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Prioritising culturally appropriate interventions to increase antenatal immunisation in Aotearoa New Zealand: a Delphi study

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ABSTRACT

Introduction. Antenatal immunisation rates for influenza and pertussis in Aotearoa New Zealand (NZ) are low and inequitable. Culturally appropriate interventions are urgently needed. **Aim.** This study aims to identify and prioritise culturally appropriate, equitable interventions to improve antenatal immunisation rates in NZ. **Methods.** A three-round Delphi study was conducted. In the first round, interventions to increase antenatal immunisation rates were identified in qualitative interviews with 40 healthcare professionals. In the second and third rounds, 21 panellists (healthcare professionals and health policy and practice experts) rated 10 interventions for their feasibility, equity and impact on a five-point Likert scale. Median and interquartile ranges (IQRs) were calculated. For each parameter, consensus was defined as an interquartile range ≤1. In the third round, panellists selected their 'top three' prioritised interventions for NZ. **Results.** Panellists rated all interventions arising from the first round highly for feasibility, equity and impact. Consensus for all parameters was achieved at the strongest level for 5 of the 10 interventions in the second round. At the completion of the third round, consensus had been achieved for all parameters for 8 of the 10 interventions. The introduction of outreach immunisation services for hapū māmā appeared most frequently in participants' 'top three' (selected by 55% of panellists). **Discussion.** The 10 interventions identified by participants in the first round were rated highly for their feasibility, equity and impact by panellists in the second and third rounds of this Delphi study. These interventions should be considered by those developing interventions to increase antenatal immunisation rates in NZ.

Keywords: antenatal immunisation, Health equity, Immunisation, Māori health, pregnancy vaccination, vaccine uptake.

Introduction

Infection with influenza during pregnancy or in the first months of life can have serious morbidity and mortality consequences for hapū māmā[A] (pregnant people) and pēpi (babies), and whooping cough (pertussis) can cause serious morbidity and mortality in young infants.[1,2] Antenatal immunisation is a safe, effective way of protecting hapū māmā and pēpi from these diseases[3] and in Aotearoa New Zealand (NZ), influenza and pertussis immunisations during pregnancy are recommended and available free of charge.[4] However, antenatal immunisation uptake is low overall, and coverage is inequitable, with Māori, Pacific People and people from areas of high socioeconomic deprivation being half as likely to receive immunisations as other groups. This leaves hapū māmā and pēpi in these groups at greater risk of infection.[5–7] For Māori (the Indigenous people of NZ), this represents a failure of the Crown to uphold rights to good governance under Article One and health equity under Article Three of Te Tiriti o Waitangi.[8]

[A]We acknowledge that not all birthing people identify as mothers, and in this text, we use hapū māmā as a term to describe the contribution that the parent is making to their wider whānau and hapu in nurturing their pēpi through haputanga (pregnancy).

WHAT GAP THIS FILLS

What is known about the topic: Antenatal immunisation rates for influenza and pertussis in Aotearoa New Zealand are low and inequitable. Culturally appropriate interventions to improve immunisation rates and achieve equity are urgently needed.

What this study adds: Ten possible interventions identified by healthcare professionals to increase antenatal immunisation rates received high scores when rated by Delphi study panellists for their feasibility, equity and impact. These interventions should be considered for implementation by policy makers and healthcare providers to increase antenatal immunisation rates in New Zealand.

The low and inequitable antenatal immunisation rates observed in NZ are influenced by a range of complex factors across multiple levels.[9,10] Interventions to target these factors in culturally appropriate ways are urgently needed to improve immunisation rates.[11] Potential interventions can be identified in a variety of ways, including through literature searches. However, seldom are NZ healthcare professionals, who regularly care for hapū māmā and whānau and/or who provide immunisation services to this group, consulted as to which interventions are suitable for the NZ contexts within which they work and to contribute to the prioritisation and optimisation of such interventions. 'Delphi' methodology provides a way to obtain the views of a group of healthcare professionals and develop consensus on the topic in question.[12] The aim of this study was to use Delphi methodology with a group of currently practising NZ healthcare professionals to identify, optimise and prioritise culturally appropriate interventions aimed at increasing immunisation rates for pertussis and influenza among hapū māmā in NZ.

Methods

The research presented in this paper was done as part of a larger investigation into supporting vaccination for hapū māmā. This paper focuses on the Delphi study that was a part of the umbrella study.

Delphi methodology

Although Delphi methodology has several key characteristics, strict guidelines for its use do not currently exist.[12] For the purposes of this project, we largely followed the methodological recommendations of Trevalyan and Robinson.[12] We set the number of rounds in this Delphi study *a priori*, specifying three rounds, which is deemed to be optimal.[12] The first round is frequently qualitative and generates ideas, whereas the second and third rounds are frequently quantitative and involve the ranking of ideas from the first round.[12] Ethical approval for all rounds was obtained from the University of Otago Human Ethics Committee through two applications (H23/113 for the umbrella project under which this sits, including the first round of the Delphi study, and 24/0267 for the Delphi study specifically, including the second and third rounds). See Fig. 1 for an overview of the study design.

The first round

As part of the umbrella study, between March and July 2024, qualitative interviews were conducted either face-to-face or online with 40 healthcare professionals (currently practising GPs, nurses, midwives, pharmacists, immunisation coordinators and kaiāwhina[B]). Focus groups with seven Māori and/or Pacific hapū māmā were also completed. Healthcare professionals were recruited across the country through professional networks and snowballing. Hapū māmā were recruited from local networks in Gisborne with help from Turanga Health and in Porirua with help from the Ora Toa primary health organisation (PHO) (both Māori health providers). These two locations were selected for the recruitment of hapū māmā because of their large Māori and Pacific People populations and relatively low immunisation coverage rates and research team members' whānau or other links to these two Iwi.[7,14–16] Interviews traversed a number of areas relating to influenza and pertussis antenatal vaccination. Of relevance to this study, participants were asked to make suggestions for interventions to increase antenatal immunisation rates. Although COVID-19 vaccination is also recommended during pregnancy, this is only for some individuals,[4] unlike pertussis and influenza vaccination, for which there is a universal recommendation. Furthermore, guidelines have been changing as we learn more about COVID-19, the different strains that predominate, and consequently who would most likely benefit from immunisation. Thus, COVID-19 vaccination was not included in this study.

Each interview was recorded and transcribed using an online transcription service (turboscribe.ai).[17] One researcher (LF) was responsible for reviewing each transcript and creating a table describing the possible additional interventions suggested by participants. The research team then discussed the interventions identified, modifying and combining the suggestions to create distinct interventions to be rated, optimised and prioritised by Delphi panellists in the second and third rounds.

[B]'Kaiāwhina' is an overarching term used to describe non-regulated roles in the health and disability sector which support hauora (holistic wellbeing) outcomes for all in NZ [13]. Ministry of Health | Manatū Hauora and Toitū to Waiora | Workforce Development Council for Community, Health, Education and Social Services. Kaiāwhina Workforce Plan 2020-20252021.

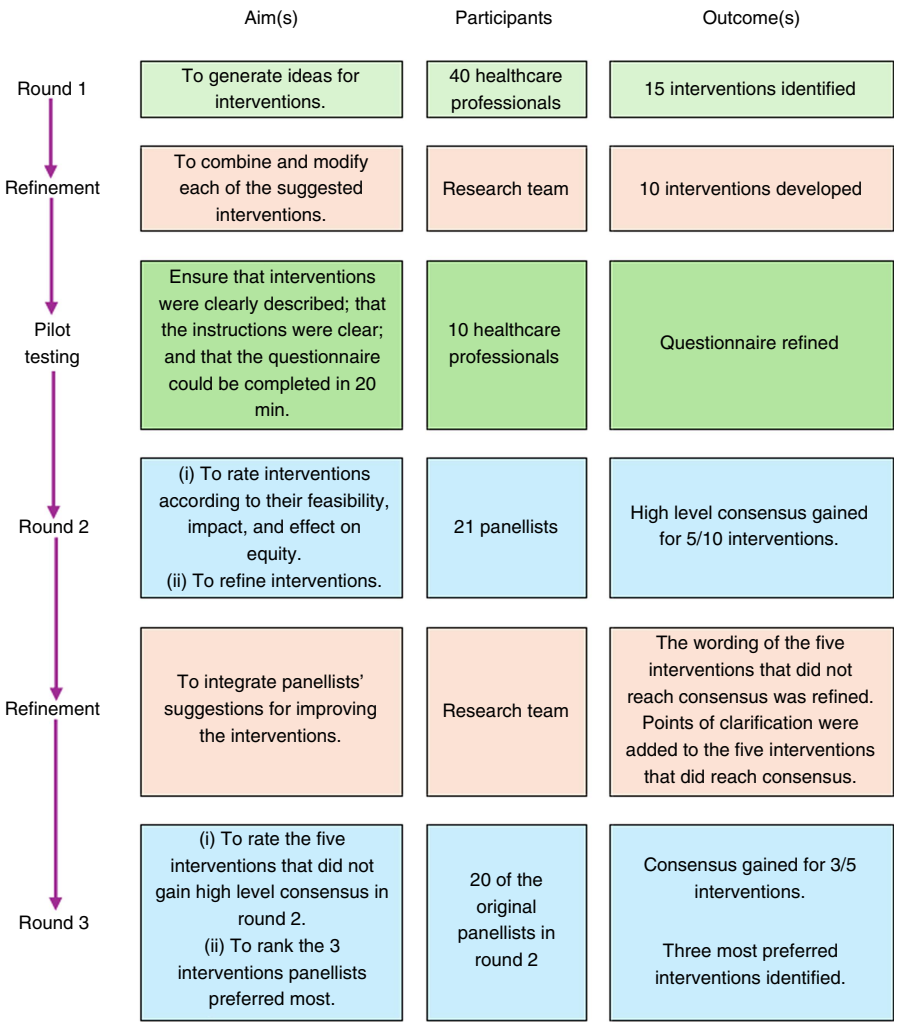

Fig. 1. Overview of study design.

The second round

Rating scales. The second round was undertaken to rate and optimise the interventions identified in the first round. A questionnaire to rate the interventions was developed by the research team. This asked panellists to rate whether they thought the intervention would improve immunisation coverage ('This intervention would improve overall immunisation rates in pregnant women in New Zealand'), improve equity ('This intervention would increase immunisation coverage for Māori and Pacific hapū māmā and eliminate other disparities in immunisation rates') and be feasible within the constraints of the health system ('If cost was not a barrier, this intervention would be do-able within our current health system'). Ratings were collected on a 5-point Likert scale, whereby 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. After rating each intervention, panellists could comment on how the intervention could be improved. Demographic information (panellists' role in the healthcare workforce, length of time spent working in that role, ethnicity, age and gender) was also collected. The questionnaire was disseminated using Qualtrics software. Pilot-testing was undertaken with 10 healthcare professionals (n = 2 GPs, 3 midwives, 5 pharmacists) and one academic prior to the second round. Minimal changes were required to ensure the interventions were clearly described, panellists understood the process, and the questionnaire could be completed within 20 min.

Panellists. Purposive sampling was employed to find 21 panellists to take part in the second and third rounds. The research team identified potential panellists from their networks and invited them to participate via email. To be eligible to participate, panellists had to be currently practising GPs, nurses, midwives, pharmacists, immunisation coordinators, kaiāwhina or health policy or practice experts in NZ. They needed to be involved in either immunisation and/or caring for hapū māmā and be able to communicate in English. Potential Māori and Pacific People panellists were approached before other potential panellists to prioritise Indigenous and Pacific voices. After agreeing to participate, panellists were allocated a Panellist ID number and sent an electronic link to the survey for the second round via email.

Panellists were informed that completing the survey on Qualtrics implied consent. Responses were collected over a 1-month period during October and November 2024.

Analysis. The median and interquartile range (IQR) were calculated as measures of central tendency and dispersion for each of the parameters of feasibility, equity and impact for each of the interventions as per standard practice.[12] The IQR is generally accepted as an objective and robust method of determining consensus in Delphi studies; when a 5-point scale is used, an IQR of ≤ 1 is usually considered to be a suitable consensus indicator.[18] Thus, in the current work, we defined consensus between panellists as IQR $\leq$ 1. Qualitative feedback about how each intervention could be improved was collated and discussed by the research team prior to the third round.

The third round

Questionnaire. The median value and whether consensus had been reached for each parameter from the second round were presented in a table for each intervention and shared with panellists. Where consensus was achieved at the highest possible level (5 = strongly agree) for all three parameters (equity, feasibility and impact) for a single intervention, panellists were not asked to re-rate the intervention, although they had the opportunity to comment on it in the free text if they wished. Where consensus had not been achieved and/or the mean for any parameter was less than 5 (strongly agree), interventions were revised by the research team to reflect panellist suggestions for improvement, and panellists were asked to re-rate the revised interventions. They were able to use the free text to comment further on all interventions if desired. Finally, the questionnaire listed the interventions and asked panellists to select the three that they would most like to see prioritised in NZ. Responses from the third round were collected via a Qualtrics questionnaire over a 5-week period in December 2024 and January 2025.

Results

The first round (qualitative)

Participants

The demographic characteristics of the 40 healthcare professionals (1 GP, 14 nurses, 3 pharmacists, 13 midwives, 6 immunisation coordinators and 3 kaiāwhina) and 7 hapū māmā who participated in the qualitative interviews in the first round are shown in Supplementary Table S1. Over one-third (37.5%) identified as Māori, and 14 (35%) worked for a Māori health provider or an iwi–Māori partnership board. Five (12.5%) were of Pacific ethnicity. All except one were female. Participants came from 12 different urban and rural locations throughout NZ.

The second and third rounds (quantitative)

Panellists

Twenty-one panellists from seven professions were recruited (4 nurses, 3 general practitioners, 3 pharmacists, 3 midwives, 3 kaiāwhina, 3 health policy/practice experts and 2 immunisation coordinators/advisors). All except one were female. Two-thirds were of Māori ethnicity. Panellists came from a variety of rural and urban locations around NZ (data not shown). Characteristics of the 21 panellists who completed the online questionnaire in the second round are shown in Table 1.

Identification of the interventions

Fifteen strategies suggested by healthcare professionals to increase antenatal immunisation rates were identified in the first round (see Supplementary Table S2). The research team adapted them into 10 distinct interventions, which were slightly modified and clarified in response to feedback in the second round of this study (Supplementary Table S3). Of note, offering incentives to hapū māmā to be vaccinated was contentious; this was therefore modified to offering incentives to attend education sessions about vaccination, rather than receiving the vaccine itself. Each intervention has been given a shortened name for use within this manuscript.

The second round: intervention ratings and consensus

In the second round, consensus was achieved at the strongest level (5 = strongly agree) in all three parameters for five (50%) of the interventions: 'incentivised education sessions', 'outreach immunisation services', 'walk-in immunisations', 'funded immunisation training for midwives' and 'immunisation resourcing for midwives'. Additionally, consensus was achieved at a slightly lower level (4 = agree) for all parameters for 'data provision for healthcare professionals', and across two levels (5 = strongly agree for feasibility and 4 = agree for equity and impact) for 'public health campaign'. Despite high medians (4 = agree or 5 = strongly agree), consensus was not achieved for any of the three parameters for 'vaccine prescriptions' and was also lacking for both the feasibility and the equity of the 'funded antenatal immunisation healthcare appointment' intervention. Finally, although a high median (5) was again achieved, there was a lack of consensus for the equity of the 'authorised vaccinator within LMC [Lead Maternity Carer] services intervention' although consensus was achieved at the 'strongly agree' level for this intervention's feasibility and impact. Table 2 displays the ratings received and whether consensus was achieved for each intervention for the feasibility, equity and impact parameters in the second and third rounds.

A range of responses were received regarding how interventions could be improved (data not shown). Some comments described personal or anecdotal experiences with similar interventions, stated personal opinions on various

Table 1. Demographic characteristics of Delphi study panelists.[A]

Characteristic	*n* (%)
Role	
Nurse	4 (19.0)
General practitioner	3 (14.3)
Pharmacist	3 (14.3)
Midwife	3 (14.3)
Health policy/practice expert	3 (14.3)
Immunisation advisor or coordinator	2 (10.0)
Kaiāwhina or Kai Manaaki	3 (14.3)
Ethnicity[B]	
Māori	14 (66.7)
Pacific people	3 (14.3)
New Zealand European/Pākehā	9 (42.9)
European, other	2 (10)
Gender	
Female	20 (95)
Male	1 (5)
Age (years)	
20–29	1 (4.8%)
30–39	6 (28.6%)
40–49	7 (33.3%)
50–59	3 (14.3%)
60+	4 (19.0%)
Time in role (years)[C]	
<2	3 (14.3%)
2–5	5 (23.8%)
6–10	3 (14.3%)
11–15	4 (19.0%)
16–20	3 (14.3%)
21+	3 (14.3%)

[A]'Panellists' are those who completed the online Round 2 and Round 3 questionnaires.
[B]Multiple answers were permitted and thus totals add to >100%.
[C]Refers to the time that the person has spent working in that role across their lifespan, not in their current position.

facets of the interventions, or focused on barriers to the feasibility, equity or impact of the suggested intervention, instead of suggesting improvements. The comments that did suggest improvements informed the revised interventions in the third-round questionnaire. For example, several panellists commented on the importance of having Māori worldviews represented in the 'public health campaign' intervention, which led to the revision of this intervention to a campaign co-designed with Māori and Pacific People. Several panellists commented that single interventions alone would have less impact than combining several interventions into one large campaign.

Third round ratings and consensus

Twenty (95%) of the 21 second-round panellists completed the third-round questionnaire. Notably, none of the five revised interventions achieved consensus at the highest level (5 = strongly agree) in all three parameters, although consensus was met across the two highest levels (5 = strongly agree and 4 = agree) in all parameters for the 'data provision for healthcare professionals', 'public health campaign' and 'authorised vaccinator within LMC services' interventions. Consensus was not met for any of the three parameters for the revised 'vaccine prescription' intervention, despite the median value of 4 for each parameter. Similarly, despite medians of 4, consensus was not achieved for the equity or the impact of the 'funded antenatal immunisation healthcare appointment' intervention. Table 2 displays the ratings and whether consensus was achieved for the five revised interventions that did not achieve consensus at the highest level (5 = strongly agree) in the second round.

Overall, panellists made fewer qualitative comments about the interventions in the third round than in the second round (data not shown). Where comments were made, they often described the concerns that panellists had about specific interventions (for example, concern that the 'vaccine prescription' intervention would require hapū māmā to organise a trip to another healthcare provider when having immunisations available at an existing healthcare appointment would be preferable) or simply relayed that a panellist approved of the revisions to an intervention.

Third round prioritisation of interventions

Panellists were asked to select the three interventions they preferred most. 'Outreach immunisation services' was included as one of the preferred three interventions by 11 (55%) panellists, whereas 'authorised vaccinator within LMC services' was included by 9 (45%). 'Public health campaign', 'incentivised education sessions' and 'walk-in immunisations' were each selected within the top three of 8 (40%) panellists. At the other end of the scale, 'Funded antenatal immunisation healthcare appointment' was only selected by 1 (5%), and 'data provision for healthcare professionals' was selected by 2 (10%). Table 3 shows the number of votes received by each intervention when panellists selected their three preferred interventions.

Discussion

In this Delphi study, 10 interventions to increase antenatal immunisation against pertussis and influenza during pregnancy were identified by health professionals, rated for effects on equity, their feasibility and potential impact, and then

Table 2. The feasibility, equity and impact of 10 interventions to increase antenatal immunisation rates: Delphi study second and third round.

Intervention	Round[A]	Rating and IQR for consensus					
		Feasibility[B]		Equity[B]		Impact[B]	
		Median	IQR	Median	IQR	Median	IQR
			Consensus		Consensus		Consensus
1. Data provision for healthcare professionals	2	4	1.0	4	1.0	4	1.0
			✓		✓		✓
1. Data provision for healthcare professionals	3	5	1	4	1	4	1
			✓		✓		✓
2. Public health campaign	2	5	0.5	4	1.0	4	1.0
			✓		✓		✓
2. Public health campaign	3	5	0	5	1	4.5	1
			✓		✓		✓
3. Funded antenatal immunisation healthcare appointment	2	5	1.5	4	2.0	4	1.0
			×		×		✓
3. Funded antenatal immunisation healthcare appointment	3	4	1	4	1.5	4	1.5
			✓		×		×
4. Incentivised education sessions	2	5	1.0	5	1.0	5	1.0
			✓		✓		✓
5. Vaccine prescriptions	2	5	2.0	4	2.0	4	2.0
			×		×		×
5. Vaccine prescriptions	3	4	1.5	4	1.5	4	1
			×		×		×
6. Outreach immunisation services	2	5	1.0	5	1.0	5	1.0
			✓		✓		✓
7. Walk-in immunisations	2	5	1.0	5	1.0	5	1.0
			✓		✓		✓
8. Funded immunisation training for midwives	2	5	1.0	5	1.0	5	1.0
			✓		✓		✓
9. Immunisation resourcing for midwives	2	5	1.0	5	1.0	5	1.0
			✓		✓		✓
10. Authorised vaccinator within LMC services	2	5	1.0	5	1.5	5	1.0
			✓		×		✓
10. Authorised vaccinator within LMC services	3	5	1	4.5	1	5	1
			✓		✓		✓

✓ Indicates that consensus was achieved (IQR ≤ 1) while × indicates that consensus was not achieved (IQR > 1)
[A]Those that achieved a median rating of 5 (strongly agree) for all three parameters and achieved consensus in round 2 were not sent for rating in round 3.
[B]Measured on a 5-point Likert scale, whereby 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

ranked for preference. Consensus was achieved at the highest level for all three parameters for five of the suggested interventions, including (i) incentivised education sessions, (ii) outreach immunisation services, (iii) walk-in immunisations, (iv) funded immunisation training for midwives, and (v) immunisation resourcing for midwives.

Consensus was achieved at a satisfactory level for three interventions: (i) data provision for healthcare professionals, (ii) public health campaign, and (iii) authorised vaccinator within LMC services.

The interventions most frequently selected by panellists as being in their 'top three' for prioritisation in NZ were

Table 3. Preferred interventions of Delphi study panelists.[A]

Intervention[A]	Number of votes[B]	Rank
Outreach immunisation services	11	1
Authorised vaccinator within LMC services	9	2
Public health campaign	8	=3
Incentivised education sessions	8	=3
Walk-in immunisations	8	=3
Immunisation resourcing for midwives	7	6
Funded immunisation training for midwives	4	7
Vaccine prescriptions	2	=8
Data provision for healthcare professionals	2	=8
Funded antenatal immunisation healthcare appointment	1	10

[A]Each panellist was asked to select the three interventions that they would most like to see prioritised in New Zealand, from the list of 10.
[B]As each of the 20 panellists selected three answers, the total number of votes is 60.

'outreach immunisations', 'authorised vaccinator within LMC services' and, as third equal, 'public health campaign', 'incentivised education sessions' and 'walk-in immunisations'. Given the increased chance of adverse outcomes for māmā and pēpi who are not vaccinated, some urgency needs to be given to supporting interventions, such as those identified in our study, that have a high likelihood of being effective. These interventions are more likely to be effective if combined with wider systems changes.

The strong ratings and high degree of consensus could potentially be attributed to the fact that low antenatal immunisation rates are a known problem in NZ,[6,7] particularly in the current environment of a pertussis epidemic where low vaccination rates have been publicised as contributing to the epidemic.[19] Thus, it is possible that the panellists who completed the second and third rounds held the view that almost any intervention aimed at reducing influenza and pertussis infections in pregnancy and infancy would be worthwhile.

The consistently high ratings make it somewhat difficult to prioritise some interventions over others. However, it has been noted that multipronged approaches are required to increase immunisation coverage.[20] 'Outreach immunisation services', which was rated within the top three interventions by over half of the panellists, should be considered for urgent implementation in areas where immunisation rates are low, given the current pertussis epidemic. Research into immunisation outreach services consistently demonstrates service effectiveness in boosting immunisation coverage,[21,22] so the findings from our study are unsurprising, but lend a voice to call for wider services to be delivered that support hapū māmā immunisation.

Two midwife-focused interventions to support midwives' role in antenatal immunisations; 'funded immunisation training for midwives' and 'immunisation resourcing for midwives' both achieved consensus at the highest level for all three parameters in the second round. It is well known that midwives are trusted, and most hapū māmā will have a midwife as their LMC during their pregnancy.[23] It has been stated that midwives offering immunisations would help improve antenatal immunisation uptake.[24] However, the midwifery workforce in NZ is under-resourced and stretched,[25] and midwives' have concerns about being able to deliver immunisation services.[26] Panellists in our study strongly agreed with the interventions that would offer support for midwives in playing a role in increasing antenatal immunisations. Since the completion of the study, some progress has been made in this area. At the time of writing, national policy changes mean that midwives are able to be paid for each vaccination, they are paid for the time it takes them to complete the online training and they are able to access resources, such as fridges, to assist with providing vaccinations.[27] The recent changes to support midwives to provide vaccines are promising, and could be enhanced by other changes, such as sharing relevant information between midwife LMCs and general practitioners and providing funding to support outreach immunisation services.

The lack of consensus for the equity and impact of the revised 'funded antenatal immunisation healthcare appointment' intervention may be indicative of a range of potential challenges with this intervention, such as some hapū māmā being unable to easily access healthcare providers, or not having established or trusting relationships with those that can be accessed.[28] Health providers experiencing high demand may also find it difficult to fit new appointments for this purpose into their existing workloads. Thus, it may be appropriate to prioritise more walk-in or easy-to-access appointments and the 'incentivised education sessions' intervention (where immunisation may be available, but where the purpose of the session is primarily to learn about pregnancy immunisations in a safe environment). However, as pointed out by panellists and outlined in the revised version of this intervention in Table 1, any education sessions would need to be carefully designed and likely need to be community-specific to be effective. Participants and panellists had differing views on the pros and cons of incentives, and thus, careful consideration would need to be given to if and what incentives might be offered.

Strengths and limitations

This work has several strengths. The participants and panellists in all three rounds included healthcare professionals who had intimate knowledge of the māmā, whānau and communities within which they were working, and who could reasonably be expected to competently consider whether the suggested interventions would work for them. A high percentage of participants and panellists (n = 15, 38% in the first round and n = 14, 67% in the second

Box 1. **Key take-home messages**

1. We have identified culturally appropriate interventions that should be urgently implemented to increase antenatal immunisation rates, particularly in marginalised communities.
2. Among the 10 interventions assessed in this Delphi study, outreach immunisation services are the top-prioritised intervention, suggesting that taking vaccines directly to hapū māmā, rather than expecting them to seek out immunisation services, may be a highly effective strategy.
3. Midwives play a crucial role in antenatal care, and interventions such as funded immunisation training for midwives and embedding authorised vaccinators within lead maternity carer (LMC) services received strong support.

round) identified as Māori. As mentioned earlier, the lower antenatal immunisation rates among Māori represent both a breach of Te Tiriti o Waitangi,[8] and an increased risk to the health of Māori māmā, pēpi and communities. It is paramount that some interventions are identified and developed 'by Māori, for Māori'[29] to eliminate inequities in antenatal immunisation coverage and protect health.

There were also some limitations with the characteristics of the participants and panellists in this study. Almost all were female, which may have been influenced by the fact that several of the included professions (such as nursing[30] and midwifery[25]) are dominated by females. Furthermore, this is a small study. For practical purposes, we choose to limit the number of panellists in the second and third rounds to 21. We realise that the scope of practice within these professions is wide, and different results may have been obtained if a larger, more diverse, non-purposive sample had been used.

Conclusion

Reducing access barriers to antenatal immunisation, such as by extending outreach services, having an authorised vaccinator within LMC services, and increasing walk-in immunisation clinics, were identified as potential solutions to support equitable immunisation uptake. Improving hapū māmā and whānau knowledge and understanding of the importance of antenatal immunisation could also help and be potentially achieved through co-designed large public health campaigns and incentivised immunisation education sessions. The key take-home messages from this study are provided in Box 1.

Supplementary material

Supplementary material is available online.

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