How COVID-19 has impacted immunisation service delivery in Australia: a national study

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Abstract

Objective: The objective of this study was to determine the impact the COVID-19 pandemic had on the delivery of adult, maternal and childhood immunisation services in Australia in 2020 prior to the rollout of COVID-19 vaccines, and to understand the adaptations made at a service delivery level that may have contributed to the successful delivery of immunisation services during the first year of the pandemic.

Methods: An electronic survey was sent to immunisation providers and pharmacists in all states and territories in Australia between November 2020 and December 2020. It explored interruption to the delivery of immunisation services, strategies implemented to maintain services, prioritisation of populations, and self-reported challenges and solutions initiated by providers.

Results: A total of 850 people responded to the survey. Of these, the most common professional groups identified were pharmacists followed by nurse immunisers, nurses/midwives and general practitioners. Several changes were implemented including relocation of vaccination clinics, change to bookings rather than walk-in appointments, infection prevention measures, clients waiting in cars pre- and post-vaccination and reduced observation period post-vaccination.

Conclusion: The pandemic has provided opportunities for services to trial new and innovative strategies such as electronic pre-assessment, electronic consent and drive-through vaccination services.

Implications for public health: Immunisation providers mostly viewed these changes positively and intend to continue many post-pandemic. The experience gained from the trialling of these strategies may be adapted for vaccine delivery and National Immunisation Program vaccines beyond the pandemic.

Key words: vaccine, COVID-19, service, immunisation, Australia

The pandemic caused by SARS-CoV-2 has led to illness, death and social disruption globally.[1] This has affected the delivery of many essential health services including immunisation.[1] Disruption to immunisation services during a public health crisis has the potential to result in increased numbers of individuals in the population susceptible to vaccine-preventable diseases, such as has been reported with measles during the Ebola outbreak in West Africa.[2] This can place even more strain on an already stretched health care system. It is therefore critical to sustain immunisation services during a pandemic.

A poll developed by the World Health Organization (WHO), conducted in May 2020 provided a snapshot of the global impact of COVID-19 on immunisation services.[3] Responses were received from 105 countries and reported widespread disruption to routine immunisation services.[3] Demand for vaccines was also affected, with the most common reason cited being respondents' concerns about the risk of exposure to COVID-19 if they attend for vaccination, followed by limited public transport, restrictions related to lockdown and physical distancing policies. In early 2021, WHO launched a second round of the *National pulse survey on continuity of essential health services during the COVID-19 pandemic,* which reported disruption to both facility-based and outreach immunisation services.[4]

Recognising the risk related to a reduction in essential public health services, both the WHO and the Australian Technical Advisory Group on Immunisation (ATAGI) published guidance on maintaining immunisation services during the pandemic.[5,6] Guiding principles from these publications recognised immunisation as a core health service and stated that delivery strategies should be adapted where possible so they could continue under safe conditions, minimising risk to healthcare workers (HCWs) and the community.[5] Both the WHO guidance and ATAGI highlighted the importance of preventing influenza through vaccination during the COVID-19 pandemic, recognising that failure to do so would place an additional burden on the healthcare system.[5,6]

In the Australian context, ATAGI recommended immunisation services specifically plan and implement the full hierarchy of infection prevention and control measures, including physical distancing, to

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ensure the safety of staff and the community.[6] The guidance also suggested that if a service was not able to meet the immunisation needs of its clients that populations might be prioritised, such as newborns, infants, children <2 years of age, pregnant women, individuals with specified risk conditions associated with an increased risk of a vaccine-preventable disease, older adults (>65 years) and Aboriginal and Torres Strait Islander people.[6]

The aim of this study was to assess the impact of the COVID-19 pandemic in 2020 on adult, childhood and maternal immunisation services across Australia. This study also sought to explore changes made at a service delivery level and plans for service delivery post-pandemic.

Methods

A survey was developed using the RedCap online survey platform by researchers from Monash University and was reviewed by members of the Immunisation Branch, Commonwealth Department of Health, Australia.

The survey was aimed at immunisation providers and covered the following areas:

- Participant demographics
- General questions on changes in immunisation service delivery related to COVID-19
- Childhood vaccination: Impact of COVID-19 and changes implemented
- Adult vaccination: Impact of COVID-19 and changes implemented
- Maternal vaccination: Impact of COVID-19 and changes implemented
- School-based vaccination programs

The survey link and explanatory letter were provided to the Commonwealth Immunisation Branch to distribute to their respective immunisation branches within each state or territory. The immunisation branches then distributed the survey link to their immunisation providers. The researchers at Monash University also distributed the survey link and explanatory letter to the Pharmacy Guild of Australia for distribution to their members. The survey was open for responses from 12 November 2020 to December 31 2020 (prior to the COVID-19 vaccine rollout). Completion of the survey was voluntary and anonymous and was estimated to take approximately 10 minutes.

Table 1: Participant details. Numbers are frequency (%).

	Total	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Missing
In which state/territory do you work?	850	30 (4)	396 (46)	6 (1)	60 (7)	24 (3)	80 (9)	105 (12)	74 (9)	75 (9)
What is the most accurate description of your job?	775	30	395	6	60	24	80	105	74	1
General Practitioner	73 (9)	1 (3)	60 (15)	2 (33)	4 (7)	0 (0)	2 (3)	2 (2)	1 (1)	1 (100)
Nurse/Midwife	206 (27)	7 (23)	123 (31)	1 (17)	4 (7)	3 (13)	24 (30)	15 (14)	29 (39)	0 (0)
Nurse Immuniser	209 (27)	6 (20)	123 (31)	0 (0)	4 (7)	7 (29)	33 (41)	18 (17)	18 (24)	0 (0)
Pharmacist	227 (29)	9 (30)	58 (15)	3 (50)	46 (77)	14 (58)	12 (15)	62 (59)	23 (31)	0 (0)
Administration/support officer	20 (3)	6 (20)	10 (3)	0 (0)	1 (2)	0 (0)	1 (1)	2 (2)	0 (0)	0 (0)
Other	40 (5)	1 (3)	21 (5)	0 (0)	1 (2)	0 (0)	8 (10)	6 (6)	3 (4)	0 (0)
How long have you been administering vaccines?	772	30	394	6	60	24	80	103	74	1
<1 year	65 (8)	12 (40)	16 (4)	3 (50)	6 (10)	5 (21)	2 (3)	14 (14)	7 (10)	0 (0)
1–<5 years	288 (37)	9 (30)	112 (28)	2 (33)	40 (67)	9 (38)	27 (34)	61 (59)	28 (38)	0 (0)
5–<10 years	106 (11)	3 (10)	66 (17)	1 (17)	7 (12)	1 (4)	13 (16)	3 (3)	12 (16)	0 (0)
≥10 years	313 (41)	6 (20)	200 (51)	0 (0)	7 (11)	9 (38)	38 (48)	25 (24)	27 (37)	1 (100)
In what setting(s) do you administer vaccines? Select all that apply.										
Hospital	95	4	56	0	2	0	17	5	11	0
Medical Practice	334	7	228	1	10	3	37	26	21	1
School	77	5	45	0	0	3	15	3	6	0
Local council/CHC	82	5	24	0	1	6	21	10	15	0
Pharmacy	231	10	60	3	45	14	14	59	26	0
Workplace	101	3	44	0	7	3	17	13	14	0
RACF	35	3	19	0	2	2	6	1	2	0
Other	33	2	13	0	1	1	8	3	5	0

Responses to survey questions were summarised by frequencies and percentages, and compared across states/territories. For questions where more than one answer was possible, only frequencies were presented. Results were also grouped by adult, childhood and maternal vaccines to investigate whether the impact of COVID-19 differed among these services.

Answers to open-ended questions were grouped according to common themes that emerged.

Ethics approval for this project was obtained from the Monash University Human Research and Ethics Committee (Project ID Number: 25687).

Results

Overall, there were 850 respondents, distributed across all jurisdictions in Australia (Table 1). Almost half of the responses (46.6%) were from New South Wales (NSW) followed by Victoria (VIC), 12.4%. Some jurisdictions such as the Northern Territory (NT) and South Australia (SA) had small numbers of responses (six and 24, respectively) limiting the ability to perform analyses according to state/territory. Nurses were the largest group represented when both nurse/midwife and nurse immunisers were combined (53.6%), followed by pharmacists (29.3%). Pharmacists represented 77% of the respondents from Queensland (QLD), 59% from VIC and 58% from SA.

Jurisdictions that reported a more experienced workforce were more likely to have respondents who identified as a nurse (NSW, Tasmania) compared to states reporting 1–5 years' experience which were likely to have a greater proportion of pharmacists responding (QLD and VIC).

What impact has COVID-19 had on the delivery of vaccines in your setting?

Of the 672 respondents who answered this question, 390 (58%) reported they delivered an *increased* number of vaccines. This was reported by most respondents in all states/territories and was attributed to increased demand. This was particularly reported by pharmacists (Table 2). Immunisation providers reported increased demand for several vaccines, most commonly influenza and pneumococcal. Increased demand was reported by 501/672 (75%) respondents

across all jurisdictions, ranging from 61% in the Australian Capital Territory (ACT) to 85% in SA and 100% in the NT. Feeling no impact or continuing but delivering a reduced number of vaccines was chosen by 267/672 (40%) of respondents, but uncommonly by pharmacists compared to other providers (Table 2). Only a small number (15/672 [2%]) reported they could not offer vaccines at all, and this option was the lowest chosen for each state/territory across the country.

Of those who were unable to deliver the same number of vaccines, the most common reason was "less demand (clients reluctant or unable to visit health service)", reported by 83 participants. The next most common reason cited was physical distancing requirements (n=51), followed by staff shortages (n=15) and stock shortages (n=14). Reasons other than these were reported by 31 participants. Only a small proportion of respondents (47/668 [7%]) were not able to meet the immunisation needs of their clients, and this proportion was evenly distributed across most states and territories.

More than 50% of respondents (350/671) reported that staff shortages during the pandemic affected the service. The main reason for staff shortages was "self-isolation/ possible COVID-19 exposure" (40.3%, 141/350). Sick leave and illness were also commonly reported as a reason for staff shortages (34.9%, 122/350).

Overall, 609/660 (92%) of respondents administered adult vaccines as part of their work; 447/659 (68%) of participants reported administering maternal vaccines; and half of respondents 362/667 (54%) reported administering childhood vaccines as part of their usual workload. It was rarely reported that immunisation providers were unable to continue to provide vaccines according to specific populations (adult, pregnant women or children), see Figure 1a. Reluctance to attend services and reduced number of clients due to physical distancing requirements were commonly reported to affect service delivery for adult, maternal and childhood vaccines (Figure 1b).

One-third of respondents (221/657 [34%]) provided vaccines as part of the secondary school vaccination program. Only 2% were unable to continue to provide this service during the pandemic in 2020. Just over half (117/221 [53%]), however, although able to continue their program, had to make some operational changes to maintain their service delivery to schools.

How have you adapted immunisation service delivery because of COVID-19?

Nearly all respondents (647/669 [97%]) reported that their services implemented measures to reduce the transmission of COVID-19. This was consistent across all states and territories with no statistically significant differences between jurisdictions (p=0.141). It was noted that the small number of respondents who answered "no" to implementing measures to reduce COVID-19 transmission came from a range of states and territories including Victoria, New South Wales, Tasmania, Queensland and the ACT. If the answer to this question was no, then the list of options introduced such as social distancing, COVID-19 screening etc was 'skipped' due to built-in rules of the survey logic design. Unfortunately, this meant that there was no way to verify the answer to this question, although it only represented 3% of the responses. Overall, 451/668 (68%) reported they had to adapt the way they delivered their immunisation service because of COVID-19. The range of ways that services adapted during the pandemic is summarised in Figure 2a. After infection control measures, additional sessions and changing to an appointment-based system were the most frequent changes made.

Of the 141 respondents who marked that they had moved the location for vaccination (e.g. drive-through service, separate building to health service, separate area) this was more commonly reported by respondents from NSW (n=78) followed by Tasmania (n=26). Interestingly, VIC, despite having the greatest number of infections in their second wave of

Table 2: Key results by provider.

	Total*	General Practitioner	Nurse/Midwife	Nurse Immuniser	Pharmacist	Admin/support officer	Other
	N=775	N=73	N=206	N=209	N=227	N=20	N=40
What impact has COVID-19 had on the number of vaccination encounters in your setting?							
No impact	141 (21.0%)	21 (34.4%)	57 (31.7%)	40 (21.3%)	13 (6.6%)	3 (23.1%)	7 (21.9%)
Unable to offer at all	15 (2.2%)	0 (0.0%)	2 (1.1%)	4 (2.1%)	8 (4.0%)	1 (7.7%)	0 (0.0%)
Continued but reduced number	126 (18.8%)	8 (13.1%)	35 (19.4%)	58 (30.9%)	15 (7.6%)	4 (30.8%)	6 (18.8%)
Increased number	390 (58.0%)	32 (52.5%)	86 (47.8%)	86 (45.7%)	162 (81.8%)	5 (38.5%)	19 (59.4%)
Have you had any staff shortages during COVID-19?	350 (52.2%)	19 (31.1%)	94 (52.5%)	94 (50.0%)	120 (60.6%)	8 (61.5%)	15 (46.9%)
Shortage reason:							
Sick leave/illness	122 (34.9%)	8 (42.1%)	32 (34.0%)	36 (38.3%)	36 (30.0%)	4 (50.0%)	6 (40.0%)
Self isolation/poss COVID	141 (40.3%)	9 (47.4%)	38 (40.4%)	34 (36.2%)	54 (45.0%)	2 (25.0%)	4 (26.7%)
Redeployment	31 (8.9%)	0 (0.0%)	8 (8.5%)	14 (14.9%)	7 (5.8%)	1 (12.5%)	1 (6.7%)
Other	56 (16.0%)	2 (10.5%)	16 (17.0%)	10 (10.6%)	23 (19.2%)	1 (12.5%)	4 (26.7%)
Have any changes implemented by your organisation worked particularly well in responding to COVID-19 and related requirements?							
No	105 (16.4%)	11 (18.6%)	16 (9.2%)	23 (12.6%)	47 (25.0%)	2 (20.0%)	6 (20.0%)
Yes	363 (56.5%)	33 (55.9%)	110 (63.6%)	105 (57.7%)	89 (47.3%)	7 (70.0%)	19 (63.3%)
Unsure	174 (27.1%)	15 (25.4%)	47 (27.2%)	54 (29.7%)	52 (27.7%)	1 (10.0%)	5 (16.7%)
Are there any changes implemented that have not worked well?							
No	398 (62.0%)	44 (74.6%)	119 (68.4%)	98 (53.8%)	112 (59.6%)	6 (60.0%)	19 (65.5%)
Yes	55 (8.6%)	5 (8.5%)	7 (4.0%)	25 (13.7%)	14 (7.4%)	0 (0.0%)	4 (13.8%)
Unsure	189 (29.4%)	10 (16.9%)	48 (27.6%)	59 (32.4%)	62 (33.0%)	4 (40.0%)	6 (20.7%)

Note:

** Questions do not total to 775 due to non-response or NA.*

COVID-19 infections in 2021, did not report this as a common measure implemented (n=16). This may be related to the large proportion of responses from pharmacists who may be unable to move venues to facilitate the delivery of vaccines.

Overall, 296/671 (44%) had to prioritise certain groups to receive vaccinations. The most common groups prioritised were adults (special risk) followed by pregnant women and children (special risk), see Figure 2b.

Changes that worked well

Almost half of respondents 363/642 (43%) felt that the changes implemented by their organisation worked well in responding to COVID-19 and related requirements. There were no significant differences according to the type of provider (Table 2). A reasonable proportion (20%) were unsure whether the changes worked well, and only 105/642 (13%) believed that the changes had not worked well. Of these 105 respondents, 25/105 (24%) were nurse immunisers (Table 2).

When asked to describe the changes that worked well, seven major themes emerged from the qualitative analysis.

Theme 1: Introduction of appointments

Instead of the walk-in appointments, we implemented appointments by booking only. Customers were contacted prior to appointments to answer most of the pre-vaccination questions over the phone. This practice was put in place to minimise the waiting time prior to vaccination. Appointments were spaced 15 minutes apart to allow time for observation in the counselling room, and to disinfect between each patient. – Respondent: NSW Pharmacist

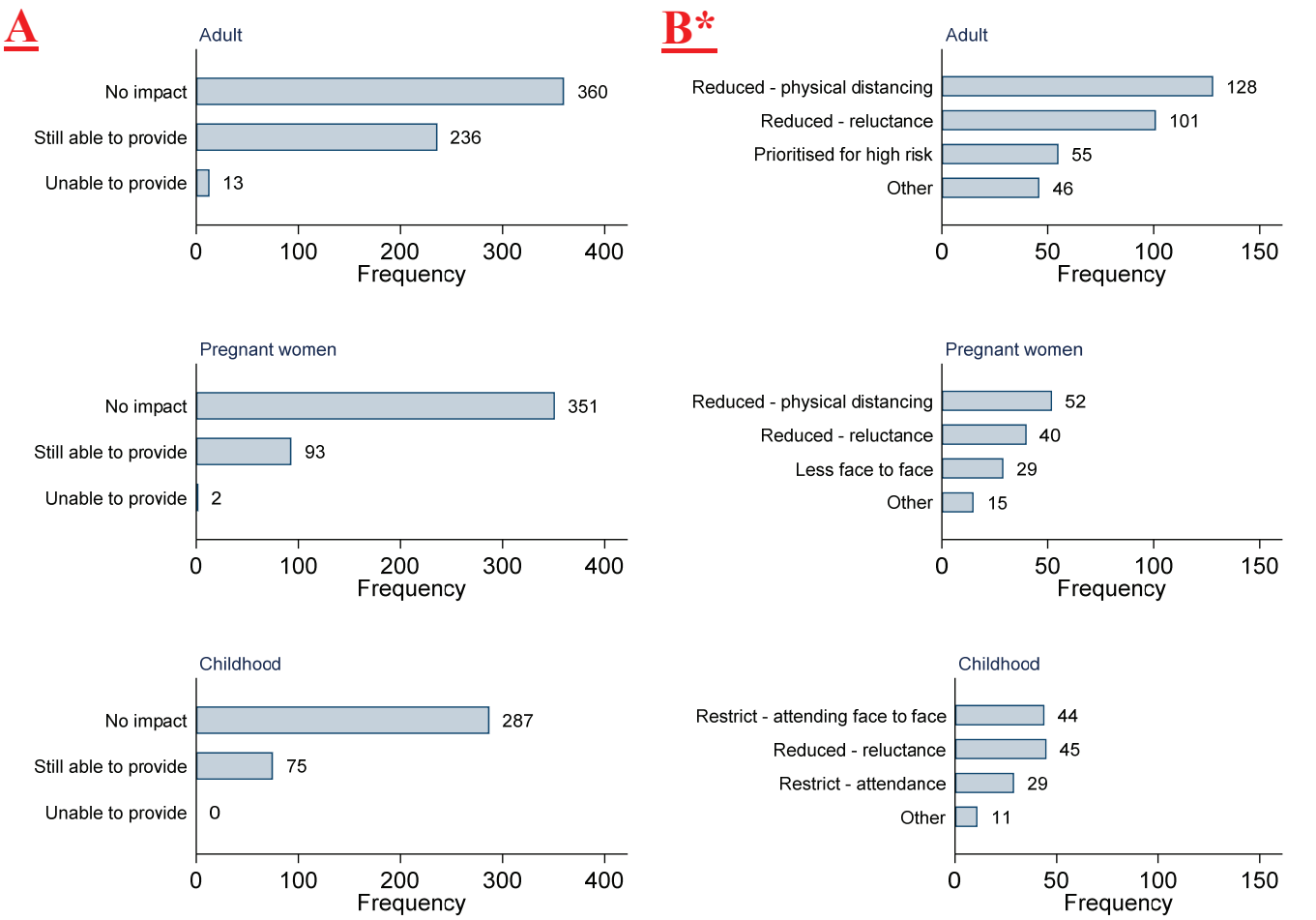
Theme 2: Telehealth/triaging service prior to clinic

This included both the pre-immunisation consult to assess which immunisations were required, and triaging people at the front door to ensure those who came into the clinic were not symptomatic of possible COVID-19.

Requiring consent forms to be completed and submitted electronically before the vaccination appointment has streamlined our record-keeping. – Respondent: NSW Pharmacist

We developed online pre-vaccination screening via unique QR code (other health conditions as well as screening for any covid symptoms). The online booking system is very effective. – Respondent: NSW Pharmacist

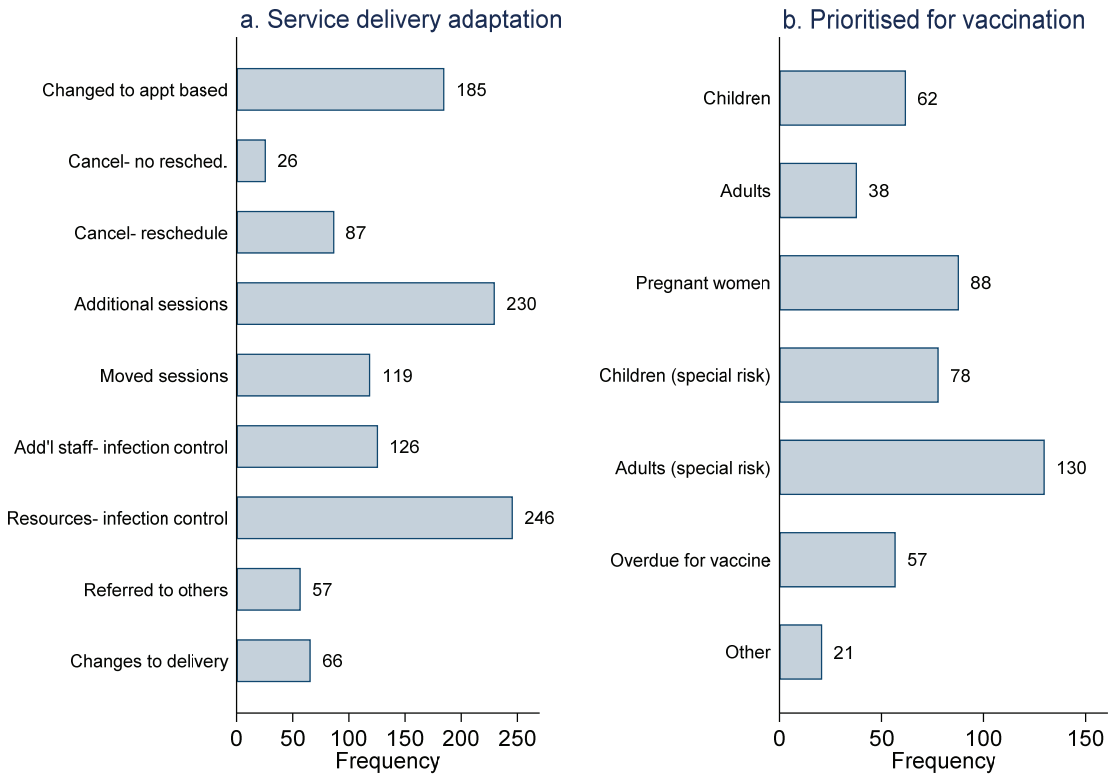
Figure 1. a. Impact of pandemic on capacity to provide adult, maternal and childhood vaccines, b. The ways COVID-19 has impacted on ability to provide adult, maternal and childhood vaccines.



Notes:

* *Adult vaccination responses: Able to offer vaccines but reduced in number of clients able to be seen due to physical distancing measures, Able to offer vaccines but prioritised only to individuals at high risk for vaccine preventable diseases, Able to offer vaccines but reduced in number as individuals reluctant to attend service due to concerns about COVID-19; Maternal vaccination responses: Able to offer vaccines but reduced in number of clients able to be seen due to physical distancing measures, Able to offer vaccines but reduced in number of presenting clients as pregnant women reluctant to attend service, Able to offer vaccines but reduced in number of presenting clients as pregnant women having reduced face to face antenatal appointments.*

Figure 2. a. Ways immunisation providers have adapted their service delivery because of COVID-19, b. Groups that were prioritized by immunisation providers during the pandemic.



Theme 3: Clients waiting in car (either pre- or post-vaccination)

Theme 4: Reduced waiting time post-vaccination

Theme 5: PPE and physical distancing

A significant number (n=126) of respondents commented about the use of PPE and social distancing as something that worked well, particularly in maintaining staff safety during COVID.

Theme 6: Reducing number of support people in the clinic

Theme 7: Re-location of clinics

Re-location of clinics was an umbrella term used to capture the setup of separate influenza vaccination clinics. Examples included: setting up either in the carpark of the centre, at a separate immunisation clinic from the main practice, the immunisation service being moved to a separate part of the clinic with its own entry and exit and/or having a drive-through clinic for immunisation (either onsite or offsite).

> *A lot of planning was needed to be able to offer them from a different venue as our surgery was too small. We acquired the local community hall as an alternate venue for immunisation sessions – much bigger space than the surgery, and able to apply COVID safety measures more easily. – Respondent: TAS midwife*

Two-thirds (243/363 [66.9%]) of respondents plan to continue with these changes into the future.

The common themes that arose from the open-ended questions in relation to interventions that worked well centred around safety – both perceived safety from healthcare providers in reducing their risk of exposure and reduced risk to clients attending. The interventions such as an appointment system, clients waiting in cars, PPE, physical distancing, and reducing the number of people in clinics were able to achieve both goals and provide some control back to immunisers, which was likely to be well received during uncertain times and with multiple changes occurring.

Changes that did not work well

Only a small number 55/642 (9%) reported that the changes implemented had not worked well.

Of the 55 who responded, the examples and reasons given included changes with staffing (e.g. additional burden of running two sites and of having two teams, and not having the same unity and morale at work) and physical distancing requirements leading to issues with patient flow and waiting room space.

A small number of respondents believed the changes were a barrier to patient care, e.g. splitting up family units due to only one support person being allowed in.

> *Allowing only one adult to attend. This is not family-friendly and often the father chose to stay/wait outside the building.* – Respondent: ACT Nurse immuniser

> *It has restricted the amount of family in at any one time. Single parents with multiple children find it difficult.* – Respondent: NSW Nurse immuniser

> *Waiting room and consulting room size has limited partners and support people attending resulting in increased stress and*

anxiety and negative feedback, angry clients.
– Respondent: TAS Nurse immuniser

Infection control measures were also reported as problematic by a minority including contributing to difficulties building rapport with facemasks, children finding PPE frightening, and difficulty maintaining PPE due to issues with availability of supplies.

The common themes that arose from the open-ended questions in relation to interventions that did not work well centred around changes to workforce structure and impacts on morale, along with perceived negative impacts infection control measures had on clients. This seemed to disproportionately affect families with only one parent allowed to support the individual being vaccinated and single parents. Furthermore, answers to the open-ended questions suggested that for a small number of clients, the use of PPE may have negatively affected the delivery of immunisation services, especially to young children.

Discussion

This survey captured responses from immunisation providers in all states and territories in Australia. The key findings are that immunisation providers adopted a wide range of changes to facilitate the ongoing provision of their service. The changes introduced primarily addressed reducing COVID-19 transmission to staff and creating a safe environment for clients to attend. These changes were in line with those recommended by ATAGI, such as the use of PPE, physical distancing measures, reduced number of people allowed per area and reduced observation time post-vaccination. Although many of these changes were highlighted as strategies that worked well, this study did not assess whether any of these strategies remained in place with the easing of public health restrictions and removal of public health orders. It remains to be seen what measures to prevent transmission will be kept by immunisation providers in the future with high rates of COVID-19 vaccination coverage in the community, yet with increasing case numbers as new variants emerge. This may need to be balanced against the concerns raised by a small number of respondents in relation to potential negative impacts on families of some of these restrictions.

In addition to the changes implemented to reduce COVID-19 transmission to staff or clients, two-thirds of respondents noted changes in the way their immunisation service was delivered. These included dedicated clinics, appointment systems, processes for identifying individuals who may have had COVID-19 infection prior to them entering the clinic and alternate models for delivering the service such as outdoor vaccination clinics.

An appointment-based system was welcomed by many and was highlighted as a change which streamlined workflow and was likely to remain in place post-pandemic. There were other system-based changes that respondents indicated assisted with workflow including utilising online consent forms and pre-screening checklists prior to attendance. Importantly, the needs of specific groups such as culturally and linguistically diverse (CALD), the elderly or those with a disability need to be considered as they may not be able to access or use the technology required for these innovations, particularly if they are only provided in English. Alternative processes need to be developed that are specific to their needs so the streamlined workflow does not in itself create a barrier to access.

The changes and responses in our report reflect a period when the healthcare capacity in Australia remained intact and essential health services were operational. This has not been the experience globally with various countries experiencing disruptions to routine immunisation programmes or corresponding decreases in vaccine coverage – or both – in 2020, especially during the earlier phases of the COVID-19 pandemic.[7-14] In Australia, data reported by the National Centre for Immunisation Research and Surveillance confirmed that vaccination uptake in Australian children to date has shown no evidence of any substantial impact on coverage at the national or jurisdictional level up to July 2020.[15,16] However, when looking at populations such as adolescents, there may be early signs of impact on coverage. For example, despite the Annual Immunisation Coverage Report 2020 finding human papilloma virus (HPV) coverage continuing to increase, the proportion of adolescents aged 11–14 who received their second dose of HPV vaccine (course completion) in the same calendar year was lower in 2020 compared to 2019.[17] Given the impact of the pandemic on school closures in Australia in 2021, it is essential that we continue to monitor coverage from school-based vaccination programs. In contrast, during the period of this study (2020) influenza vaccine coverage remained high, reflecting the responses of providers in this survey citing increased demand for vaccines, particularly those targeting respiratory viruses.[18]

According to responses from our study, the main drivers contributing to a reduction in vaccination were anxiety and reluctance by clients to attend services for fear of exposure to COVID-19 infection. Healthcare services are often viewed as a location where you may be at higher risk of exposure to COVID-19.[19] Therefore, to maintain high immunisation coverage, communication strategies to the public should include messages about the safety of individuals who attend for vaccination (from an infectious disease exposure perspective). Public health orders, if required in the future, should consider including vaccination as an explicit reason to leave the house, including to receive any of the vaccines on the National Immunisation Program.

Innovative methods for vaccination delivery were also explored to optimise service delivery such as drive-through vaccination clinics. Drive-through vaccination clinics were established to deliver vaccines on the National Immunisation Program prior to the availability of COVID-19 vaccines and have been demonstrated to be an effective and safe option. Increased access to these should be considered, especially in regions of reduced coverage.[20] Further work should be undertaken to better understand the ideal model for this depending on the setting, such as a drive-through service for all vaccines or a setting restricted to only a limited range such as COVID-19 or influenza. These innovative methods for vaccine delivery could also be considered as a targeted strategy for settings of low vaccine uptake, to facilitate uptake without requiring attendance at a traditional healthcare service.

There are several limitations to our study worth mentioning. Firstly, most respondents were nurse immunisers and pharmacists, and given the researchers were not involved in the distribution of the survey (this occurred through jurisdictional immunisation branches), we do not have a denominator to determine the response rate. Although many of these practitioners identified primary care as a place of employment, we had very few responses from general practitioners. This does not necessarily reflect low rates of

GPs providing immunisation services, but rather the methodology for distribution of the survey. Secondly, there were very few responses from some states and territories which may limit the generalisability of results to these regions more broadly. It also limits the capacity to explore differences between states and territories which to date have been differentially impacted by the COVID-19 pandemic.

Maintaining vaccine coverage has not been possible without significant changes implemented by immunisation providers to maintain their safety and that of their clients attending for vaccination. Understanding the breadth of these changes, and what has worked and not worked, is essential so vaccine delivery can continue in the face of the ongoing pandemic. The experience gained from the introduction of these strategies can also be used to inform options in settings outside of Australia. Furthermore, the COVID-19 pandemic has allowed immunisation providers to develop and test new strategies for delivery that may be maintained into the future. With the current COVID-19 vaccine rollout, there has never been a more important time to understand the optimal strategies to deliver vaccines safely and effectively to the community. As one of our respondents explained:

> *COVID has brought out the best and the worst in some people. Adapting to the changes it has brought has been vital. Not everyone handled this well, but for those who have, it has actually been an opportunity to learn and grow from the experience. We now need it to end – bring on the COVID vaccines – more challenges to come.* – Respondent: SA Nurse immuniser

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