

Reaching Zero-Dose and Under-Immunised Children in East New Britain, Papua New Guinea



Year 1 Formative Data Collection
Summary Results
November 2023



PAPUA NEW GUINEA
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MEDICAL RESEARCH



NATIONAL
DEPARTMENT OF HEALTH

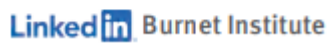
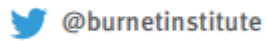
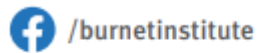


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Executive Summary

Immunisation is a life-saving public health intervention, but routine immunisation coverage varies substantially across Papua New Guinea. This study aimed to identify children in East New Britain province who have never been immunised, or who have missed some of their routine immunisations, analyse the barriers to and enablers of achieving widespread immunisation coverage, and strengthen service delivery and community uptake of routine immunisation in areas with significant numbers of un(der)-immunised children.

Analyses using routine surveillance data shared by East New Britain Provincial Health Authority highlighted that immunisation coverage varies widely across the province, with coverage declining in most local-level government (LLG) areas over the past five years. Across the province in 2021, 72% of children under one year received the first dose of the Pentavalent vaccine (Pentavalent-1), while only 54% of children received the first dose of Measles-Rubella (MR-1) vaccine.

It was estimated that there were approximately 3270 and 5446 children under one year of age across East New Britain in 2021 who had not received Pentavalent-1 or MR-1 vaccines respectively. Dropout between Pentavalent-1 and MR-1 was 26% (**Section 1**). Unvaccinated children were more likely to reside in Gazelle or Rabaul districts. With the guidance of East New Britain Provincial Health Authority, sites to target for data collection to better understand barriers to routine immunisation and future program implementation were identified in five LLGs. This included Kokopo Urban district to ensure representation from a predominantly urban area, and Duke of York Islands, to understand barriers to immunisation in remote island regions.

In contrast to surveillance data, structured interviews with 237 parents and caregivers in these target areas revealed that 98% self-reported their child had received at least one vaccine, and all believed that vaccination was important (**Section 3**). This indicates that further efforts to identify and reach caregivers who do not engage with routine immunisation services in East New Britain may be needed to gain a more holistic understanding of reasons why children are not immunised. However, service satisfaction and trust in healthcare workers varied across the target areas, suggesting that the challenges faced may differ by location.

Structured interviews were also undertaken with 30 healthcare workers (Section 3). While most had more than 10 years' work experience, not all staff had received recent immunisation training. Additionally, knowledge of some vaccines was lacking, and there was variability with regards to recording immunisation data in the health facility registers. Further efforts should engage healthcare workers in opportunities to strengthen skills and knowledge to enable them to better communicate with and support their communities.

In-depth interviews with 33 caregivers and 28 healthcare workers provided further insights into the barriers and enablers identified by the structured interviews. Quotes from these interviews are included throughout this report to add additional context to some of the quantitative findings.

Qualitative data were also collected through focus group discussions with 53 community and religious leaders (**Section 4**). There were some notable differences between the five LLGs but generally, community leaders raised the importance of community level healthcare through aid posts, flagged the significance of traditional medicine in some communities, and wanted to be more involved in advocating and creating awareness about immunisations in their communities.

Health facility assessments at nine facilities across Gazelle and Kokopo districts representing a wide range of service providers highlighted issues with vaccine stock-outs, availability of cold chain infrastructure, and incomplete electronic health record management (**Section 2**).

Overall, the two biggest barriers to routine immunisation identified through this formative research were:

- 1) Inadequate community knowledge, understanding, and awareness of vaccines and schedules.
- 2) Healthcare workers report have insufficient training, especially around communication, to support their communities and advocate for routine immunisation.

Strategies to address these barriers are multi-faceted. **Section 5** describes in more detail some potential activities that can be tailored to specific areas to increase immunisation coverage in East New Britain and improve health outcomes for all. These strategies were co-designed with East New Britain Provincial Health Authority, in consultation with other key partners and local organisations working at the community level to respond to health needs. Over the next two years, these strategies will be implemented and evaluated to determine their impact, and recommendations for future policy, health service, and program delivery will be developed.

Glossary of acronyms and abbreviations

ANC	Antenatal care
BCG	Bacillus Calmette–Guérin vaccine
EPI	Expanded Program on Immunisation
FGD	Focus group discussion
IEC	Information, Education and Communication
IPV	Inactivated Poliovirus vaccine
LLG	Local level government
MR	Measles and Rubella vaccine
NDoH	National Department of Health
OPV	Oral Poliovirus vaccine
PCV-13	Pneumococcal conjugate vaccine
Pentavalent	Diphtheria, tetanus, pertussis, haemophilus influenzae type B, and hepatitis B vaccine
PHA	Provincial Health Authority
PNG	Papua New Guinea
UNICEF	United Nations International Children's Emergency Fund

Section 1: Study background and site selection

Immunisation is a life-saving public health intervention, but coverage varies substantially across Papua New Guinea (PNG). In East New Britain province in 2021, 72.2% of children under one year received the first dose of the Pentavalent vaccine (“Pentavalent-1”), while only 53.7% of children received the first dose of Measles-Rubella (MR) vaccine (“MR-1”).

Previous work conducted in East New Britain, including a cross-sectional assessment study¹, identified that inaccurate assessment of target populations and inaccurate reporting of the number of vaccinations are key barriers to improving immunisation rates. Contributing factors highlighted include healthcare worker shortages, financial challenges, insufficient strategic and operational planning, and inadequate surveillance of vaccine-preventable diseases. COVID-19 has exacerbated these challenges, with global declines in routine immunisation alongside other health program implementation.

For this study, sites were identified through mapping of zero-dose and under-immunised children across East New Britain based on health facility routine immunisation coverage data, alongside extensive consultation and knowledge of the local context to guide feasibility. Considerations around feasibility included law and order concerns, safety and working conditions of study staff, and modes of transport and budget required to reach remote areas, especially Pomio district. This means that this sample may be somewhat biased to more accessible locations or towards parents/caregivers who were more accessible and engaged with the healthcare system, thus over-representing the proportion of children who were immunised.

Routine immunisation coverage data at the health facility level from 2015 – 2021 was shared by East New Britain Provincial Health Authority (PHA). As interventions are targeted at the ward or local-level government (LLG) level, health facilities across the province were mapped (Figure 1) to their corresponding LLG and district, and coverage rates averaged across facilities to determine routine immunisation coverage at the LLG level. The number of children who had not received Pentavalent-1 or MR-1 (“zero-dose”) by one year of age was also calculated for each LLG and district.

¹[Morgan CJ, Saweri OP, Larme N, Peach E, Melepia P, Au L, et al. Strengthening routine immunization in Papua New Guinea: a cross-sectional provincial assessment of front-line services. BMC Public Health. 2020;20\(1\):1-10](#)

Table 1: Mean, minimum, and maximum coverage for Pentavalent-1 and MR-1 vaccines reported at the health facility level in each district in East New Britain, 2021

District	Pentavalent-1				MR-1			
	Mean coverage (%)	Min coverage (%)	Max coverage (%)	Estimate zero-dose (N)	Mean coverage (%)	Min coverage (%)	Max coverage (%)	Estimate zero-dose (N)
Gazelle	69.6	22.3	147.8	1477	51.7	28.5	92.5	2346
Kokopo	78.5	54.1	161.8	671	55.4	36.8	100.9	1392
Pomio	80.6	39.1	129.5	460	57.7	14.5	99	1003
Rabaul	50.1	60.6	66.8	742	48	37.8	64.6	773
East New Britain Province	72.2	22.3	161.8	3270	53.7	14.5	100.9	5446

This analysis identified that Rabaul district had the lowest overall coverage for both Pentavalent-1 and MR-1 vaccines. Coverage in most LLGs has declined over the past five years. Table 1 shows the mean, minimum, and maximum coverage reported at the facility level in each district in East New Britain in 2021. In 2021, coverage of Pentavalent-1 and MR-1 at operational health facilities in East New Britain ranged from 22.3% to 161.8%, and 14.5% to 100.9%, respectively. Coverage greater than 100% indicates an under-estimation of the target population (children less than one 1 year), or more children than expected being vaccinated at one clinic, perhaps due to closures at other local clinics. Overall, 14 operational health facilities (48%) reported less than 50% coverage of either MR-1 or Pentavalent-1 in 2021. Coverage greater than 100% indicates an under-estimation of the target population (children less than one 1 year), or more children than expected being vaccinated at one clinic, perhaps due to closures at other local clinics.

It was estimated that there were approximately 3270 and 5446 children across East New Britain in 2021 who had not received their first dose of the Pentavalent or MR vaccine (“zero-dose), respectively. Dropout between Pentavalent-1 and MR-1 was 25.6%, highlighting the decrease in health system engagement between one and six months of age.

Zero-dose children were disproportionately more likely to reside in Gazelle or Rabaul districts. However, to ensure that this cohort was broadly representative of the wider population, which includes approximately 15% of people residing in urban areas, it was decided to include Kokopo district (a predominantly urban district) in the study. Gazelle and Kokopo districts were therefore targeted for data collection. To ensure wide population representation and sampling, five priority LLGs in these two districts (Inland Baining, Toma-Vunadidir, Bitapaka, Kokopo Urban and Duke of York) were identified in consultation with East New Britain PHA as the project sites in which to undertake data collection².

² Specific wards where data collection occurred were: Avungi, Raunsepna, Lamarain, Yayem (Inland Baining); Gunanur, Tanaka, Wairik #1 (Toma-Vunadidir); Malakuna #5, Ralubang, Tau #1 (Bitapaka); Tinganavudu, Vunamami #2, Malakuna #4 (Kokopo Urban); Molot, Kabilomo, Kababiai, Butlivuan, Nakukur, Karawara, Palipal, Kabatirai (Duke of York).

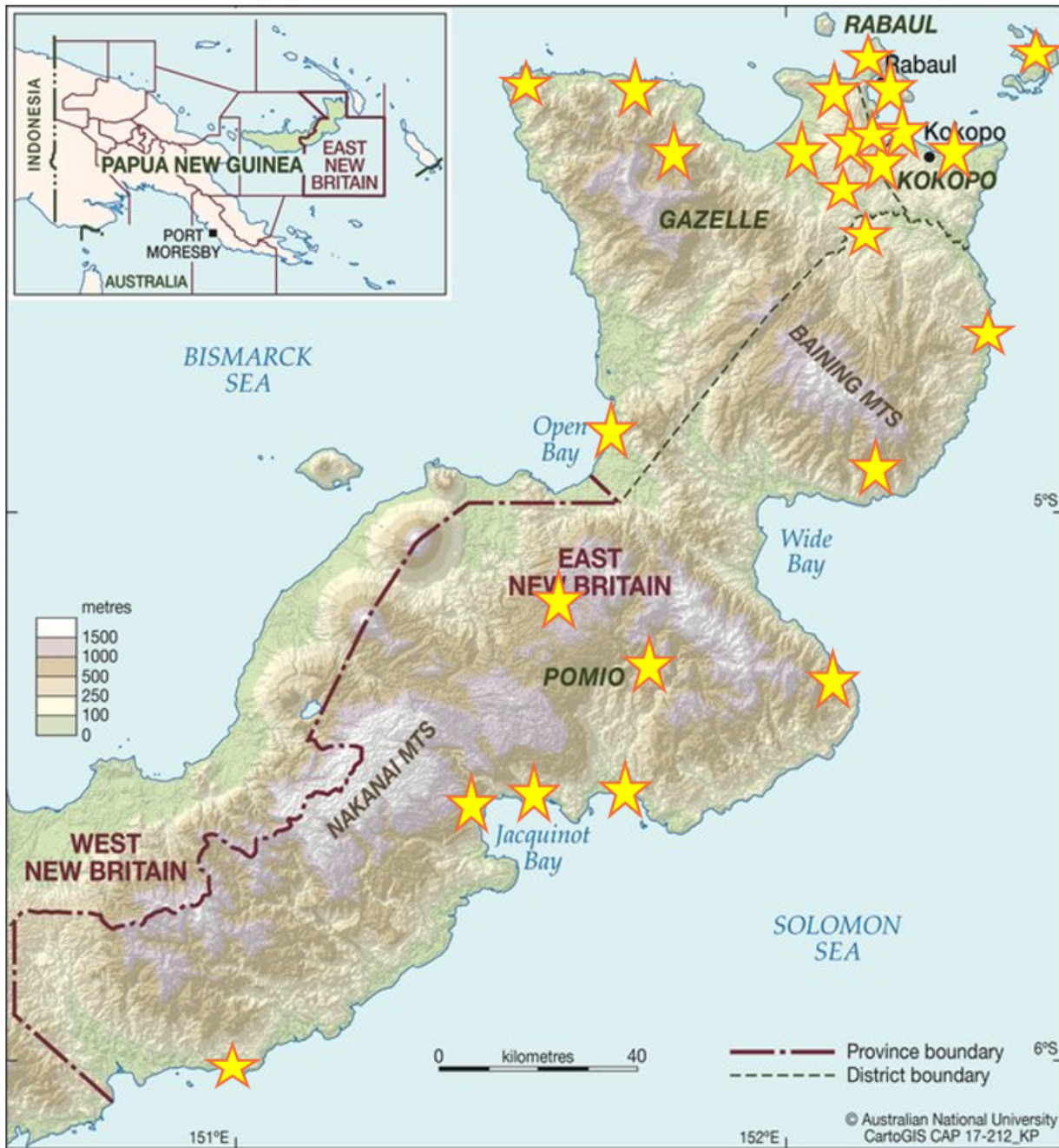


Figure 1: Map of healthcare facilities reporting immunisation data in East New Britain in 2021.

Note: Yellow stars indicate the location of health facilities.

Section 2: Health Facility Assessment

Nine health facility assessments were undertaken across the five target LLGs between March and August 2023. Approval for this data collection was granted from East New Britain PHA Chief Executive Officer in February 2023 and a letter was presented to the officer-in-charge at each health facility taking part in the assessment.

This assessment collected information on general facility characteristics including services offered, staffing, availability of immunisation-related guidelines and equipment, sanitation, and vaccines in stock. The information collected was accurate on the day of the assessment. Purposive sampling was used to ensure that a variety of different facilities were assessed, and there was representation of facilities from across all five target LLGs where this project is being undertaken.

The health facilities included in this assessment were:

1. St. Marys Mission District Hospital, Vunapope, Kokopo Urban
2. Butuwin Urban Clinic, Kokopo Urban
3. Tapo Health Centre, Bitapaka
4. Molot Health Centre, Duke of York
5. Vatnabara Health Centre, Duke of York
6. Tapipipi Health Centre, Toma-Vunadidir
7. Papatava Health Centre, Toma-Vunadidir
8. Gaulim Health Centre, Inland Baining
9. Raunsepna Health Centre, Inland Baining

Table 2 describes the general characteristics of the above health facilities included in the assessment.

Table 2. Facility type and setting

	N=9	
	n	%
Facility type		
District hospital	1	11
Urban clinic	1	11
Health facility	7	78
Urban-rural		
Urban	2	22
Rural	7	78
Managing authority		
Church		
Catholic	3	33
Uniting	2	22
Government	4	44

Table 3 details the immunisation-related resources that were available at each health facility included in the assessment. This includes human resources, availability of guidelines, facility records, cold chain, syringes, and water, sanitation, and hygiene facilities.

Six of the nine (67%) health facilities assessed reported issues with their cold chain equipment. Only two health facilities (22%) had all relevant guidelines and child health books available in their facility on the day of that the assessment was conducted.

While eight out of nine (89%) health facilities had paper records of vaccine stock, only four (44%) health facilities had electronic (mSupply) vaccine stock records. All nine health facilities had paper-based birth and immunisation records, however these records were incomplete at two of the nine (22%) health facilities, and only three facilities (33%) had records stored on a computer.

Water, sanitation, and hygiene facilities were generally present at clinics, but four of the nine (44%) health facilities assessed were missing at least one critical piece of equipment or infrastructure. At least one type of vaccine syringe was also not available at four of the nine (44%) health facilities on the day of these assessments were undertaken.

Table 3. List of resources available by Health Facility, on the day of the assessment

	Kokopo Urban		Bitapaka	Duke of York		Toma-Vunadidir		Inland Baining	
	St. Marys Mission District Hospital	Butuwin Urban Clinic	Tapo Health Centre	Molot Health Centre	Vatnabara Health Centre	Tapipipi Health Centre	Paparatava Health Centre	Gaulim Health Centre	Raunsepna Health Centre
Human resources									
Number of vaccinators	7	3	9	4	8	20	1	3	5
Number of staff trained in Expanded Program on Immunisation (EPI)	4	0	4	3	2	1	2	2	1
Government guidelines and record books									
EPI guidelines available	✗	✓	✓	✓	✗	✓	✓	✓	✓
AEFI guidelines available	✗	✗	✗	✓	✗	✓	✓	✗	✓
AEFI reporting tool available	✗	✗	✓	✓	✗	✓	✓	✗	✓
Child health book for girls	✓	✓	✗	✗	✓	✗	✓	✗	✓

Child health book for boys	✓	✓	✗	✗	✓	✗	✓	✗	✓
Facility records									
Birth and immunisation records complete	✓	✓	✓	✗	✓	✗	✓	✓	✓
Birth and immunisation records stored – paper	✓	✓	✓	✓	✓	✓	✓	✓	✓
Birth and immunisation records stored – computer	✓	✗	✓	✗	✓	✗	✗	✗	✗
Vaccine stock – paper records	✓	✓	✗	✓	✓	✓	✓	✓	✓
Vaccine stock – electronic records	✓	✓	✗	✗	✓	✗	✗	✓	✗
Cold chain									
Functioning vaccine refrigerator	✓	✓	✗	✓	✓	✓	✓	✓	✓
Continuous temperature monitoring advice	✓	✓	✓	✓	✓	✓	✓	✓	✓
Continuous power supply for vaccine refrigerator	✓	✓	✓	✓	✓	✓	✓	✓	✓
Back-up power supply vaccine refrigerator	✓	✓	✓	✗	✗	✓	✓	✓	✗
Back-up power supply vaccine	✓	✗	✓	N/A	N/A	✗	✓	✓	✗

refrigerator works									
Cold box carriers	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ice packs	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vaccine syringes									
10ml single use	✗	✓	✗	✓	✓	✓	✓	✓	✓
5ml single use	✓	✓	✓	✓	✓	✓	✓	✓	✓
2ml single use	✗	✓	✓	✓	✓	✓	✗	✓	✓
0.5ml single use	✓	✗	✗	✓	✓	✓	✓	✓	✓
Water, Sanitation and Hygiene									
Hand washing stations	✓	✓	✓	✓	✗	✓	✓	✓	✓
Alcohol swabs	✓	✓	✓	✓	✓	✓	✓	✗	✓
Clean running water	✓	✓	✓	✓	✓	✓	✓	✓	✓
Surgical gloves	✗	✓	✓	✓	✓	✓	✓	✓	✓
Disinfectant	✓	✓	✓	✓	✓	✗	✓	✓	✓

✓ = Yes ✗ = No N/R = Not applicable

Table 4 shows the availability of routine Expanded Program on Immunisation (EPI) vaccines by health facility. In total, five out of the nine (56%) health facilities assessed were out of stock of one or more vaccines on the day of the assessment. The most common vaccine to be out of stock was Hepatitis B (3/9, 33%).

Additionally, seven of the nine clinics (78%) reported stock outs of at least one vaccine in the 12 months prior to the health facility assessment being undertaken.

Table 4. Vaccine availability by health facility, on the day of the assessment

	Kokopo Urban		Bitapaka	Duke of York		Toma-Vunadidir		Inland Baining	
	St. Marys Mission District Hospital	Butuwin Urban Clinic	Tapo Health Centre	Molot Health Centre	Vatnabara Health Centre	Tapipipi Health Centre	Paparatava Health Centre	Gaulim Health Centre	Raunsepna Health Centre
BGC	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hepatitis B	✓	✓	✗	✗	✓	✗	✓	✓	✓
IPV	✓	✓	✓	✓	✓	✓	✓	✓	✓
OPV	✓	✓	✗	✓	✓	✓	✓	✓	✓
Pentavalent	✓	✓	✓	✗	✓	✓	✓	✓	✓
PCV-13	✓	✗	✓	✓	✓	✓	✓	✓	✗
MR	✓	✓	✓	✓	✓	✓	✓	✓	✓
Td	✓	✗	✗	✓	✓	✓	✓	✓	✓

BCG: Bacillus Calmette–Guérin vaccine; IPV: inactivated polio vaccine; OPV: Oral polio vaccine; Pentavalent: diphtheria, tetanus, pertussis, haemophilus influenzae type B, and hepatitis B; PCV-13: pneumococcal vaccine; MR: measles-rubella vaccine; Td: tetanus-diphtheria vaccine.

Outreach and mobile clinics

The number of outreach services and mobile clinics offered by each health facility in the six months prior to the assessment being conducted was also assessed.

Outreach and mobile clinics were not specifically defined to study participants (usually the officer-in-charge), but were generally defined during the study as:

- Outreach: Health workers going to remote or hard-to-reach parts of an area and staying there for more than one night to deliver immunisations
- Mobile clinics: Organised within the catchment area of the health facility at popular/public locations (e.g., Church, School, Marketplace) - delivered by teams within one day

The average number of outreach services offered in the past six months was calculated for each LLG by calculating the average number of outreach services offered by each health facility assessed within that LLG (Figure 2). Outreach services were more likely to occur in rural LLGs, noting that the one urban LLG (Kokopo Urban) included in this study did not report conducting any outreach visits in the prior six months.

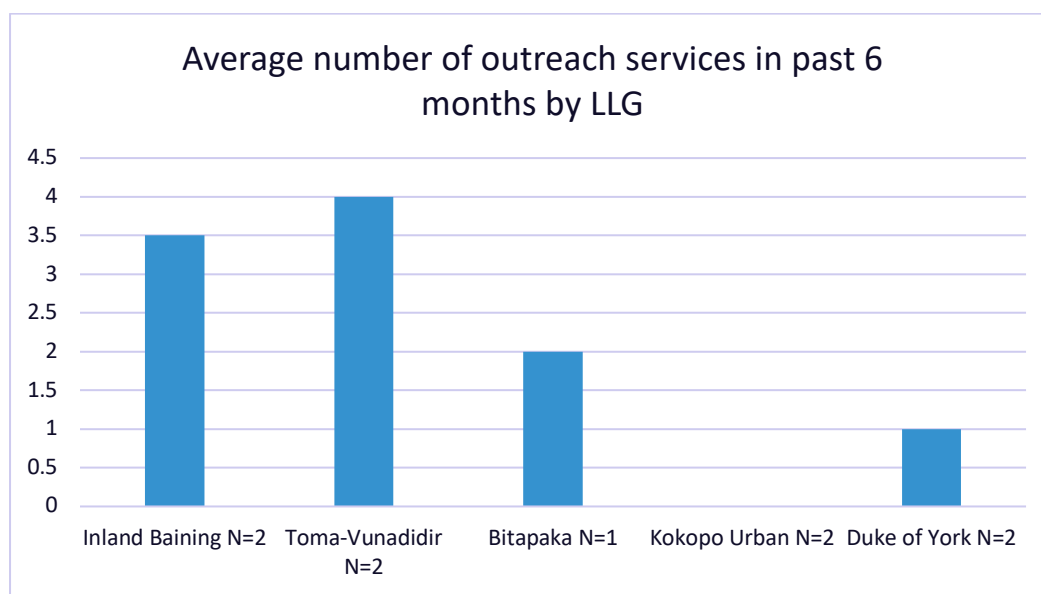


Figure 2. Average number of outreach services conducted in the past 6 months prior to the assessment, presented by LLG (average of all health facilities in each LLG).

The average number of mobile clinics offered in the past six months was also calculated for each LLG. Similar to above, the number of mobile clinics reported by each health facility assessed was averaged across each LLG. Figure 3 shows the number of outreach services offered across each of the five target LLGs with the predominantly urban LLG (Kokopo Urban) reporting conducting most mobile clinics.

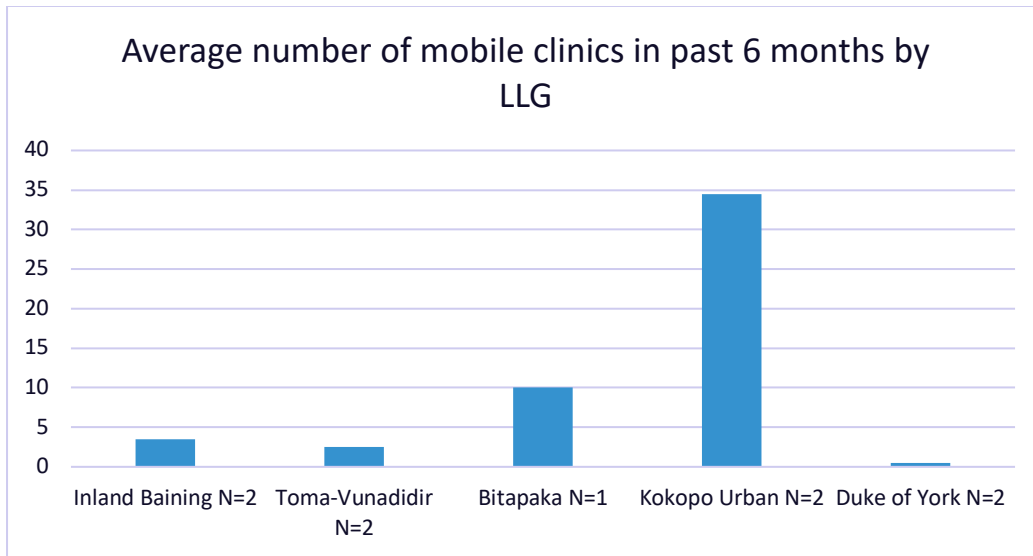


Figure 3. Average number of mobile clinics conducted in the past 6 months prior to the assessment, presented by LLG (average of all health facilities in each LLG).

Section 3: Caregivers and Healthcare Professionals

Surveys were carried out with 237 parents and caregivers and 30 health professionals (nurses, midwives, health extension officers and community health workers). These survey questions were derived from the World Health Organisation's Behavioural and Social Drivers of Vaccination Tool³, as well as the medical literature and feedback from immunisation experts. Caregivers and healthcare workers were asked about their overall and previous experiences of, and sentiments towards, immunisation services. In addition to the surveys, in-depth interviews were conducted with 33 caregivers and 28 healthcare workers to provide deeper insights into barriers and enablers surrounding routine immunisation.

Caregivers

All survey respondents were from rural areas, with the exception of Kokopo Urban district where 65% were from urban areas.

Table 5 gives the demographic characteristics for the parents and caregivers that participated in the survey. Parents and caregivers were eligible to participate in the study if they had a child between 9 and 23 months of age. 53% of the children were male and the median age was 15 months.

³ [Behavioural and social drivers of vaccination: tools and practical guidance for achieving high uptake \(who.int\)](https://www.who.int/publications/i/item/behavioural-and-social-drivers-of-vaccination-tools-and-practical-guidance-for-achieving-high-uptake)

Table 5. Caregiver participant demographics

	Inland Baining (N=43)		Toma-Vunadidir (N=48)		Bitapaka (N=49)		Kokopo Urban (N=48)		Duke of York (N=49)	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Gender										
Male	0	0	3	6	2	4	1	2	2	4
Female	43	100	44	92	47	96	47	98	47	96
Other	0	0	1	2	0	0	0	0	0	0
Age (years)										
<20	2	5	2	4	1	2	0	0	0	0
20-30	25	58	32	67	35	71	30	63	27	55
31-40	12	28	13	27	9	18	10	21	20	41
41-50	3	7	1	2	5	10	7	15	1	2
50+	1	2	0	0	0	0	1	2	1	2
Education level										
Primary or less	36	84	19	40	20	41	13	27	29	59
High/secondary	5	12	20	42	22	45	21	44	11	22
Tertiary/vocational	2	5	9	19	7	14	14	29	9	18
Employment status										
Gardener/farmer	22	51	3	6	21	43	6	13	5	10
Small business owner	0	0	0	0	2	4	5	10	2	4
Household duties	19	44	35	73	16	33	21	44	37	76
Student	0	0	4	8	2	4	4	8	1	2
Formal employment – full time	1	2	1	2	2	4	1	2	0	0
Formal employment – part time	0	0	3	6	3	6	1	2	1	2
Unemployed	1	2	2	4	2	4	9	19	3	6
Other	0	0	0	0	1	2	1	2	0	0
Urban-rural										
Urban	0	0	0	0	0	0	31	65	0	0
Rural	43	100	48	100	49	100	17	35	49	100

Disability

Parents and caregivers were also asked about physical disabilities, using the Washington Group on disability statistics proposed questions questionnaire⁴. Participants were asked if they had any difficulties seeing, hearing, or walking, with responses options of 'No – no difficulty', 'Yes – some difficulty', 'Yes – a lot of difficulty', or 'Cannot do at all'.

The overall proportion of caregivers in each LLG who replied 'Yes – some difficulty', 'Yes – a lot of difficulty', or 'Cannot do at all' to any of the three questions is shown below in Figure 4. In total, 28 caregivers reported some kind of physical disability. Of these, the most commonly reported issue was some difficulty with seeing (N=21, 9%).

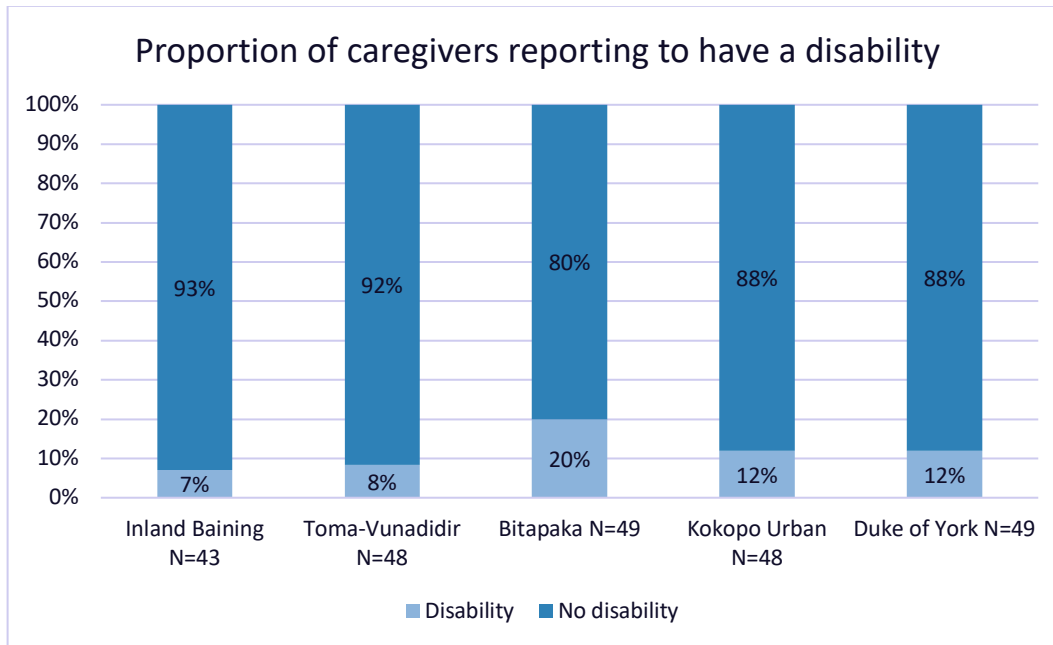


Figure 4. Proportion of parents or caregivers who self-reported having any difficulties with seeing, hearing, or movement, by LLG.

Caregivers were also asked the same questions about their child aged between 9 and 23 months. Only three children were reported to have some difficulty with moving (two in Bitapaka and one in Kokopo Urban); no seeing or hearing impairment was reported. The data for this is represented below in Figure 5.

⁴ <https://www.washingtongroup-disability.com/question-sets/>

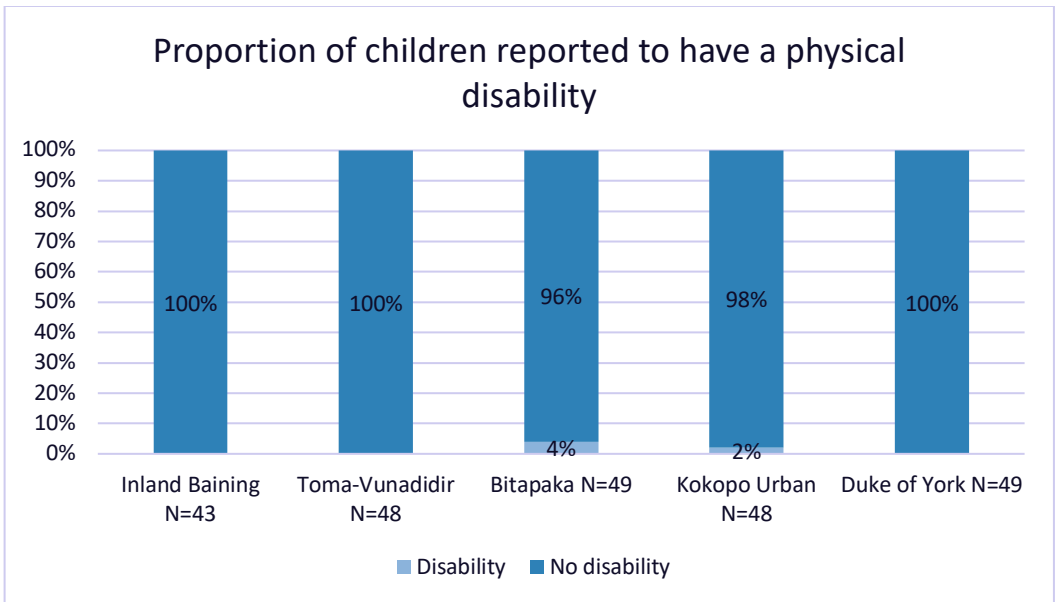


Figure 5. Proportion of children 9-23 months with a physical movement, seeing, or hearing impairment, as reported by their parent/caregiver, by LLG.

Mobile phone access

Of the 237 survey respondents, 158 (66%) reported that their household owned a mobile phone. This varied substantially by LLG, from only 21% mobile ownership among caregivers residing in Inland Baining, where mobile phone network is very poor, to 90% in Kokopo Urban, as illustrated below in Figure 6.

Of the 158 participants who report household ownership of a mobile phone, 89% can use it whenever they need.

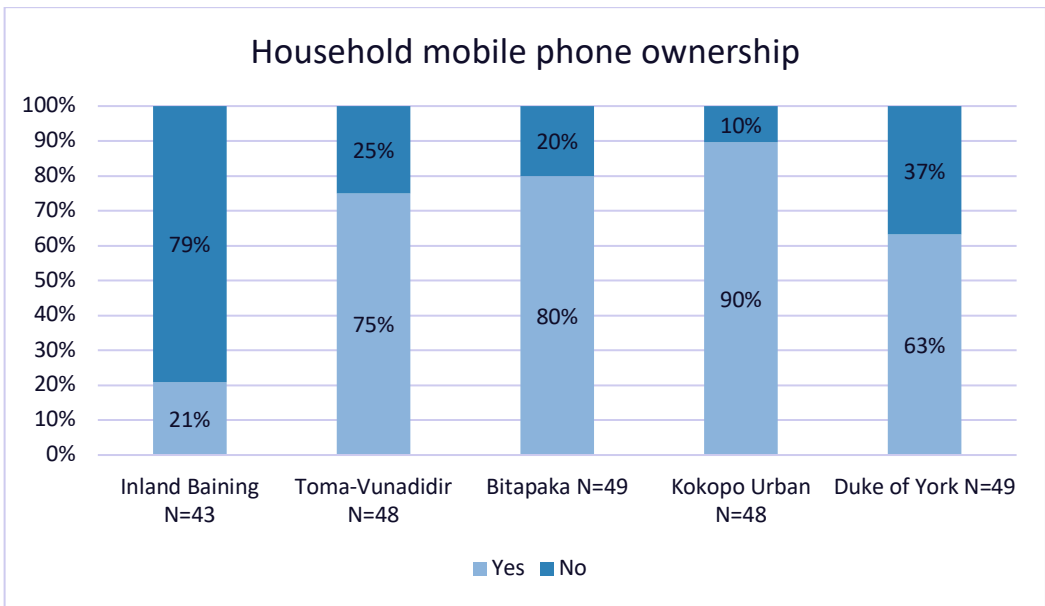


Figure 6. Proportion of households in which one member owns a mobile telephone, by LLG

Antenatal care (ANC) and postnatal care

Of the 237 caregivers interviewed, 229 respondents reported that they were the mother of the child aged 9 to 23 months whose immunisation experiences they were discussing. These mothers received a question about where they gave birth to the child, with 76% reporting that they gave birth in a health facility. The figure below shows this breakdown by LLG, with Inland Baining and Duke of York LLGs having the highest proportion of births outside of a health facility (35% and 26% respectively).

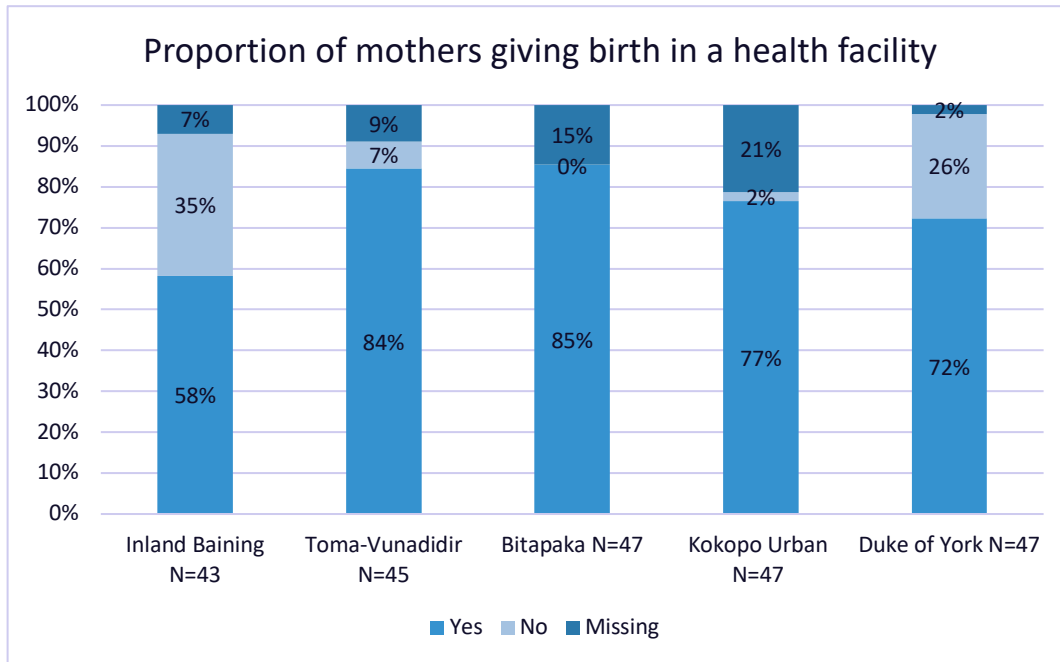


Figure 7. Proportion of mothers giving birth in a health facility, by LLG.

Of the 229 mothers, 86% reported having had an ANC visit prior to giving birth. The data are presented by LLG in Figure 8 below. The proportion of mothers who reported having attended at least one ANC visit were quite similar across LLGs, although notably, 98% of mothers surveyed in Duke of York LLG reported having attended for at least one ANC visit.

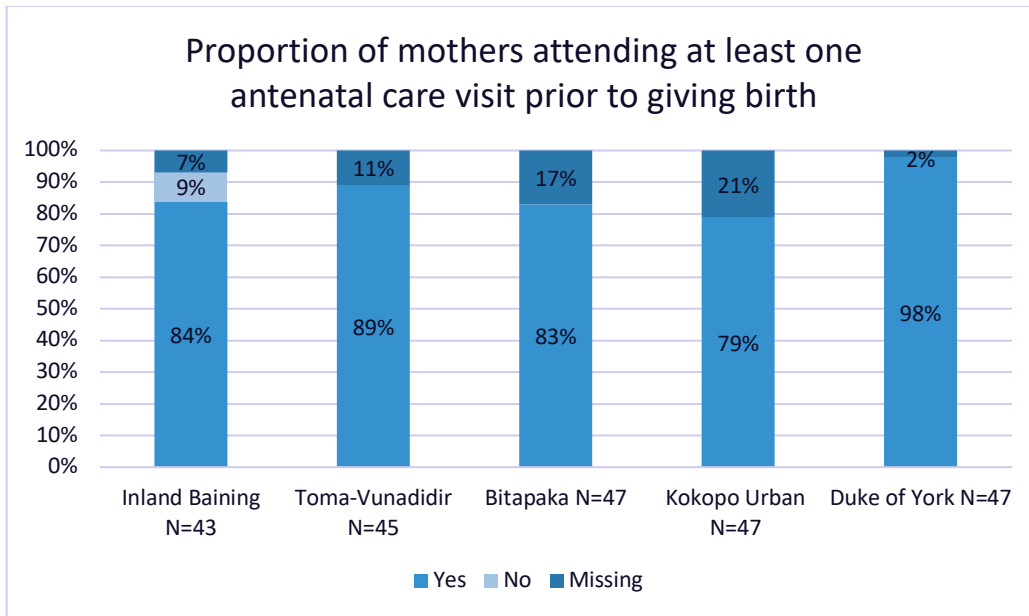


Figure 8. Proportion of mothers attending at least one antenatal care (ANC) visit prior to giving birth, by LLG.

Of the 229 mothers, 76% received their tetanus-diphtheria vaccination whilst pregnant, with the results broken down by LLG in Figure 9 below. The LLGs with the most mothers not having been vaccinated during their pregnancy were Inland Baining (16%) and Duke of York (23%).

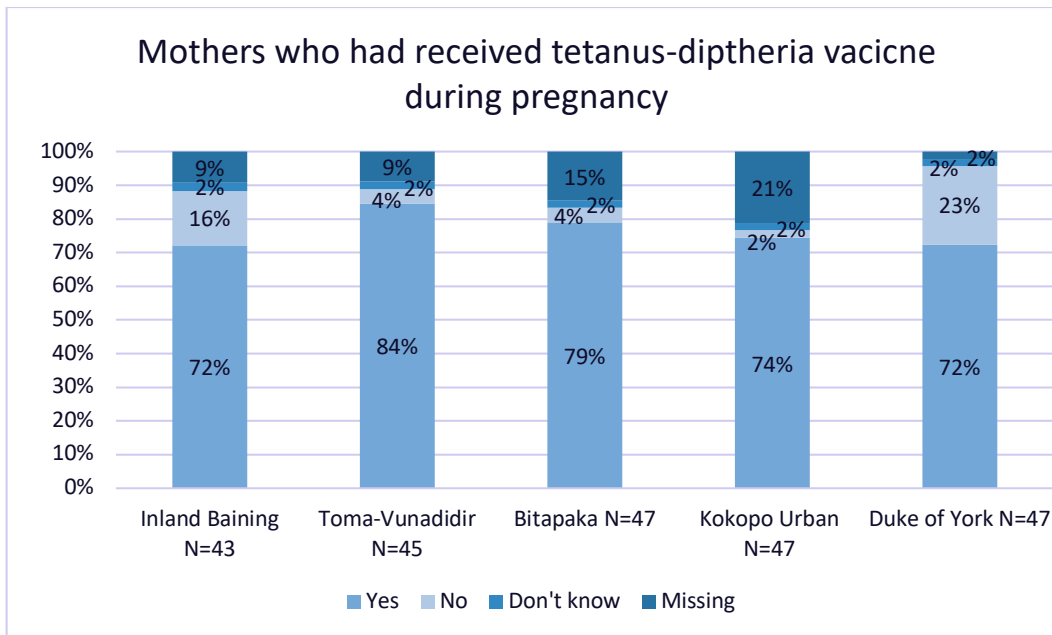


Figure 9. Mothers reporting to have been vaccinated with tetanus-diphtheria vaccine during pregnancy, by LLG.

Additionally, among these 229 mothers, 56% reported attending a health facility for a postnatal check-up after birth, with these data presented by LLG in Figure 10 below. The LLGs with the highest attendance at health facilities for postnatal check-ups were Inland Baining (88%) and Toma-Vunadidir (78%).

In 66% of cases, the postnatal check-up was only for the baby; for 20% of respondents it was for both the mother and the baby, and in 1% of cases it was just for the mother. In most cases (42%), this post-birth check-up occurred less than six weeks after giving birth, with 28% of mothers having their check up six weeks after giving birth.

The number of mothers attending a postnatal check-up was much lower than those attending at least one ANC check-up, highlighting the need for enhanced messaging to ensure women and their partners understand the importance of postnatal care. Simultaneously, ongoing messaging is needed around the importance of attending for more than one (ideally four in total) ANC visits during a pregnancy. Both antenatal and postnatal check-ups provide a good opportunity to provide messages about the importance of routine immunisation, which could be targeted specifically to new mothers and families.

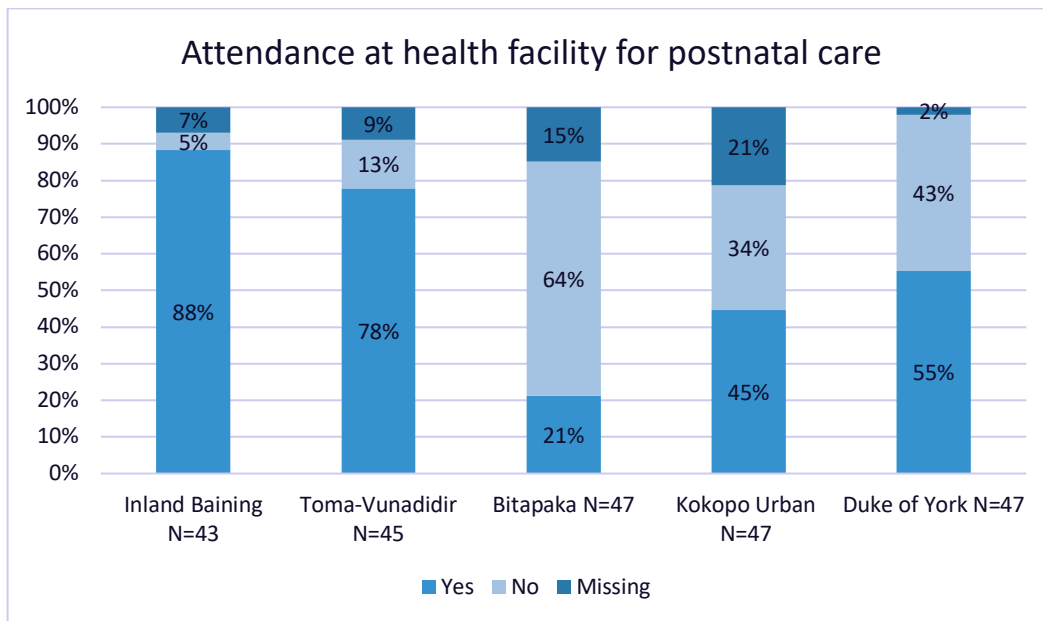


Figure 10. Proportion of women who received a postnatal check at a health facility, by LLG.

Child vaccination status

Of the 237 survey respondents, 98% self-reported that their child had received any vaccine, with high rates of immunisation reported across all five LLGs included in this study. Most caregivers (88%) were able to locate their child’s Baby Health Book, but verbal recall was also accepted if this was not available. If both were available, the child’s Baby Health Book was taken as the data source. Predictors of the caregiver having the Baby Health Book available at the time of the interview were explored, however there was insufficient data available to draw any definitive conclusions.

A total of 12 children across all study sites were reported to have received no vaccine doses (“zero-dose”), which contrasts substantially with the estimated 28–46% of unvaccinated children identified in our earlier analyses reported in Section 1. Qualitative data from in-depth interviews with healthcare workers and caregivers indicates that whilst some zero-dose children are located in urban areas, most are located in remote areas with limited transportation options, areas with law-and-order issues and areas with nomadic plantation workers. These issues may have prevented our study team from identifying and reaching these families, so the actual number of zero-dose children in East New Britain is likely to be higher than what was found in the study.

When asked about specific vaccines, 93% of respondents reported that their child had received the Pentavalent-1 vaccine, and 84% of respondents reported that their child had received the third dose of the Pentavalent vaccine. Interestingly, although the first dose of MR vaccine is given three months after the third dose of the pentavalent vaccine and immunisation coverage usually declines as the child ages, 88% of parents reported that their child had received a first dose of MR.

These figures are substantially higher than the East New Britain provincial average, which in 2021 was 72% for Pentavalent-1 and 54% for MR-1. This may suggest that the people who participated in this survey were more engaged with the healthcare system and thus were more likely to have had their child immunised. Recall or social desirability bias may have also impacted these findings, so dried blood spots have also been collected from over 350 children aged 10-23 months to determine if they had antibodies to five different vaccine preventable diseases (diphtheria, pertussis, tetanus, measles, or rubella). Analysis of these dried blood spots is ongoing at the time of this report and will be critical in understanding immunity in this cohort and how representative this study sample is of the broader population.

Timely vaccine receipt was defined as the vaccine being received within 5 days prior to or 28 days after the recommended dosing time, as per the PNG EPI schedule. For instance, the 'timely vaccine' window for the Pentavalent-1 vaccine, usually given at one month (31 days) was between 26 and 59 days after birth. Timely receipt of the Pentavalent-1 vaccine ranged from 47% in Inland Baining to 76% in Bitapaka, although this difference was not statistically significant.

Service quality

When respondents were asked if they were satisfied with the routine immunisation services they had been provided, there were notable differences in responses by LLG, as illustrated in Figure 11. The highest service satisfaction was reported among survey participants in Bitapaka (88%), and the lowest satisfaction reported in Toma-Vunadidir (29%).

The in-depth interviews indicated that law-and-order issues could have affected access to, and therefore satisfaction of, immunisation services in select wards in some LLGs at certain points in time, and could have therefore been an external confounding factor influencing caregiver responses to this question. However specific events were not examined further, and recent law and order issues in some areas may have also impacted on participants' recall.

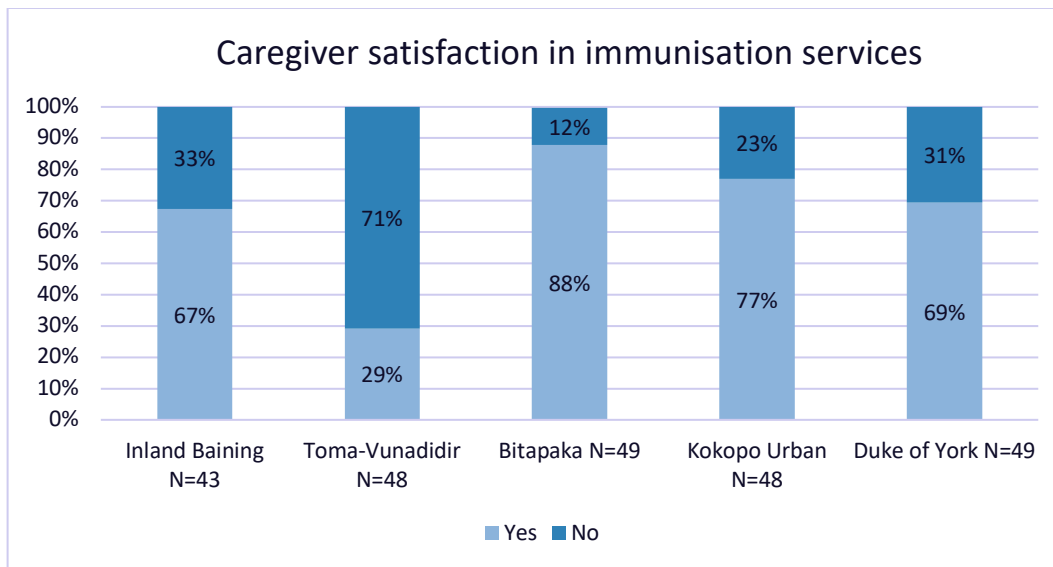


Figure 11. Proportion of respondents satisfied with routine immunisation services they received

The 80 respondents who were not satisfied with the routine immunisation services they had experienced when getting their child immunised were asked for the reasons for this dissatisfaction. Data is presented in the Table 6, with the most frequently reported reasons per LLG in bold. Although there were differences across LLG, the most commonly reported reasons for dissatisfaction were vaccine unavailability, staff not spending enough time with the participant, and clinic waiting times.

Table 6. Reported reasons for dissatisfaction (N=80 participants) in service quality of routine immunisation, by LLG, with noteworthy findings bolded.

	Inland Baining N=14	Toma-Vunadidir N=34	Bitapaka N=6	Kokopo Urban N=11	Duke of York N=15
Vaccine not available	100%	100%	0%	36%	100%
Clinic not open	0%	12%	17%	9%	53%
Waiting times	57%	71%	67%	27%	93%
Clinic not clean	0%	3%	0%	0%	27%
Staff are poorly trained	0%	3%	0%	0%	7%
Staff not respectful	0%	9%	0%	0%	20%
Staff don't spend enough time	57%	26%	67%	73%	47%

Note: Multiple reasons could be selected.

The belief that staff do not spend enough time with caregivers (and hence insufficient time explaining immunisation to them) is also supported by the in-depth interviews. One caregiver from Bitapaka reported: *"Sometimes going to the hospital the nurses don't explain to us the medication and the injections. They only administer it and tell us to come back later on with no explanation of its purpose"*.

When asked whether a routine immunisation service they had taken their child to had ever been cancelled, 149 (63%) of the 237 respondents responded 'yes'. Cancellation of immunisation sessions was most commonly reported by participants in Toma-Vunadidir (88%) and Duke of York (80%).

Reasons for the cancellation differed by LLG, but were principally due to no vaccine availability, with 100% of respondents in Inland Baining and 95% in Duke of York attributing cancellation to no vaccine availability (Figure 12).

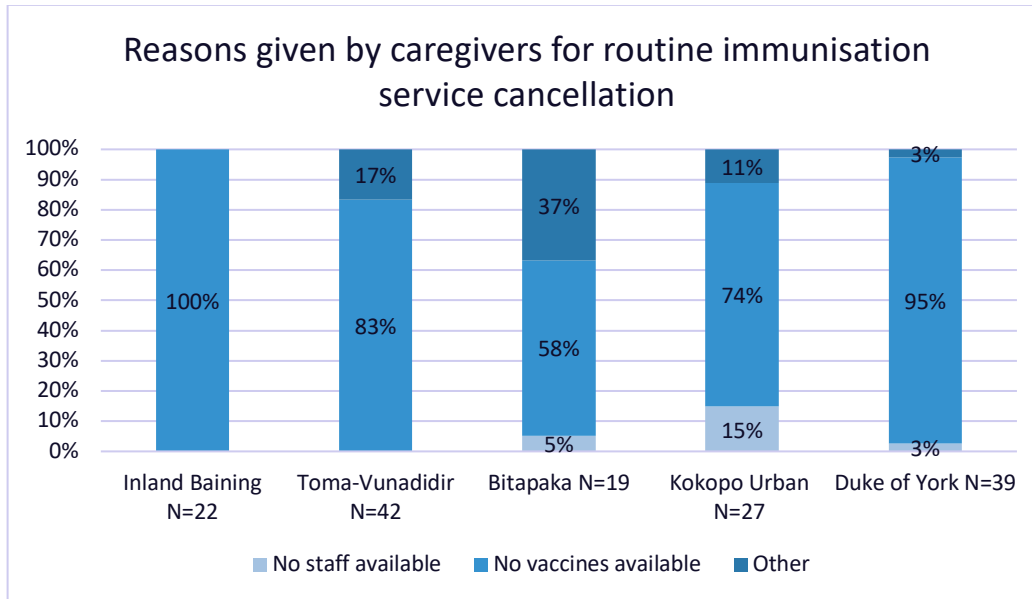


Figure 12. Reported reasons for routine immunisation service being cancelled, by LLG.

Note: Multiple reasons could be selected; proportion is of the total number of responses given by LLG.

The in-depth interviews with both caregivers and health care workers reinforced that vaccine stockouts are a frequent problem, which then discourage caregivers from going to the clinic to get their children vaccinated. One healthcare worker from Duke of York reported:

“Sometimes they have to walk quite a distance all the way to the clinic just to be told there is no vaccine in stock and they are sent all the way back... that is why they don’t want to go”.

Despite these challenges, immunisation was highly sought after among respondents, with 75% reporting that they would take their children back to the clinic again if they were not able to be vaccinated on that occasion.

Respondents were asked about their level of trust in health workers who vaccinated their child with the options to respond ‘little’, ‘moderately’, and ‘very much’. In Inland Baining, Bitapaka, Kokopo Urban and Duke of York, most respondents reported ‘very much’ (77%, 80%, 65% and 47% respectively). However, in Toma-Vunadidir, most respondents (67%) reported that they only ‘moderately’ trust health workers (Figure 13). In-depth interviews revealed that some of this mistrust in healthcare workers could stem from the lack of vaccine availability, which is indirectly blamed on healthcare workers. One caregiver from Duke of York reported: *“... they (caregivers) do not trust the doctors or nurses.... Because most times when they go for their routine immunisation they are told the vaccine is out of stock”.*

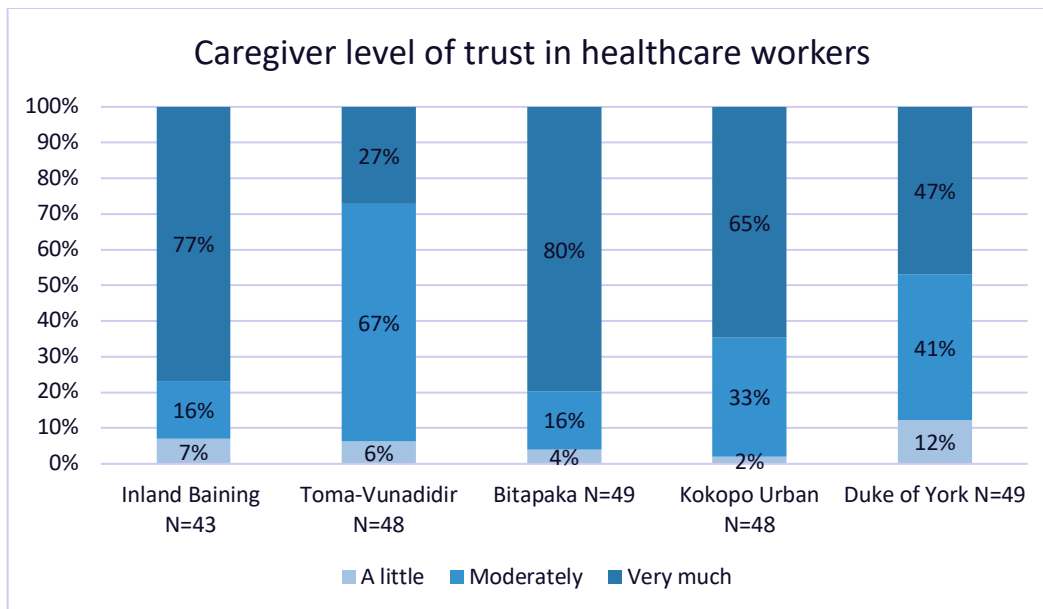


Figure 13. Level of trust of respondents in the healthcare workers providing vaccines, by LLG.

Of the 237 respondents, 51% responded ‘no’ to the question on whether health care workers explain services and respond to questions well, with the highest proportion of answer ‘no’ coming from participants in Toma-Vunadidir and Duke of York. In all LLGs, the main response for what healthcare workers could do to improve their services was ‘spending more time with me’. This is of course a challenge in a context with insufficient health staff and long waiting times at health facilities.

Access to vaccination services

Respondents were asked how easy it is to pay for vaccination with the options to respond ‘not at all affordable’, ‘somewhat affordable’, and ‘affordable’. Overall, 55% of respondents found accessing vaccination services affordable. However in Toma-Vunadidir, 60% of respondents reported access services to only be ‘somewhat affordable’, indicating higher costs involved in some areas.

Almost all respondents (93%) indicated that they would miss work to get their child vaccinated. Kokopo Urban had the lowest proportion of parents and caregivers stating that they had to miss work to have their child vaccinated (75%), but in all other LLGs more than 90% of respondents said that they would miss work to have their child vaccinated.

In considering the total cost of getting a child immunised, both actual costs such as transport, and opportunity costs, such as the lost employment time as caregivers attend clinic, were considered. Figure 14 illustrates the various expenses that respondents reported having to pay when attending the clinic for vaccination. Transport was the biggest expense for participants in Bitapaka and Kokopo Urban. This is supported by qualitative feedback from a caregiver from Toma-Vunadidir through an in-depth interview: *“There is a financial issue – bus fare... When I feel like I cannot afford this, I will just stay back with my child”*. As reported by a healthcare worker from Duke of York, *“It depends on their families. If the families can support their finances, they come, otherwise they don’t come”*.

The cost of the vaccine was the most commonly noted cost incurred in Duke of York and Inland Baining. According to the PNG National Department of Health (NDoH) Free Primary Health Care and Subsidised Specialist Services Policy (2013)⁵, all primary healthcare (therefore including childhood vaccines) should be available free of charge in order to maximise uptake and coverage. While not supported by the policy, it appears that many health facilities still charge a small user fee.⁶ One report from 2020 noted that despite the introduction of PNG’s free primary health care policy, health facilities in East New Britain raised more revenue from charging user fees than any other province⁷.

From discussions with East New Britain PHA staff, these fees were usually around 20-50t in the case of mobile/outreach services and K1-2 per appointment in static clinics. They are charged for all services, not just immunisations, and meant to cover basic health facility running costs including fuel and stationery. Thus, it is likely that the vaccine cost being referred to by caregivers in this study is not a payment for the vaccine itself, but is in fact part of these user fees. Further investigation to clarify this understanding is important.

From our study data, it appeared that government-run clinics were less likely to charge a service fee than church-run clinics, which may reflect the need for additional monetary support at non-government run clinics.

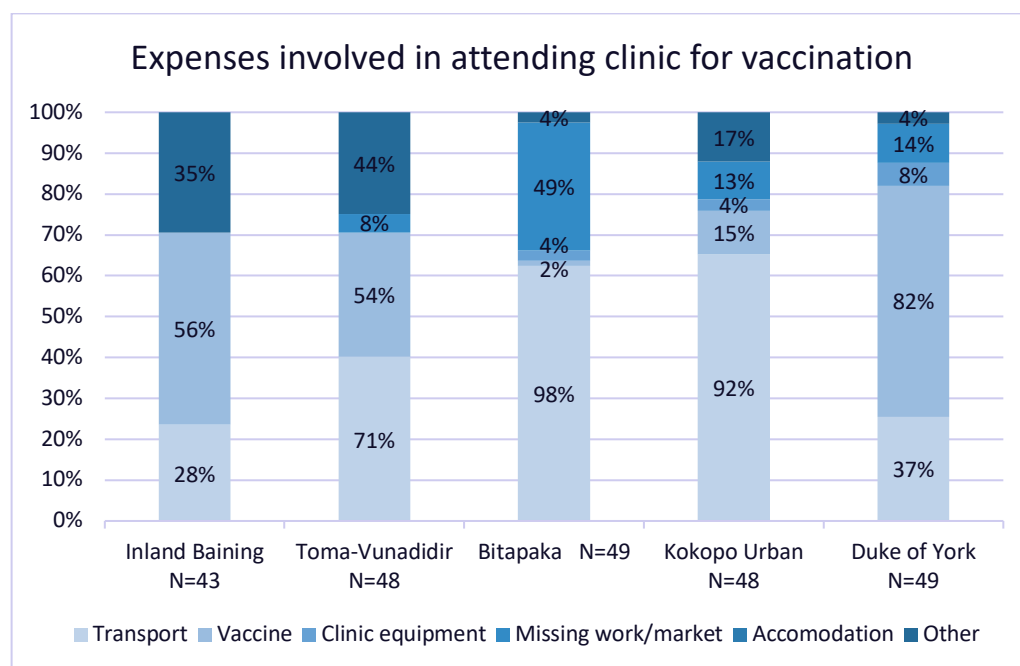


Figure 14. Different expenses involved for the caregiver in attending the clinic for vaccination, by LLG.

⁵ [Policy on Free Primary Health Care an Subsidized Specialized Health Services in PNG](#)

⁶ [Independent State of Papua New Guinea Health System Review, World Health Organisation: 9789290226741-eng.pdf \(who.int\)](#)

⁷ [Wiltshire, C., A.H.A. Watson, D. Lokinap and T. Currie 2020. Papua New Guinea’s Primary Health Care System: Views from the Front Line. Canberra and Port Moresby: ANU and UPNG.](#)

77% of respondents (N=182) reported spending more than 30 minutes travelling to the clinic for their child to be vaccinated. However, mode of travel differed across LLG, with the vast majority of participants in Inland Baining and Toma-Vunadidir walking to the clinic (94% and 82% respectively) and the majority in Bitapaka and Kokopo Urban taking public motor vehicles (97% and 93% respectively). One caregiver from Toma-Vunadidir reported:

“It is hard for us mothers to walk to the hospital, it is too far away.... Sometimes they send us back and tell us to come again for routine immunisations, it’s hard for us to go to the clinic so we just don’t come”.

Notably for caregivers living in Duke of York, an LLG comprising of a number of islands, many caregivers have to take a boat to get to the closest health facility which can be challenging if seas are rough, and with the cost of fuel.

Regarding clinic wait times, most of the 237 respondents reported waiting between 1-2 hours for vaccination services (Figure 15). Residents in Inland Baining and Bitapaka had the shortest self-reported clinic wait time, with 40% and 41% of respondents respectively waiting less than one hour, compared to 61% of respondents in Duke of York waiting 1-2 hours.

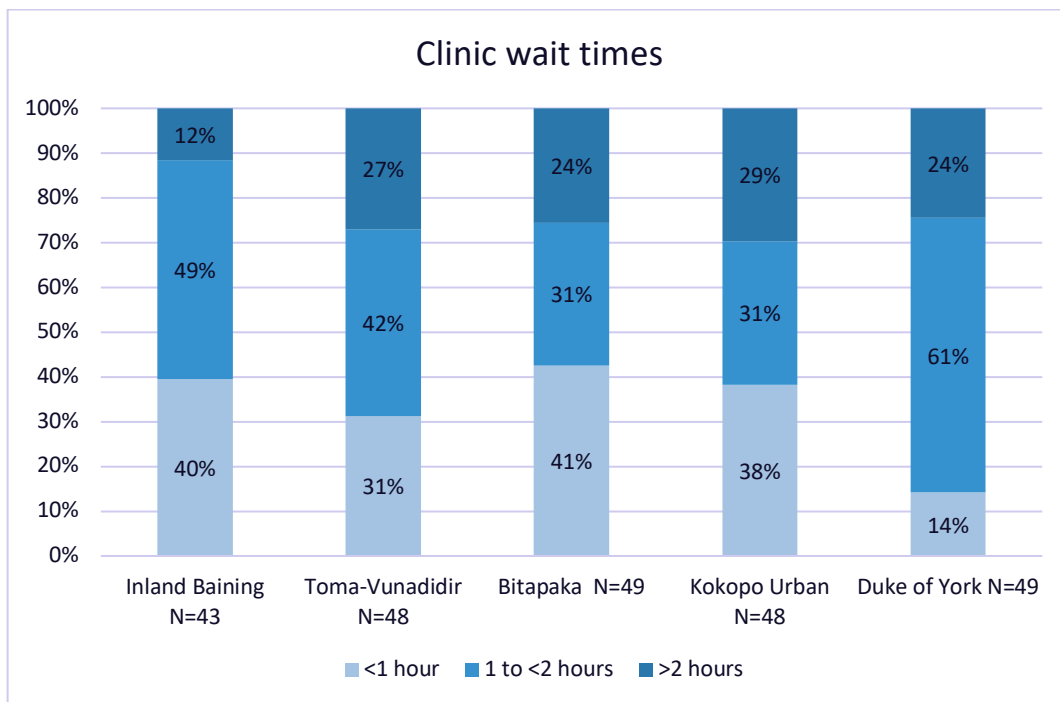


Figure 15. Self-reported waiting time at the clinic to receive child immunisation, by LLG

Service delivery

Respondents were asked if they had ever accessed immunisation through a mobile clinic or outreach services (Figure 16). The question did not differentiate between the two modalities. In Inland Baining, Toma-Vunadidir and Duke of York, the majority of respondents reported that they had been reached by mobile clinics or outreach services, whilst in Bitapaka and Kokopo Urban, the majority reported that they had not. Given that the same three LLGs reported much higher rates of having been vaccinated through an immunisation campaign (Figure 17 below), it is possible that there is some confusion in the exact definition of an outreach or mobile clinic, and participants reported “yes” if any service had brought vaccination to their community rather than needing to visit a health facility for vaccination.

The in-depth interviews highlighted the benefits of reaching more children with outreach and mobile clinics, but also the challenges related with providing this service. A healthcare worker from Toma-Vunadidir reported:

“We only have one car, just the ambulance. It would be good to have a vehicle specifically to go out with the maternal and child health clinics. It would make it very easy to reach the remote children for the routine immunisations”.

Another healthcare worker from Duke of York reported that the challenge is having fuel for the vehicle, and insufficient human resources was given as a challenge by a healthcare worker from Kokopo Urban.

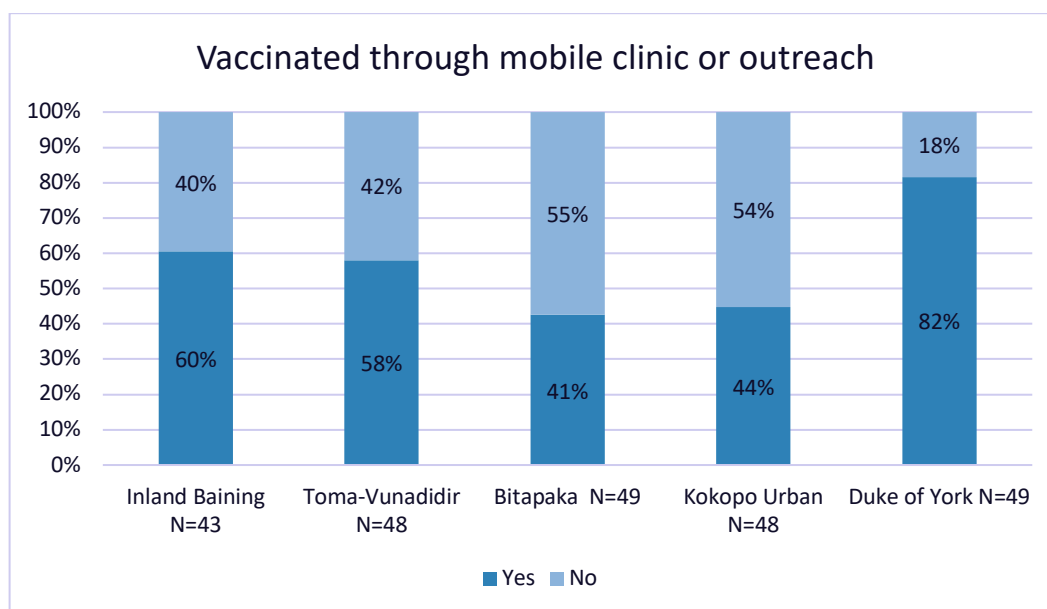


Figure 16. Proportion of respondents whose child was vaccinated through outreach or mobile clinics, by LLG.

In addition to the routine immunisation system, immunisations can also be conducted through supplementary immunisation activities or ‘campaigns’, which are a delivery strategy used to quickly reach large numbers of children with one or more vaccines, often to ‘catch up’ on missed vaccinations. When respondents were asked if their child had been vaccinated during a vaccination campaign, the majority in Inland Baining, Toma-Vunadidir and Duke of York replied ‘yes’ (Figure 17). However, fewer than half of respondents from Bitapaka and Kokopo Urban reported that their child had been vaccinated during a campaign.

These findings correlate with the timing of a supplementary immunisation campaign for MR taking place at a similar time (mid 2023) to when the study was being conducted. Study fieldwork in Bitapaka and Kokopo Urban was conducted earlier in the year (between March and June 2023), so they were likely to have been visited before the most recent campaign reached their LLGs, and were more likely to respond “no” to the question on whether they had been vaccinated through a campaign. The targeted areas within these LLGs reached by our study team were also less rural and thus potentially had less need for mobile or outreach services compared to some other parts of East New Britain. Conversely, Inland Baining, Toma-Vunadidir and Duke of York were visited later in the study (between June and August 2023), likely around the same time or after the supplementary immunisation activity. They were also more likely to reply “yes” to the question on whether they had been vaccinated through a campaign.

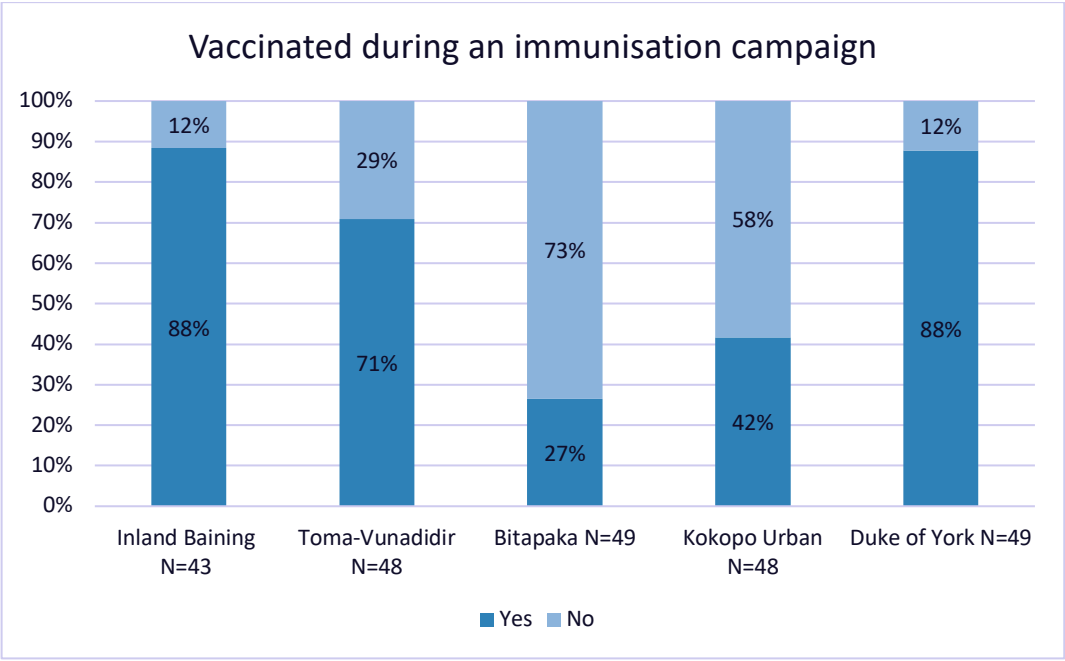


Figure 17. Proportion of respondents reporting that their child had been vaccinated during a vaccination campaign, by LLG

The qualitative data collected from the in-depth interviews highlighted the importance of immunisation campaigns and outreach services in increasing vaccination coverage. These programs may reach children of caregivers who have financial or access barriers to attending static clinics. One healthcare worker from Duke of York involved in a campaign reported “*When we went out to each community, the turnout was good. Many of the mothers that normally do not come to facilities to receive routine childhood immunisations, we saw their faces there*”. Similarly, a caregiver from Duke of York reported of outreach “*When they came to serve us in the community it really helped us because we did not have to walk the distance to the hospital... for once our baby’s immunisation did not feel like a burden for us*”.

Household decision making

The 237 respondents were each asked who in the household decides if the child(ren) should be vaccinated (Figure 18). In all LLGs, the mother was reported to be the main decision maker, however qualitative data collected indicated that grandparents also positively support caregivers to get their children vaccinated in some cases.

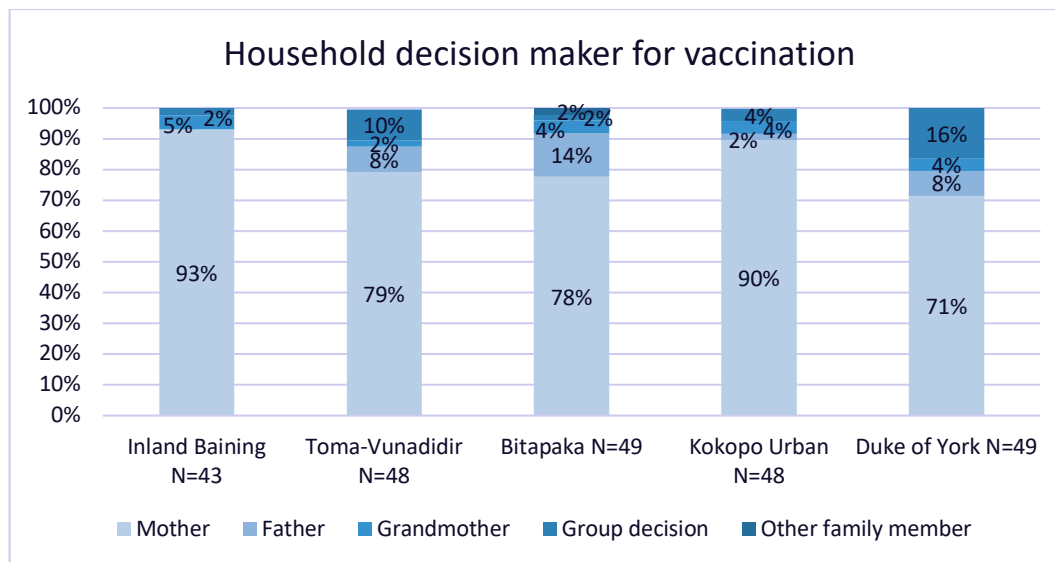


Figure 18. Household decision maker regarding whether a child gets vaccinated

Of the 237 respondents, 9 reported that they had decided not to get their children vaccinated for reasons other than illness or allergy. Across all LLGs, the principal reason for this was 'family didn't want me to take child to be vaccinated' (6 out of 9 respondents, 67%).

Reasons for missed vaccination

Both healthcare workers and caregivers were asked about the reasons they thought a child might have missed being immunised. This question did not specifically relate to their experiences, but just general community sentiment. Participants were asked about each of the potential reasons shown in Figure 19 below, and could report as many answers as they wished.

There were notable disparities between the beliefs of healthcare workers and caregivers in several areas, including vaccine safety and effectiveness, healthcare worker recommendations around immunisations, and how supportive community and religious leaders were. Caregivers were more likely than healthcare workers to report that any queried characteristic was a potential reason for missed vaccination, raising some question around reporting biases or unclear asking of the question.

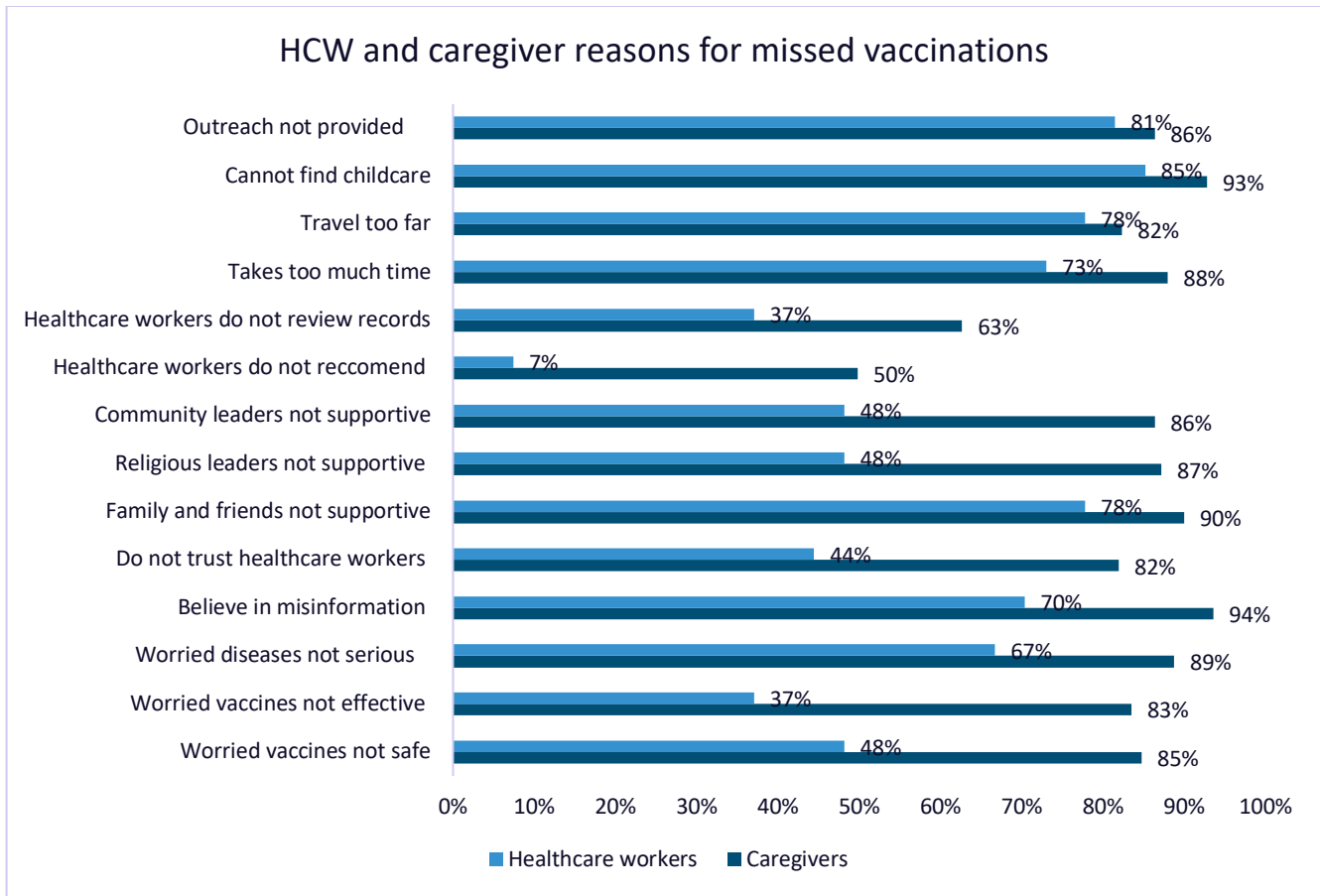


Figure 19. Healthcare worker and caregiver belief around why children may miss vaccinations

The qualitative information gathered from the in-depth-interviews highlighted that healthcare workers consider caregivers to be uninformed and worried about side effects of vaccines. According to one healthcare worker from Inland Baining:

“They (mothers) may not be educated and will not bring their child because they don’t know the importance of immunisation... Sometimes they think that if the child gets the immunisation, they will get sick, so that’s the reason why some of them don’t come”.

Some healthcare workers also consider caregivers to be unmotivated, despite knowing the importance of immunisation.

Conversely, some caregivers report the desire for more health education. As quoted by a caregiver from Bitapaka:

“I would like to be informed further so I will know the importance of child immunisation and how it can protect my child from illnesses. When I am properly informed I can ask what type of dose my child is receiving”.

According to the in-depth-interviews, some caregivers reportedly avoid attending the health facility for immunisation for fear of being scolded by the healthcare workers for not giving birth in a hospital or for not having their child’s clinic book.

One caregiver reported *“Some mothers give birth in the village and are scared to take the children to the hospital. They fear that the nurses will get on them and ask them questions which they cannot comprehend”*.

Caregivers also report that being illiterate is a barrier to accessing immunisation:

“Most mothers here are like me... just completed Grade 1... do not know how to read and write, and we just live like that. We do not know about routine immunisation. Nurses must come and talk to us in the village...”

In-depth interviews also revealed that some mothers fear vaccinating their children as they mistake routine childhood immunisation with the COVID-19 vaccination, around which there was substantial mistrust and questioning about in PNG. One healthcare worker from Duke of York reported: *“We ask them why they missed certain dates, and they say we were scared you would give our kids the COVID-19 vaccine. Just the sound of the word vaccine scares them”*.

Whilst it was not one of the options given in the survey, the in-depth interviews with both caregivers and healthcare workers suggested that healthcare workers have poor communications skills, which results in poor caregiver understanding of the importance of and processes around vaccination. A caregiver from Bitapaka reported, *“Sometimes going to the hospital the nurses don’t explain to us the medication and injections. They only administer it and tell us to come back later on with no explanation of its purpose”*. A healthcare worker from Toma-Vunadidir echoed this sentiment: *“Sometime the fault is also with the staff. Mothers just want clarity (on vaccines), so we should take the time to explain, the mother will understand”*.

Vaccination importance

All 237 caregivers surveyed thought that vaccination was important. As reported by one caregiver from Bitapaka during an in-depth interview, *“I like to bring my child to the hospital because I know that immunisation would make my child grow up to be strong and healthy and avoid illness”*. However, there were differences across the LLGs in the proportion of caregivers who thought their child should get some or all of the vaccines recommended in the PNG routine immunisation schedule (Figure 20). Caregivers in Toma-Vunadidir were more likely to say their child should only get some of the recommended vaccines compared to other LLGs.

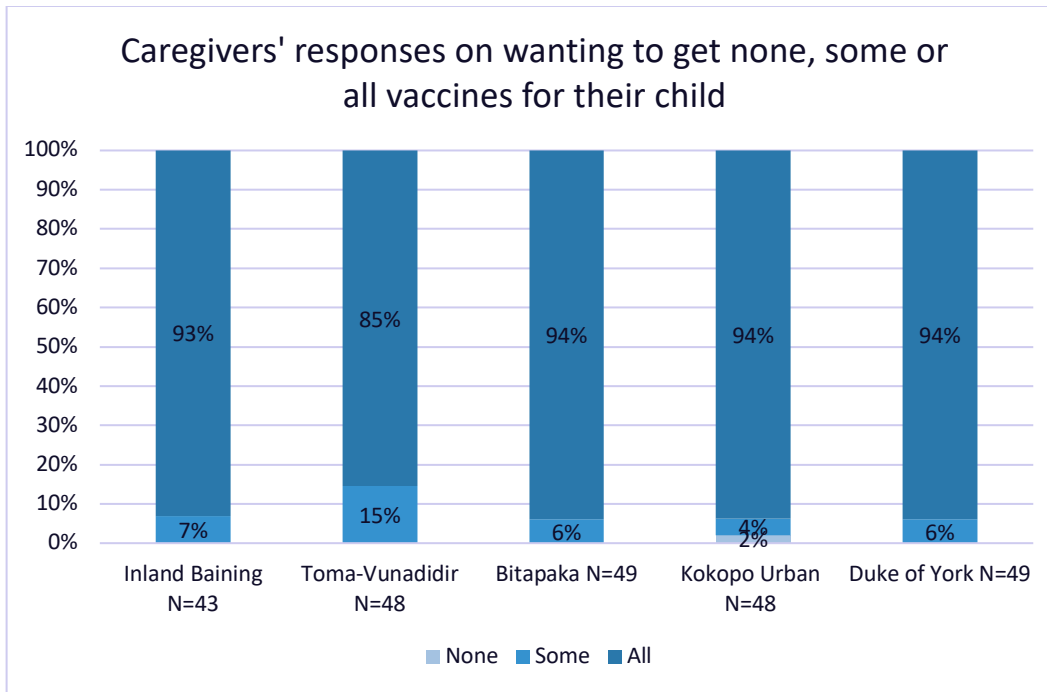


Figure 20. Proportion of caregivers who want their child to get none, some, or all of the vaccines recommended in the PNG routine immunisation schedule, by LLG.

Healthcare Professionals

Surveys were also conducted with 30 healthcare workers from across the five target LLGs. The number of surveys conducted with healthcare workers in each LLG was based on availability and the number of clinics visited. Participants were purposively sampled to ensure a range of perspectives, roles, and experiences were reflected in this report.

Most participants were community health workers (41%) or nurses (38%), and two-thirds had been in their role for more than 10 years.

The demographic details of the 30 interviewed health care workers are outlined in the Table 7 below, including median age, gender, education level and health role. Throughout this section it is important to note the small number of respondents within each LLG, so their views are not necessarily representative of broader experiences, opinions, or beliefs. Additionally, all data are reported as percentages instead of raw numbers but should not be over-interpreted due to the low numbers.

Table 7. Healthcare worker demographic details, by LLG

	Inland Baining N=7	Toma-Vunadidir N=6	Bitapaka N=2	Kokopo Urban N=9	Duke of York N=6
Median age (range) years	36 (25 – 51)	58 (36 – 65)	58 (57 – 59)	50 (34 – 56)	47 (32 – 63)
Gender					
Male	43%	0%	50%	11%	17%
Female	57%	100%	50%	89%	83%
Education level					
Grade 10 or less	0%	0%	0%	11%	0%
Secondary (grade 11 or 12)	0%	0%	50%	0%	17%
Tertiary/vocational	100%	100%	50%	89%	83%
Role					
Nurse	29%	33%	50%	33%	50%
Midwife	0%	17%	0%	11%	0%
Health extension officer	14%	0%	50%	22%	0%
Community health worker	57%	50%	0%	22%	50%
Missing	-	-	-	11%	-

Healthcare worker training

Overall, 19 (63%) of the healthcare workers interviewed had received some type of immunisation training (Figure 21). There was variation by LLG, with 100% of healthcare workers in Bitapaka having received training, versus 56% in Kokopo Urban. All reporting having found it helpful. Of the 17 healthcare workers who reported the year they had received the training, 59% had been trained since 2019.

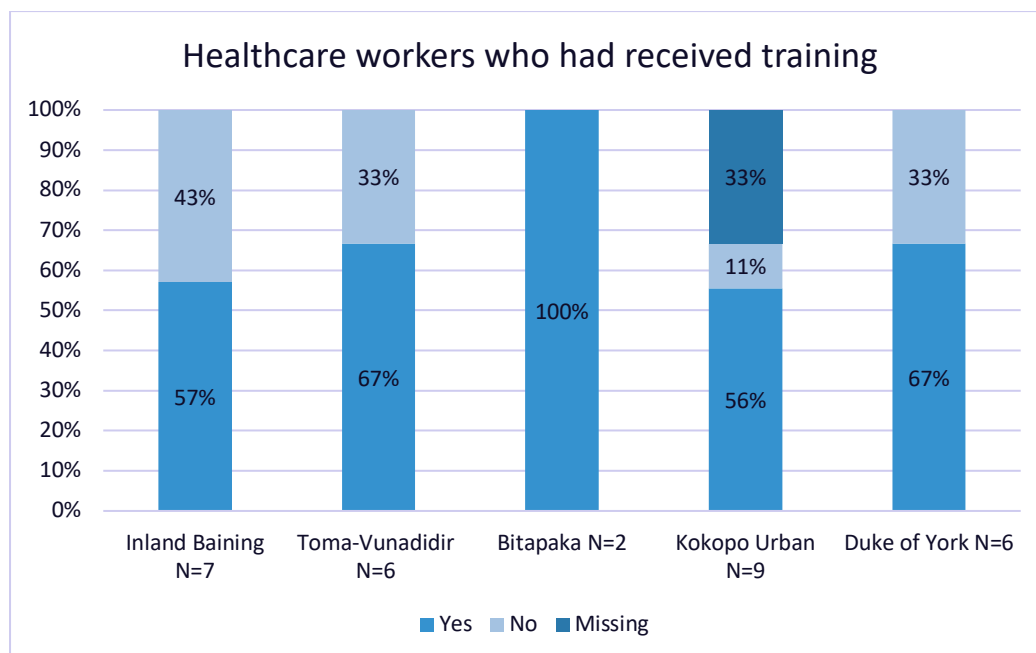


Figure 21. The proportion of healthcare workers who report ever having received immunisation training, by LLG

Type of training healthcare workers have received

Figure 22 shows the proportion of healthcare workers who reported being trained in several areas critical to immunisation service delivery. The most common type of training that healthcare workers reported receiving was cold chain training (84%).

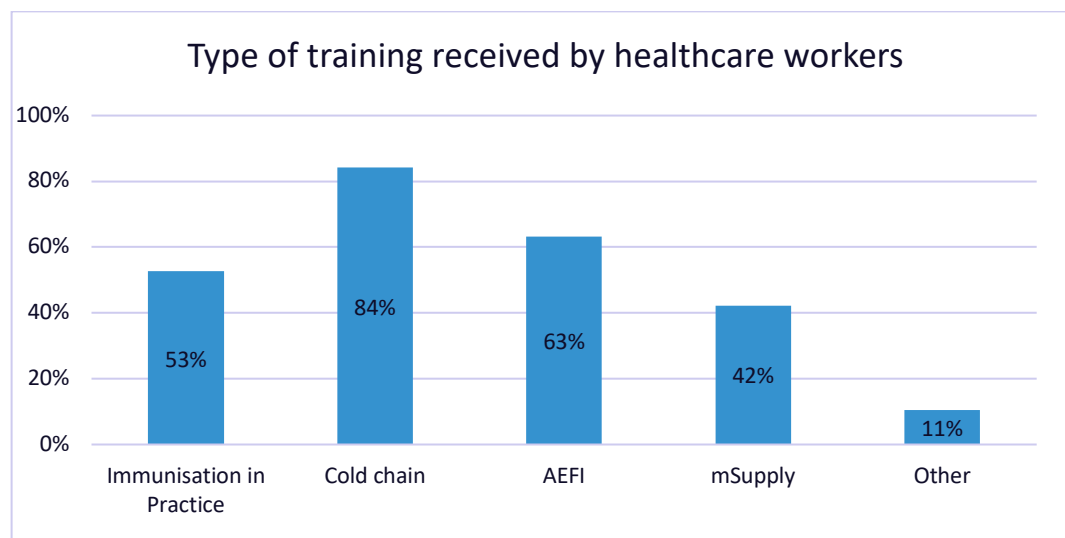


Figure 22. Type of training healthcare workers have received among healthcare workers who report having received any training (N=19)

Record keeping

Two-thirds (67%) of the 30 healthcare workers interviewed reported that they always recorded a child's vaccination in the health centre register. However, this varied by LLG, with the most reliable LLGs for reporting being Toma-Vunadidir and Bitapaka, where 100% of health workers reported that they record a child's vaccination in the health facility register 'all of the time' (Figure 23).

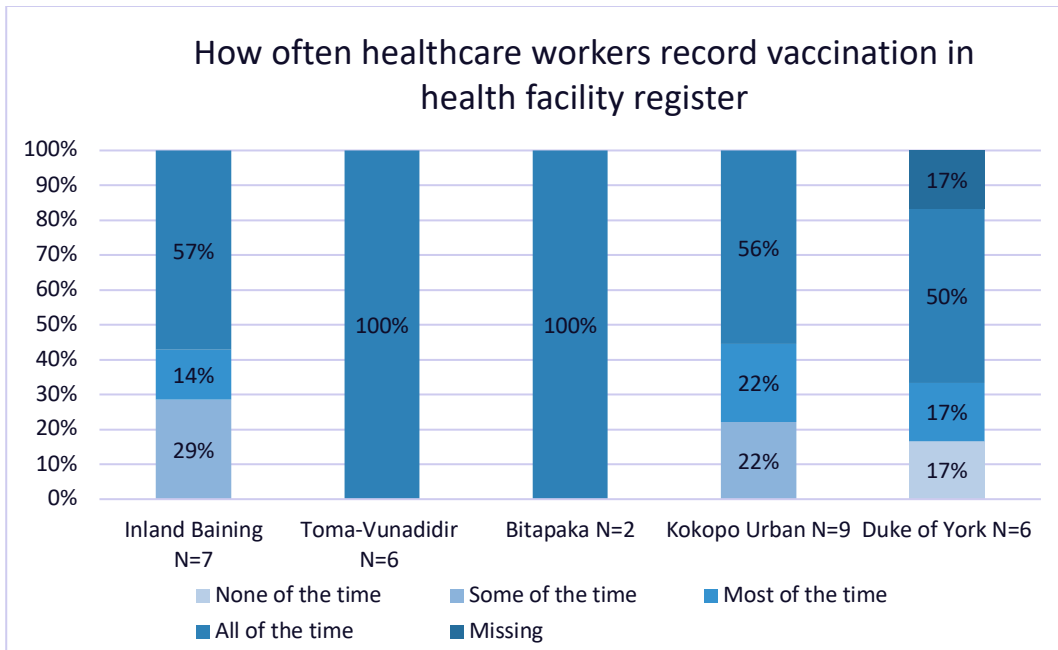


Figure 23. Self-reported frequency of healthcare workers recording a child's vaccination in health facility register, by LLG

Those staff who did not always record a child’s vaccination status in the health facility register (N=10) were asked to choose from a list of reasons as to why they did not always record vaccinations. The most common reasons for not recording were not having time to complete the record, not having access to a tablet or computer, and not having time to transfer record from paper to tablet (Table 8).

Table 8. Healthcare worker self-reported reasons for not recording a child’s vaccine in the health facility register (N=10), with notable responses in bold.

	Inland Baining N=3	Kokopo Urban N=4	Duke of York N=3
No time	67%	50%	0%
No access to tablet or computer	33%	50%	33%
Tablet or computer not working	0%	25%	0%
No time to transfer record from paper to tablet	0%	75%	0%
Other	0%	25%	33%

Note: Other healthcare workers surveyed reported they always recorded vaccines in the health facility register and hence were not asked reasons for not recording. All healthcare workers surveyed reported that they always recorded the vaccines given to a child in the child’s immunisation record.

Missed vaccination

All healthcare workers surveyed thought that at least some children missed out on some or all of their recommended vaccinations, however, the extent to which they believed children missed their immunisations varied by LLG (Figure 24), with the majority of healthcare workers believing children would miss vaccines coming from Duke of York.

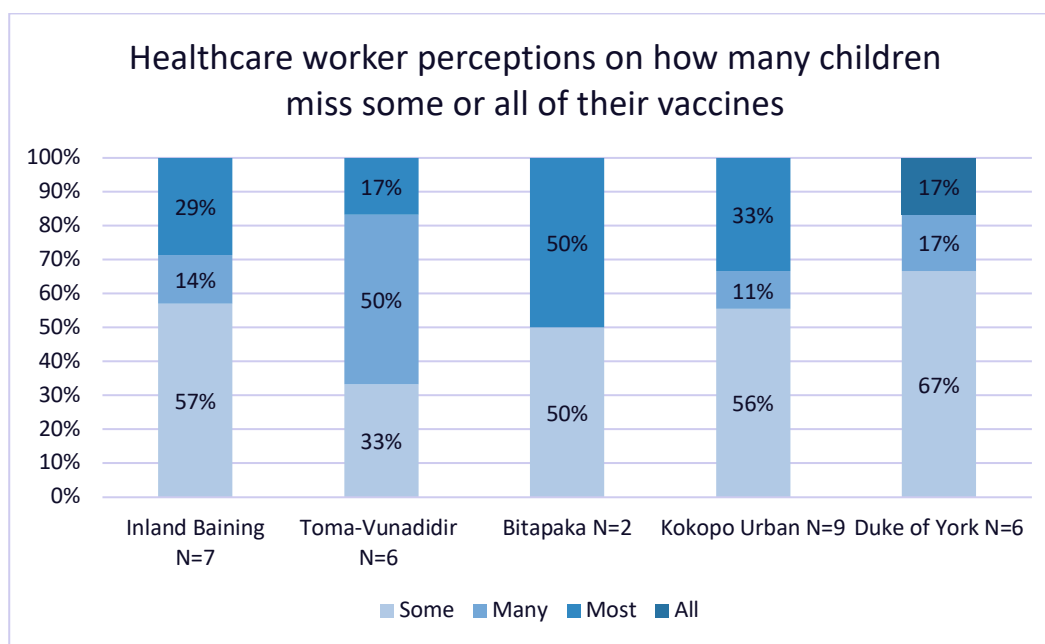


Figure 24. Proportion of healthcare workers who believe that children miss out on some or all of their vaccinations, by LLG

Health worker vaccine knowledge

Healthcare workers were also asked which vaccines a healthy child in PNG should receive (Table 9). Staff interviewed in Kokopo Urban appeared to be less knowledgeable about which vaccines a child should receive compared to the other LLGs.

Healthcare workers were less aware of the need for a child to receive the Hepatitis B birth dose or the pneumococcal vaccine, so further awareness and education may be required for some vaccines.

Table 9. Knowledge of healthcare workers about which vaccines a healthy child in PNG should receive, by LLG (N=30)

	Inland Baining N=7	Toma-Vunadidir N=6	Bitapaka N=2	Kokopo Urban N=9	Duke of York N=6
BCG	100%	100%	100%	78%	100%
HEPATITIS B BIRTH DOSE	86%	100%	100%	56%	83%
OPV OR IPV	100%	100%	100%	89%	100%
PENTAVALENT	100%	100%	100%	78%	100%
PCV-13	86%	100%	100%	56%	100%
MR	100%	100%	100%	89%	100%

BCG: Bacillus Calmette–Guérin vaccine; IPV: inactivated polio vaccine; OPV: Oral polio vaccine; Pentavalent: diphtheria, tetanus, pertussis, haemophilus influenzae type B, and hepatitis B; PCV-13: pneumococcal vaccine; MR: measles-rubella vaccine.

Section 4: Community and religious leaders

One focus group discussion (FGD) was held with community and religious leaders in each of the five target LLGs, with a total of 53 participants (approximately 10 participants in each focus group). Religious leaders included a church female president, a resister/nun and a male church representative; community leaders included members of the Ward Development Committee (Ward Member, Ward Recorder and other Ward executives).

Community attitudes towards routine immunisation

There is consensus among community and religious leaders that immunisation is safe, protects against serious diseases, and contributes to the wellbeing of children. Community leaders observed increasing population numbers, which they attribute to higher vaccination rates. Many have lost family members to vaccine-preventable diseases and are determined that their own children are immunised to prevent this happening in the future.

The leaders that participated in the focus group discussions believe that most mothers trust vaccination programs as they have been implemented in the community for many years and want their children to be immunised. However, they reported that some mothers are afraid to vaccinate their child(ren) after witnessing side effects, such as fever or swelling, and communities are wary of new vaccines being introduced without proper awareness. It was felt that healthcare workers can alleviate these fears by providing information and education alongside immunisations.

The participants reported that some communities have distrust in 'modern science' and Western approaches to health care can be met with resistance in some communities. People may also have conflicting religious or cultural beliefs (e.g. sorcery), which can lead to confusion about health messaging. Moreover, many individuals have not received a formal education, so they may have limited knowledge about immunisations, but targeted education can be successful in shifting beliefs and practices. For instance, one participant stated:

"I am happy about the vaccination because now I am well informed, and it has broadened my knowledge knowing that I have been suspicious of health-related issues instead of sorcery which is a lost cause".

It was reported that complete knowledge of the routine immunisation schedule is not common within communities. While most people are aware of "Baby sut" (routine immunisation), they often have difficulty describing the specific diseases each vaccine prevents. Some parents believe that a single vaccine is sufficient to protect against all illnesses, which can lead them to doubt the legitimacy of vaccines when they are notified to return for another vaccination. It is important that parents understand vaccination is disease-specific and cannot provide protection against unrelated diseases.

Capacity within communities to attend healthcare facilities

Geographical considerations

The leaders spoken with reported that those living in remote areas face the challenge of travelling long distances, which can make them dependent on monthly outreach services. Weather, particularly in rainy season when flooding occurs, can prevent travel for both mothers and healthcare workers. Some areas lack quality roads for transport.

Shortage of aid posts

Communities consider additional aid posts as vital to increasing immunisation coverage and improving relationships between healthcare workers and communities. Aid post staff can provide tailored messages in the local languages to their communities, and are more closely aware of their needs (e.g. knowing which children are at the age for which vaccines). These are considered particularly important in Duke of York where some communities have to travel across water to reach the closest health facility.

Financial capacity

Financial restrictions often prevent mothers from attending health facilities. This includes travel costs, and in some instances, it was reported that mothers had to cover the cost of their baby's vaccines and could be denied services by health staff if they were unable to pay. Although some health workers would accommodate mothers who are unable to pay, they may expect payment later which can act as a deterrent for parents returning to the clinic for later immunisations.

Competing demands

The community and religious leaders indicated that mothers may have difficulty bringing their baby to a healthcare facility if they are required to work and have no one to look after their children. Busyness with work also impacts other activities, such as attending church, which means that they may not receive awareness conducted through community channels and thus do not know when healthcare workers are coming for immunisation.

Family and community support

The FGDs confirm the quantitative finding that mothers typically serve as the primary caregiver for their children and childcare is typically considered the mother's duty by communities. In some instances, fathers may assist in sharing caregiver responsibilities, but largely through providing financial support. Parents are expected to ensure their children receive their routine immunisations. This responsibility does not extend to the broader family or community, although mothers may be provided with reminders about immunisation in some communities.

Mothers may face challenges in accessing healthcare facilities if they cannot find suitable childcare. In families with multiple children, the older sibling may be left at home if the mother can only carry one child. Fathers may occasionally assist in bringing the child to the healthcare facility, but the primary responsibility for this task remains with the mother.

Younger mothers and family planning

Community and religious leaders expressed concern for younger mothers who may have experienced early marriage or an unintended pregnancy, as they are often less prepared for childcare. These mothers are more likely to have missed education and may lack knowledge about medications and immunisations available for protecting children against disease. In addition, younger mothers may be afraid of healthcare workers or ashamed to visit healthcare facilities, often only seeking healthcare when their child is ill.

Challenges faced within healthcare settings

Black outs and vaccine stock-outs

The FGDs indicated that black outs occur frequently in some regions and sometimes the back-up generator also fails, meaning there is no electricity for refrigeration. This has contributed to many vaccine stock-outs as the heat damages the vaccines and they have to be thrown out. Children miss out on immunisation because a new supply can take a long time to arrive. The unavailability of vaccines at health facilities can be discouraging for caregivers.

Staff shortages

Community and religious leaders noted that staff shortages often resulted in extended wait times and, in some cases, force mothers to travel further to access alternative facilities. In some instances, mothers have had to wait an entire day at the health facility without receiving care. Health facility staff may recommend that caregivers return on another day if they cannot attend to them immediately, but this can be inconvenient and results in them paying for transports costs twice.

Interactions between health facility staff and caregivers

FGDs revealed that at times, healthcare workers can be stern with caregivers who do not bring their child to the clinic regularly for immunisation. In such cases, caregivers may return to their community and spread the idea that health workers are unkind and harsh, which can discourage others from attending.

Additionally, concerns were raised that healthcare worker communication with caregivers was inadequate and could be improved, with clear explanations needed about which diseases each vaccine can prevent, and discussion of potential side effects. When post-vaccination side effects such as a fever occur without a parent expecting it, it can erode trust in healthcare workers and vaccines.

Interactions between health facility staff and community leaders

Community and religious leaders believe that healthcare workers actively promote routine immunisation within most communities. However, clear emphasis was placed on the importance of healthcare workers liaising with community leaders in advance of outreach visits so they can prepare their communities and ensure people show up for vaccination at the intended day/time.

Furthermore, community and religious leaders expressed their desire and ability to play a more significant role in supporting health matters in their communities. They are eager to assist in translating health information into local languages and to participate in awareness raising campaigns for routine immunisation. Greater awareness within communities can help alleviate fears and concerns when new vaccines or immunisation-related activities are introduced.

Location-specific issues

FGDs also identified issues specific to certain LLGs. Table 10 shows specific areas that were mentioned by community and religious leaders as having higher numbers of under-immunised children.

For instance, in Toma-Vunadidir, it was reported that there was a reliance on traditional remedies and medicines over western medicine, and that many community members were hesitant about modern technologies. Older members of the community were often more wary of vaccines. There were also religious divisions between communities which can complicate relationships between people.

Similarly, traditional cultural practices were reported to be important in Bitapaka, with a Tolai ritual subjecting infants to a form of initiation to protect them from illnesses. While caregivers remain hesitant towards modern approaches to healthcare, they are open to receiving more information and increased awareness to help them make informed decisions. However, this is complicated through poor network connectivity which makes it difficult to share information.

In Duke of York, the primary barrier to immunisation was reported to be the expense of travel. However, in Kokopo Urban, law and order issues were reported as one of the primary reasons why some infants do not receive their routine immunisations. Additionally, a generational divide between community and religious leaders and younger members of the community who can be dismissive of the health messages shared by senior community leaders can lead to tensions among different age groups.

Table 10. Areas with higher numbers of under-immunised children and reasons identified from Focus Group Discussions with community and religious leaders, by LLG

Local-level government area	Reason for Under-immunisation
Inland Baining	
Yalam ward, between Raunsepna and Kombi	Nomadic people, mistrust in healthcare workers, aid post staff absent
Malasait	Aid post staff absent
Komdi	Aid post staff absent
Yalakasam	Aid post staff absent
Toma-Vunadidir	
Gunanur	Distance to health facility
Vunakunai	Distance to health facility
Vuokvuok	Distance to health facility
Tapo	Distance to health facility
Tomari	Distance to health facility
Bitapaka	
Area between Taburtwe village and Ward 6	Distance to health facility
Kokopo Urban	
Plantation workers	Distance to health facility (may visit Vunapope)
Sonama	
Four lane area	Lack of knowledge
Vunabobala, coming up from Kateko	Distance to health facility
Duke of York	
Kababiai ward	Distance to health facility

Section 5: Proposed Strategies

The data in this report have been collected to help inform strategy development and activity implementation during years two and three of the project. Zero-dose mapping undertaken for this study has confirmed that vaccine coverage for Pentavalent-1 and MR-1 varies across facilities, districts, and LLGs in East New Britain province, and that there is substantial dropout between children who receive the first dose of Pentavalent vaccine at one month of age and those who go on to receive the first dose of MR vaccine at six months of age.

By focusing on specific population groups and needs highlighted within this formative year of research, future interventions will be more effectively targeted at removing barriers to immunisation and reaching zero-dose and under-immunised children in East New Britain province.

We acknowledge that some barriers identified are beyond the scope of the project, and indeed beyond the control of East New Britain PHA and other partners to address in short to medium term. This includes ongoing vaccine stockouts, increasing law and order issues in East New Britain, and an insufficient number of health workers/ ageing health workforce and infrastructure.

With consideration of feasibility, sustainability, cost, human resources available, and the timeframe for implementation, the significant barriers identified through this formative research that can be addressed through the project in coming years, and some proposed solutions are outlined in Table 11 below. These strategies were co-designed with East New Britain PHA and developed in consultation with other partners to ensure they are context-appropriate, aligned with identified needs, and will be locally led.

In addition, whilst outside the scope of this project, there is a need for higher level advocacy on several issues at the provincial and national level:

- Ongoing discussions with East New Britain PHA and advocacy to NDoH on the importance of **re-establishing and adequately staffing the remote aid posts**. **Aid posts** ensure vaccines and other health services are available closer to remote communities, improve trust and communication between healthcare workers and the community, and enable local health staff to easily identify children eligible for immunisation and those who may have missed vaccine doses. They are particularly important in remote communities, such as island locations like Duke of York, where communities are separated from health facilities by water.
- Work with other implementing partners to increase confidence in and use of **mSupply or other electronic monitoring and surveillance systems** to ensure adequate vaccine supply and (re)-distribution of vaccines to the provincial and health facility level as needed throughout the year.
 - o Further training and implementation would help local healthcare workers forecast vaccine stock needs appropriately, identify when vaccine stocks are getting low and need to be re-ordered, and give them confidence in using these new electronic systems.

- Need for higher level advocacy with NDoH and UNICEF to ensure a **strengthened vaccine supply and cold chain** to avoid stockouts at national, provincial, district and health facility levels. This will ensure that people travelling to the clinic are not sent away or deterred by the lack of vaccine available.
 - o Further discussions at the national level (Departments of Treasury and Finance, as well as NDoH) are also needed to ensure there are sufficient funds available to order and distribute vaccines in a timely manner.
 - o Ongoing discussions with NDoH and UNICEF to ensure cold chain facilities are functional to protect vaccines, or and conduct repairs timely where needed to minimise any loss or damage to stock and infrastructure.

Table 11: Barriers to routine immunisation in East New Britain province and proposed solutions that could be implemented over coming years

Barrier identified	Proposed solution(s)
<p>Inadequate community awareness and understanding about vaccines, the routine immunisation schedule and side effects, and lack of knowledge of when immunisation services will be available in communities.</p>	<ul style="list-style-type: none"> • Increased engagement with community and religious leaders given their ability to influence their communities on important issues. Their role could include emphasising the value of immunisation and informing their communities about upcoming immunisation sessions. They should ensure information is provided to all community members, not only mothers. All community leaders should receive training on the importance of immunisation, how vaccines work, what diseases they prevent, why multiple doses are needed and potential side effects so that they are able to accurately share this information to communities. Where appropriate, community leaders should be provided with basic information tools such as flip charts illustrating key messages on immunisation that could be shared with their communities. Specific community groups to engage with include: <ul style="list-style-type: none"> - Religious leaders – can be very influential members of the community to disseminate messages through churches on the importance of immunisation and upcoming outreach/mobile clinics, as confirmed by feedback from in-depth interviews. - Increased engagement of Ward Development Committees (notably the Ward Recorder, and also the Ward Development Health member). These individuals are closely connected to communities as well as government and can help identify the zero dose children and inform community members when upcoming immunisation sessions are taking place. • Strengthened communication between healthcare workers and community/religious leaders is needed to enhance collaboration on immunisation related issues, notably reaching out to track zero dose and under-immunised children, and informing of health facility outreach days. • Additional training for Village Health Committees on immunisation. <ul style="list-style-type: none"> - Consider ways of inputting into the Village Health Committee curriculum, which is currently being developed by NDoH with partners including Australian Doctors International and World Health Organisation, to ensure an immunisation module is included. Consider a trial of this in East New Britain.

- Pilot of the Village Health Assistant program, including training and development of an information, education and communication (IEC) kit on how to engage with community members, community leaders and religious leaders as a vaccine champion and increase coverage in their communities.
- Production of **visual and audio-visual IEC materials**, such as:
 - Videos and diagrams with limited text (e.g. to be viewed on phone), suitable for people with limited reading or writing ability, and with captions and audio for people with hearing or visual impairments.
 - There is also the potential to develop and trial a swaddle blanket given to new mothers displaying the immunisation schedule in a locally appropriate manner as a reminder tool about returning for regular vaccination appointments as their child grows.
 - Utilising community volunteers or village health assistants to conduct immunisation awareness sessions during waiting times at clinics, to free up the time of health workers during the actual appointments. These could be through the form of posters, video recordings, or verbal explanations of common immunisation-related questions.
- Increased involvement of **community members beyond only women**.
 - Work with community leaders to reach **men** with messages on immunisation – so that they will know what immunisation is for and why it is important, and encourage their wives to bring their children for vaccination. Men have an interest in having strong children who can contribute to their family’s productivity so the role of immunisation in healthy development should be emphasised.
 - As many mothers are young, ways of increasing involvement of **youth** should also be explored. This may include partnering with the Department of Education to incorporate greater immunisation awareness and education into the school curriculum so students can feed this information back to their families, and also feel more confident about vaccines when planning their own families.
 - Provide immunisation information sessions at **larger events**, e.g. markets / other busy areas and on **radio** to reach a wider audience.

<p>Some healthcare workers have received insufficient immunisation-related training to feel confident discussing immunisation, including awareness of how best to communicate with caregivers about immunisation.</p>	<p>Refresher training should cover the following areas, aligning where possible with the government’s plans to update and roll out the ‘Immunisation in Practice’ training. It is acknowledged that the train-the-trainer model does not always allow for information to filter down to the health staff on the ground delivering the immunisation programs, so a direct training model is preferred.</p> <ul style="list-style-type: none"> • Healthcare workers should be provided with refresher training on routine immunisation, how this differs from COVID-19 vaccines, vaccine benefits, side-effects and what to expect post-vaccination, the PNG routine EPI schedule, why multiple vaccines and doses are needed, the importance of vaccines and their role alongside traditional medicine, how to communicate this to caregivers, and how to correctly complete the child health books and clinic records. • Support other training partners to deliver refresher training that focuses on identified areas of need, including new vaccine introductions (e.g. pneumococcal) or technologies (e.g. mSupply) to encourage uptake and increase confidence. • Training to be provided in enhanced microplanning and data analysis skills to enable healthcare workers to accurately assess their own target catchment populations and calculate the number of vaccines required and administered each month. Data should be shared with East New Britain PHA for ongoing analysis and discussion, with regular feedback to assist future service delivery planning. • Training in interpersonal and communication skills may also be beneficial to ensure interactions with the public are respectful and informative, and healthcare workers feel empowered to share information about routine immunisations and answer questions clients may have. • Explore ways of training midwives and incorporating immunisation messaging into antenatal and postnatal check-ups to sensitise new mothers on immunisation.
<p>Data are collected but not analysed or fully</p>	<ul style="list-style-type: none"> • Motivate and utilise Ward Recorders to ensure data collection adequately captures all new births and can be fed back to their communities to assist with decision making.

<p>utilised for evidence-based decision making and targeting programs to needs of specific areas.</p>	<ul style="list-style-type: none"> • Increased training for health workers in health facilities and aid posts on use of routine immunisation coverage data for microplanning, identification and estimation of target populations, and to track the zero dose and under-immunised children in their communities. Empower healthcare workers to conduct regular coverage assessments to check if they are on track with reaching their target populations. This will also require regular conversations (for instance, each quarter) between national, provincial, and local health units to interpret data and use this information to shape future health planning and service delivery. • Explore ways that Burnet Institute can assist East New Britain PHA with any additional data analysis for information that has been collected but is not currently utilised in program planning <ul style="list-style-type: none"> - E.g. EPI supervisory checklist to be entered and automatically analysed each quarter
<p>26% dropout rate between Pentavalent-1 vaccine at 1 month and MR-1 vaccine at 6 months of age.</p>	<ul style="list-style-type: none"> • Parents and caregivers of children above six months of age require additional education, awareness, and targeted focus to ensure they understand the importance of continuing to bring their child for routine immunisation. Targeting activities in geographic areas with the highest numbers of zero-dose children, as identified through previous analyses, will have the greatest impact.
<p>People residing in more remote areas (including nomadic populations) are not being reached with immunisation and other health services as effectively.</p>	<ul style="list-style-type: none"> • Churches and community leaders to be involved in disseminating information about immunisation to more remote communities with adequate time for messages to spread and ensure people can travel to clinics when healthcare workers are visiting for outreach. • Support East New Britain PHA in developing budgets and workplans for monthly or bi-monthly outreach/mobile clinics.

Conclusions

Routine immunisation coverage rates in PNG are amongst the lowest in the world, although coverage varies substantially across the country. Notably, one in four children who receive the Pentavalent-1 vaccine do not go on to receive the MR-1 vaccine, so further efforts are needed to reach and engage families with vaccination programs as children grow. This research identified geographic areas in East New Britain which had the highest numbers of zero dose children and then conducted further research in five target LLGs to explore the enablers of and barriers to immunisation. The research utilised a combination of qualitative and quantitative methodologies within health facilities and with healthcare workers, caregivers and community and religious leaders.

The study showed that, amongst those interviewed, there is overall desire for children to be vaccinated and a belief that vaccination is important. However, we acknowledge that there may be some bias in the results of those spoken to, either through those interviewed being more connected with the health system or a social desirability bias in their responses. Additional engagement of zero-dose and under-immunised communities is critical to ensuring vaccine coverage required for herd immunity to prevent future outbreaks is reached.

During data collection, communities made it clear to the study team that they were very interested in the findings from this research, and being able to utilise the data to inform evidence-based decision making and future program planning. The study team will re-visit all the communities in which data were collected to share these findings and support them in reaching their communities with routine immunisation.

There were some common challenges identified for why children had not been vaccinated, which can be grouped into some overarching themes, many of which are inter-linked.

1. **Long distance to health facilities** (in some cases across water), and the resulting costs, including for transport, travel, accommodation, and missing work.
2. **Lack of staffing at health facilities**, resulting in long waiting times and less time for the healthcare worker to spend with each caregiver to provide an explanation on the vaccine(s) being administered, and immunisation more generally.
3. **Poor caregiver knowledge on vaccines**, including what diseases different vaccines provide protection against and number of doses needed, coupled with a fear of side-effects. Association of routine vaccines with the COVID-19 vaccine, around which there is substantial misinformation and distrust, also need to be dispelled. This is closely linked to point 2, whereby healthcare workers do not have time to provide a good explanation on vaccines to the caregivers, exacerbating misconceptions. There is also a relatively prevalent belief in some communities about only using traditional medicines to treat and prevent illness.
4. **Vaccine stockouts** were frequently cited as a reason for not attending clinics for immunisation, as many caregivers frequently travel long distances, only for the clinic to be cancelled due to having no vaccine stock.

During the next phase of the project, the study team will work with East New Britain PHA and partners to implement the strategies described above with the aim of increasing immunisation coverage and reducing the number of zero dose and under-immunised children in the province.

Strategies will include increased engagement of community and religious leaders to engage and promote vaccination in their communities; refresher training for health workers to have up-to-date knowledge on vaccination, including skills to improve their communication around key messages on vaccination; and improved data monitoring and recording to improve planning and forecasting for vaccines. Novel information, education and communication materials will be developed in an effort to reach wider audiences, for example radio and video (via mobile phone) communication and swaddle blankets with context-appropriate pictures to remind caregivers on the vaccine schedule. Where relevant, strategies will be tailored to particular areas, recognising the different challenges and the unique context of each LLG identified in the formative research.

Outside the direct scope of the project, the study team will also engage with the PHA, NDoH and other key partners to address ongoing issues like vaccine stockouts and healthcare worker shortages in PNG, as well as to advocate for stronger routine immunisation programs and greater community awareness.