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ORIGINAL RESEARCH

Tailoring immunisation programs in Lismore, New South Wales - we want our children to be healthy and grow well, and immunisation really helps

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ABSTRACT:

Introduction: In 2018 in the Australian town of Lismore, New South Wales, 175 children were overdue for scheduled vaccinations, 11% of them being Aboriginal and/or Torres Strait Islander (2018). This study aimed to gain a deeper understanding of the reasons for low coverage.

Methods: Aboriginal and non-Aboriginal parents, carers and health service providers were invited to take part in semi-structured interviews and focus groups. Open-ended questions were asked about immunisation barriers and enablers, and what strategies may be effective in improving coverage in Lismore.

Results: A total of 35 participants took part. Six themes were developed: childhood immunisation in Lismore is limited by access barriers to health services, some families may need additional support to access vaccination services, health services need to ensure that Aboriginal families feel safe and comfortable when accessing their service, parents and carers value reminders and recalls to keep their children's vaccinations up to date, parents' and carers' views influence their decisions to immunise their children, and reliable information about immunisation needs to be available in ways that are meaningful and appropriate for parents and carers.

Conclusion: Access barriers and vaccine hesitancy have been contributing to children falling behind in their scheduled vaccinations in Lismore. More flexible health services, culturally safe and appropriate care and more practical support can help overcome structural barriers to health services. Tailored health messages for both Aboriginal and non-Aboriginal parents and carers can assist parents in making wise immunisation choices. More consistent analysis and reporting of routinely available data can identify pockets of low coverage. Publicly funded health services and Aboriginal Community Controlled Health Services are well placed to provide flexible vaccination services for those families who may struggle with access barriers.

Keywords:

Aboriginal health, Australia, childhood immunisation, primary health care, public health, vaccine hesitancy.

FULL ARTICLE:

Introduction

Achieving high immunisation rates is a priority for public health units in Australia. Aspiring to 95% coverage rates for all children regardless of financial or geographic barriers is a national strategic aim[1]. While immunisation is well supported in Australia and most children are fully immunised for their age, pockets of low coverage exist. In June 2020, in the Richmond Valley Hinterland, within the Northern New South Wales Local Health District (NNSWLHD), 88.9% of children aged 24–27 months were fully immunised. The coverage rate for those aged 60–63 months was 92.2%[2]. Analysis of 2018 data from the Australian Immunisation Register by the NNSWLHD Public Health Unit showed that in Lismore, a town in the district (population approximately 28 400), a high number of children aged less than 5 years (175) were at least 30 days overdue for one or more scheduled vaccinations. Aboriginal and/or Torres Strait Islander (hereafter 'Aboriginal') children accounted for 11% of children whose vaccinations were overdue. The 2016 Census of Population and Housing reported that Aboriginal children made up about 12% of the town's children aged under 5 years, and that about 6% of the township's total population identified as Aboriginal[3]. Currently childhood vaccination is available in Lismore during business hours through general practitioners and the Aboriginal Community Controlled Health Service (ACCHS) and on two half days per month from Child and Family Health Nursing (CFHN). All services require appointments. There is no assistance with transport and no home visits for vaccination.

Previous research found barriers to childhood immunisation include service access barriers (including hours of operation, transport, difficulty getting an appointment, out-of-pocket costs), lack of cultural safety in some health services and competing family priorities (food, housing, employment)[4-7]. Service models that were family centred and offered flexible options such as drop-in clinics and after-hours services that are conveniently located, free of charge and culturally appropriate for Aboriginal families were recommended by health service providers and parents as ways to improve immunisation coverage. Using reminders and recalls helped parents make and keep appointments[4-7]. Strategies should be tailored to meet the unique needs of communities where coverage is low[8,9].

Lismore is set amongst national parks, rainforest and rich pastoral land, and is 35 km from the Pacific Ocean. Most residents were born in Australia (90.6% compared to 65.5% in NSW) and only 5.3% speak a language other than English at home (compared to 25.2% in NSW)[3]. The area is part of the traditional lands of the Aboriginal peoples of the Bundjalung Nation, and Aboriginal peoples from other areas also live in Lismore. Lismore is seen as a good place to bring up children, with its friendly atmosphere and country lifestyle. Lismore is experiencing gentrification of its suburbs, causing rental stress, rising house prices and a shortage of jobs, all of which put pressure on low-income families. Lismore is an area of socioeconomic disadvantage, with unemployment rates higher than the national average[10].

The WHO's Tailoring Immunization Programmes (TIP) guide was developed to assist public health services to identify areas of low childhood immunisation coverage, to gain a deeper understanding of the local barriers to and drivers of immunisation and to identify strategies that may be effective in improving coverage. The TIP guide has three phases: situational analysis, research and intervention design. A post-TIP period includes implementation, evaluation and adjustments[9]. TIP is underpinned by the COM-B theory of behaviour change, which comprises the characteristics of individual capability, contextual opportunity and individual motivation[11]. These factors can reveal barriers to childhood immunisation (limited access to services), and also strengths (positive motivation of parents and the workforce) that can be further supported or developed to increase the number and percentage of children able to achieve full immunisation. Reasons for low immunisation coverage are often complex and context specific, so effective solutions require a thorough understanding of the problem[9]. Using the TIP approach, this study aimed to gain a deeper understanding of the reasons why both Aboriginal and non-Aboriginal children in Lismore were overdue for their vaccinations, and the potential strategies that may be effective in reducing the number of overdue children.

Methods

The study's methods were adapted from the WHO's TIP methods. Qualitative methodology was used to explore participants' views and experiences in using vaccination services in Lismore. TIP uses a qualitative approach to explore community perceptions about immunisation, parent's individual views and to better understand the accessibility of health services to parents in a local context.

Participants' views and experiences were explored using focus groups, individual interviews and small-group discussions. Individual parent interviews provided a safe and confidential space for parents to express their views. Focus groups were used for health workers who were known to each other and shared similar workplace experiences. Some individual interviews were held with health service providers who requested anonymity or to include those who missed earlier focus groups. Some small-group discussions were held with parents who felt more comfortable sharing views with researchers in the company of their peers.

Health service providers included those providing childhood vaccinations or who were involved in the planning of vaccination services in Lismore. Health service providers with direct clinical experience and managers with knowledge of policy and strategic planning were invited to participate.

Parents and carers from local playgroups were invited to participate. Aboriginal parents were invited through the YWCA (Young Women's Christian Association, a non-denominational movement that champions young women[12]), which provides a safe and central place of belonging for Aboriginal families. Snowball techniques were used to reach a greater range of parents[13].

Aboriginal and non-Aboriginal parents, carers and health service providers were invited to take part in semi-structured interviews and focus groups. Parents and carers of children overdue for vaccination were identified and invited by vaccination staff from the public health unit. Potential participants were provided an information statement. Written consent was obtained prior to participation. An A$30 gift card was given to participating parents and carers in appreciation for their time. Focus groups and interviews were held at times and in locations convenient to participants. Some interviews were undertaken by telephone. The question guide was simple, with open-ended questions that allowed participants to discuss issues important to them and allowed researchers to follow emerging lines of enquiry. Maximum variation sampling was used to select a wide representation of views about childhood immunisation, relevant to the present study aim, in Lismore[13].

Interviews and focus groups were led either by one researcher or were co-facilitated by a second who observed, took notes and asked additional clarifying or probing questions. Aboriginal researcher VP undertook both roles and was present during all interviews and focus groups with Aboriginal parents and carers. The interview team had a range of knowledge and experience in child health, immunisation and research. ST is a public health researcher from Newcastle with experience in qualitative methodology. VP is an Aboriginal Immunisation Health Worker based in Lismore. CL has nursing qualifications with expertise in public health and childhood vaccination. Team members were alert to their 'insider or outsider knowledge' and how potential biases may influence data collection and analysis[14]. All interviews and focus groups were audio-recorded and transcribed verbatim.

Data analysis was undertaken by ST, VP and CL. An open, inductive approach was used[15]. Analysis was underpinned by the COM-B theory of behaviour change – researchers were cognisant of factors related to capacity, opportunity and motivation as contributors to behaviours underlying the high number of overdue children in Lismore. These factors guided the development of themes[11]. Initially, each transcript was read by an individual member of the research team, with concepts highlighted and grouped into general categories. This analysis was then shared with the other two researchers and agreement was reached about the data interpretation and proposed categories. Attention was paid to comparing the views of different groups such as Aboriginal and non-Aboriginal parents. Ongoing reflection and back and forth discussion led to the development of themes that described the essence of the categories.

Data analysis adopted a strength-based approach, avoiding negative or blaming discourse and focusing on opportunities to build on participants' strengths. This approach challenges negative thinking and ethnocentric assumptions[16]. Aboriginal researcher VP used an Aboriginal lens to interpret qualitative data in a way that incorporated cultural values, lived experience and Aboriginal ways of 'knowing, being and doing'[17].

Ethics approval

Ethics approval for the study was obtained from the Hunter New England Human Research Ethics Committee (HNEHREC 18/06/20/5.03) and the NSW Aboriginal Health and Medical Research Council (AH&MRC 1449/18).

Results

A total of 35 participants (12 parents and carers, and 23 health service providers) took part between August 2019 and February 2020. Among the parents and carers, seven were of Aboriginal descent. Of the 23 health workers, five were employed in Aboriginal-specific roles (three were of Aboriginal descent). A small number of health service providers in general practice declined to participate due to time constraints. Six themes were developed:

- Childhood immunisation in Lismore is limited by access barriers to health services.
- Some families may need additional support to access vaccination services.
- Health services need to ensure that Aboriginal families feel safe and comfortable when accessing their service.
- Parents value reminders and recalls to keep their children's vaccinations up to date.
- Parent's views influence their decisions to immunise their children.
- Reliable information about immunisation needs to be available in ways that are meaningful and appropriate for parents.

Childhood immunisation in Lismore is limited by access barriers to health services

Participants raised several access barriers to vaccination services. Many reported that transport was a significant barrier and that, without it, vaccination was unlikely to happen. Some parents and carers spoke about not having a car, relying on family or friends to drive them and difficulties using public transport, including cost and inconvenient bus timetables; cost of taxis; and the challenges of alternatives, such as walking long distances and pushing a pram (sometimes uphill) in hot weather. Some parents and carers felt that using any form of transport with more than one child or as a single mother always made things more difficult. A small number of participants noted that health services generally do not provide transport or the vehicles are not fitted with child seats.

> *Because transport is a big thing in this community, in this area, you know, like, it really is. (Aboriginal parent/carer)*

> *So there are financial issues. You know, whether there's bus money. Whether there's taxi money. Those are not necessarily things that that parent can resolve themselves. (non-Aboriginal health service)*

Parents and carers described other access barriers including difficulty getting appointments and limited service hours. Many reported that existing services were not flexible and did not offer options other than standard booked appointments during business hours. The CFHN clinics were run only twice a month for a half day each, with appointments required. Services were not seen to be accommodating to parents and carers with complex and busy lives, who may miss an appointment and then have to make another. With a long wait time, children easily became overdue for vaccinations.

> *The mums already know that the kids are overdue. They want to get them done. It's everything else that gets in the way and time. (non-Aboriginal health service provider)*

> *A lot can happen in a fortnight. Especially with our families. There's so much stuff around Sorry Business and all sorts of things. (Aboriginal health service provider)*

> *So if I've got a young baby and four other children, I've got no one to watch the kids, so I can't get the immunisations because I've got to bring the four kids with me plus the baby. (Aboriginal health service provider)*

Some families may need additional support to access vaccination services

Some health service providers felt that families may need practical support to help them make and keep appointments. This could include assistance with transport so that no children are left out of the system. It could also mean help with calling services to make appointments.

> *There are other times when [a] mum has actually said to me, 'I'm too shame to ring up the AMS [Aboriginal Medical Service]'. I say, that's okay, I'll ring up the AMS and make the appointment. It's an opportunistic thing … she'd rung up a couple of times and made appointments, and never turned up. She said 'I haven't got any transport'. (Aboriginal health service provider)*

Some parents and carers spoke of emotional support and the importance of a compassionate and caring provider. Mothers didn't want to see their child hurt or crying, and a positive and continuous relationship with health service providers meant they were more likely to come back.

> *We keep going to the same place, they know my concerns and they know I hate it. I can't handle it. I guess, that's easier if you do have people that you make a rapport with. (non-Aboriginal parent/carer)*

Some participants suggested ways to improve access by providing more flexible service models that included outreach, drop-in and home visiting. Some health service providers felt that more opportunistic vaccination could be provided, taking advantage of every chance to vaccinate the child in front of them. Some Aboriginal mothers suggested that locations could be easier to get to, in places where they frequently go, such as 'right near Woolworths or Coles or something'.

> *It would be good if there was a program like that [home visiting], that they could come in and give your child the immunisation at home for those who have too many kids, don't want to bother about going to the doctor with all your children running around crazy in there. (Aboriginal parent/carer)*

> *I'd say that [drop-in] would be more inviting … to actually have that type of initiative because scheduling people in and having a tight framework around that, sometimes doesn't work for our families. (Aboriginal health service provider)*

Health services need to ensure that Aboriginal families feel safe and comfortable when accessing their service

Aboriginal parents and health service providers spoke about the importance of having a service where Aboriginal families felt safe and comfortable. This included having more Aboriginal Health Workers who understood family situations and were non-judgemental. Information provided in a way that was useful to familes, without jargon, was valued. The CFHN service in Lismore had been without an Aboriginal Health Worker for a long time and many families did not feel comfortable using that service. Some Aboriginal health service providers commented that young mums may be shy or feel judged on their appearance and that having a culturally safe health service with Aboriginal staff helped alleviate this.

> *If there's no Aboriginal worker at … any of these facilities, how are they going to connect with the Aboriginal community? (Aboriginal parent/carer)*

> *Because they're going into a non-Aboriginal setting, they're feeling that people are looking at them and judging them, whether their appearance or whether their kids are being naughty or their – it's just that stigma, I suppose, that hangs around in our community that Aboriginal people don't immunise our kids because they're drunk or they're using drugs or there's – there's just all this other stuff, the racial sort of stuff. But a lot of them don't go into the centre. (Aboriginal health service)*

Some Aboriginal parents and carers felt it was important to have a local, respected Aboriginal Health Worker in the community to remind mothers and tell them why it was important to have their children fully immunised. That person needs to know the community, be willing to 'mix with the mob' and attend community events, not to be a '9–5 black' but to yarn with the girls and build rapport.

> *Don't just put a black worker in up there, it has to be*

> *someone that's local, someone that knows the community and that is willing to engage. Like, that is prepared to go and to knock on the mother's door and, you know what I mean? Like, or ring the others – you can't have someone in a key role like that, especially with our Jarjums [children] – that's not going to do stuff like that. (Aboriginal parent/carer)*

Many participants spoke about the importance of trust and that, without it, parents and carers wouldn't use a service, or would only use it if a trusted staff member was working that day. Other aspects of culturally safe and appropriate services that were raised included a service model that was family centred, 'which is the Aboriginal way', not a 'white centrist model'. This often meant other family members were welcomed into the clinic for support. Most Aboriginal families felt comfortable using the Aboriginal Medical Service in Lismore.

> *The AMS [Aboriginal Medical Service] workers up here that have got community knowledge, they're in the community, they talk to the community outside of work. So, that trust, that builds a bit of trust. (Aboriginal health service)*

Parents value reminders and recalls to keep their children's vaccinations up to date

The Aboriginal Immunisation Healthcare Workers used posted reminders or phone calls to remind mothers when vaccinations were overdue. Some Aboriginal parents observed that they might need someone to remind them to get their children vaccinated, especially if it's not something they are committed to.

> *Like, a lot of us mothers, you know, do need that extra push – well, not push but that extra pull, you know. (Aboriginal parent/carer)*

Many parents and carers mentioned their child's 'Blue Book' (children's health and development record) as a way of reminding themselves their child's vaccinations were due. Others said their health provider reminded them when they were attending an appointment for something else. Some reported receiving reminders from their general practitioner and liked the telephone calls as they could book an appointment on the spot. Some parents and carers considered the letter from social services provider Centrelink as a reminder, although this was a warning their family support payments were in danger of being cut off as their child was already overdue. Some commented that the service they used did not use reminders but wondered if they could start.

Some health service providers acknowledged they don't use reminders or recall systems. Some said it was time consuming and there were many other priorities.

Parents' views influence their decisions to immunise their children

Overall, Aboriginal parents and carers were very supportive of immunisation for their children. They were concerned about the risk of disease and understood the benefits of prevention. Some spoke about the benefits for the child, like 'getting a good start' and not being disadvantaged or falling behind. One participant said 'it's proper', which in the community meant the accepted thing to do. Having a 'champion' or someone to 'vouch' for immunisation, for services and for health service providers was mentioned as a way to encourage Aboriginal mothers to have their children immunised. Some Aboriginal mothers mentioned the negative influence of others, who don't immunise their children and said 'you can be swayed by them'.

> *I think [immunisation] it's good. It's protecting them away from bad sicknesses that are actually out there. I think it's important for kids to be immunised. (Aboriginal parent/carer)*
>
> *I'm all for it. I get my kids' flu vaccine as well, which is not compulsory or anything like that. It's just something I choose to do. (Aboriginal parent/carer)*

Non-Aboriginal mothers in the study expressed more hesitant views. Some thought their newborns were too young, not strong enough to be immunised and chose to wait until they were older. Some were 'torn' in their beliefs, swaying from one side to the other. One mum was concerned about her child's 'predisposition to autism' and so chose to delay. Some parents were worried about side-effects, additives and allergies and were also reluctant to do anything that might hurt their child. One parent had been negatively influenced or 'controlled' by her partner's family.

> *I didn't start his immunisations until he was 18 months. He was just small, just little, and it didn't feel like the right thing to do. First of all, I didn't want to be in charge of hurting him. (non-Aboriginal parent/carer)*
>
> *My partner at the time, his whole family was very, very against it. That influenced it a lot. I would have been happy to start him at four months, but there was a lot of judgment and a lot of push around the in-laws. We were very, very controlled (non-Aboriginal parent/carer)*
>
> *I just don't like the fact that they have to have two or three shots at once. I don't necessarily like the fact that they're giving them five diseases at once. I understand that it's probably convenience and whatever. I'm just not sure if it's the best for the child. (non-Aboriginal parent/carer)*

Not all non-Aboriginal parents and carers expressed hesitancy. Some were supportive of immunisation and understood its value. One mother commented that she had never had a bad experience and that this made her feel comfortable.

> *They're all fully immunised, because I believe for them to participate in the world, they need to have their immunisations. The thing we want our children to do is be healthy and grow well and immunisation really helps that. (non-Aboriginal parent/carer)*

Reliable information about immunisation needs to be available in ways that are meaningful and appropriate for parents

Parents and carers felt it was important to have reliable, unbiased information about immunisation. This included information about vaccines, vaccination and about where and when services were available in Lismore. Some felt judged as bad mothers, not looking after their child simply by seeking more information. Some parents and carers were not aware that CFHN had two clinics every month, or where and when they were held or how to access them.

> *As soon as you mention any kind of concern, that's not even against immunisation, but you just want more information or you want to make sure you're looking after your children in a good way, then it feels like it's all, 'well, why wouldn't you, do you want your children to die, do you want them to hurt everyone in the community'. (non-Aboriginal parent/carer)*

Some participants observed that some parents may have low literacy skills and some may not understand the current messages or the importance of immunisation. Information needed to be provided in ways that parents and carers understood.

> *Not everyone can read as well. Visuals are very powerful, I think. If you had a picture of a rash that turns into something. Or fasteners [interactive learning materials] or things like that, I think that would be helpful too. (Aboriginal parent/carer)*

Some participants commented on the quality of interaction between parents and health service providers, with both positive and negative experiences being recounted. Some parents and carers felt they were not respected or given time to have questions answered. Some health service providers noted that it takes time to answer questions or correct misinformation. Catch-up programs were also time consuming. This may have meant that some providers avoided those conversations or did not promote immunisation as much as they could.

> *When I do find someone that just talks to me in a respectful manner in any of the healthcare things, I just instantly feel so much better, because I don't feel like they're talking over the top of me. (non-Aboriginal parent/carer)*

> *It's very overwhelming, especially as a first time mother. You don't want to hurt them [your child] and you've got no clue what you're doing. (non-Aboriginal parent/carer)*

> *They're concerned that what they're injecting into their child might be harmful. That requires an honest and open conversation with the parents. The second thing is there's often a lot of work to undo misinformation. That actually can take a long time. [The internet] has a lot to answer for. (non-Aboriginal health service provider)*

Discussion

Reflecting on the COM-B theory, the present study uncovered opportunity factors, in the form of service access barriers, that contributed to children falling behind in their vaccinations. These barriers were built into the service models in Lismore. All vaccinations were delivered through booked appointments, whether that was through general practice, the Aboriginal Medical Service or the CFHN clinics. Appointments were only available Monday to Friday, during business hours, and waiting times were long. Out-of-pocket costs associated with attending appointments contributed to access barriers as did lack of transportation, because many families did not have a car or struggled to use public transport. These access barriers have been found in other communities in NSW with high numbers of children overdue for vaccination[6,7]. Often parents wanted their children to be vaccinated but had difficulty making and keeping appointments. Missing an appointment in Lismore meant another long wait, with children becoming overdue as a result. Service models that are not flexible or accommodating to families' needs, especially those experiencing a range of conflicting priorities, can contribute to the problem.

Lack of cultural safety in some health services presented another opportunity factor, further limiting access to services for Aboriginal families in Lismore. Many health reports and literature discuss the necessity of cultural safety in health services[18-22]. Davy et al (2016) describes cultural determinants that act as access barriers to primary healthcare services (where vaccination is provided)[21]. These include how well services 'understand cultural, historical and social fabric of the community' and how they accommodate local beliefs and values. Community acceptance is key to seeking and engaging with a service. In the present study this was referred to as 'vouching', providing word-of-mouth acceptance of a service or a health worker, and as the importance of having a local Aboriginal Health Worker who engaged with the community. Davy et al found cultural safety and investing in ACCHSs that understand and meet community needs were the most important factors facilitating access to health services[21]. Awareness of the social determinants of health (unemployment, low level of education, poverty, lack of transport) and their impact on families was also important in addressing access barriers[21].

An important component of cultural safety is having a strong Aboriginal health workforce. The present study found this to be an important element in any future strategy aimed at improving immunisation coverage for Aboriginal children in Lismore. Strengthening the Aboriginal health workforce requires opportunity for professional development, employment and training of local health workers (rather than 'importing' staff), providing flexible work arrangements that include family and cultural leave, strong leadership from Aboriginal role models and mentors who are advocates for change in health systems and policy[20].

In 2012, NSW Health funded the Aboriginal Immunisation Healthcare Worker program with positions based in public health units across NSW[23]. Each worker promotes immunisation in their communities and help families access culturally safe services, where available. They 'pre-call' parents whose children are due for scheduled vaccination and use the Australian Immunisation Register to identify and follow up overdue children[24]. The present study found that, despite the benefits of the program, it is unrealistic to expect these workers to overcome the many structural and cultural barriers of families in Lismore and across the larger region for which the workers are responsible. The role does not include the pragmatic services of providing vaccination or transportation.

The present study found that many Aboriginal families, due to disparities and complexities of their daily lives, would benefit from practical support to overcome the access barriers. This could come from health services, in the form of assistance with transport, more flexible hours, drop-in services, and even home visiting for those who need it most. Better use of reminders and recall systems can also help families plan and organise their children's vaccination appointments well in advance. Support may also come from families who help make it all happen on the day – for example assisting with transport, looking after other children, accompanying mothers to services on the day or just providing reassurance that immunisation is safe and effective. All parents value the support of caring health service providers who take the time to listen, answer questions and create a friendly, non-judgemental rapport[25-27]. These examples of support also represent opportunity factors, which may influence behaviour. With additional support and assistance, more families who do want their children to be fully immunised may find it easier to access vaccination services.

In Australia, many state and national policies and standards prioritise flexible primary health care services, including vaccination, for vulnerable children and families[1,28-31]. These include families experiencing domestic violence, poor mental health, drug and alcohol misuse, insecure housing and financial stress[31]. As such, good intentions exist at the policy level but, as seen in Lismore and in other disadvantaged communities, it may be difficult to translate those intentions into practice through provision of family-centred options that meet the needs of families. Flexible, family-centred approaches fit well with the TIP approach, where new, evidence-based strategies can be co-designed in partnership with services and community members. Public child health services are well placed with nurse immunisers and a home visiting policy to step in and provide this level of support for those who are most vulnerable.

The present study also uncovered motivational factors, in the form of vaccine hesitancy, that were contributing to the number of overdue children. Hesitancy was found primarily among non-Aboriginal mothers. Vaccine hesitancy is described as an individual behaviour influenced by knowledge and past experience, underpinned by social, cultural, political and personal constructs. It is reduced by a good relationship with health professionals and trust in the health system, in policymakers and in available information[9]. The factors associated with hesitancy in the present study were similar to those found in the literature, including concerns about the timing, number, necessity and safety of vaccines, fear of autism and the influences of family and friends[32]. An Australian study exploring vaccine hesitancy found parenting practices believed to boost a child's natural immune system such as breastfeeding and eating organic food were thought to provide sufficient protection from illness and hence remove the need for vaccination. Parents believed they could make informed decisions about the need for vaccination based on their own 'research' and that they did not need to rely on the advice of health practitioners. The study found that the idea of herd immunity was rarely considered[33].

Effective efforts to encourage childhood immunisation among hesitant parents may include community-based health education[34]. A communication plan should draw on theory, be informative and responsive to misinformation. It should include multicomponent engagement with consumers and trusted health messengers in order to understand local concerns and build trust. Interventions should be tailored to the needs of the target population[34]. An online resource, *Sharing knowledge about immunisation*, was developed in Australia to assist mothers who are concerned about vaccine safety and usefulness, providing reliable information ranging from basic to comprehensive detail, with further reading and references[35]. Such resources could form one part of a more comprehensive, tailored strategy to address hesitancy in Lismore.

Designing and delivering health information with Aboriginal families requires a respectful cultural approach. Examples may include yarning circles where an exchange of information and discussion can occur in a shared, safe space[36]. Two-way communication between health workers and community members (that may include Elders) can be empowering and respectful of local knowledge. Storytelling in community settings can help parents make decisions either individually or in groups[37]. Use of arts, music, dance and theatre provide elements of tradition and community wellbeing that can link health messages to culture[38]. These strategies can be invaluable when sharing information with those who may have low health literacy.

Using the TIP approach helped identity Lismore as an area with a high number of children not fully immunised for their age. Surveillance data is readily available from the Australian Immunisation Register, allowing public health units to identify pockets of low coverage, plan service delivery, extend reach, and monitor and evaluate vaccination outcomes. This level of analysis is not routinely done, leaving areas of low coverage unnoticed, putting communities at risk. Vaccination service providers in the present study were not aware of the scope of the problem in Lismore, or that many overdue children were Aboriginal, residing in distinct locations where culturally safe and appropriate services were not available. The authors found a similar lack of awareness in other TIP studies conducted in NSW (in Maitland, Umina, Tamworth and Kempsey)[4-7]. There is potential to build capacity in public health units to conduct this level of analysis routinely, to monitor processes and evaluate outcomes in areas of low coverage.

Using COM-B to assist with this study's analysis helped frame the results. Significant opportunity factors included the access to services, where lack of transport and other practical barriers made it difficult to make and attend appointments. Lack of cultural safety in some health services also posed an access barrier for some Aboriginal parents and carers. Motivational factors included those described as vaccine hesitancy including a lack of trust and confidence in vaccine safety. Future work will focus on phase 3 of TIP, the intervention design, where vaccination partners and community representatives collaborate to co-design a tailored strategy for Lismore[9].

Limitations

Possible delays or incorrect entering of data into the Australian Immunisation Register may mean some fully immunised children appeared as overdue[39]. While our results are particular to Lismore and may not be generalisable to other settings, the present study has been described in sufficient detail so that the reader can determine whether or not results may be applicable in other communities[14]. Broader concepts that may apply elsewhere include service access barriers, lack of cultural safety for Aboriginal families, vaccine hesitancy and better use of Australian Immunisation Register data.

Conclusion

This study found service access barriers (opportunity factors) and vaccine hesitancy (motivational factors) were contributing to the high number of children falling behind in their scheduled vaccinations in Lismore. Providing more flexible options through family-centred primary health care, culturally safe and appropriate services and more practical support including transport can help overcome structural barriers to health services. Designing a range of tailored health messages for both Aboriginal and non-Aboriginal parents can assist parents in making wise vaccination choices. There is an important role for public health services to play in analysing and reporting routinely available data to identify pockets of low coverage. Publicly funded health services and ACCHSs are well placed to provide flexible vaccination services for those families who may struggle with access barriers.

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