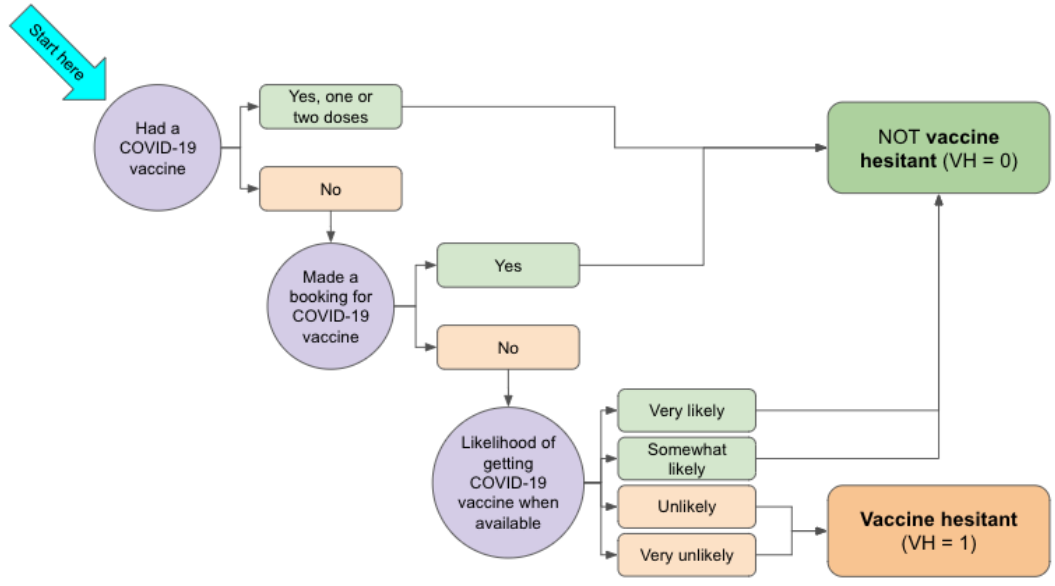
- *Confidence* refers to trust in the safety and efficacy of vaccines, the system that delivers them, and the motivations of those behind vaccination policies and programs.
- *Complacency* exists when the perceived risks of vaccine-preventable diseases are low, thus reducing the perceived need for vaccination or perceiving it as unnecessary.
- *Convenience* relates to the accessibility of vaccines, influenced by availability, affordability, and easiness to get the vaccine. This includes perceptions of the health system's ability to deliver vaccination programs.

By classifying overall vaccine hesitancy into these categories, the 3Cs model facilitates a nuanced and consistent analysis of the barriers to vaccination uptake and its relationship with sociodemographic and contextual determinants.

Measuring overall vaccine hesitancy in the Pulse Survey

Using SAGE's 2014 definition we measured vaccine hesitancy based on the likelihood of accepting a vaccine when offered, or on reported vaccine uptake. To determine whether a respondent was vaccine hesitant, we employed a decision tree, detailed in Figure 1a. Respondents were categorised as vaccine hesitant (vh=1) if they had not received a COVID-19 vaccine, and had not scheduled a vaccination appointment, and expressed being unlikely or very unlikely to accept a vaccine when it became available. Conversely, respondents were considered non-vaccine hesitant (vh=0) if they reported having received at least one vaccine dose, had made a vaccination appointment, or, if neither, stated they were likely or somewhat likely to get vaccinated. This measurement is consistent with similar studies aiming to understand drivers of vaccine hesitancy (Liu & Li, 2021, Biddle et al., 2021).

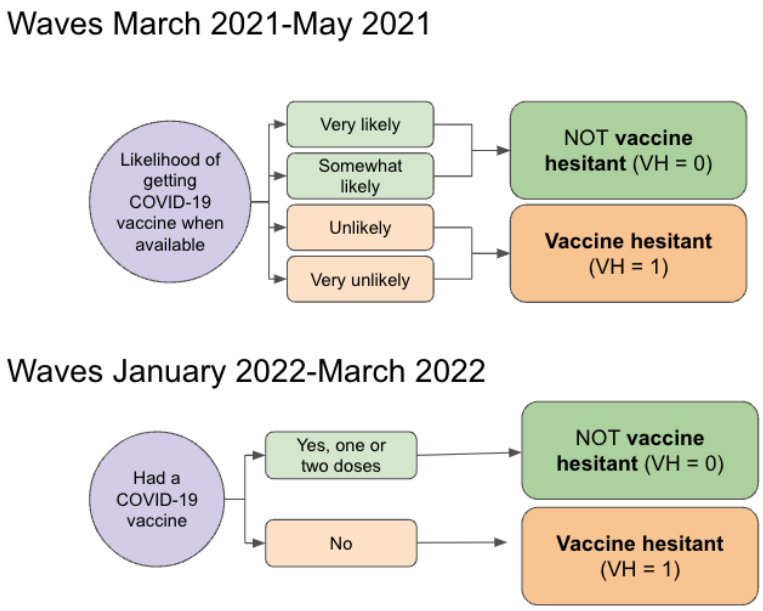
Figure 1a Vaccine Hesitancy – Decision Tree Based on Pulse Survey Items (Jun 2021-Dec 2021).



However, the vaccine hesitancy measurement changed according to the survey items included in different waves. For instance, in the initial three waves of the survey, from March to May 2021, respondents were not asked if they had received a COVID-19 vaccine, or if they had scheduled a vaccination appointment. They were only asked about their likelihood of accepting a vaccine when it became available. Additionally, for the last three waves – from January to March 2022 – we classified respondents who had not been vaccinated as

vaccine hesitant, as likelihood of vaccination was not captured anymore by the survey and the vaccine had been readily available for over six months (see Figure 1b).

Figure 1b Vaccine Hesitancy – Decision Tree Based on Pulse Survey Items (Mar-May 2021, Jan-Mar 2022)



The binary coding of each respondent as either 'hesitant' or 'not hesitant' is common in the literature but may overlook nuances within responses indicative of "somewhat likely" intentions. We coded respondents who indicated they were "somewhat likely" to get vaccinated as 'not hesitant'. However, we found that 82% of individuals expressing a high likelihood ("very likely") of vaccination indicated a preference for immediate uptake ("as soon as possible"), compared to only 11% among those categorised as "somewhat likely". This discrepancy underscores the potential for deeper examination of the "somewhat likely" category by vaccination specialists, to elucidate the intricate dynamics between stated likelihood and temporal preferences for vaccination.

Measuring confidence, convenience, and complacency dimensions of vaccine hesitancy in the pulse survey

We used the 3Cs framework to map survey items against each dimension of vaccine hesitancy: Confidence, Convenience, and Complacency.

- We classified respondents as vaccine hesitant for reasons of *confidence* if they expressed any concerns about the safety or efficacy of the vaccine (see Table 1 for definitions of dimensions mapped against specific survey items.).
- We classified respondents as vaccine hesitant due to *complacency* if, among the barriers they chose, they indicated a perceived low risk or threat from COVID-19, a willingness to wait for others to get vaccinated first, or a belief that vaccination was unnecessary.
- We classified respondents as vaccine hesitant for reasons of *convenience* if they reported finding it very difficult or somewhat difficult to book a vaccination appointment or to physically obtain a vaccine, or if they expressed concerns about the vaccine rollout in Australia (such as supply availability and the time it is taking).

These three measures were constructed as a binary indicator. Due to variations in survey items over time, measures for confidence, convenience, and complacency were not included in the final three waves (January to March 2022).

Table 1: 3Cs Dimensions Mapped Against Pulse Survey Items.

VH Dimension	Definition	Pulse Survey Item
Confidence	Trust in the safety and efficacy of vaccines, the system that delivers them, and the motivations of those behind vaccination policies and programs.	"I believe the vaccine could be unsafe"
		"I feel there is inadequate testing or research"
		"Unsure of short-term side effects in the days just following vaccination"
		"Unsure of long-term side effects"
		"Process feels rushed"
		"I have concerns about all vaccinations"
		"Don't know enough about it yet"
		"I believe a vaccine won't be effective for this virus"
Complacency	Perceived risks of vaccine-preventable diseases are low, thus reducing the perceived need for vaccination or perceiving it as unnecessary.	"I would want to wait until others have had it first"
		"I feel the risk or threat from COVID-19 is low"
		"I don't feel the need to get the vaccine"
Convenience	Accessibility of vaccines, influenced by availability, affordability, and easiness to get the vaccine. This includes perceptions of the health system's ability to deliver vaccination programs.	"I have concerns about the vaccine rollout in Australia (e.g. supply availability, the amount of time it's taking)"
		"Ease of getting COVID-19 vaccine when available" (very difficult and somewhat difficult)
		"Ease of booking COVID-19 vaccine when available" (very difficult and somewhat difficult)
		"Ease of physically getting COVID-19 vaccine" (very difficult and somewhat difficult)

Measuring factors associated with vaccine hesitancy in the Pulse Survey

We took a pragmatic approach to plan our retrospective analysis of factors associated with vaccine hesitancy in the Pulse Survey:

Demographic Factors

Research on vaccine hesitancy, as synthesised in a comprehensive umbrella review (Kafadar et al., 2022), highlights several sociodemographic factors that influence individuals' willingness to vaccinate. Among other factors outlined in the review, age, education, income, living in a rural area and ethnicity play significant roles. Younger adults, for instance, often show higher levels of hesitancy compared to older populations who perceive themselves at greater risk. Educational attainment is also a critical factor; individuals with higher education levels tend to exhibit lower vaccine hesitancy, likely due to better access to reliable health information and higher health literacy. Income disparities affect vaccine attitudes as well, with lower-income groups displaying more hesitancy, possibly due to mistrust in medical systems, logistical barriers, or systemic inequalities. Ethnic minorities and women are also generally more likely to have higher levels of hesitancy, driven by historical mistrust in healthcare systems and, for women, specific concerns about vaccine safety.

The Pulse Survey measured respondents' self-reported gender, age, country of birth, living in metro area, indigenous background, and parental status. We used gender, age group and living in metro areas as individual covariates in the analysis.

We have excluded data on Indigenous background and ethnicity/country of birth from our analysis due to their underrepresentation in the sample, which could compromise the reliability and generalisability of our findings for these groups. Additionally, parental status was excluded because it was only collected starting from September 2021, limiting the consistency of this variable across the entire dataset.

In addition, socioeconomic status was not directly measured in the Pulse Survey. However, from July 2021 onwards, the survey collected self-reported postcodes of residence. We matched this information with ABS data on median household income by postcode. This approach offers a proxy for respondents' economic standing, compensating for the lack of direct survey data on income levels or educational attainment. However, using median household income by postcode as a proxy for respondents' economic standing has its limitations, as it may not accurately reflect individual economic conditions and can mask the diversity of socioeconomic statuses within a single postcode area.

In our analysis, we incorporated income level by postcode into a separate regression model due to the unavailability of this data prior to July 2021. Including it in the main model would have resulted in the exclusion of a substantial number of observations and periods from the analysis, potentially limiting the breadth and depth of our findings.

We also consider respondents' state of residence and the distinction between metropolitan and regional areas to investigate geographic disparities in vaccine hesitancy. A summary of the descriptive statistics can be found in Table 1.

Table 2: Unweighted Descriptive Statistics

Panel A	Frequency	Percent
Vaccine Hesitancy		
Overall vaccine hesitancy	7,766	13%
Hesitancy due to confidence	6,635	13%
Hesitancy due to convenience	5,695	12%
Hesitancy due to complacency	3,071	6%
Gender		
Female	30,629	52%
Male	28,498	48%
Non-binary / other term	202	0.34%
Prefer not to say	32	0.05%
Age group		
18-19	1,360	2.3%
20-29	11,309	19%
30-39	12,090	20%
40-49	9,420	16%
50-59	9,209	16%
60-69	9,899	17%
70+	6,074	10%
Aboriginal or Torres Strait Islander		
ATSI	1,106	1.90%
Language at home (coded)		
English	49,800	92%

Panel B	Frequency	Percent
State or Territory		
ACT	2,741	5%
NSW	11,758	20%
NT	2,707	5%
QLD	10,591	18%
SA	7,084	12%
TAS	3,832	6.50%
VIC	11,541	19%
WA	9,100	15%
Region of origin		
Australia and NZ	41,535	78%
NW and West Europe	4,012	8%
South East Asia	1,673	3%
Southern Asia	2,754	5%
Southern and East Africa	618	1%
Chinese Asia	416	1%
Other	2,068	4%
Wave number		
202103	5,142	10%
202104	5,174	10%
202105	5,178	10%
202106	5,179	10%

Other	4,195	8%	202107	5,180	10%
Income Level by postcode			202108	5,176	10%
Low	3,612	10%	202109	5,180	10%
Middle-Low	8,691	23%	202110	5,176	10%
Middle-High	12,335	32%	202111	5,174	10%
High	13,368	35%	202112	5,172	10%
Live in metro area					
Yes	42,497	72%			
No	16,857	28%			

State Level Factors

We incorporated into the analysis the Oxford COVID-19 Government Response Stringency Index as a covariate at the state/territory level. The Stringency Index, which is a composite measure based on nine response indicators such as school closures, workplace closures, and travel bans, provides a quantifiable measure of the severity of government responses over time.

This inclusion is driven by the hypothesis that public health policies and their enforcement can influence public health behaviours and perceptions. Even though the evidence is mixed based on a diversity of contexts and interventions, our hypothesis is that the stringency of government responses, such as restrictions on movement and public gatherings, is likely to affect public perceptions of the pandemic's severity and urgency. Incorporating this index allows us to explore how varying levels of government stringency across different regions might correlate with changes in vaccine hesitancy.

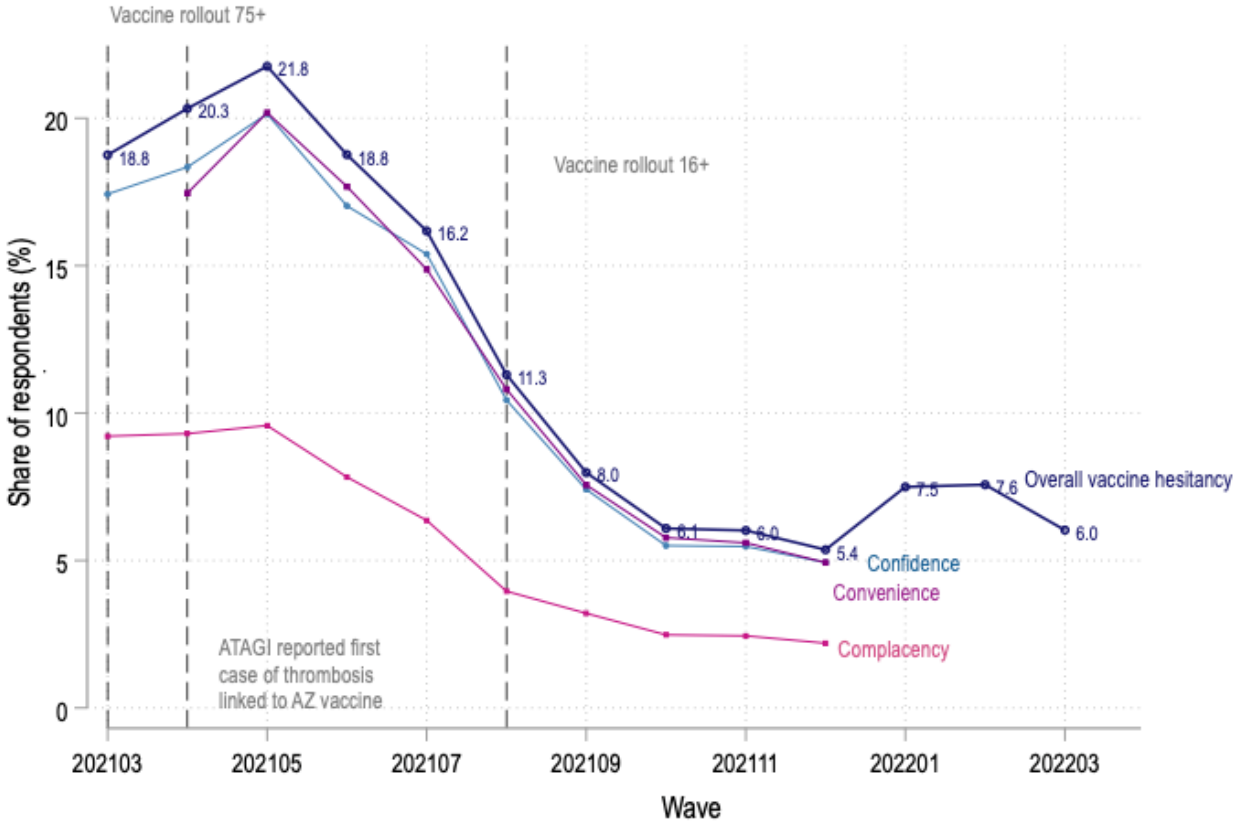
To account for the potential delayed effects of policy changes on public attitudes, we used monthly lagged average values of each state's Stringency Index for each wave of data collection. This approach allows us to capture the influence of state-level policy stringency on vaccine hesitancy, recognising that individuals' responses to policy changes or pandemic dynamics may not be immediate.

In addition, in our analysis, we conducted two distinct regression models to assess the impact of government policy stringency on vaccine hesitancy. The first model was run without the Oxford COVID-19 Government Response Stringency Index to establish a baseline understanding of vaccine hesitancy influenced by other covariates. Subsequently, we introduced the Stringency Index into a second model. This approach allows us to understand additional explanatory power provided by including government response measures.

Findings

Vaccine hesitancy changed over time

Figure 2. Vaccine Hesitancy in Australians from March 2021 to March 2022



Our retrospective analysis of the Pulse Survey uncovered a dynamic trend in *overall vaccine hesitancy*. Initially, there was an increasing trend from March to May 2021, which then shifted to a consistent decline through December 2021 (see Figure 2). The proportion of respondents identified as vaccine hesitant in our study dropped from 19% in March 2021 to 6% in March 2022.

Investigation of each dimension of vaccine hesitancy showed that hesitancy was mainly driven by confidence and convenience as it closely tracked overall vaccine hesitancy throughout the data collection period. Notably, these forms of hesitancy rose with the commencement of the vaccine rollout to the general population and the emergence of reports concerning thrombosis cases associated with the AstraZeneca vaccine abroad. A significant spike in hesitancy was observed following the Australian Technical Advisory Group on Immunisation's first thrombosis case report in April 2021. As the vaccine became available for all children and adults older than 16 years, hesitancy related to both confidence and convenience issues began a marked decline.

In contrast, hesitancy due to complacency was less common among the sample. This dimension of vaccine hesitancy remained stable during the initial three waves (Mar-May 2021) and subsequently declined at a slower rate compared to hesitancy due to confidence or convenience.

The multilevel logistic regression analysis indicates that in May 2021 the odds of individuals being identified as vaccine hesitant, increased by 16% compared to the baseline period. It was only until August 2021 where the odds of individuals being identified as vaccine hesitant decreased significantly compared to the baseline

period for all three types of vaccine hesitancy. Overall, the odds of an individual being identified as vaccine hesitant decreased by 36% in August 2021 compared to March 2021. These fluctuations over time highlight the influence of temporal shocks, possibly reflecting the public's reaction to evolving pandemic dynamics or policy changes (See Annex II- Panel A).

State / territory of residence was associated with vaccine hesitancy

Figure 3. Overall Vaccine Hesitancy by State and Territory (March 2021–March 2022)

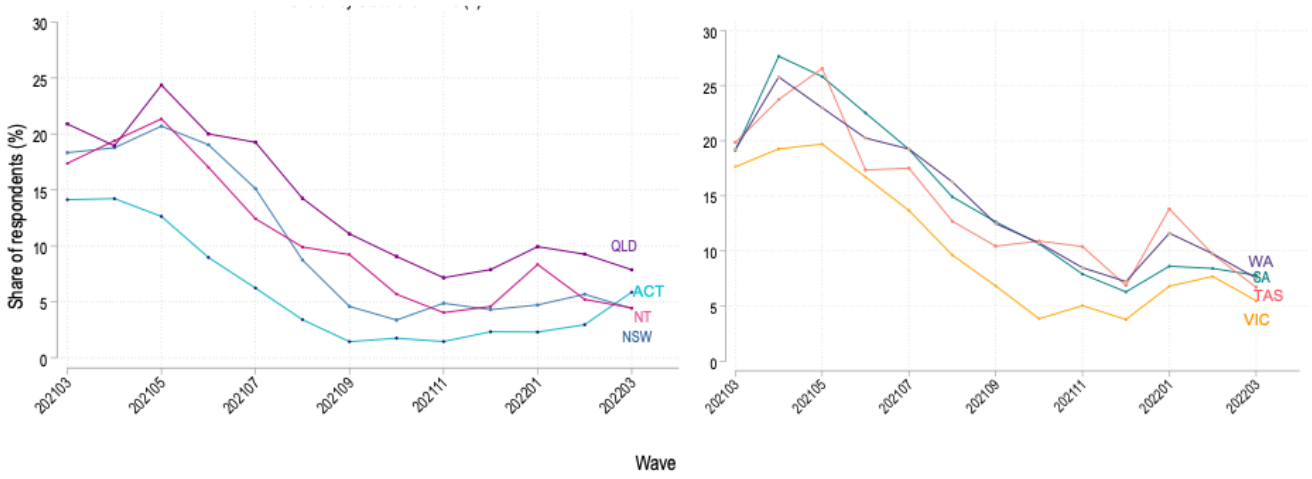


Figure 3 illustrates the variation in vaccine hesitancy across Australian states and territories from March 2021 to March 2022. Notably, the ACT had the lowest average vaccine hesitancy, with about 6% of respondents indicating reluctance, and a relatively small standard deviation of 0.05 (See Table 3). This suggests a consistently lower rate and less variable hesitancy among its population compared to other regions. In contrast, South Australia (SA) and Western Australia (WA) each showed a higher average hesitancy rate of 15% over the period, while South Australia showed greater variability in its hesitancy rate (0.07). This pattern is mirrored in the hesitancy attributed to confidence and convenience issues.

Furthermore, while all states showed a declining pattern in hesitancy due to confidence, convenience and complacency, the pace varied across states (see graphs by hesitancy measures in Annex 3). Western Australia and Queensland registered the highest levels of hesitancy stemming from complacency, whereas Victoria and ACT exhibited the lowest rates of such hesitancy over the period.

Table 3. Overall Vaccine Hesitancy by State/Territory – Average Share of Respondents and Standard Deviation (in italics), March 2021–March 2022.

State/Territory	Overall VH	Confidence	Convenience	Complacency
ACT	6%	6%	5%	3%
	0.05	*0.05*	*0.05*	*0.02*
NSW	10%	11%	10%	5%
	0.07	*0.07*	*0.07*	*0.03*
NT	11%	11%	10%	5%
	0.06	*0.06*	*0.06*	*0.03*
QLD	14%	14%	13%	7%
	0.06	*0.06*	*0.06*	*0.03*
SA	15%	16%	15%	7%
	0.07	*0.07*	*0.07*	*0.04*
TAS	14%	14%	14%	6%
	0.06	*0.06*	*0.06*	*0.03*
VIC	10%	11%	10%	5%
	0.06	*0.06*	*0.06*	*0.03*
WA	15%	15%	15%	7%
	0.06	*0.06*	*0.06*	*0.04*

We conducted a separate logistic regression analysis to examine temporal changes in vaccine hesitancy across states considering ACT as the reference group (see Annex II, Panel B). The interaction effects between state and time (state#wave) reflect that there were statistically significant differences in the temporal trends between ACT and Queensland, South Australia, Tasmania, and Western Australia. For these states, on average, the odds of vaccine hesitancy decreased at a slower pace than ACT. For example, in ACT, the odds of vaccine hesitancy decreased on average by 21% in each data collection period, while in Queensland, the odds of vaccine hesitancy decreased on average by 12% in each data collection period.

Both the descriptive and regression analysis illustrate the fluid nature of vaccine hesitancy, with specific regional trends. The observed heterogeneity in vaccine hesitancy across Australian states and territories indicates that local contextual factors may play a substantial role in shaping vaccination attitudes. This is consistent with international research findings. For instance, research in the United States has identified a correlation between higher vaccine hesitancy rates and states with a majority of Republican voters (Liu & Li, 2021). Meanwhile studies in the UK point to sociodemographic disparities linked to location (Nguyen et al., 2022). We suggest that in Australia this variation may be partly associated with the differential impact of the pandemic across states and territories, along with the varying stringency of governmental responses, which could have influenced public vaccination attitudes.

Living outside major cities was associated with higher odds of vaccine hesitancy

Figure 4. Vaccine Hesitancy by Place of Residence (Major City vs. Non-Major City).

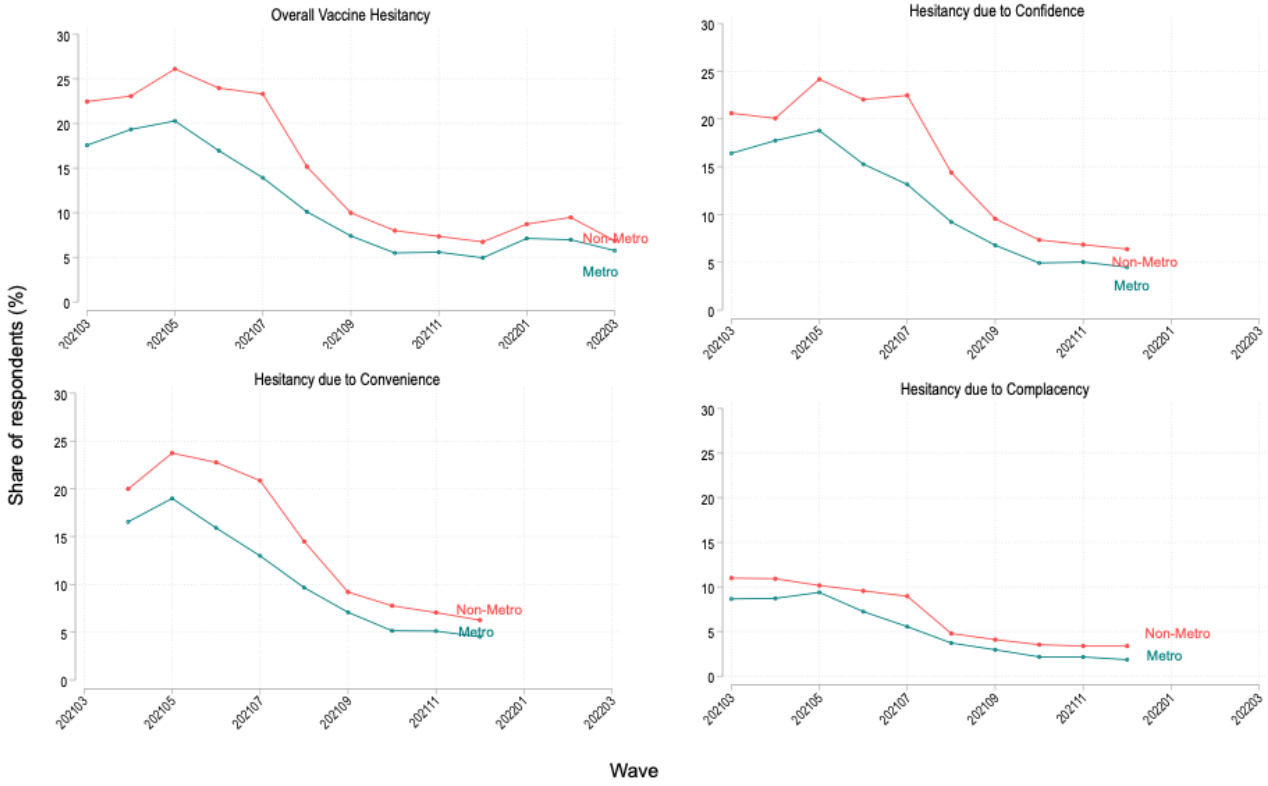


Figure 4 highlights disparities in vaccine hesitancy between major cities and non-major city areas, with rates being notably higher in non-major city areas (15%) as opposed to major cities (11%). Interestingly, the disparity is least pronounced in hesitancy due to complacency, with rates of 7% in non-major city areas compared to 5% in major cities, suggesting a relatively uniform perception of vaccine necessity across different geographic settings. However, hesitancy related to confidence and convenience issues is more prevalent outside major urban centres. Additionally, hesitancy due to confidence issues remained elevated for a longer duration in non-major city areas before showing signs of decline, whereas in major cities, a consistent decrease in hesitancy was observed starting from May 2021. Overall, vaccine hesitancy is more pronounced and persistent in non-major city areas compared to major cities, particularly concerning confidence and convenience issues.

Our multilevel logistic regression estimates that, consistent with the descriptive analysis, the odds of people living in major cities identified as vaccine hesitant were 33% less than individuals living outside major cities (See Annex II, Panel C, Col 4). This effect is observed across all three types of hesitancy. Moreover, the magnitude of the effect is reduced by more than half when introducing the variable income level by postcode, pointing out the correlation between level of income by postcode and type of location (See Annex II, Panel C, Col 5).

Additional analysis investigated how vaccine hesitancy changed over time for metro residents vs. non-metro residents (See Annex II, Panel D). On average, the odds of vaccine hesitancy for non-metro residents decreased slightly faster than metro residents. However, the difference is not statistically significant. This pattern is observed across all dimensions of hesitancy.

Women had higher odds of vaccine hesitancy than men

Figure 5. Measures of Vaccine Hesitancy by Gender

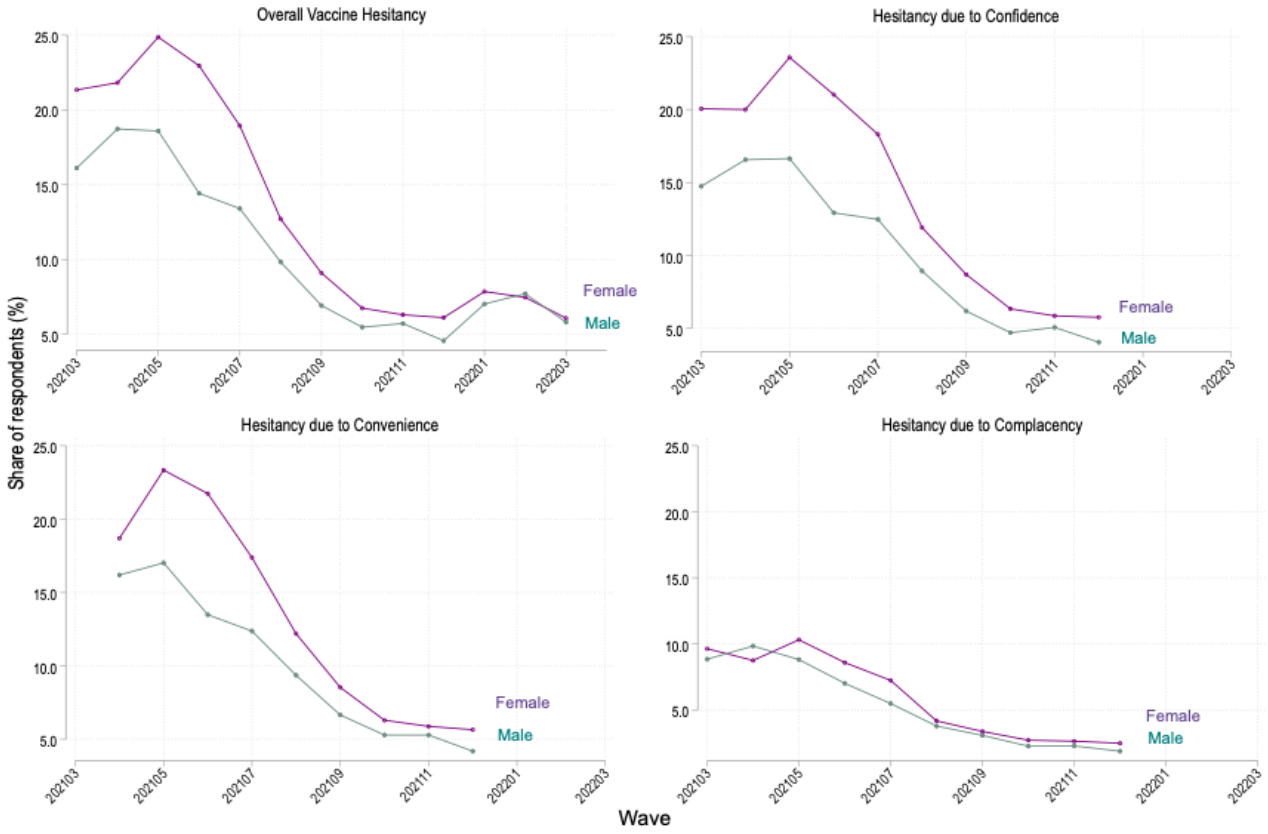


Figure 5 illustrates that women exhibited higher levels of vaccine hesitancy than men across all four measured dimensions. Initially, 21% of women were vaccine hesitant, in contrast to 16% of men. This disparity grew from April to July 2021 as the thrombosis concerns associated with the AstraZeneca vaccine disproportionately impacted women. However, by the end of the study period, vaccine hesitancy rates among both women and men converged at 6%. Notably, the gap between genders in hesitancy due to complacency was smaller, with both showing similar levels and trends over time. We were not able to include gender-diverse groups in this analysis (i.e., individuals identifying as genders other than male or female), due to the small sample size of respondents from these groups. Further studies are needed to fully understand vaccination attitudes within these groups, which could provide valuable insights into tailored public health strategies.

The multilevel logistic regression confirmed the patterns identified in the descriptive analysis, with males being 26% less likely to exhibit overall vaccine hesitancy compared to females (see Annex II, Panel C, Col 4). This significant disparity underscores the gender-based differences in attitudes towards vaccination. Consistent with trends noted in the descriptive analysis, the gap in hesitancy due to confidence issues is more pronounced, with males 32% less likely to show hesitancy from confidence concerns (see Annex II, Panel C, Col 9). Conversely, the gap narrows for hesitancy attributed to complacency, where males are 16% less likely than females to be hesitant due to this factor (see Annex II, Panel C.2, Col 9).

To understand differences in vaccine hesitancy over time, Annex II, Panel E shows the results of interaction effects between gender and time. Even though men were less likely to be vaccine hesitant compared to women, on average the decline in vaccine hesitancy was slower for men than for women. For example, the

odds of vaccine hesitancy due to convenience decreased on average by 17% for women in each collection period, while for men decreased by 13%.

Younger people were more likely to be vaccine hesitant than older people

Figure 6. Measures of Vaccine Hesitancy by Age Group

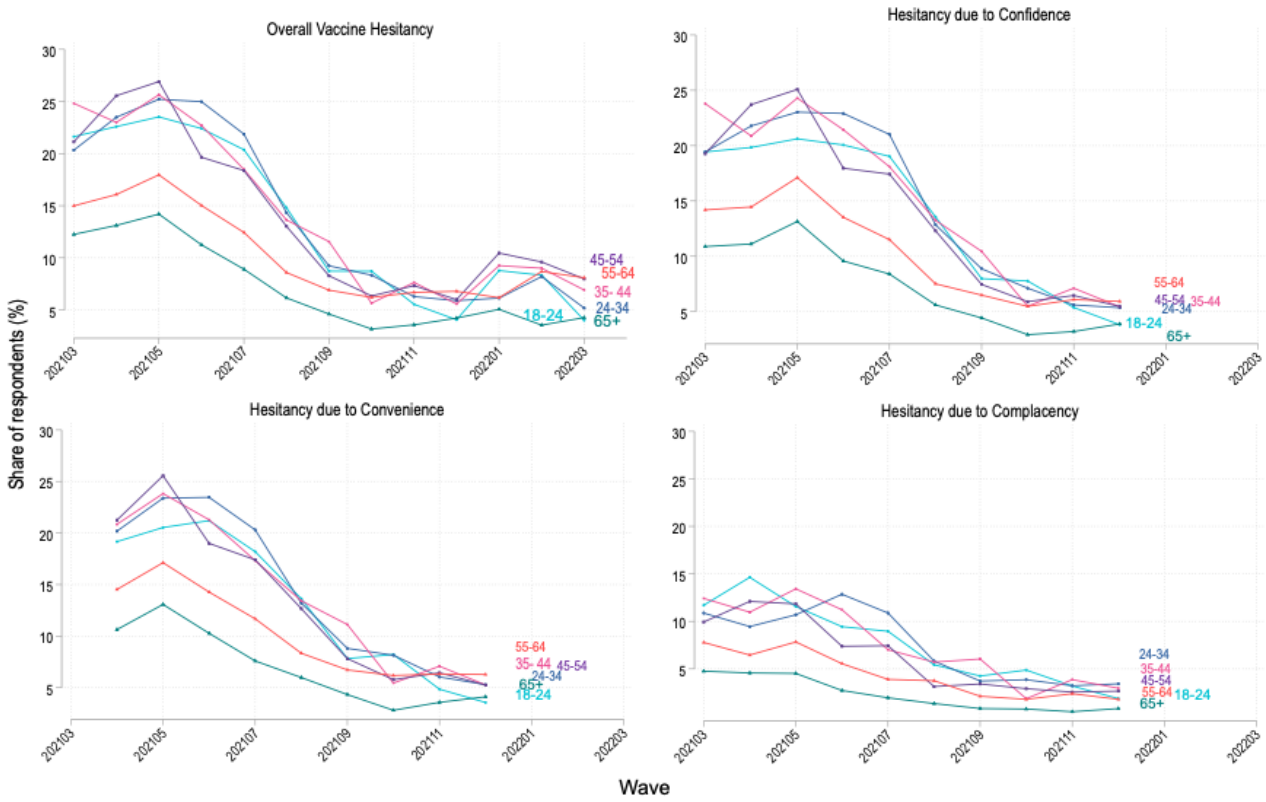


Figure 6 shows different trends of vaccination hesitancy by age group. We observe that younger age groups (18–24 and 25–34) exhibited higher levels of hesitancy across its three dimensions at the start of the period, with figures gradually reducing over time. For example, in March 2021, the 18–24 age group showed an overall hesitancy of 22%, which notably decreased to 4% a year later. In contrast, older age groups (65+) have consistently shown lower levels of hesitancy across all categories from the outset. Starting with an overall hesitancy rate of 12% in March 2021, this percentage decreased to just 4% by March 2022, emphasising the strong vaccine acceptance among the older population.

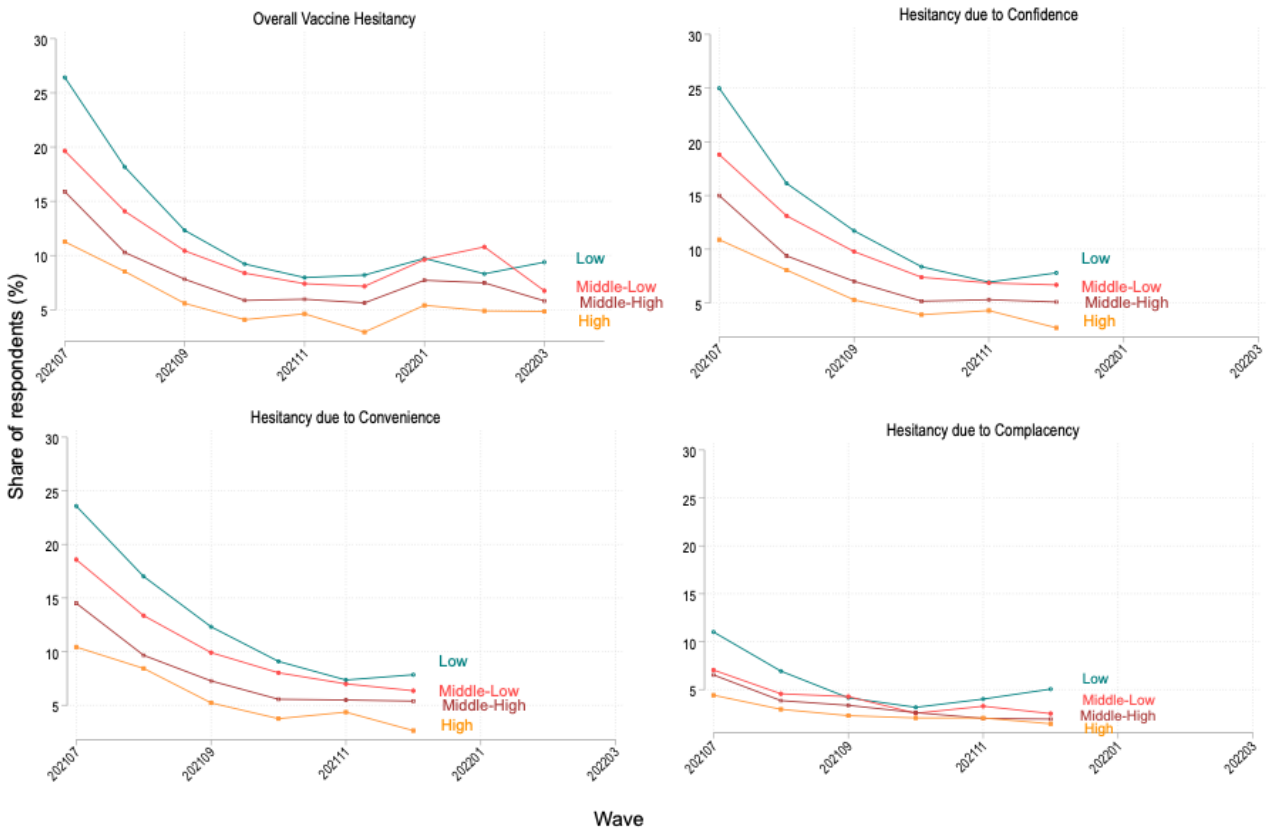
Our regression analysis, using the younger cohort (18–24) as a reference group, confirms that hesitancy varied among age groups. While in age groups younger than 54 years old, there was no statistically significant difference with the reference group (18-24), individuals aged 55–64 were 33% less likely, and those 65 or older an even greater 55% less likely to be vaccine hesitant (See Annex II, Panel C, Col 4). Hesitancy due to confidence and convenience followed a similar pattern. Notably, the likelihood of vaccine hesitancy due to complacency decreased with age. For example, respondents older than 65 were 72% less likely to be hesitant due to complacency than the younger cohort (See Annex II, Panel C.2, Col 9). This trend was likely influenced by the significant health risks posed by COVID-19 to older individuals.

The interactions between various age brackets and time reveal distinct patterns of vaccine hesitancy evolution as well (Annex II, Panel F). For instance, on average, the odds of overall vaccine hesitancy decrease

at a slower pace for people in age groups above 45 years old, compared to the youngest cohort (18–24). Similar to the descriptive analysis, on average, for respondents older than 65 the odds of being hesitant due to complacency decreased by 20% in each collection period, six percentage points faster than the younger cohort.

Socioeconomic status was associated with vaccine hesitancy

Figure 7. Measures of Vaccine Hesitancy by Level of Income



Note: The level of income was determined based on the weekly household median income within each postcode area. Source: ABS 2021 Census.

Figure 7 shows that respondents living in lower income postcodes had on average higher levels of vaccine hesitancy (12%) and higher variance, compared to respondents living in higher income postcodes (6%). The trend for all levels of income declined steadily from March 2021 to March 2022

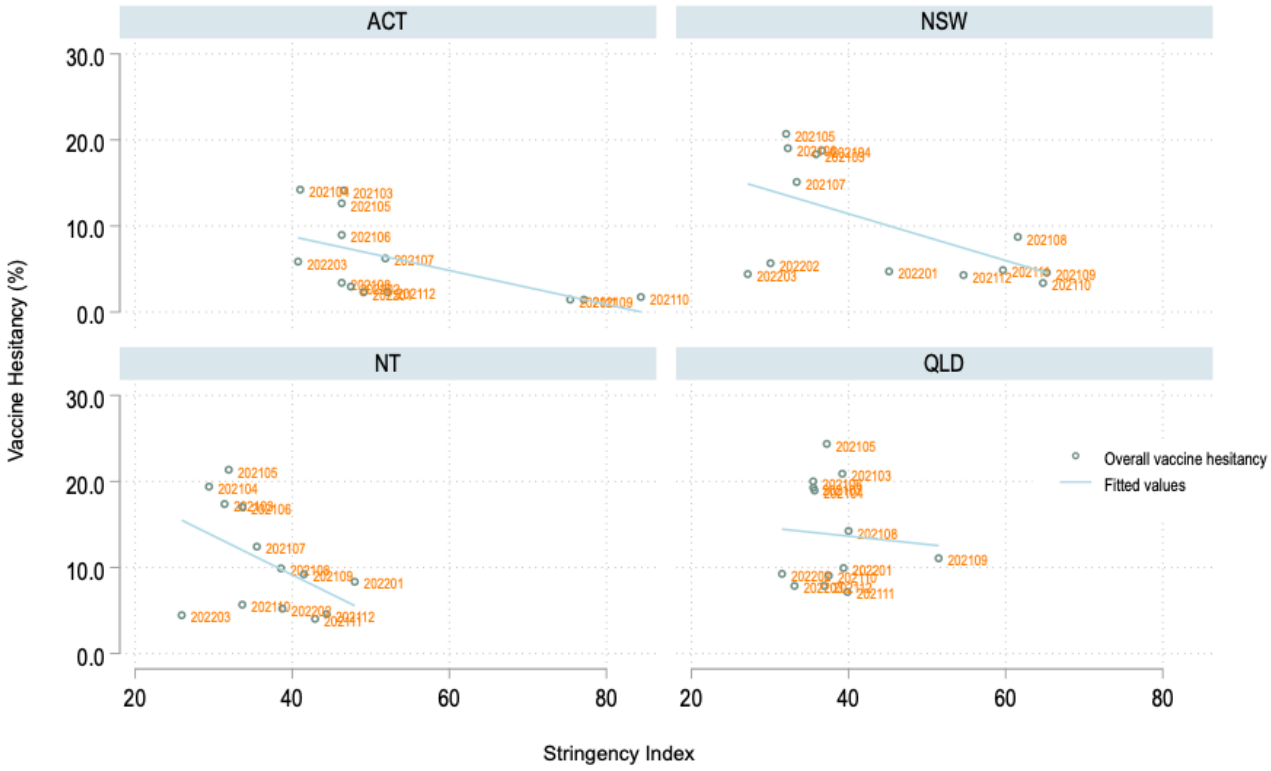
The multilevel analysis (Annex II, Panel C, Col 5) highlights significant disparities across income level groups. Respondents living in middle-low income postcodes were 22% less likely to be vaccine hesitant compared to respondents living in low-income postcodes. The odds decrease two-fold for middle-high income postcodes. Similarly, respondents living in high-income postcodes are 58% less likely to be vaccine hesitant than respondents in low-income postcodes. Hesitancy due to confidence, convenience and complacency follow a similar pattern. This pattern may be attributed to several factors, including better access to healthcare and reliable health information, higher levels of education, and higher levels of trust in health institutions, among other factors. Our analysis did not indicate any statistically significant differences in the temporal changes in

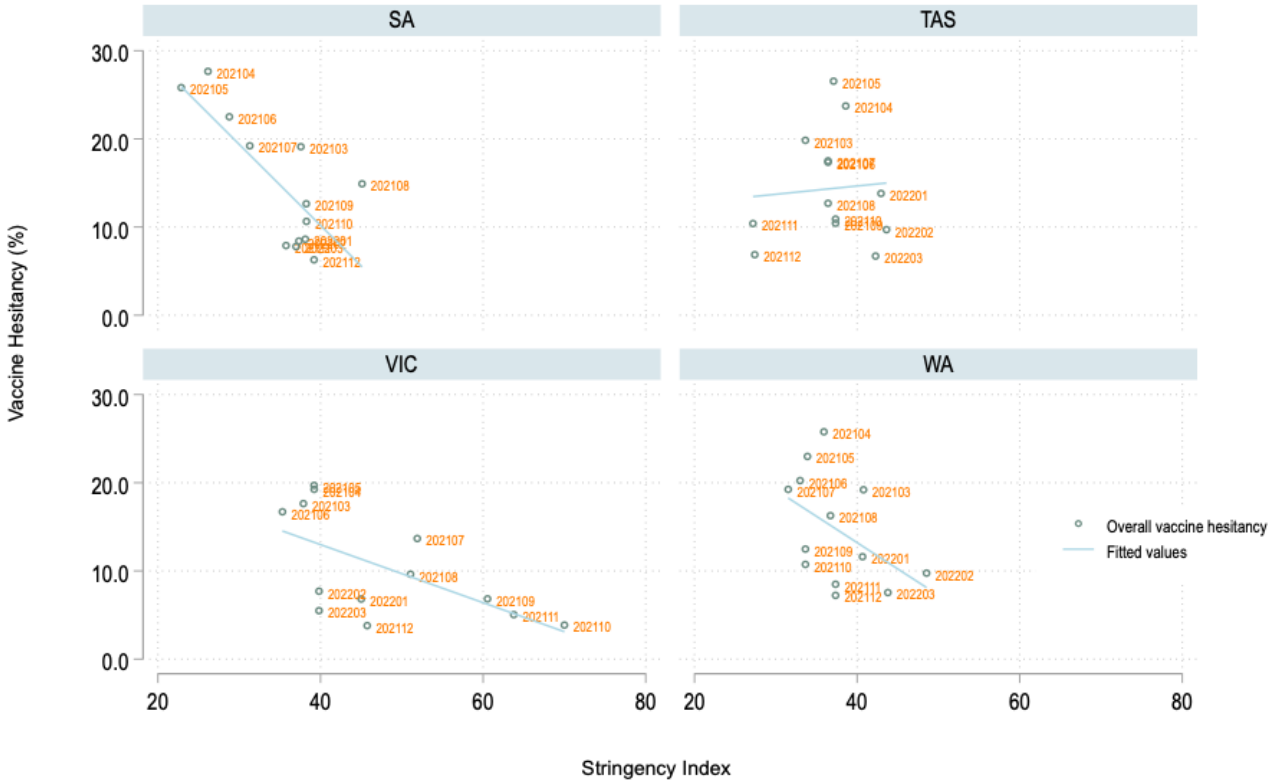
vaccine hesitancy across these groups (Annex II, Panel G). However, these results should be interpreted with caution as income level was not measured at the individual level.

States and territories with more stringent measures were associated with lower vaccine hesitancy

The data illustrated in Figure 8 showcases a negative correlation between overall vaccine hesitancy and the Stringency Index across states, with Tasmania as an exception. This trend persists across all measures of hesitancy (Annex IV), suggesting that in states with less stringent public health measures –likely reflecting a lower perceived threat from the pandemic– there were higher levels of vaccine hesitancy. Conversely, in states where public health measures were stricter, indicating possibly a more direct impact of the pandemic, vaccine hesitancy tended to be lower. This could also suggest that stricter measures, acting as a "stick" by imposing penalties or restrictions, may effectively motivate individuals towards vaccination by highlighting the seriousness of the pandemic and the importance of vaccination for a return to normalcy.

Figure 8: Relationship between Vaccine Hesitancy and Stringency Index





We incorporated the Stringency Index to the baseline model to assess how variations in state policies might be associated with changes in vaccine hesitancy (Annex II, Panel C, Col 4). The Stringency Index, reflecting the level of government policy strictness in response to the pandemic, was a significant predictor across all aspects of vaccine hesitancy explored. For overall vaccine hesitancy, each unit increase in the Stringency Index corresponds to a 1.6% reduction in the odds of being vaccine-hesitant, suggesting that stricter policies might be associated with hesitancy reduction. This effect is consistent but slightly varies in magnitude across the different hesitancy measurements.

For states with large changes in the Stringency Index, this is then associated with significant changes in the odds of being vaccine hesitant over time. For example, in Victoria the Stringency Index increased from 38 in March 2021 to 64 in November 2021. This 26-unit increase would be correlated with a 33% decrease in the odds of individuals being vaccine hesitant in Victoria. This analysis underscores the potential influence of governmental policy stringency on public health outcomes, particularly in the context of vaccine hesitancy, but as noted above, public sentiment could be shifting due to a higher perceived risk or due to penalties imposed by the restrictions. However, in our analysis we cannot disentangle the effect of perceived threat and the effect of stricter measures. Further research is needed to understand these relationships with vaccine hesitancy.

Conclusion

Through this descriptive and multilevel regression analysis, we've highlighted diverse patterns of vaccine hesitancy across demographic groups and geographic regions in Australia, spanning from March 2021 to March 2022. Utilising the '3Cs' framework – Confidence, Convenience, and Complacency – has allowed us to delve into the self-reported drivers of hesitancy, revealing that residence, gender, age, and socioeconomic status significantly influence vaccine attitudes. Notably, our findings confirm that stricter governmental

policies were correlated with reduced hesitancy, possibly due to increased perceived risk or because such measures incentivised vaccination.

Our analysis also shows that vaccine hesitancy's decline was not uniform; it varied in pace across demographic groups – for instance, as observed in gender-specific and age-group trends. It also varied across geographies, with some states like Queensland, South Australia, Tasmania, and Western Australia experiencing slower decreases. This variability underscores the importance of tailored public health interventions and highlights the crucial role of ongoing trend monitoring to optimise communication strategies and policy responses.

However, this analysis is subject to limitations including potential sampling and measurement biases. The analysis was also constrained by a restricted availability of relevant demographic variables. For example, we were not able to assess the relationships between cultural background or minority groups and hesitancy, or socioeconomic disparities or levels of trust, which are crucial to understand from a policy perspective.

Moreover, our analysis underscores several key areas where further research could significantly enrich our understanding of vaccine hesitancy and its broader implications. More research is needed on the nuanced definitions of vaccine hesitancy and its measurement and on the effects of government's stringency measures on vaccine hesitancy.

Finally, our quantitative analysis not only highlights the value of POD as a critical feedback mechanism during crises but also exposes the potential complexities involved in leveraging such data effectively. One challenge is ensuring the representativeness and appropriateness of the survey design while addressing evolving informational needs under time and resource constraints. Moreover, while the data provides essential insights into the 'what' and 'who' of vaccine hesitancy, our analysis underscores the need to delve deeper into the 'why' – a dimension not fully captured by quantitative measures alone. This gap illustrates that employing mixed methods is crucial, as it enriches our understanding of public sentiment, thereby facilitating the development of targeted and effective interventions tailored to meet specific community needs.

The forthcoming section will delve into the Pulse Survey's objectives, process, and impact, further exploring how the survey was designed and how it aimed to inform decision-making processes.

III. Design, Process and Impact of the Pulse Survey – A Qualitative Analysis

To understand the influence and impact of the Pulse Survey we delved into understanding its purpose and process. The survey's purpose defines its scope and ensures it addresses relevant issues, while its process, encompassing design and methodology, underpins the credibility and utility of the data. Together, these elements determine the survey's potential to influence and shape policy. This section presents the insights gathered through semi-structured interviews with key stakeholders involved in the process of implementing the Pulse Survey.

Methods

We conducted five semi-structured interviews with a purposive sample of public servants closely involved in the Pulse Survey's development, implementation, and the subsequent utilisation of its findings. The interviews were conducted remotely via Zoom from November 2023 to February 2024. Ethics approval was obtained from the Monash University Human Research Ethics Committee [ID: 30009] prior to data collection commencing. Interviews were recorded, and transcripts were analysed using thematic analysis to identify key themes that emerge from the data.

Our interview framework was structured to explore three critical dimensions (see Figure 9):

Purpose

- What problem(s) was the Pulse Survey designed to address?
- What knowledge gaps were intended to be filled by the Pulse Survey findings?

Process

- How were constructs selected for measurement in the Pulse Survey, and how did this change over time?
- How was data collected and analysed or processed into insights?
- How were insights from the Pulse Survey communicated, and to whom?

Impact

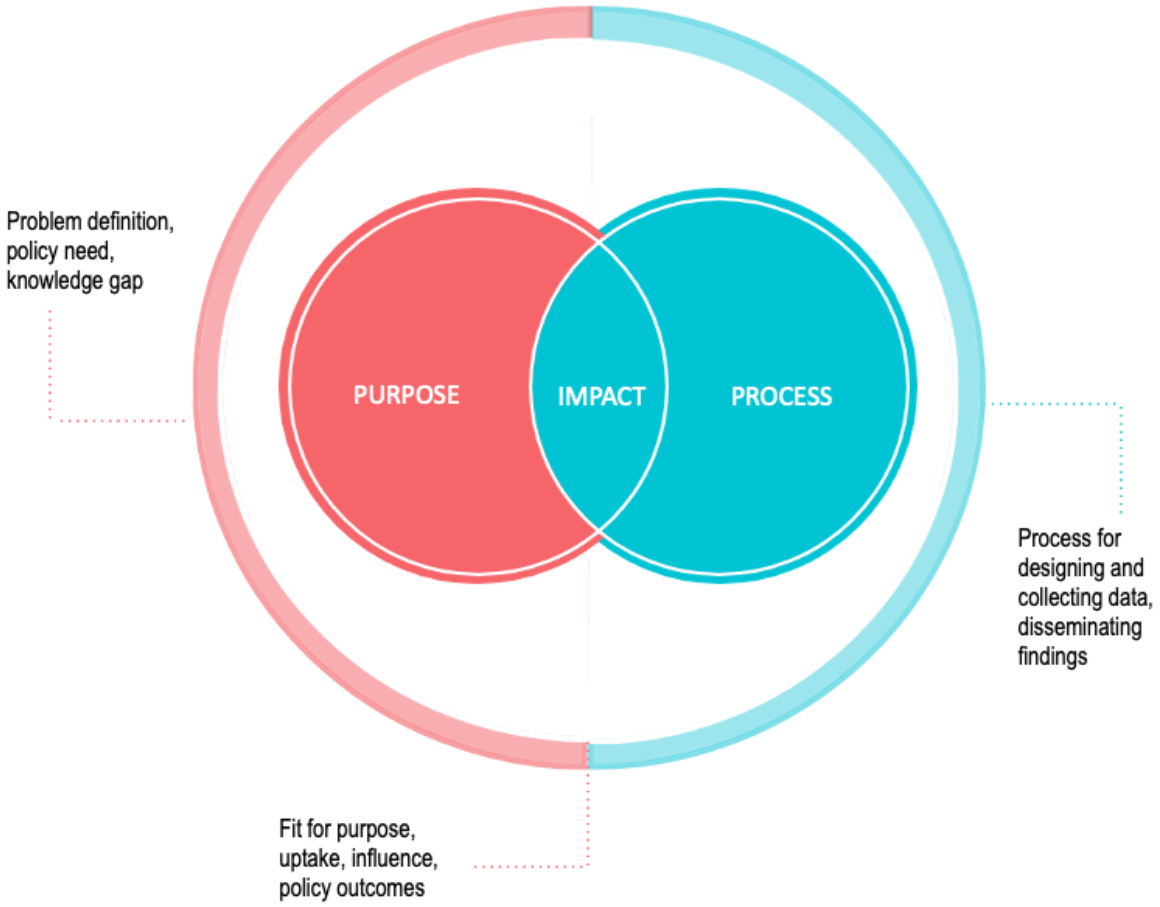
- Did the Pulse Survey address a problem that its users / stakeholders had?
- How was data or insights from the Pulse Survey used?
- What changes can be attributed to the Pulse Survey?

Tracing the journey of the Pulse Survey from collection to policy integration is essential for identifying shortcomings when impacts are not evident. By examining each phase – data gathering, analysis, dissemination, and application – we can pinpoint where things work or failures occur, such as in the rigour of methods or dissemination effectiveness. This thorough analysis helps reveal process gaps or misalignments with policy goals, enabling targeted improvements to enhance POD's effectiveness and impact.

One limitation of our analysis is the sample size. While it facilitates insights into the Pulse Survey's lifecycle, it became evident early on that garnering comprehensive insights across purpose, process, and impact necessitated engaging a larger and more diverse array of stakeholders, particularly to understand its impact. To gather a more comprehensive picture on how the Survey was utilised and how it influenced policymaking,

a more extensive identification of key stakeholders and decision-makers who engaged with the Pulse Survey would be required.

Figure 9: Interview Framework



Findings

Purpose

The inception of the Pulse Survey was marked by an urgent need to navigate an informational void about public experiences and attitudes during the COVID-19 pandemic. The Pulse Survey was markedly distinct from similar POD efforts in 'business as usual' contexts, which are typically predicated on well-defined policy queries or specific research objectives. Instead, the Pulse Survey was catalysed by a broader, anticipatory approach to information gathering. Aiming to respond to the unprecedented and unpredictable nature of the pandemic, it emerged from a need to gather a wide array of insights amidst the evolving crisis, operating without the compass of a singular policy aim guiding its creation.

> *"No one knew how this thing was going to evolve. I think that was probably one of the good things about the survey, is that we got started before we had a fully formed picture of what it was going to ask." (Interviewee no 1)*

Moreover, it became apparent that while larger Australian states were conducting their own POD projects, there was a lack of a cohesive, coordinated effort that could systematically benchmark and evaluate public attitudes across all states and territories over time. This gap highlighted the need for a national scope to capture and analyse public opinions consistently throughout the duration of the pandemic. A critical

information need was to understand public attitudes towards vaccination, which was crucial not only for shaping the vaccine rollout strategy but also for informing policies related to reopening and driving economic recovery efforts.

> *"There was a gap and [PM&C] didn't have to do this, but there was a desire to bring more evidence in whatever way to help shape thinking and decision making." (Interviewee no. 2)*

During the COVID-19 pandemic, the reliance on media outlets and independent pollsters for public opinion data raised concerns about the neutrality and objectivity of the information being disseminated. Interviewees noted a prevailing sense that much of the available data might be coloured by underlying political agendas or editorial biases, potentially skewing the representation of public sentiment. This concern underscored the critical need for a data collection initiative that could stand apart in its commitment to unbiased, rigorous analysis.

> *"I think a really clear differentiation was that it was intended to be really robust. It was designed to be robust and rigorous, so it could be used for a variety of different purposes." (Interviewee no. 1)*

Therefore, the foundational aim of the Pulse Survey was to establish a reliable, impartial platform for gauging public attitudes, thereby providing policymakers with unbiased insights. In doing so, by ensuring the credibility of the data collected, the survey designers sought to offer a solid ground upon which a wide array of decisions could be based, from public health strategies to economic recovery plans.

Process

The development of the Pulse Survey was a collaborative endeavour, engaging expertise from the Health Department and the Australian Bureau of Statistics (ABS) Methodology Division to ensure that the survey questions were not only relevant but also methodologically sound. Given the urgent context of the crisis, the development process was rapid and responsive, with the team prioritising immediate action over extensive literature research on the topics in question.

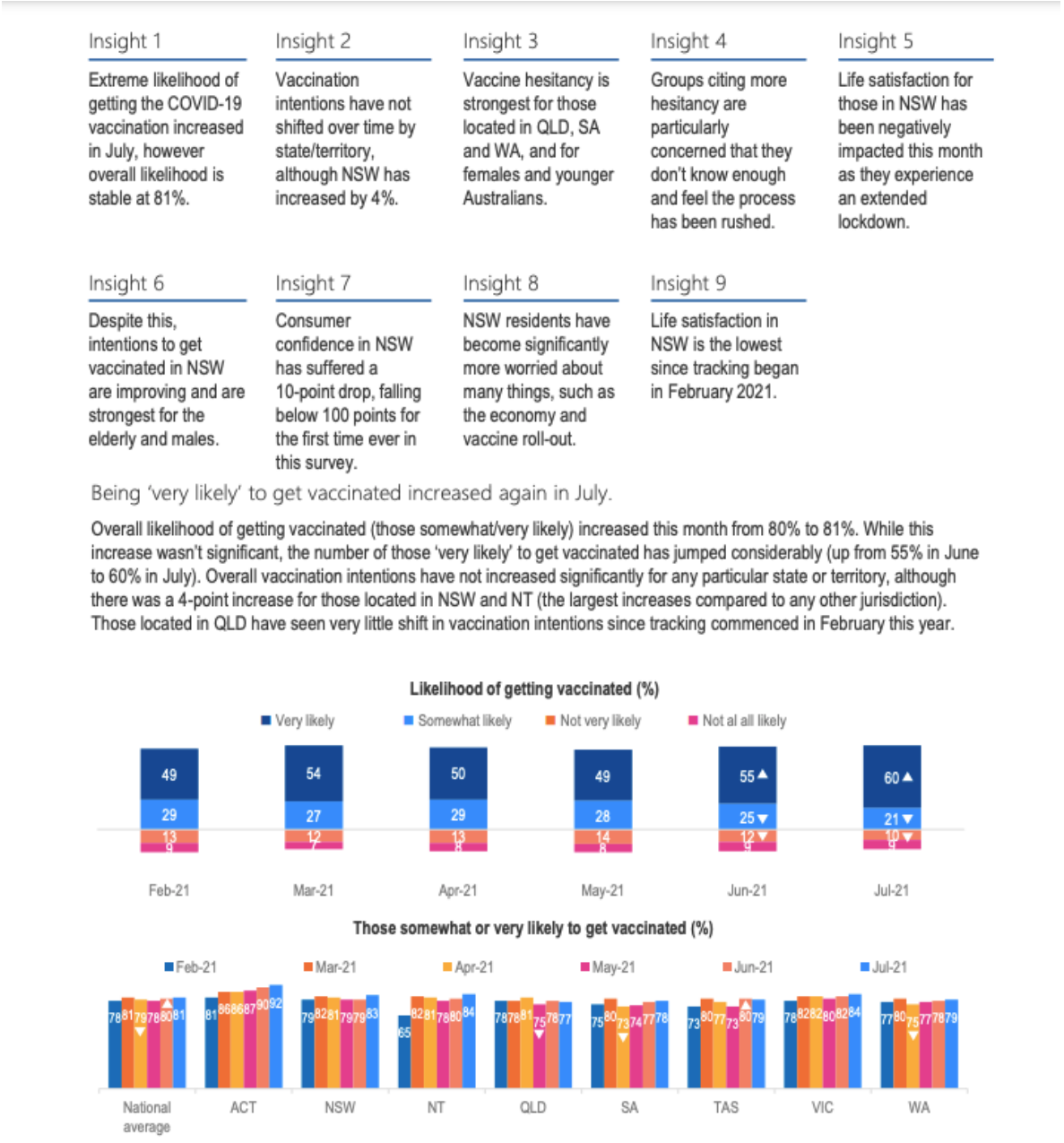
> *"It's that thing of being fast and flexible. There was less of a culture and also less time to sit down and read through a paper or a lot of different articles and try and figure out the best way forward. It was more, let's get something out there and get it moving." (Interviewee no.3)*

To refine the survey's focus and ensure its relevance across various stages of the pandemic, the team engaged in continuous stakeholder consultations, but also adopted a proactive approach to try to anticipate stakeholder needs based on media insights and other sources. This process allowed for the dynamic adjustment of survey content, maintaining a core set of baseline questions while incorporating or excluding items to reflect the changing information landscape and needs.

> *"We were anticipating something [stakeholders] might need or use and that was sort of the general guiding principle." (Interviewee no. 3)*

Moreover, a 'fail-fast' methodology was adopted, wherein the survey was rapidly deployed with the intention of iteratively addressing any issues in subsequent waves. This is reflected in the refinement of the survey instrument through time. Interviewees highlighted several benefits of this approach: it allowed for quick adaptability to changing circumstances, enabled timely adjustments to meet potential policymakers' needs, and provided early insights that could be refined in later iterations to improve the data's relevance and accuracy.

Figure 10: Snapshot of the Pulse Survey Report from July 2021



In disseminating the findings, the survey team first reached-out to a diverse array of stakeholders across state, territory and federal levels to gauge interest in the data that was being collected. Interested stakeholders and PM&C executives received a monthly brief. The briefs provided a summary of 5 to 10 key headline insights alongside visual representations such as bar charts depicting vaccination willingness trends over the preceding five months and a breakdown by state and territory. They also provided key insights on barriers and an in-depth analysis on a specific issue or jurisdiction (see Annex VI for an overview of the topics

reported). The analysis was conducted by the survey company under the direction of the PM&C team. The team decided to stop the data collection efforts upon observing that the data trends were stabilising and no further insights could be gained.

Although the survey was structured to facilitate a trend analysis, the dissemination of its findings primarily focused on month-to-month changes. This approach stemmed from an understanding that there was minimal demand for trend analysis among stakeholders, coupled with the practical consideration that conducting such an analysis would exceed the team's analytical capacity. Consequently, the reports emphasised discrete, monthly shifts without delving into the longitudinal trends that the survey's design potentially offered.

> *"People liked the big headline charts of vaccination and mostly they were more interested in what is a particular point I could look at, is it up or down this month? And less so over time. If you actually could sit aside and draw that out, I think people would've been interested, but it was never the highest priority I guess." (Interviewee no. 3)*

Impact

The process of rolling out the Pulse Survey highlighted a challenge in understanding its direct impact on policy decisions, primarily due to limited visibility on how decision-makers utilised the insights provided. During this series of interviews, we were unable to directly engage with the decision-makers themselves to delve into how the Pulse Survey insights informed policy responses. However, several interviewees played a pivotal role in conveying this information to the relevant decision-makers.

> *"Everyone loses visibility of what is then done with that information, and how do you actually measure impact and influence from things like survey and information when getting that information to all of the SES of PM&C… We obviously didn't see how the states and territories were using it, or the Department of Health. We just provided it to them." (Interviewer no. 1)*

From these, we have identified specific instances that indicated the survey's utility and relevance. For example, the survey filled an informational void that was particularly valuable in regions like the Northern Territory, which relied on less formal methods of gathering public sentiment. It provided context and benchmarking insights, empowering decision-makers with a clearer comprehension of the stances held by other jurisdictions, such as during national cabinet discussions.

> *"So we are very small and we don't have a lot of maturity and capability on things like sentiment testing and things like that. It's not often done in the Northern Territory by the Northern Territory Government. And so we had pretty limited availability of our own data about vaccine sentiment. So it was useful in that respect. We had a little bit of community by community data, but that was very sort of localised and anecdotally collected. So it wasn't something we could benchmark against other states and territories." (Interviewee no 4)*

Moreover, the survey team received requests from stakeholders for more data or the addition of survey items which suggests that those stakeholders were actively using the data.

On the other hand, insights from the interviews indicate that relevant policy responses were predominantly informed by other inputs such as real-time vaccination uptake data, the Doherty Modelling, and insights from field operators.

Furthermore, interviewees highlighted the potential of the Pulse Survey's data in shaping communication and targeting strategies, as well as aiding in the implementation of vaccine rollout plans. Yet, it was also noted that the Commonwealth's capacity to directly influence these strategies was moderated by its reliance on state-level decision-makers. This underscores a limitation: while the survey provided valuable insights, the Commonwealth's relative lack of direct implementation power meant that the utility of this data was inherently constrained at the federal level.

> *"There's inherent limitations to what you do with that data. The Commonwealth can't control some of the public health responses." (Interviewee no. 5)*

In exploring the challenges in leveraging the Pulse Survey data effectively, one interviewee highlighted the sheer volume of information generated. This suggests that the spread of topics collected and the way they were reported may have led to difficulties in digesting the key takeaways of the data.

> *"It felt like there was just so much information coming in. It was almost like there was too much data." (Interviewee no. 5)*

Another interviewee noted that despite the survey's effectiveness in delivering overarching benchmarking information across jurisdictions, it was less useful in providing detailed, representative, and localised insights. This was particularly relevant in the case of the Northern Territory, where the unique challenges posed by cultural diversity and the remoteness of the communities demanded more nuanced data collection efforts. The Pulse Survey had an inherent limitation in capturing these local perspectives in a representative way. Therefore, the Survey was less useful to inform interventions tailored to the specific needs of those communities.

Conclusion

Delving into the genesis and objectives of the survey, our first aim was to understand the precise policy needs it intended to address and the specific knowledge gaps it sought to fill. This was also crucial for understanding the strategic context in which the survey was conceived. From this exploration, The Pulse Survey was identified as a key initiative, aimed to bridge the critical information gap with evolving demands for trusted, consistent data sources. It aimed to offer a reliable and comparative analysis of public attitudes on an array of topics across various states and jurisdictions, without a specific policy focus or aim.

Insights gathered collectively shed light on the strengths and weaknesses of the Pulse Survey. They underscore the value of adopting a flexible, agile and pre-emptive approach to address the rapidly changing informational needs during a crisis. This informed a diversity of stakeholders at both the Commonwealth and the states and territories on the changing attitudes of the population on a diversity of topics. It also highlighted the need to coordinate data collection efforts that could easily provide a snapshot of what was happening throughout the country.

However, delving into the purpose and process of the Pulse Survey uncovered the intricacies of linking POD to decision-making in a crisis context. These insights emphasise the critical need to balance this adaptability with a purposeful approach to tackle evolving informational needs or policy problems to produce actionable insights. More interviews with other users are needed to form a more comprehensive picture of the influence and impact of the survey.

IV. Reflections for Further Discussion

This section reflects on the findings from the Pulse Survey and insights gathered from semi-structured interviews. Our aim is not to critique the survey's methodology or outcomes but to highlight its nuances and place it in context with other POD applications during the COVID-19 crisis, which will be further explored in subsequent research stages. These reflections are specifically intended to promote dialogue among policymakers and practitioners, focusing on how to effectively balance the delicate interplay between standard best practices and the adaptive strategies required in crisis contexts to better leverage POD.

Establishing robust feedback mechanisms

In crisis contexts, such as the COVID-19 pandemic, traditional, rigorous approaches to POD may conflict with the need for rapid decision-making. The Pulse Survey illustrates this tension. While business-as-usual (BAU) approaches emphasise meticulous design, problem definition, and consistency, the urgent demands of the COVID-19 pandemic required swift, adaptable strategies. According to the Cynefin framework, changes in decision-making style are necessary to respond effectively to different contexts (Snowden & Boone, 2007). For example, in simple contexts, responses are clear and straightforward, while complex contexts require allowance for experimentation. In contrast, chaotic contexts, such as the COVID-19 pandemic, demand immediate action to reestablish order.

In this context, the Pulse Survey's anticipatory and agile approach to information gathering and identification of intended users aligns with the best approach to decision-making in chaotic situations. Similarly, the SCRUB survey by Monash University's BehaviourWorks Australia emerged as a forward-looking strategy to understand behaviours and attitudes during the pandemic, with the key objective of providing policymakers with actionable insights. After two waves of data collection, the Victorian Government identified the SCRUB survey as a valuable tool for informing responses and partnered on the survey for a further four waves before commissioning subsequent rounds to focus on Victorians' public attitudes and behaviours.

However, our Pulse Survey interviews and data analysis suggest that these proactive measures did not sufficiently evolve to meet specific policy needs. While gathering broad data helped to understand the situation, it lacked the depth to significantly influence decisions, highlighting the need for more focused, actionable insights.

Moreover, the feedback mechanisms were inadequate, as evidenced by the design team's limited understanding of how insights were utilised. This disconnect suggests a need for clearer communication between decision-makers and survey designers to ensure data meets evolving needs. An interviewee suggested establishing regular communication with stakeholders to assess the utility of insights, although acknowledged the challenges posed by the demanding crisis environment. This reflection not only underscores the necessity of targeted data dissemination but also highlights the complex dynamics between the ideal practices for stakeholder engagement and the realities imposed by an emergency.

To enhance decision-making in dynamic crisis environments, it is crucial to establish structured yet flexible engagement mechanisms between decision-makers, survey designers, and data analysts. This should include developing effective communication channels that allow for rapid, real-time exchanges of insights and feedback.

Balancing methodical and agile approaches

Theoretical framework

To analyse the Pulse Survey data, we reviewed similar surveys to guide our methodology. Most published studies, mainly from academia, provided a theoretical framework that underpins survey design and analysis. However, our comparison revealed only partial alignment with these frameworks. For example, in the context of Sage's 3C's model, the survey emphasised confidence-related barriers but inadequately addressed complacency and convenience. Similarly, according to the Theory of Planned Behaviour, the focus was primarily on attitudes rather than on subjective norms and perceived behavioural control. This imbalance, due to a shortage of questions capturing these dimensions or inconsistent inclusion across survey waves, limited the Pulse Survey's usefulness for analysis.

Implementing a consistent theoretical framework could have standardised the analysis and reporting of findings. As detailed in Annex VI, the variability of reporting scope likely reflected shifting priorities, which led to a trade-off: the breadth of topics in each wave may have diluted the report's focus, complicating the drawing of concise, actionable conclusions. This issue was highlighted by an interviewee who noted the importance of focusing on 'the key bits of data we really need,' to aid decision-makers.

Overall, the lack of a solid theoretical underpinning in a POD survey can significantly hinder not only its data collection and interpretation, but also its credibility. Without a clear theoretical basis, the survey design may lack direction, and questions may fail to capture relevant information or provide actionable insights. Addressing this balance between methodical and agile approaches is crucial for ensuring the credibility and utility of the data in informing policy decisions.

Credibility and soundness: Critical conditions for using POD in decision-making

The Pulse Survey was perceived by stakeholders as a rigorous and credible initiative. Its emphasis on providing a reliable source of data underscores the importance of confidence in the accuracy of public opinion data for informing policy development. This need for reliability and credibility is similar to requirements within the intelligence community, where the foundational reliance on POD is predicated on both its credibility and methodological robustness (NASEM, 2022). Credibility is driven by factors such as the clarity of the survey's purpose, the contextual background, transparency regarding sponsorship, the qualifications of the research team, and the reputation of the survey firm. Methodological soundness includes thorough quality assessments addressing sampling, coverage, response rates, measurement errors, and openly acknowledging any inherent limitations of the sampling methodologies.

Considering the Pulse Survey's reliance on an online panel for data collection, a notable limitation is the potential for selection bias. This bias may arise because individuals with internet access and the willingness to participate in online surveys might not fully represent the diversity of opinions and experiences related to vaccine hesitancy across the entire population. For instance, the Pulse Survey reports did not disclose the non-probabilistic nature of the sample, its implications in interpreting the data, or its limitations.

However, data collected from an online panel does not invalidate the insights gained from the Pulse Survey. Moreover, in a crisis context, it is one of the fastest mechanisms to collect data. Nonetheless, it highlights the importance of interpreting insights with caution. It suggests that while the survey provides valuable data

on public attitudes, the findings should be considered as one of several sources of information, ideally complemented by data from other methodologies or available evidence that can help mitigate the limitations of online panels.

Adequate sampling strategies for crisis contexts, or when probabilistic or representative samples are not feasible, merit further discussion. For instance, based on the problem definition, reviewing available evidence beforehand can help pinpoint which variables or groups are most relevant. In chaotic contexts, where the problem is undefined or uncertain, exploratory and adaptive approaches to sampling may be necessary. Such strategic considerations are crucial for ensuring that the data collected not only aligns with the evolving context, but also provides a solid foundation for actionable insights in dynamic and challenging environments.

Fostering collaboration and partnerships for effective problem solving

As reflections from the pandemic response emerge regarding the uptake of evidence for decision-making, the importance of enhanced collaboration between expert researchers and policymakers has come to the fore. Specifically, fostering a joint effort from the outset – for instance, through the co-creation of comprehensive research questions – could not only enhance the credibility and methodological rigour of the collected data but also ensure a tighter integration of empirical evidence and theoretical frameworks with the government's specific informational needs, thereby bridging any existing gaps more effectively.

An illustration of such collaboration is seen in the development and implementation of Victoria's SCRUB survey. This partnership, while fruitful, introduced its own set of challenges, particularly in the form of negotiations between government officials and researchers over the inclusion or exclusion of specific survey items. These discussions were crucial for aligning the survey's content with governmental priorities, rigorous methodological approaches and research objectives, showcasing the complex dynamics of integrating academic research within governmental decision-making processes.

Establishing trusted relationships in a crisis context presents challenges due to time constraints and the inherent pressure to act quickly. Lessons learned from practitioners during the COVID-19 pandemic underscore the importance of establishing mechanisms and networks during business-as-usual (BAU) periods.[3] This necessitates a shift in institutional culture to ensure that these resources are readily available when a crisis occurs, thereby facilitating more effective response efforts.

Understanding uptake, influence and impact of POD

Moreover, our research highlights the nuances of establishing a clear connection between POD and policy outcomes, suggesting that the link is not straightforward. To understand the pathways through which POD influences decision-making processes, we propose developing a framework based on the issues identified in our research and the critical conditions necessary for effectively integrating evidence into policy. This framework could provide a structured approach to assessing the impact of POD on policy and decision-making outcomes and define best practices for both BAU and crisis contexts.

[3] See for example the discussion held in the panel "Use of Evidence in Crisis and Fast Paced Policy Environment." The recording is available at: https://www.youtube.com/watch?v=fzgdf73Pv8g

Fit for purpose – Ensuring the data and its analysis directly tackles the policy problem or information gap, underpinned by evidence-based design and clear objectives.

Conditions:

- Clarity of objectives
- Design process and collaborations
- Credibility and soundness

Outputs:

- Actionable insights

Uptake – Assessing whether the information reaches and is comprehensible to the intended audience, and its use in critical discussions.

Conditions:

- Identified target audience/main users
- Engagement with main users
- Quality of knowledge translation and brokerage
- Engagement – Iterative approach/established feedback loops

Outcomes:

- Extent to which POD was mentioned in relevant discussions (depth and frequency and types of engagement (e.g. cabinet meetings, etc.)

Influence – Assessing to what extent POD informs decisions, complements other evidence inputs.

Conditions:

- Fit for Purpose
- Uptake
- Decision-makers' heuristics and belief system
- Policy context

Outcomes:

- Extent to which insights informed decisions
- Extent to which insights were revisited to understand feedback loops between policy and public opinion

Impact – Policies or strategies that somehow were shaped by POD

Conditions:

- Fit for Purpose
- Uptake
- Influence
- Decision-makers' heuristics and belief system
- Policy context

Outcomes:

- Communication and implementation strategies
- Policy decisions aligned with public sentiment
- New policies/programs or changes in policy settings/programs

References

Australian Bureau of Statistics (2022). 2021 Census General Community Profile for Postal Areas, accessed 1st February 2024.

Biddle, N., Edwards, B., Gray, M., & Sollis, K. (2021). Change in vaccine willingness in Australia: August 2020 to January 2021 [Preprint]. *Public and Global Health*. https://doi.org/10.1101/2021.02.17.21251957

Burstein, P. (2003). The Impact of Public Opinion on Public Policy: A Review and an Agenda. *Political Research Quarterly*, 56(1), 29–40. https://doi.org/10.2307/3219881

Bragge, P., Kellner, P.,Tsering, D. & Delafosse, V. (2024). Use of Public Opinion Data to Inform COVID-19 Policymaking: *ANZSOG Research Insights No. 31.*

Carle, A. C. (2009). Fitting multilevel models in complex survey data with design weights: Recommendations. *BMC Medical Research Methodology,* 9, 49.

Kafadar, A. H., Tekeli, G. G., Jones, K. A., Stephan, B., & Dening, T. (2022). Determinants for COVID-19 vaccine hesitancy in the general population: A systematic review of reviews. *Zeitschrift Fur Gesundheitswissenschaften,* 1–17. https://doi.org/10.1007/s10389-022-01753-9

Liu, R., & Li, G. M. (2021). Hesitancy in the time of coronavirus: Temporal, spatial, and sociodemographic variations in COVID-19 vaccine hesitancy. *SSM - Population Health*, 15, 100896. https://doi.org/10.1016/j.ssmph.2021.100896

MacDonald, N. E., & SAGE Working Group on Vaccine Hesitancy. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, 33(34), 4161–4164.

National Academies of Sciences, Engineering, and Medicine. (2022). *Applications of an Analytic Framework on Using Public Opinion Data for Solving Intelligence Problems: Proceedings of a Workshop*. Washington, DC: The National Academies Press.

Nguyen, L.H., Joshi, A.D., Drew, D.A. et al. (2022) Self-reported COVID-19 vaccine hesitancy and uptake among participants from different racial and ethnic groups in the United States and United Kingdom. *Nat Commun* 13, 636. https://doi.org/10.1038/s41467-022-28200-3

Shergold, P., Broadbent, J., Marshall, I., & Varghese, P. (2022). *Fault Lines: An independent review into Australia's response to COVID-19*. Retrieved from https://assets.website-files.com/62b998c0c9af9f65bba26051/6350438b7df8c77439846e97_FAULT-LINES-1.pdf

Snowden, D. J., & Boone, M. E. (2007). A leader's framework for decision making. *Harvard Business Review,* 85(11), 68.

APPENDIX I. Survey items captured across waves

1 – Item included in wave
0 – Item not included in wave

Survey Item	Mar 21	Apr21	May 21	Jun21	Jul21	Aug21	Sep21	Oct21	Nov21	Dec21	Jan22	Feb 22	Mar 22	No. waves measured
D2. Age	1	1	1	1	1	1	1	1	1	1	1	1	1	13
D2x. Age range	1	1	1	1	1	1	1	1	1	1	1	1	1	13
D3. Gender	1	1	1	1	1	1	1	1	1	1	1	1	1	13
D4. State or territory	1	1	1	1	1	1	1	1	1	1	1	1	1	13
D5. Live in metro area	1	1	1	1	1	1	1	1	1	1	1	1	1	13
D6. Employment status	1	1	1	1	1	1	1	1	1	1	1	1	1	13
D7. Industry currently or normally work in	1	1	1	1	1	1	1	1	1	1	1	1	1	13
D8. In which country were you born?	0	1	0	0	0	0	0	0	0	0	0	0	0	1
D9. You indicated you were born outside Australia. In what year did you first move to Australia?	0	1	0	0	0	0	0	0	0	0	0	0	0	1
D9. You indicated you were born outside Australia. In what year did you first move to Australia?	0	1	0	0	0	0	0	0	0	0	0	0	0	1
D10. Language mainly speak at home	0	1	0	0	1	1	1	1	1	1	1	1	1	10
D11. Which religion to do you belong to or most closely identify with?	0	1	0	0	0	0	0	0	0	0	0	0	0	1
D12. Language mainly speak at home	0	0	1	1	0	0	0	0	0	0	0	0	0	2
D13. Country of birth	0	0	1	1	1	1	1	1	1	1	1	1	1	11
D13b. Year moved to Australia	0	0	0	0	1	1	1	1	1	1	1	1	1	9
D14. Postcode	0	0	0	0	1	1	1	1	1	1	1	1	1	9
D15. ATSI - No	0	0	0	0	1	1	1	1	1	1	1	1	1	9
D15. ATSI - Yes, Aboriginal	0	0	0	0	1	1	1	1	1	1	1	1	1	9
D15. ATSI - Yes, Torres Strait Islander	0	0	0	0	1	1	1	1	1	1	1	1	1	9
D15. ATSI - Prefer not to say	0	0	0	0	1	1	1	1	1	1	1	1	1	9
D16. Parent of child under 18	0	0	0	0	0	0	1	1	1	1	1	1	1	7
D16a. Age groups of children - 0-4	0	0	0	0	0	0	0	0	0	0	1	1	1	3
D16a. Age groups of children - 5-11	0	0	0	0	0	0	0	0	0	0	1	1	1	3
D16a. Age groups of children - 12-15	0	0	0	0	0	0	0	0	0	0	1	1	1	3
D16a. Age groups of children - 16-17	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q1. likelihood to get the COVID-19 vaccination when it is available	1	1	1	1	1	1	1	1	1	1	0	0	0	10

Q2. When will choose to be vaccinated	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Q3. Would encourage to be vaccinated against COVID-19 - If there was community transmission of COVID-19 in my local area	1	1	1	1	0	0	0	0	0	0	0	0	0	4
Q3. Would encourage to be vaccinated against COVID-19 - If vaccination helped us to get back to normal life more quickly	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If vaccination helped Australia's economy recover	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If it was easy to get the vaccine (e.g. available out-of-hours or in pharmacies, easy to book, no long queues)	1	1	1	1	0	0	0	0	0	0	0	0	0	4
Q3. Would encourage to be vaccinated against COVID-19 - If I felt confident that it was safe for me to get the vaccine	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If large numbers of people around the world had been safely vaccinated against COVID-19	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If large numbers of Australians had been safely vaccinated against COVID-19	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If COVID-19 vaccines were shown to be reducing the number of people getting severe symptoms or dying	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If many of my family or social circle had been vaccinated for COVID-19	1	1	1	1	0	0	0	0	0	0	0	0	0	4
Q3. Would encourage to be vaccinated against COVID-19 - If my workplace or employer gave me time off to get	1	1	1	1	0	0	0	0	0	0	0	0	0	4

vaccinated (and recover if I had side effects)														
Q3. Would encourage to be vaccinated against COVID-19 - If it gave me more freedom to travel within Australia	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If a COVID-19 vaccine was required for overseas travel	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If it meant I didn't have to quarantine on arrival or return when travelling interstate or overseas	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If I was required to interact more in person with the public, vulnerable or immuno-compromised people	1	1	1	1	0	0	0	0	0	0	0	0	0	4
Q3. Would encourage to be vaccinated against COVID-19 - If it meant I didn't have to self-isolate if there was a local outbreak of COVID-19	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - If there were changes to my health that made me more at risk from COVID-19	1	1	1	1	0	0	0	0	0	0	0	0	0	4
Q3. Would encourage to be vaccinated against COVID-19 - If it was recommended for me by a GP or other health professional	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q3. Would encourage to be vaccinated against COVID-19 - If it was required for my employment/job/work	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q3. Would encourage to be vaccinated against COVID-19 - If my friends and/or family said I should	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q3. Would encourage to be vaccinated against COVID-19 - Other (please specify)	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q3. Would encourage to be vaccinated against COVID-19 - None	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q4. Concerns have about the COVID-19 vaccination	1	1	1	1	1	1	1	1	1	1	0	0	0	10

- I believe the vaccine could be unsafe														
Q4. Concerns have about the COVID-19 vaccination - I feel there is inadequate testing or research	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q4. Concerns have about the COVID-19 vaccination - Unsure of short-term side effects in the days just following vaccination	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q4. Concerns have about the COVID-19 vaccination - Unsure of long-term side effects	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q4. Concerns have about the COVID-19 vaccination - Process feels rushed	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q4. Concerns have about the COVID-19 vaccination - I have concerns about all vaccinations	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q4. Concerns have about the COVID-19 vaccination - Don't know enough about it yet	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q4. Concerns have about the COVID-19 vaccination - I am allergic or have had reactions from vaccines	1	1	1	1	0	0	0	0	0	0	0	0	0	4
Q4. Concerns have about the COVID-19 vaccination - I feel the risk or threat from COVID-19 is low	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q4. Concerns have about the COVID-19 vaccination - I don't feel the need to get the vaccine	1	1	1	1	0	0	0	0	0	0	0	0	0	4
Q4. Concerns have about the COVID-19 vaccination - I would want to wait until others have had it first	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q4. Concerns have about the COVID-19 vaccination - I believe a vaccine won't be effective for this virus	1	1	1	1	0	0	0	0	0	0	0	0	0	4
Q4. Concerns have about the COVID-19 vaccination - I have concerns around needles or medical treatments in general	1	1	1	1	0	0	0	0	0	0	0	0	0	4
Q4. Concerns have about the COVID-19 vaccination - I have concerns about the vaccine rollout in Australia (e.g. supply availability, the amount of time it's taking)	0	1	1	1	1	1	1	1	1	1	0	0	0	9
Q4. Concerns have about the COVID-19 vaccination - Other (please specify)	1	1	1	1	1	1	1	1	1	1	0	0	0	10

Q4. Concerns have about the COVID-19 vaccination - None	1	1	1	1	1	1	1	1	1	1	0	0	0	10
Q5. Overall satisfication with life as a whole these days	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q5a. Reason for satisfaction with life	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Your standard of living and your financial situation : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Your physical health : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Your mental health : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Your ability to achieve what you want in life : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Your personal relationships : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Your personal safety : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. The economy : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Australia's healthcare systems being able to cope with COVID-19 impacts : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Your current employment situation : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Getting access to the support services you need : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. 'Sourcing and buying essential items (e.g. groceries, water, fuel, medications)' : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Going into mandatory lockdown as a result of COVID-19 : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. International instability and uncertainty : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. 'Natural disasters, such as bushfires, floods and hailstorms' : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Increasing community transmission of COVID-19 in Australia : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. The long term economic impacts of COVID-19 : Level of worry	1	1	1	1	1	1	1	1	1	0	0	0	0	9
Q6. Please confirm you're reading the questions correctly by selecting "Extremely worried" : Level of worry	1	0	0	0	0	0	0	0	0	0	0	0	0	1

Q6. Delays to the rollout of the COVID-19 vaccination in Australia : Level of worry	0	1	1	1	1	1	1	1	1	0	0	0	0	8
Q6. The long-term health impacts of catching COVID-19 : Level of worry	0	0	1	1	1	1	1	1	1	0	0	0	0	7
Q7. Financial situation compared to last year	1	1	1	1	1	1	0	0	0	0	0	0	0	6
Q8. Expected financial situation next year	1	1	1	1	1	1	0	0	0	0	0	0	0	6
Q9. Australian economic conditions in next 12 months	1	1	1	1	1	1	0	0	0	0	0	0	0	6
Q10. Australian economic conditions in next 5 years	1	1	1	1	1	1	0	0	0	0	0	0	0	6
Q11. Opinion on currently buying major household items	1	1	1	1	1	1	0	0	0	0	0	0	0	6
Q12. Where get information about the COVID-19 vaccine - From Australian media sources	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q12. Where get information about the COVID-19 vaccine - From your country of birth or home language media sources	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q12. Where get information about the COVID-19 vaccine - From other international media sources	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q12. Where get information about the COVID-19 vaccine - Not applicable â€“ have not come across any information	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q12. Where get information about the COVID-19 vaccine - Don't know	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13A. Television : How frequently used mainstream media source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13A. Radio : How frequently used mainstream media source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13A. Online : How frequently used mainstream media source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13A. Printed Newspaper : How frequently used mainstream media source	0	0	1	1	0	0	0	0	0	0	0	0	0	2

for COVID-19 vaccination in past fortnight														
Q13B. 'Government sources (e.g. Department of Health website, spokespeople)' : How frequently used source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13B. 'Online sources â€“ excluding mainstream media sources (e.g. blogs, podcasts, YouTube)' : How frequently used source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13B. Social media : How frequently used source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13B. Friends and family : How frequently used source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13B. Doctors or other health care providers : How frequently used source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13B. Workplace (colleagues or employer) : How frequently used source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13B. Religious / community groups : How frequently used source for COVID-19 vaccination in past fortnight	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q13B. Online Government eligibility checker/booking system for the COVID-19 vaccine : How frequently used source for COVID-19 vaccination in past fortnight	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Q14. Ease of getting COVID-19 when available	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Q14a. Ease of booking COVID-19 when available	0	0	0	0	1	1	1	1	1	1	0	0	0	6
Q14b. Ease of physically getting COVID-19 vaccine	0	0	0	0	1	1	1	1	1	1	0	0	0	6
Q15. Had COVID-19 vaccine	0	0	0	1	1	1	1	1	1	1	1	1	1	10
Q16. Made a booking for first/next COVID-19 vaccine	0	0	0	1	1	1	1	1	1	1	0	0	0	7
Q17. Important sources of information on COVID-19 - Television	0	0	0	0	0	0	1	1	1	0	0	0	0	3

Q17. Important sources of information on COVID-19 - Radio	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Newspaper (including online newspapers)	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Online sources â€“ non-mainstream media (e.g. blogs, podcasts, YouTube)	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Social media (e.g. Facebook, Instagram, Twitter)	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Government sources (e.g. Department of Health website, spokespeople)	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Friends and family	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Doctors or other health care providers	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Workplace (colleagues or employer)	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Religious / community groups	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Online Government eligibility checker/booking system for the COVID-19 vaccine	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Not applicable â€“ have not come across any information	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q17. Important sources of information on COVID-19 - Don't know	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q18. Activities looking forward to resuming once restrictions eased - Going out to eat or to have a drink	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q18. Activities looking forward to resuming once restrictions eased -	0	0	0	0	0	0	1	1	1	0	0	0	0	3

Attending sporting, music, cultural or other events														
Q18. Activities looking forward to resuming once restrictions eased - Attending group facilities (e.g. gym, church)	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q18. Activities looking forward to resuming once restrictions eased - School or other educational institutions	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q18. Activities looking forward to resuming once restrictions eased - Retail shopping	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q18. Activities looking forward to resuming once restrictions eased - Travel	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q18. Activities looking forward to resuming once restrictions eased - Outdoor activities (e.g. picnic, hiking, playing sport)	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q18. Activities looking forward to resuming once restrictions eased - Attending celebrations and events with family and friends (e.g. weddings, parties)	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q18. Activities looking forward to resuming once restrictions eased - Other (please specify)	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q18. Activities looking forward to resuming once restrictions eased - Nothing</ span>	0	0	0	0	0	0	1	1	1	0	0	0	0	3
Q19a1. Likelihood to get children aged 5-11 vaccinated	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19a2. Likelihood to get children aged 12-15 vaccinated	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19a. Likelihood to get child vaccinated	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - The advice of health authorities	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - Advice from my, or my child's, GP	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - Information	0	0	0	0	0	0	0	0	0	0	1	1	1	3

and evidence that the vaccine is safe for a child of that age														
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - Previous reaction to other vaccines (including fear of needles)	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - I do not intend to let my child get the COVID-19 vaccine	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - My child (or children) has never had any kind of vaccine	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - If it was required for my child to access venues/events	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - If it was required for my child to travel overseas	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - If it was required for my child to travel within Australia	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - If it was required for my child to access school/childcare	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - Other (please specify)	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b1. Influence the likelihood of getting your child/children aged 5-11 vaccinated - None of the above	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - The advice of health authorities	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15	0	0	0	0	0	0	0	0	0	0	1	1	1	3

vaccinated - Advice from my, or my child's, GP														
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - Information and evidence that the vaccine is safe for a child of that age	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - Previous reaction to other vaccines (including fear of needles)	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - I do not intend to let my child get the COVID-19 vaccine	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - My child (or children) has never had any kind of vaccine	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - If it was required for my child to access venues/events	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - If it was required for my child to travel overseas	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - If it was required for my child to travel within Australia	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - If it was required for my child to access school/childcare	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - Other (please specify)	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Q19b2. Influence the likelihood of getting your child/children aged 12-15 vaccinated - None of the above	0	0	0	0	0	0	0	0	0	0	1	1	1	3

Q19b. Influence the likelihood of getting your child/children vaccinated - The advice of health authorities	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q19b. Influence the likelihood of getting your child/children vaccinated - Advice from my, or my child's, GP	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q19b. Influence the likelihood of getting your child/children vaccinated - Information and evidence that the vaccine is safe for a child of that age	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q19b. Influence the likelihood of getting your child/children vaccinated - Previous reaction to other vaccines (including fear of needles)	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q19b. Influence the likelihood of getting your child/children vaccinated - I do not intend to let my child get the COVID-19 vaccine	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q19b. Influence the likelihood of getting your child/children vaccinated - My child (or children) has never been vaccinated	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q19b. Influence the likelihood of getting your child/children vaccinated - Other (please specify)	0	0	0	0	0	0	1	1	1	1	0	0	0	4
Q19b. Influence the likelihood of getting your child/children vaccinated - None of the above	0	0	0	0	0	0	0	1	1	1	0	0	0	3
Q20. Aspects of life under restrictions would like to see continue - Working or studying from home	0	0	0	0	0	0	1	1	1	1	1	1	1	7
Q20. Aspects of life under restrictions would like to see continue - Spending more time on hobbies (e.g. cooking, gardening)	0	0	0	0	0	0	1	1	1	1	1	1	1	7
Q20. Aspects of life under restrictions would like to see continue - Slower pace of life	0	0	0	0	0	0	1	1	1	1	1	1	1	7
Q20. Aspects of life under restrictions would like to see continue - Spending less / saving more	0	0	0	0	0	0	1	1	1	1	1	1	1	7
Q20. Aspects of life under restrictions would like to see continue - Stronger sense of community	0	0	0	0	0	0	1	1	1	1	1	1	1	7

Q20. Aspects of life under restrictions would like to see continue - Spending more time with family and friends	0	0	0	0	0	0	1	1	1	1	1	1	1	7
Q20. Aspects of life under restrictions would like to see continue - Connecting with friends and family online	0	0	0	0	0	0	1	1	1	1	1	1	1	7
Q20. Aspects of life under restrictions would like to see continue - Spending more time outdoors	0	0	0	0	0	0	1	1	1	1	1	1	1	7
Q20. Aspects of life under restrictions would like to see continue - Taking more domestic holidays	0	0	0	0	0	0	1	1	1	1	1	1	1	7
Q20. Aspects of life under restrictions would like to see continue - Other (please specify)	0	0	0	0	0	0	1	1	1	1	1	1	1	7
Q20. Aspects of life under restrictions would like to see continue - None of the above	0	0	0	0	0	0	1	1	1	1	1	1	1	7
How likely are you to get a booster vaccination or COVID-19, once you are eligible (i.e., six months after your second dose)?	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. Influence likelihood of getting a booster vaccination - If it was recommended for me by a GP or other health professional	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. Influence likelihood of getting a booster vaccination - If it was recommended by the government (e.g. the Department of Health)	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. Influence likelihood of getting a booster vaccination - If the vaccines have been in use for a long time with no serious side-effects	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. What will influence the likelihood of you getting a booster vaccination (third dose) for COVID-19? - If booster vaccinations are used in other countries	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Q21b. What will influence the likelihood of you getting a booster vaccination (third dose) for COVID-19? - The risk of getting infected with	0	0	0	0	0	0	0	0	1	0	0	0	0	1

COVID-19 at the time when the booster vaccination is recommended														
Q21b. Influence likelihood of getting a booster vaccination - If it was convenient (e.g. available out-of-hours, or in pharmacies)	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. What will influence the likelihood of you getting a booster vaccination (third dose) for COVID-19? - If the booster vaccination was free of charge	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Q21b. Influence likelihood of getting a booster vaccination - If it was required for my employment/job/work	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. Influence likelihood of getting a booster vaccination - If it was required for overseas travel	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. Influence likelihood of getting a booster vaccination - If it gave me more freedom to travel within Australia	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. Influence likelihood of getting a booster vaccination - If a high uptake would ease/lift restrictions on being around people (e.g. shopping, going out to events, gathering at home)	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. Influence likelihood of getting a booster vaccination - To maintain my protection against COVID-19	0	0	0	0	0	0	0	0	0	1	1	0	0	2
Q21b. Influence likelihood of getting a booster vaccination - To increase my protection against COVID-19	0	0	0	0	0	0	0	0	0	1	1	0	0	2
Q21b. Influence likelihood of getting a booster vaccination - To maintain/increase protection before an interstate or international trip	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q21b. Influence likelihood of getting a booster vaccination - I did not experience negative side	0	0	0	0	0	0	0	0	0	1	1	1	1	4

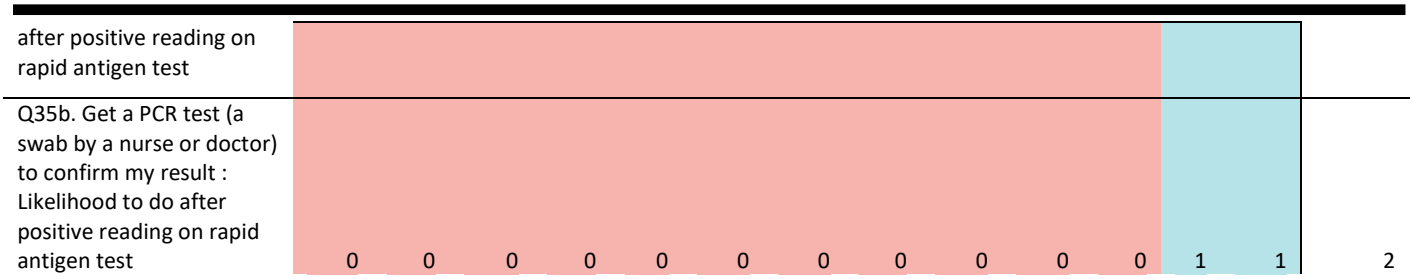
effects from my primary doses														
Q21b. Influence likelihood of getting a booster vaccination - If large numbers of people around the world have been safely vaccinated with the booster	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q21b. Influence likelihood of getting a booster vaccination - To maintain/increase my protection against COVID-19	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q21b. Influence likelihood of getting a booster vaccination - Other (please specify)	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q21b. Influence likelihood of getting a booster vaccination - Nothing, I will not be getting a booster vaccination	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Q22. View of need for protective health behaviours going forward, in local area	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q22b. Reason for view of need for protective health behaviours going forward, in local area	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q23. Physical distancing : Frequency	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q23. Mask wearing indoors : Frequency	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q23. Mask wearing outdoors : Frequency	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q23. Checked in using QR code : Frequency	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q23. 'Pick-up and delivery shopping (curb side pick-up, click and collect)' : Frequency	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q24. COVID-safe behaviours practiced last time had symptoms - Stayed at home	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q24. COVID-safe behaviours practiced last time had symptoms - Got a COVID test	0	0	0	0	0	0	0	0	0	1	1	0	0	2
Q24. COVID-safe behaviours practiced last time had symptoms - Physically distanced myself from others	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q24. COVID-safe behaviours practiced last time had symptoms - Wore a face mask	0	0	0	0	0	0	0	0	0	1	1	1	1	4

Q24. COVID-safe behaviours practiced last time had symptoms - Checked in using QR code	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q24. COVID-safe behaviours practiced last time had symptoms - Increased use of pick-up and delivery shopping (curb side pick-up, click and collect)	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q24. COVID-safe behaviours practiced last time had symptoms - Got a PCR test (a swab by a nurse or doctor)	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q24. COVID-safe behaviours practiced last time had symptoms - Used a rapid antigen test (a home testing kit)	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q24. COVID-safe behaviours practiced last time had symptoms - Other/s in my household got/used a test	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q24. COVID-safe behaviours practiced last time had symptoms - None of the above	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q24. COVID-safe behaviours practiced last time had symptoms - I haven't had COVID symptoms	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q25. Work from home : Impact of COVID	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q25. Buy retail goods in a physical store : Impact of COVID	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q25. 'Go to a restaurant, cafe, pub' : Impact of COVID	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q25. Travel interstate : Impact of COVID	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q25. Travel internationally : Impact of COVID	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q26. Physical distancing : Practice going forward	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q26. Hand hygiene : Practice going forward	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q26. Working from home (if applicable) : Practice going forward	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q26. Mask wearing indoors : Practice going forward	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q26. Mask wearing outdoors : Practice going forward	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q26. Check in using QR code : Practice going forward	0	0	0	0	0	0	0	0	0	1	1	1	1	4

Q26. 'Pick-up and delivery shopping (curb side pick-up, click and collect)' : Practice going forward	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q26. Get tested when displaying COVID symptoms : Practice going forward	0	0	0	0	0	0	0	0	0	1	1	0	0	2
Q26. Stay at home and isolate when displaying COVID symptoms : Practice going forward	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Q26. Staying at home and isolating when there is an increase in case numbers : Practice going forward	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q26. Staying at home to avoid potential exposure to COVID-19 : Practice going forward	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q27. Had COVID-19 - Yes â€“ Confirmed by a positive test result (PCR or at home rapid antigen test)	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q27. Had COVID-19 - Yes â€“ I was exposed and unwell but did not confirm with a test	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q27. Had COVID-19 - No, never	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q28. Likelihood to get COVID-19	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q29. How worried about getting COVID-19	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q30. 'If I had COVID-like symptoms (e.g. cough, fever)' : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q30. If I had been near someone who may have been sick with COVID-19 : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q30. If I had been to a crowded event or location : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q30. Before visiting a vulnerable person (e.g. a sick or elderly person) : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q30. If I could not access a PCR test (a swab by a nurse or doctor) : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q31. 'If I had COVID-like symptoms (e.g. cough, fever)' : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q31. If I had been near someone who may have been sick with COVID-19 : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q31. If I had been to a crowded event or location : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2

Q31. Before visiting a vulnerable person (e.g. a sick or elderly person) : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q31. If I could not access a rapid antigen test (home testing kit) : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q31. If I got a positive result from a rapid antigen test (home testing kit) : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q31. If I was told to by health authorities or a doctor : Frequency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q32. Could quickly get a rapid antigen test	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33a. Where quickly get a rapid antigen test - A pharmacy in my area	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33a. Where quickly get a rapid antigen test - A supermarket in my area	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33a. Where quickly get a rapid antigen test - A government centre for testing COVID-19	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33a. Where quickly get a rapid antigen test - Order online	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33a. Where quickly get a rapid antigen test - I currently own rapid antigen test(s)	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33a. Where quickly get a rapid antigen test - From friends / family	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33a. Where quickly get a rapid antigen test - Other (please specify)	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33a. Where quickly get a rapid antigen test - I don't know	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33b. Why could not quickly get a rapid antigen test - There is nowhere I can easily access to get a rapid antigen test	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33b. Why could not quickly get a rapid antigen test - The sources I can access are out of stock	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33b. Why could not quickly get a rapid antigen test - I can't afford a rapid antigen test	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33b. Why could not quickly get a rapid antigen test - I don't know where to buy or access a rapid antigen test	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q33b. Why could not quickly get a rapid antigen	0	0	0	0	0	0	0	0	0	0	0	1	1	2

test - Other (please specify)														
Q33b. Why could not quickly get a rapid antigen test - I don't know	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q34. Ever used a rapid antigen test - Yes, the test showed I did/do not have COVID-19 (negative result)	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q34. Ever used a rapid antigen test - Yes, the test showed I have/had COVID-19 (positive result)	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q34. Ever used a rapid antigen test - Yes, the test result(s) was/were inconclusive / invalid	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q34. Ever used a rapid antigen test - No, I have never used a rapid antigen test (home testing kit)	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35a. Did after positive result on rapid antigen test - Self-isolated until my symptoms resolved	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35a. Did after positive result on rapid antigen test - Reported it to my government health agency	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35a. Did after positive result on rapid antigen test - Reported it to my employer	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35a. Did after positive result on rapid antigen test - Told people who I had been in contact with recently	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35a. Did after positive result on rapid antigen test - Get a PCR test (a swab by a nurse or doctor) to confirm my result	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35a. Did after positive result on rapid antigen test - None of the above	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35b. Self-isolate until my symptoms resolved : Likelihood to do after positive reading on rapid antigen test	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35b. Report it to my government health agency : Likelihood to do after positive reading on rapid antigen test	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35b. Report it to my employer : Likelihood to do after positive reading on rapid antigen test	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Q35b. Tell people who I had been in contact with recently : Likelihood to do	0	0	0	0	0	0	0	0	0	0	0	1	1	2


after positive reading on rapid antigen test
Q35b. Get a PCR test (a swab by a nurse or doctor) to confirm my result : Likelihood to do after positive reading on rapid antigen test
0 0 0 0 0 0 0 0 0 0 0 1 1 2

APPENDIX II. Regressions

Panel A. Changes in Vaccine Hesitancy Through Time

	Overall	Confidence	Convenience	Complacency
Reference202103				
202104	0.0573	0.0203		-0.0317
	(0.0502)	(0.0520)		(0.0681)
202105	0.157**	0.145**	0.195***	0.0147
	(0.0499)	(0.0515)	(0.0508)	(0.0680)
202106	-0.0605	-0.0862	-0.0102	-0.268***
	(0.0513)	(0.0531)	(0.0522)	(0.0718)
202107	-0.185***	-0.150**	-0.143**	-0.446***
	(0.0523)	(0.0536)	(0.0540)	(0.0750)
202108	-0.456***	-0.435***	-0.365***	-0.816***
	(0.0585)	(0.0608)	(0.0627)	(0.0893)
202109	-0.724***	-0.696***	-0.627***	-0.884***
	(0.0650)	(0.0678)	(0.0705)	(0.0965)
202110	-1.008***	-1.012***	-0.922***	-1.139***
	(0.0677)	(0.0709)	(0.0724)	(0.100)
202111	-1.149***	-1.131***	-1.089***	-1.227***
	(0.0694)	(0.0723)	(0.0743)	(0.102)
202112	-1.331***	-1.319***	-1.276***	-1.376***
	(0.0705)	(0.0732)	(0.0742)	(0.103)
202201	-0.930***	0	0	0
	(0.0817)	(.)	(.)	(.)
202202	-1.020***	0	0	0
	(0.0816)	(.)	(.)	(.)
202203	-1.314***	0	0	0
	(0.0895)	(.)	(.)	(.)
Constant	-0.370**	-0.383**	-0.0162***	-1.121***
	(0.142)	(0.148)	(0.00249)	(0.176)
var(_cons[state])	0.0864	0.0865	-0.474**	0.0733
	(0.0454)	(0.0457)	(0.151)	(0.0409)
Observations	59121	51517	46391	51517
Log Likelihood	-21332.51	-18359.90	-16050.10	-10851.29
BIC	42906.75	36925.94	32293.61	21908.73
AIC	42709.03	36757.80	32136.21	21740.58

Standard errors in parentheses
Multilevel mixed-effects logistic regression models with state level random effects.
Showing log-odds estimation.
="* p<0.05 ** p<0.01 *** p<0.001"
Control variables at the individual level (age, gender, metro) and state level (stringency) are included in the models but not reported in the table

Panel B. Logistic Regression Model with State/Territory and Time Interactions

	Overall	Confidence	Complacency
NSW # Wave	0.0393	0.0594	0.0468
	(0.0336)	(0.0391)	(0.0481)
NT #Wave	0.0643	0.107*	0.0870
	(0.0378)	(0.0438)	(0.0543)
QLD # Wave	0.105**	0.131***	0.126**
	(0.0332)	(0.0388)	(0.0475)
SA # Wave	0.0858*	0.108**	0.107*
	(0.0336)	(0.0393)	(0.0482)
TAS # Wave	0.0996**	0.125**	0.129*
	(0.0352)	(0.0414)	(0.0505)
VIC # Wave	0.0655	0.0624	0.0614
	(0.0336)	(0.0392)	(0.0481)
WA # Wave	0.107**	0.128**	0.142**
	(0.0333)	(0.0390)	(0.0475)
Main			
Wave	-0.237***	-0.279***	-0.306***
	(0.0320)	(0.0373)	(0.0456)
NSW	0.558**	0.529**	0.625**
	(0.174)	(0.185)	(0.241)
NT	0.186	0.0636	0.133
	(0.203)	(0.216)	(0.282)
QLD	0.625***	0.588**	0.629**
	(0.174)	(0.185)	(0.241)
SA	0.727***	0.716***	0.719**
	(0.177)	(0.187)	(0.243)
TAS	0.360	0.291	0.259
	(0.188)	(0.200)	(0.259)
VIC	0.441*	0.504**	0.544*
	(0.175)	(0.186)	(0.242)
WA	0.592***	0.581**	0.518*
	(0.174)	(0.185)	(0.240)
Constant	-0.933***	-0.911***	-0.779***
	(0.171)	(0.181)	(0.233)
Observations	59121	51517	46391
Pseudo R^2	0.0671	0.0684	0.0696

Control variables at the individual level are included
but not shown in the results (age, gender, metro)
Standard errors in parentheses
Logistic regression with robust standard errors. Showing log-odds estimation.
="* p<0.05 ** p<0.01 *** p<0.001"

Panel C. Baseline Multilevel Regression Model with Individual and State/Territory Factors (Overall and Confidence)

	Overall VH (1)	Overall VH (2)	Overall VH (3)	Overall VH (4)	Overall VH (5)	Confidence (6)	Confidence (7)	Confidence (8)	Confidence (9)
Gender (Reference=Female)									
Male	-0.299***	-0.320***	-0.296***	-0.297***	-0.225***	-0.405***	-0.379***	-0.383***	-0.323***
	-0.0253	-0.0255	-0.0256	-0.0256	-0.0371	-0.0277	-0.0278	-0.0278	-0.0423
Age (Reference=18-24)									
25-34		0.0453	0.021	0.0201	0.0104	0.087	0.0634	0.062	0.0237
		-0.044	-0.0441	-0.0441	-0.0644	-0.0475	-0.0477	-0.0477	-0.0724
35-44		0.00905	-0.00779	-0.00728	-0.0161	0.0652	0.0493	0.0515	0.00125
		-0.0447	-0.0448	-0.0448	-0.0654	-0.0481	-0.0483	-0.0483	-0.0735
45-54		-0.0152	-0.026	-0.0269	-0.0689	-0.00251	-0.0104	-0.0115	-0.115
		-0.0449	-0.0451	-0.0451	-0.0658	-0.0487	-0.0488	-0.0488	-0.0746
55-64		-0.372***	-0.401***	-0.398***	-0.323***	-0.381***	-0.408***	-0.405***	-0.401***
		-0.0489	-0.0491	-0.0491	-0.0705	-0.0532	-0.0534	-0.0534	-0.0806
65+		-0.768***	-0.792***	-0.789***	-0.799***	-0.781***	-0.804***	-0.800***	-0.844***
		-0.0493	-0.0494	-0.0494	-0.0724	-0.0538	-0.0539	-0.0539	-0.0824
Metro Area (Reference=Non Metro)									
Metro			-0.413***	-0.404***	-0.140**		-0.431***	-0.417***	-0.207***
			-0.029	-0.0291	-0.0465		-0.0312	-0.0313	-0.0522
Stringency Index (lagged)				-0.0149***	-0.0118***			-0.0166***	-0.0156***
				-0.00213	-0.00278			-0.00235	-0.00354
Income Level [Reference=Low]									
Middle-Low					-0.252***				-0.255***
					-0.0618				-0.0699
Middle-High					-0.600***				-0.626***
					-0.0648				-0.0734
High					-0.861***				-0.831***
					-0.0731				-0.0823
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.377***	-1.216***	-0.938***	-0.370**	-1.485***	-1.298***	-1.011***	-0.383**	-1.347***
	-0.124	-0.14	-0.136	-0.142	-0.18	-0.143	-0.14	-0.148	-0.201
var(_cons[state])	0.111	0.137	0.125	0.0864	0.0733	0.141	0.13	0.0865	0.0597
	-0.0576	-0.0707	-0.0645	-0.0454	-0.0433	-0.0736	-0.0676	-0.0457	-0.0372
Observations	59121	59121	59121	59121	37836	51517	51517	51517	30365
Log Likelihood	-21718.33	-21456.04	-21357.58	-21332.51	-10807.05	-18478.01	-18385.37	-18359.9	-8429.54
BIC	43601.47	43131.84	42945.89	42906.75	21835.46	37140.46	36966.03	36925.94	17044.86
AIC	43466.66	42952.09	42757.16	42709.03	21656.1	36990.01	36806.74	36757.8	16895.08

Standard errors in parentheses
Multilevel mixed-effects logistic regression models with state level random effects. Showing log-odds estimation.
="* p<0.05 ** p<0.01 *** p<0.001"

Panel C.2 Baseline Multilevel Regression Model with Individual and State/Territory Factors (Convenience and Complacency)

	Convenience (1)	Convenience (2)	Convenience (3)	Convenience (4)	Convenience (5)	Complacency (6)	Complacency (7)	Complacency (8)	Complacency (9)	Complacency (10)
Gender (Reference=Female)										
Male	-0.339***	-0.366***	-0.342***	-0.347***	-0.266***	-0.163***	-0.192***	-0.166***	-0.169***	-0.178**
	(0.0295)	(0.0297)	(0.0299)	(0.0299)	(0.0421)	(0.0381)	(0.0385)	(0.0386)	(0.0387)	(0.0626)
Age (Reference=18-24)										
25-34		0.115*	0.0931	0.0919	0.0511		-0.00627	-0.0277	-0.0287	0.00892
		(0.0509)	(0.0511)	(0.0511)	(0.0722)		(0.0629)	(0.0630)	(0.0630)	(0.0989)
35-44		0.0210	0.00725	0.0123	-0.00867		-0.0128	-0.0266	-0.0246	-0.0890
		(0.0520)	(0.0522)	(0.0522)	(0.0737)		(0.0636)	(0.0637)	(0.0637)	(0.102)
45-54		-0.0177	-0.0249	-0.0250	-0.112		-0.188**	-0.192**	-0.193**	-0.336**
		(0.0523)	(0.0524)	(0.0524)	(0.0746)		(0.0657)	(0.0657)	(0.0657)	(0.106)
55-64		-0.351***	-0.375***	-0.372***	-0.343***		-0.612***	-0.633***	-0.629***	-0.751***
		(0.0568)	(0.0570)	(0.0570)	(0.0799)		(0.0742)	(0.0743)	(0.0743)	(0.121)
65+		-0.776***	-0.794***	-0.792***	-0.819***		-1.252***	-1.269***	-1.265***	-1.585***
		(0.0579)	(0.0580)	(0.0579)	(0.0823)		(0.0812)	(0.0813)	(0.0813)	(0.142)
Metro Area (Reference=Non Metro)										
Metro			-0.425***	-0.408***	-0.151**			-0.375***	-0.362***	-0.239**
			(0.0335)	(0.0336)	(0.0523)			(0.0434)	(0.0435)	(0.0765)
Stringency Index (lagged)				-0.0162***	-0.0147***				-0.0159***	-0.0183***
				(0.00249)	(0.00353)				(0.00338)	(0.00483)
Income Level [Reference=Low]										
Middle-Low					-0.279***					-0.356***
					(0.0697)					(0.104)
Middle-High					-0.643***					-0.597***
					(0.0730)					(0.108)
High					-0.899***					-0.792***
					(0.0821)					(0.119)
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.471***	-1.331***	-1.050***	-0.474**	-1.434***	-2.248***	-1.973***	-1.724***	-1.121***	-1.884***
	(0.129)	(0.148)	(0.146)	(0.151)	(0.202)	(0.112)	(0.141)	(0.139)	(0.176)	(0.262)
var(_cons[state])	0.121	0.151	0.142	0.0931	0.0637	0.0779	0.121	0.110	0.0733	0.0627
	(0.0637)	(0.0789)	(0.0738)	(0.0496)	(0.0397)	(0.0438)	(0.0657)	(0.0592)	(0.0409)	(0.0401)
Observations	46391	46391	46391	46391	30365	51517	51517	51517	51517	30365
Log Likelihood	-16357.96	-16149.62	-16071.58	-16050.10	-8482.28	-11130.98	-10898.48	-10862.49	-10851.29	-4494.44
BIC	32834.11	32471.16	32325.82	32293.61	17150.33	22392.15	21981.41	21920.28	21908.73	9174.66
AIC	32737.91	32331.24	32177.16	32136.21	17000.55	22285.95	21830.97	21760.99	21740.58	9024.88

Standard errors in parentheses
Multilevel mixed-effects logistic regression models with state level random effects. Showing log-odds estimation.
="* p<0.05 ** p<0.01 *** p<0.001"

Panel D. Multilevel Regression Model with Interaction Terms Between Time and Metro Area

	Overall	Confidence	Convenience	Complacency
	(1)	(2)	(3)	(4)
Wave	-0.141***	-0.149***	-0.181***	-0.146***
	(0.00678)	(0.00873)	(0.0106)	(0.0124)
Metro#Wave	0.0116	0.00431	0.0138	-0.0224
	(0.00820)	(0.0105)	(0.0126)	(0.0150)
Constant	0.347**	0.251	0.256	-0.644***
	(0.124)	(0.132)	(0.144)	(0.157)
Metro	-0.453***	-0.427***	-0.474***	-0.260***
	(0.0512)	(0.0571)	(0.0722)	(0.0777)
var(_cons[state]	0.0683	0.0728	0.0856	0.0642
	(0.0360)	(0.0387)	(0.0457)	(0.0358)
Observations	59121	51517	46391	51517
Log Likelihood	-21424.07	-18432.57	-16095.37	-10866.08
BIC	42979.99	36995.34	32319.68	21862.36
AIC	42872.14	36889.15	32214.74	21756.16

Standard errors in parentheses
Multilevel mixed-effects logistic regression models with state level random effects. Showing log-odds estimates.
="* p<0.05 ** p<0.01 *** p<0.001"
Control variables at the individual and state level are included
but not shown in the results (age, gender and stringency)

Panel E. Multilevel Regression Model with Interaction Terms Between Time and Gender

	Overall (1)	Confidence (2)	Convenience (3)	Complacency (4)
Wave	-0.148***	-0.155***	-0.189***	-0.159***
	(0.00532)	(0.00694)	(0.00862)	(0.0101)
Male #Wave	0.0333***	0.0220*	0.0398***	-0.00279
	(0.00773)	(0.0101)	(0.0120)	(0.0144)
Male	-0.465***	-0.478***	-0.549***	-0.155*
	(0.0472)	(0.0531)	(0.0677)	(0.0718)
Constant	0.382**	0.281*	0.298*	-0.575***
	(0.122)	(0.129)	(0.139)	(0.150)
var(_cons[state])	0.0688	0.0733	0.0872	0.0629
	(0.0363)	(0.0389)	(0.0464)	(0.0351)
Observations	59121	51517	46391	51517
Log Likelihood	-21415.80	-18430.28	-16090.45	-10867.17
BIC	42963.44	36990.75	32309.84	21864.53
AIC	42855.59	36884.55	32204.90	21758.33

Standard errors in parentheses
Multilevel mixed-effects logistic regression models with state level random effects. Showing log-odds estimates.
="* p<0.05 ** p<0.01 *** p<0.001"
Control variables at the individual and state level are included
but not shown in the results (age, gender and stringency)

Panel F. Multilevel Regression Model with Interaction Terms Between Time and Age Group

	Overall	Confidence	Convenience	Complacency
	(1)	(2)	(3)	(4)
Wave	-0.148***	-0.145***	-0.175***	-0.153***
	(0.0109)	(0.0140)	(0.0169)	(0.0187)
25-34 #Wave	0.00549	-0.00126	-0.00754	0.0281
	(0.0136)	(0.0173)	(0.0207)	(0.0232)
35-44 # Wave	0.00554	-0.0131	-0.00496	-0.00639
	(0.0138)	(0.0177)	(0.0212)	(0.0238)
45-54 #Wave	0.00530	-0.0238	-0.0262	-0.0300
	(0.0139)	(0.0180)	(0.0214)	(0.0248)
55-64 # Wave	0.0555***	0.0337	0.0512*	-0.00204
	(0.0148)	(0.0193)	(0.0228)	(0.0278)
65+ #Wave	0.0323*	0.0130	0.0256	-0.0811*
	(0.0151)	(0.0196)	(0.0233)	(0.0321)
25-34	-0.0119	0.0620	0.127	-0.154
	(0.0816)	(0.0917)	(0.116)	(0.119)
35-44	-0.0351	0.110	0.0385	0.00393
	(0.0829)	(0.0929)	(0.119)	(0.120)
45-54	-0.0505	0.0992	0.108	-0.0627
	(0.0837)	(0.0942)	(0.119)	(0.124)
55-64	-0.679***	-0.552***	-0.630***	-0.614***
	(0.0911)	(0.103)	(0.130)	(0.139)
65+	-0.946***	-0.853***	-0.918***	-0.946***
	(0.0906)	(0.103)	(0.131)	(0.148)
Constant	0.380**	0.231	0.218	-0.597***
	(0.131)	(0.140)	(0.156)	(0.164)
/				
var(_cons[state]	0.0690	0.0734	0.0872	0.0615
	(0.0364)	(0.0390)	(0.0464)	(0.0344)
Observations	59121	51517	46391	51517
Log Likelihood	-21413.18	-18426.32	-16087.64	-10858.93
BIC	43002.16	37026.24	32347.19	21891.45
AIC	42858.36	36884.64	32207.27	21749.85

Standard errors in parentheses
Multilevel mixed-effects logistic regression models with state level random effects. Showing log-odds estimates.
="* p<0.05 ** p<0.01 *** p<0.001"
Control variables at the individual and state level are included
but not shown in the results (metro, gender and stringency)

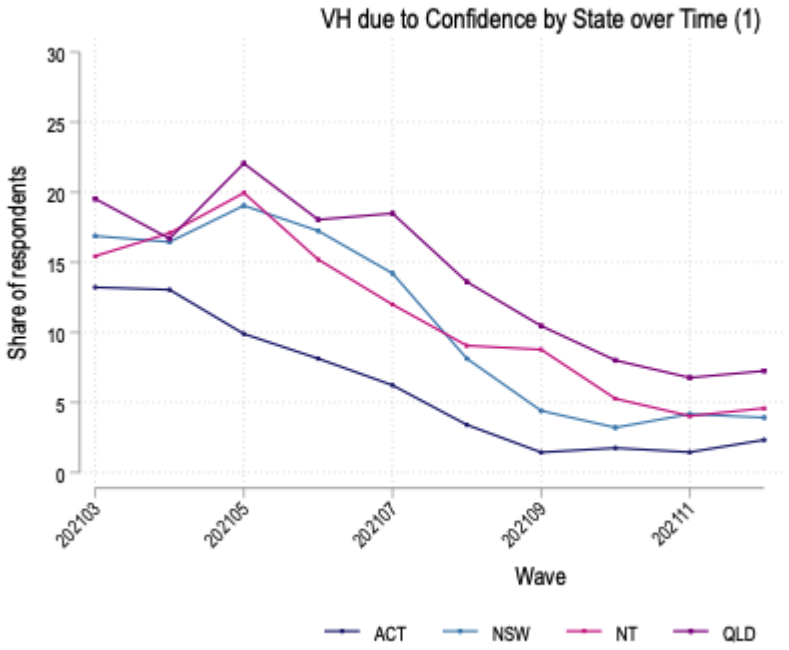
Panel G. Multilevel Regression Model with Interaction Terms Between Time and Income Level

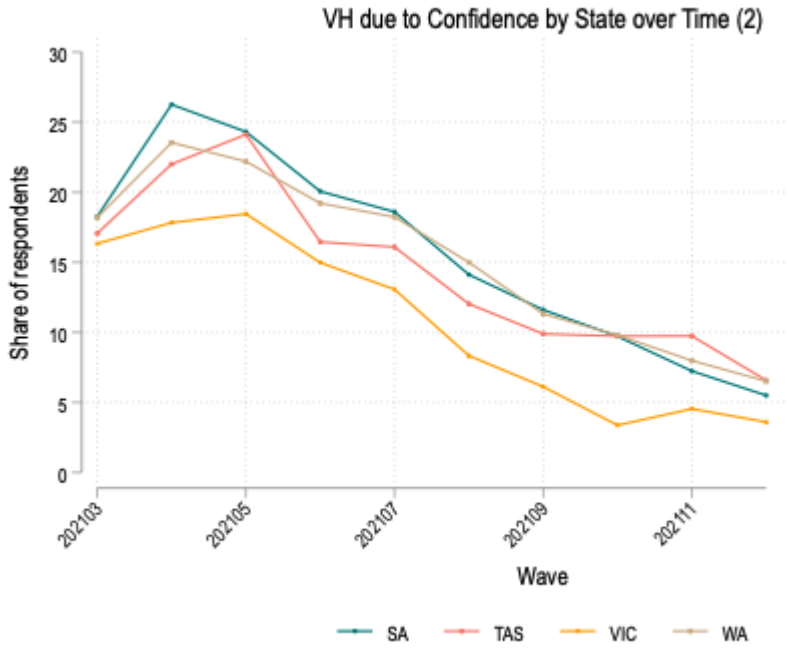
	Overall	Confidence	Convenience	Complacency
	(1)	(2)	(3)	(4)
Month/Year	-0.192***	-0.299***	-0.279***	-0.196***
	(0.0212)	(0.0333)	(0.0329)	(0.0468)
Middle-Low # Wave	0.0489	0.0736	0.0573	0.0375
	(0.0257)	(0.0400)	(0.0398)	(0.0577)
Middle-High # Wave	0.0460	0.0539	0.0465	-0.0330
	(0.0255)	(0.0400)	(0.0396)	(0.0572)
High # Wave	0.0468	0.0694	0.0393	0.0590
	(0.0265)	(0.0416)	(0.0416)	(0.0590)
Middle-Low	-0.639**	-0.770**	-0.681*	-0.621
	(0.209)	(0.287)	(0.286)	(0.419)
Middle-High	-0.966***	-1.003***	-0.969***	-0.373
	(0.208)	(0.286)	(0.284)	(0.412)
High	-1.239***	-1.317***	-1.177***	-1.207**
	(0.218)	(0.299)	(0.300)	(0.431)
Constant	0.981***	1.553***	1.250***	0.123
	(0.221)	(0.281)	(0.283)	(0.392)
/				
var(_cons[state])	0.0443	0.0510	0.0591	0.0601
	(0.0269)	(0.0317)	(0.0367)	(0.0381)
Observations	37836	30365	30365	30365
Log Likelihood	-10857.61	-8430.02	-8482.23	-4494.29
BIC	21894.42	17035.49	17139.92	9164.03
AIC	21749.22	16894.03	16998.46	9022.57

Standard errors in parentheses
Multilevel mixed-effects logistic regression models with state level random effects. Showing log-odds estimates.
="* p<0.05 ** p<0.01 *** p<0.001"
Control variables at the individual and state level are included
but not shown in the results (age, metro, gender and stringency)

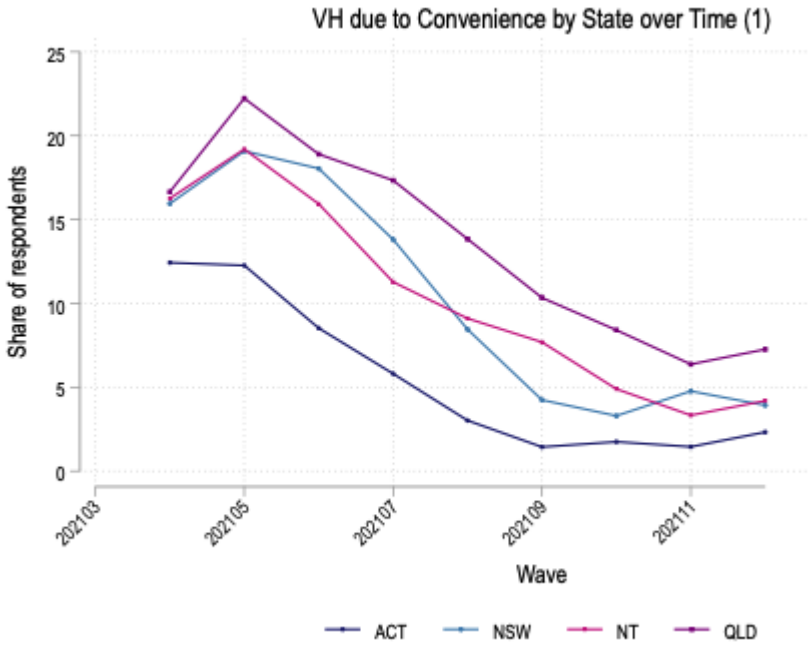
APPENDIX III. Trends of Vaccine Hesitancy by State

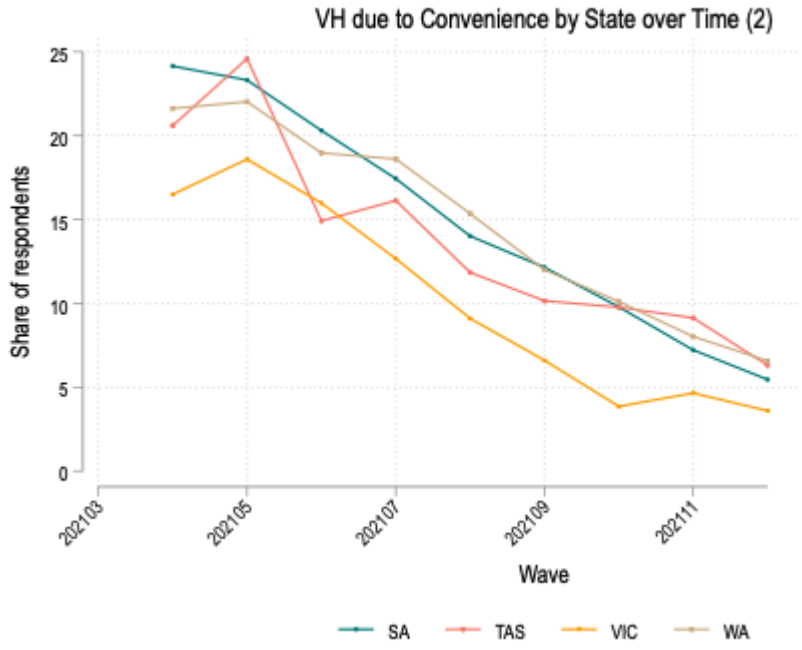
Panel A. VH Due to Confidence by State Over Time



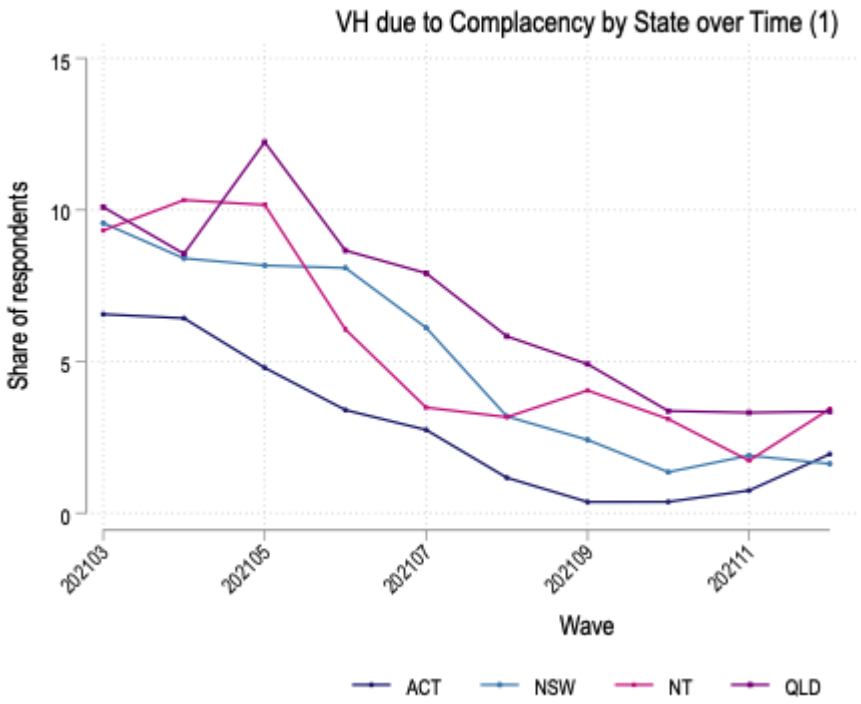


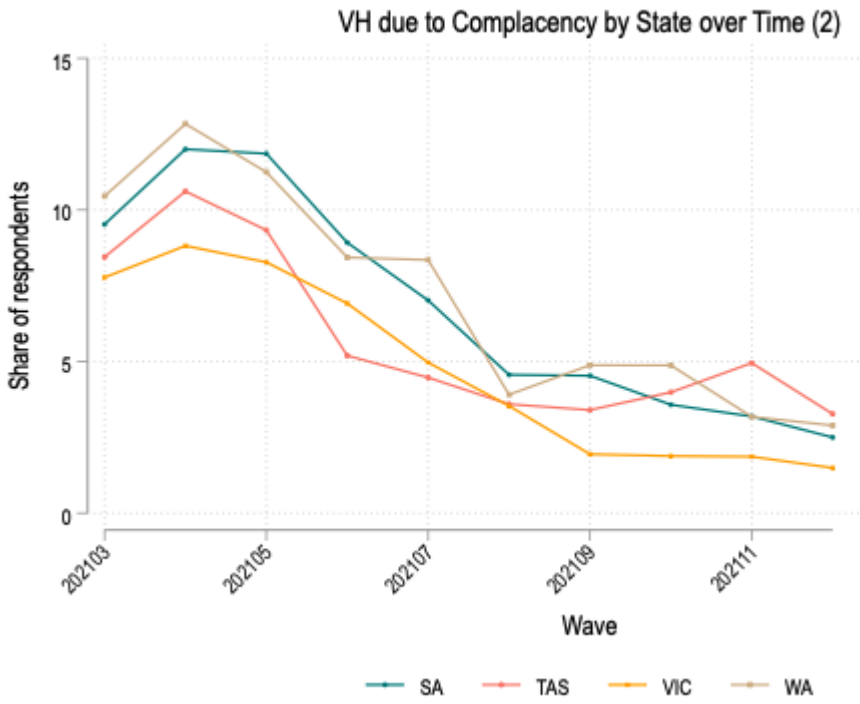
Panel B. VH Due to Convenience by State Over Time





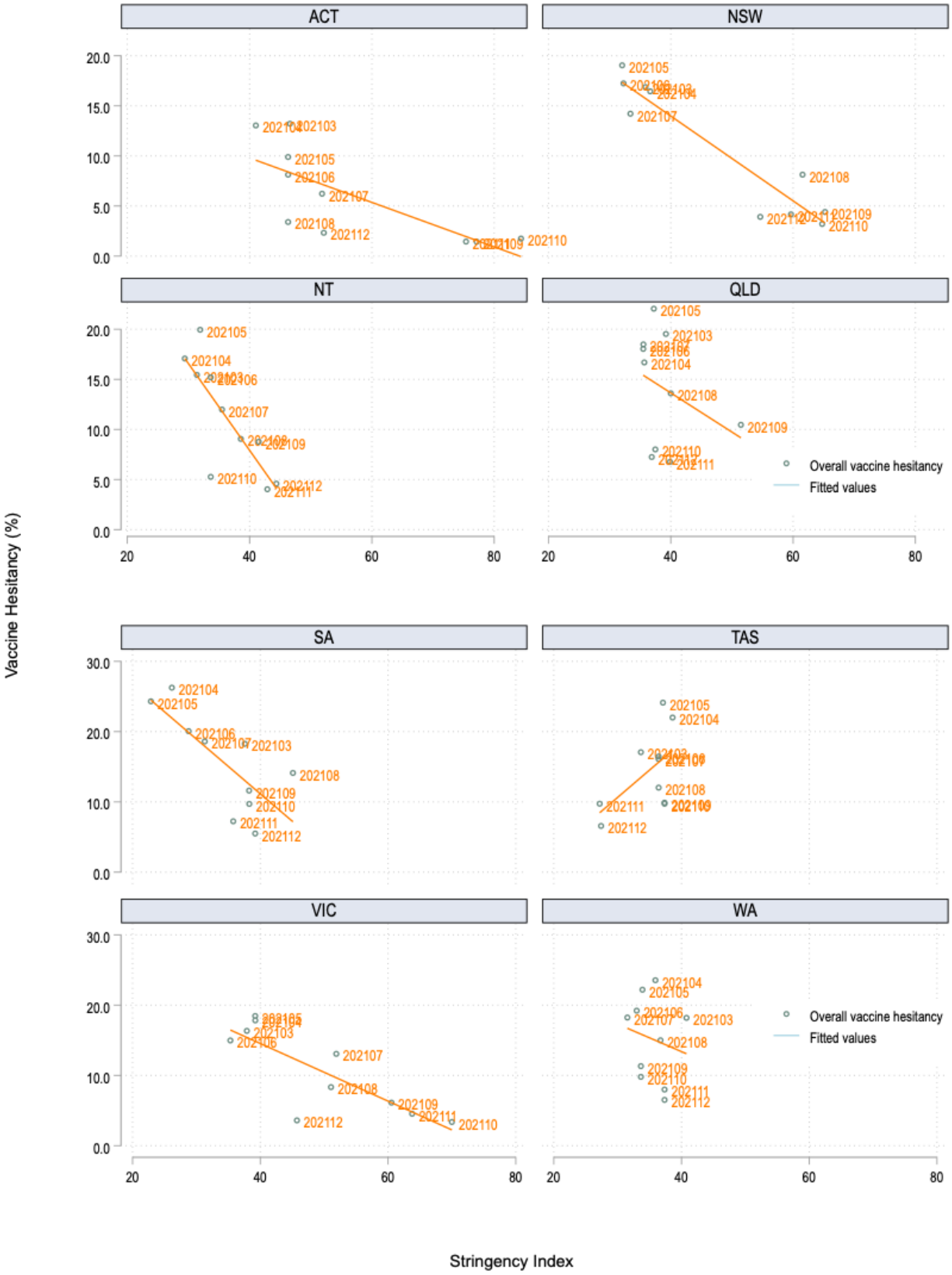
Panel C. VH Due to Complacency by State Over Time



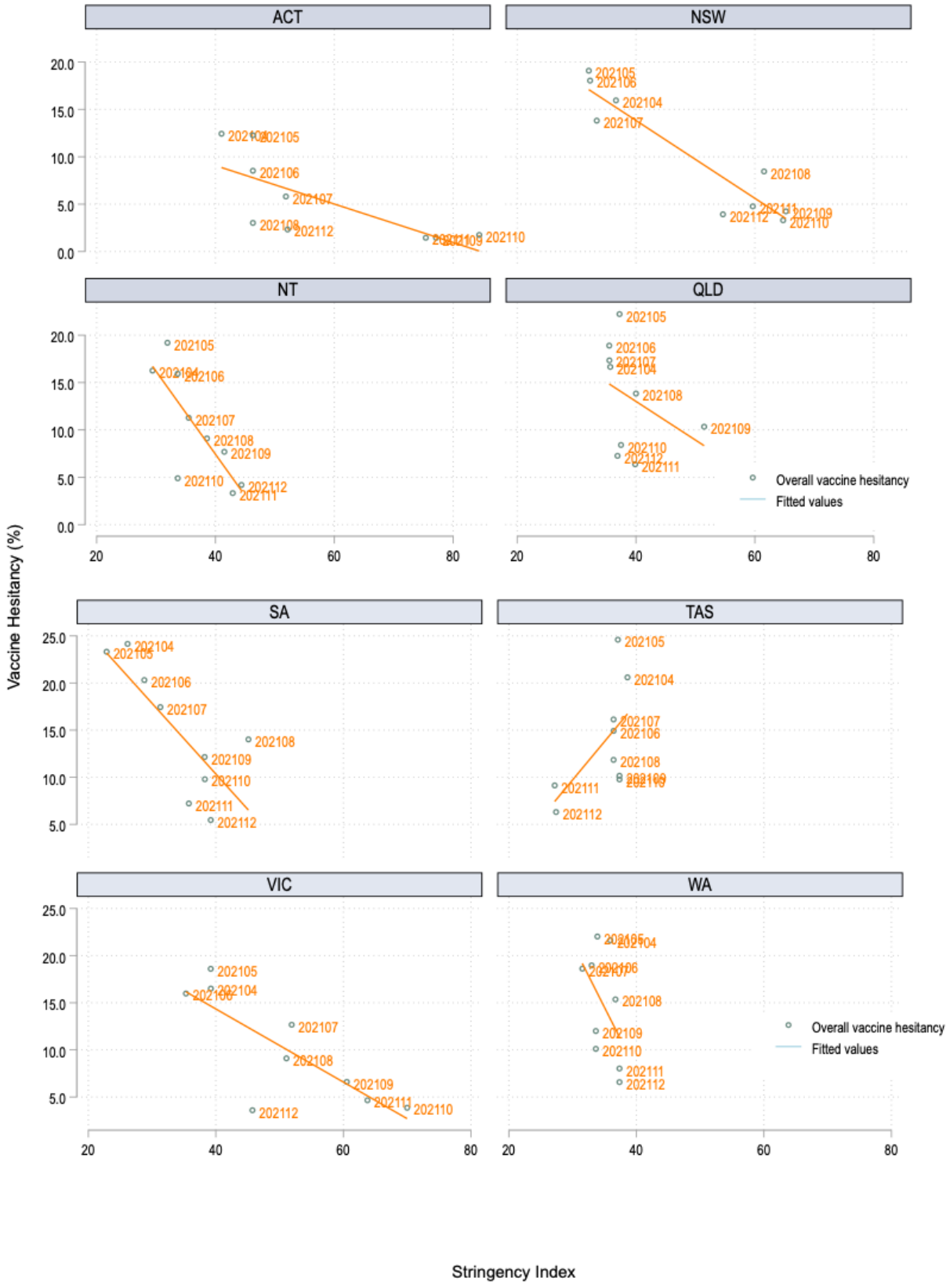


APPENDIX IV. Vaccine Hesitancy and Stringency Index Scatterplots

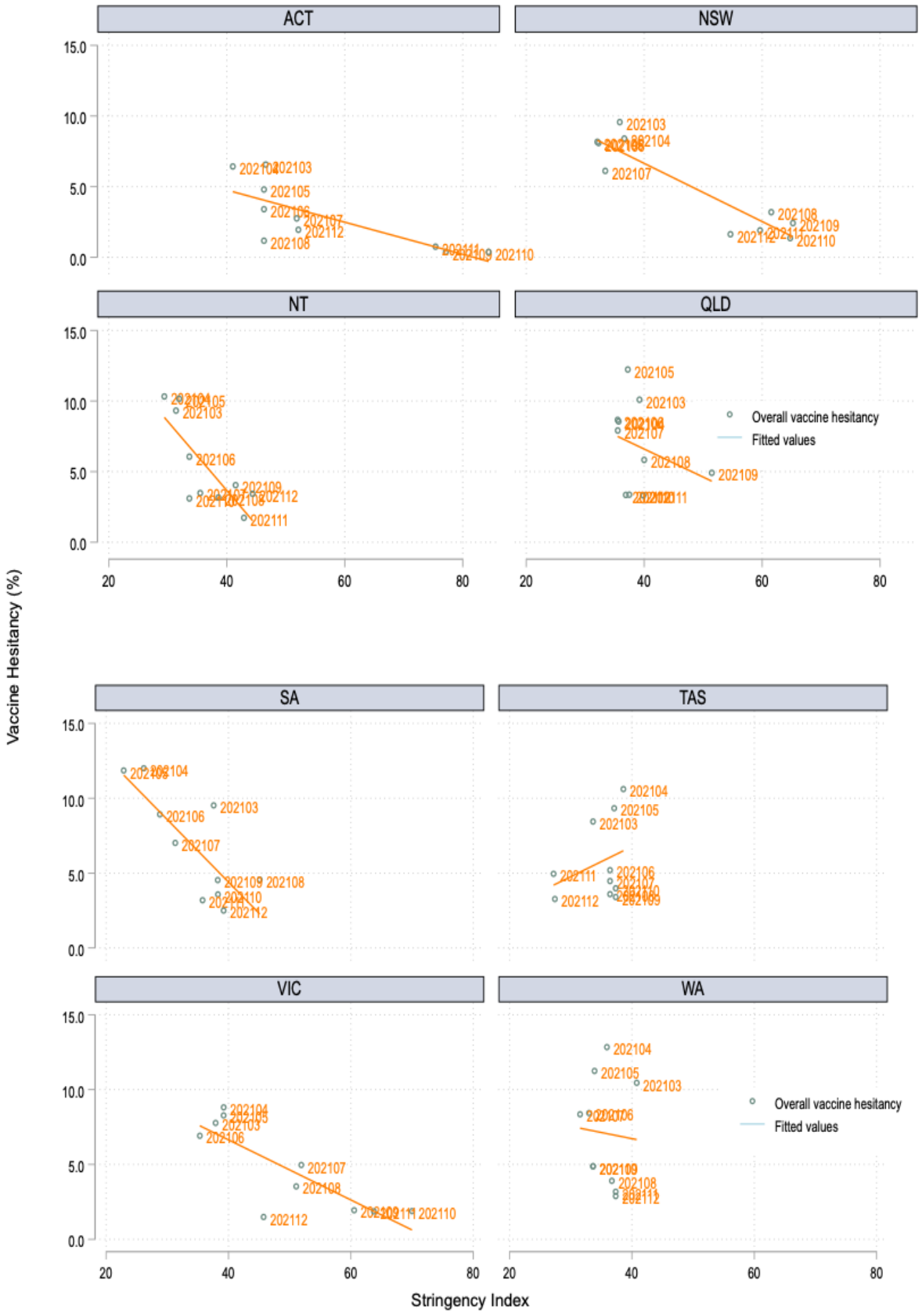
Panel A. Relationship Between Vaccine Hesitancy due to Confidence and Stringency Index



Panel B. Relationship Between Vaccine Hesitancy due to Convenience and Stringency Index



Panel C. Relationship Between Vaccine Hesitancy due to Complacency and Stringency Index



APPENDIX V. Overview of topics covered by wave

	1	2	3	4	5	6	7	8	9	10	11	12	13
Wave/Topic	**Mar 21**	**Apr 21**	**May 21**	**Jun 21**	**Jul 21**	**Aug 21**	**Sep 21**	**Oct 21**	**Nov 21**	**Dec 21**	**Jan 22**	**Feb 22**	**Mar 22**
Vaccination intentions	Text - Average AUS vs. ACT	Figure - changes in likelihood (likert scale)	Figure - changes in likelihood (likert scale)	Figure - changes in likelihood (likert scale), figure by state/territory	Figure - changes in likelihood (likert scale), figure by state/territory, vaccination intentions by demographic group	Figure - changes in likelihood (likert scale), figure by state/territory	Figure - changes in likelihood (likert scale), figure by state/territory	Figure - changes in likelihood (likert scale), figure by state/territory	Figure - changes in likelihood (likert scale), figure by state/territory	Figure - changes in likelihood (likert scale), figure by state/territory	Figure - vaccination uptake (trend), figure by state/territory, booster adoption by state	Figure vaccination uptake (trend), booster adoption by state	Figure vaccination uptake (trend), booster vaccine adoption by state
Vaccine drivers/ barriers	Text- average number of concerns reported	Text -changes in motivations and concerns. Key insights by age group	Text -changes in motivations and concerns, perceived easiness to get vaccine	Figure- key motivations and barrier	Key concerns for specific groups	Barriers by age group and metro area							
Life satisfaction	Figure by state/territory	Text	Text										
Consumer confidence	Figure by state/territory	Correlation between life satisfaction, concerns and consumer confidence	Correlation between life satisfaction, concerns and consumer confidence										
Key insights			10 key insights	10 key insights			5 insights	5 insights	5 insights	5 insights	5 insights	5 insights	5 insights

	1	2	3	4	5	6	7	8	9	10	11	12	13
Wave/Topic	**Mar 21**	**Apr 21**	**May 21**	**Jun 21**	**Jul 21**	**Aug 21**	**Sep 21**	**Oct 21**	**Nov 21**	**Dec 21**	**Jan 22**	**Feb 22**	**Mar 22**
Other focus				Included - Victoria	Included- NSW			Vaccine hesitancy, factors influencing vaccination likelihood	Booster vaccination sentiment, motivators and concerns	Booster vaccination sentiment	Workplace absenteeism		Rapid antigent testing, Workplace absenteeism
Parent's vaccination attitudes							Likelihood and motivators	Likelihood and motivators	Likelihood, figure by state	Likelihood, figure by state and motivators		Likelihood	Likelihood
Info sources							Included						
Protective health behaviour										Figure included by state	Figure perceived need and frequency	Figure Frequency and self-reported behaviours	Figure perceived need and frequency
Wary about COVID-19												Figure by state	