



Maternal and demographic factors associated with non-immunisation of Pacific infants living in New Zealand

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Abstract

Aim To identify the proportion of infants who had not received their first dose of the primary immunisation series at approximately 6 weeks of age, and to identify the maternal and demographic factors associated with non-immunisation.

Method The data were gathered as part of the Pacific Islands Families (PIF): First Two Years of Life Study in which 1376 mothers were interviewed about the immunisation status of their infant. Mothers responded to questions about whether their child had been immunised, who administered the vaccines, and how satisfied they were with the care and treatment of their child in that context.

Results Twenty-seven percent of the mothers reported that they had not had their infant immunised at approximately six-weeks of age. Factors significantly associated ($p < 0.05$) with non-immunisation were ethnic group, maternal birth place, parity, difficulty with transport, and age of the baby at the time of the interview.

Conclusions These findings demonstrate the need for education about the importance of the primary immunisation series and the current schedules, together with community resources to support mothers in the context of this infant health care initiative. Improving immunisation uptake through education may not be sufficient with the more widespread issues of deprivation and social equity needing to be addressed.

Compared with most New Zealand children, Pacific children are at increased risk of poor health with a higher incidence of respiratory infections, meningococcal disease, and infectious diseases such as measles.¹⁻³

Immunisation has been described as the first line of defence against disease, and one of the most effective health advantages available to children.^{4,5} Ensuring full and equitable distribution, accessibility, and acceptability of this health opportunity is an important health priority.⁵ The New Zealand immunisation schedule commences at 6 weeks of age and national immunisation targets have been set to achieve at least 95% coverage.⁶

Despite the demonstrated effectiveness of immunisation, current policies have become increasingly controversial due to concerns about vaccine safety. However, national and international scientific consensus is that any risks associated with immunisation are outweighed by its benefits.⁷

There are no reliable New Zealand population-derived data on immunisation rates for 6-week infants. A recent study found that 93.2% of a cohort of 979 children (registered with the childhood register in Wellington) had received their 6-week vaccines. However, this information was collected from those who remained registered with the practice and was calculated after 9 months of age.⁸

Research has shown that children who are not immunised on time are likely to be from families of low socioeconomic status, to live in urban areas, and to be members of ethnic minority groups.^{9,10} Other identified risk factors associated with sub-optimal uptake of immunisation include low parental educational level, inability to access appropriate transport, and single parent family.¹¹ Also found to contribute are rising parity,¹² inadequate antenatal care,^{13,14} negative beliefs about immunisation,^{9,11} and child health on the day of the appointment.⁹ Such risk factors suggest the need for further investigation into specific populations and the identification of barriers within subgroups.¹¹

In view of the high rates of infectious disease and hospitalisation among Pacific infants,¹⁻³ the Pacific Islands Families Study included questions designed to identify the proportion of infants who had not received their first dose of the primary immunisation series, as well as the maternal and demographic factors associated with non-immunisation.

Methods

Data were collected as part of the Pacific Islands Families: First Two Years of Life (PIF) Study. The PIF Study is a longitudinal investigation of a cohort of 1398 infants born at Middlemore Hospital, South Auckland during the year 2000.

Middlemore Hospital was chosen as the site for recruitment of the cohort as it has the largest number of Pacific births in New Zealand and is representative of the major Pacific ethnicities. All potential child participants were selected (from live births at Middlemore Hospital) if the child had at least one parent who identified as being of a Pacific Island ethnicity and who also was a New Zealand permanent resident.

Recruitment procedures occurred through the Birthing Unit in conjunction with the Pacific Islands Cultural Resource Unit that provided a daily list of Pacific admissions. Mothers were given a general description of the interview protocol, but specific areas such as immunisation were not discussed at the time of recruitment.

Approximately 6 weeks after the birth of their child, Pacific interviewers, fluent in both English and a Pacific language, visited the mothers in their homes to carry out the first interview. However, as some mothers were difficult to trace, it was not possible to administer all interviews precisely at 6 weeks.

Once eligibility criteria were established and informed consent gained, mothers participated in a 1-hour interview concerning the health and development of the child and family functioning. This interview was carried out in the preferred language of the mother. All procedures and interview protocols had ethical approval from the National Ethics Committee. Detailed information about the cohort and procedures is described elsewhere.¹⁵

Mothers responded to questions about whether their child had been immunised, who administered the vaccines, and how satisfied they were with the care and treatment of their child in that context. Maternal and sociodemographic factors that may be associated with non-immunisation was assessed by univariate and multivariate logistic regression procedures.

Results

Ninety-six percent (n=1590) of potentially eligible mothers of Pacific infants (who had been born between 15 March and 17 December 2000) gave consent to be visited in their homes when the infant was 6 weeks old.

Of the 1477 mothers contacted and who met the eligibility criteria, 1376 (93.2%) agreed to participate in the study. A more conservative recruitment rate of 87.1% would include mothers who consented to contact and were confirmed eligible, or of indeterminable eligibility due to inability to trace.

Of the 1376 mothers in the cohort (1.7% gave birth to twins), 47.2% self identified their major ethnic group as Samoan, 21% as Tongan, 16.9% as Cook Islands Maori, 4.3% as Niuean, 3.4% as Other Pacific, and 7.2% as Non- Pacific.

The Other Pacific group includes mothers identifying equally with Pacific and Non-Pacific groups, or with Pacific groups other than Samoan, Tongan, Cook Island Maori, or Niuean. The Non-Pacific group refers to mothers of infants fathered by Pacific men. The mean (SD) age of mothers was 27 (6.2) years, 80.5% were married or in *de facto* partnerships, 33% of mothers were New Zealand-born, and 27.4% had post-school qualification.

Approximately 73% of the mothers reported that they had immunised their infant. The majority of these mothers (97.1%) reported that they were satisfied with the care provided by their doctor. The main problems that were cited by mothers were being unhappy with the treatment, or having difficulties associated with communicating with the doctor.

Table 1 lists the variables examined for potential association with non-immunisation of infants in the cohort. For the categories within each variable, the numbers and percentages of mothers who did not have their infant immunised are given, along with the associated odds ratios. Mothers who were under 20 years of age, with post-school qualifications, and those who described themselves as fluent in English were significantly less likely to have had their infant immunised at 6weeks of age.

Strong cultural alignment with the Pacific, but not New Zealand, way of life and customs, and difficulties with transport were also significantly ($p < 0.05$) associated with non-immunisation. With regard to specific ethnicity, Samoan mothers were significantly more likely to report that they had immunised their infant. The age of the infant at the time of the interview was also significantly associated with non-immunisation. Those infants who were older than 8 weeks were significantly more likely to have been immunised than younger infants.

Maternal birthplace, household income, attendance at antenatal classes, parity, social marital status and number of years lived in New Zealand did not reach significance.

Table 1. Numbers (row percentages) and univariate odds ratios for non-immunisation of 6-week infants by selected variables

Variable	Category	Immunisation status				Univariate odds ratio	
		Yes	(%)	No	(%)	(95% CI)	
Infant age	<6 weeks	18	(17.1)	87	(82.9)	40.80	(22.44–74.19)
	6-8 weeks	627	(72.5)	238	(27.5)	3.20	(2.26–4.55)
	> 8 weeks	363	(89.4)	43	(10.6)	1.00	
Maternal age (yrs)	<20	70	(63.1)	41	(38.7)	1.00	
	20-29	531	(73.8)	189	(26.3)	0.61	(0.40–0.93)*
	30-39	376	(75.2)	124	(24.8)	0.56	(0.36–0.87)*
	40+	31	(70.5)	13	(29.5)	0.72	(0.34–1.52)
Ethnicity	Samoan	518	(79.7)	132	(19.7)	1.00	
	Cook Island Maori	155	(66.8)	77	(33.2)	1.95	(1.40–2.72) ‡
	Niuean	40	(67.8)	19	(32.2)	1.86	(1.05–3.32) *
	Tongan	203	(70.2)	86	(29.8)	1.66	(1.21–2.28) †
	Other Pacific ¹	22	(46.8)	25	(53.2)	4.46	(2.44–8.16) ‡
	Non Pacific	70	(70.7)	29	(29.3)	1.63	(1.01–2.61) *
Social marital status	Partnered	818	(73.9)	289	(26.1)	1.00	
	Non partnered	190	(70.6)	79	(29.4)	1.18	(0.88–1.58)
Education	No formal qualifications	413	(77.2)	122	(22.8)	0.58	(0.43–0.78) ‡
	Secondary school qualification	345	(74.4)	119	(25.6)	0.68	(0.50–0.92) *
	Post-school qualification	250	(66.3)	127	(33.7)	1.00	
Born in NZ	Yes	327	(72.0)	127	(28.4)	1.00	
	No	681	(73.9)	241	(26.1)	0.91	(0.71–1.17)
Years lived in NZ	0-5	213	(78.0)	60	(22.0)	1.00	
	6-10	105	(71.4)	42	(28.6)	1.42	(0.90–2.25)
	>10	688	(72.2)	265	(27.8)	1.37	(0.99–1.88)

English fluency	Yes	604	(71.0)	247	(29.0)	1.00	
	No	404	(77.0)	121	(23.0)	0.73	(0.57–0.94) *
Cultural alignment ²	High NZ, Low Pacific Is	307	(70.4)	129	(29.6)	1.00	
	Low NZ, High Pacific Is	358	(80.1)	89	(19.9)	0.59	(0.43–0.81) ‡
	High NZ, High Pacific Is	166	(71.2)	67	(28.8)	0.96	(0.68–1.36)
	Low NZ, Low Pacific Is	169	(67.9)	80	(32.1)	1.13	(0.81–1.58)
Parity	1	274	(73.3)	100	(26.7)	1.00	
	2-4	571	(74.3)	197	(25.7)	0.95	(0.71–1.25)
	5+	148	(68.8)	67	(31.2)	1.24	(0.86, 1.79)
Transport difficulty	No	905	(74.8)	305	(25.2)	1.00	
	Yes	103	(62.0)	63	(38.0)	1.82	(1.29–2.55) †
Household income (NZ dollars)	<\$20,000	322	(70.5)	135	(29.5)	1.00	
	\$20,001-\$40,000	526	(74.1)	184	(25.9)	0.83	(0.64–1.08)
	>\$40,001	126	(78.3)	35	(21.7)	0.66	(0.43–1.01)
	Unknown	34	(70.8)	14	(29.2)	0.98	(0.51–1.89)
Attended antenatal classes	Yes	87	(77.0)	26	(23.0)	1.00	
	No	916	(73.0)	338	(27.0)	1.24	(0.78, 1.95)

*P<0.05; † P<0.01; ‡ P<0.001

¹Includes mothers identifying equally with two or more Pacific Island groups, equally with Pacific Island and non Pacific Island groups, or with Pacific Island groups other than Tongan, Samoan, Cook Island Maori or Niuean

²Cultural alignment is measured by the General Ethnicity Questionnaire²² and assesses high and/or low alignment with Pacific and/or mainstream New Zealand way of life and customs.

When controlling for the effects of all Table 1 variables in a multiple regression model, factors that were significantly associated ($p < 0.05$) with non-immunisation were ethnic group, maternal birth place, parity, difficulty with transport, and age of the baby at the time of the interview.

Discussion

The finding that over a quarter of mothers (26.7%) had not had their child immunised at approximately 6 weeks of age demonstrates the need for education about the importance of immunisation and schedules, together with community resources to support mothers in the context of this infant healthcare initiative.

When controlling for a range of potentially confounding variables, including the age of the child at the time of the interview, those mothers who were less likely to have their child immunised with the first dose of the primary immunisation series were: Pacific born, had more than 5 children, and had difficulty with transport.

Pacific-born mothers may have less knowledge about immunisation schedules, which is likely to impact on their decision as to whether to have their child immunised in infancy. These findings also suggest that those mothers with a large number of children and those who had limited access to transport may find it difficult to get to their GP or clinic. It appears that improving immunisation coverage through education may not be sufficient and that the more widespread issues of deprivation and social equity need to be addressed.¹⁶ In terms of ethnicity, Tongan, Cook Islands Maori, Niuean, Other Pacific, and Non-Pacific mothers were significantly less likely than Samoan mothers to have had their child immunised.

The age of the infant when the interview was conducted was significantly associated with non-immunisation, with those infants older than 8 weeks more likely to have been immunised. Thus, if all interviews had been carried out at 8 weeks, then the proportion of infants who had received their first immunisation dose is likely to be higher.

We did not look at factors that may be associated with a delay in immunisation. One factor that has been highlighted in previous research is that Pacific parents are more than twice as likely to believe that immunisations are too upsetting and painful for very young children.¹⁷

Information and reassurance (pertinent to specific problems that parents are experiencing) are thought to have maximum effect on parental commitment to immunisation.¹⁸ Studies have shown that some children are not appropriately immunised because their mothers are not given satisfactory information. Furthermore, many parents lack first-hand experience with diseases, and may underestimate their communicability and potential harm.¹⁶

Findings from qualitative investigations have highlighted the problems associated with long waiting times,¹² lack of discussion time with the doctor,¹⁹ crowded clinics, and the bringing and minding of other children.¹¹

It has been suggested that opportunistic immunisation by doctors,²⁰ flexible immunisation provision, and government incentives²¹ may be the key to higher immunisation levels. Accurate, accessible and current records, and effective tracking systems would further facilitate a clear understanding of immunisation status, and

help identify children who are at high risk. It is equally important that interventions provide ongoing supportive environments (to facilitate access to immunisation services for mothers at each point in the immunisation process).

There are several limitations that need to be considered. Firstly, the study does not provide a comparative group of non-Pacific infants. Secondly, it was the intention of the study to collect data at 6 weeks; however, due to difficulties tracking some families, all infants were not reached precisely at that time. Our data shows that those infants visited later were more likely to have been immunised, thus it is possible that the infants visited earlier (at 6 weeks), who were not immunised, may have received their vaccinations in the following months.

However, the Pacific Islands Families Study does begin to provide data in this area of recognised public health importance where, despite being a Child Health priority, robust contemporary data are lacking. Furthermore, longitudinal analysis at 12 and 24 months will build a clearer picture of immunisation patterns among Pacific children living in New Zealand.

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References

1. Baker M, McNicholas A, Garrett N, et al. Household crowding a major risk factor for epidemic meningococcal disease in Auckland children. *Pediatr Infect Dis J*. 2000;19:983–90.
2. Mansoor, O, Blakely T, Baker M, et al. A measles epidemic controlled by immunisation. *N Z Med J*. 1998;111:467–71.
3. Tukuitonga, CF, Bell S, Robinson E. Hospital admissions among Pacific children in Auckland. *N Z Med J*. 2000; 113:358–361.
4. Moxon ER. The scope of immunisation. *Lancet*. 1990;335:448–51.
5. Evers DB. Childhood Immunizations. Problems, Policies, and Remedies. *JONA's Healthcare Law, Ethics and Regulation*. 2000;2:67–72.
6. Public Health Commission. Immunisation 2000-National Immunisation Strategy. Wellington: Public Health Commission; 1995.
7. Chen, RT, Mootry G, DeSefano F. Safety of routine childhood vaccinations. *Pediatr Drugs*. 2000;2:273–90.

8. Ministry of Health. Immunisation Handbook. Wellington: Ministry of Health; 2002.
9. Roberts KA, Dixon-Woods M, Fitzpatrick R, et al. Factors affecting uptake of childhood immunisation: a Bayesian synthesis of qualitative and quantitative evidence. *Lancet*. 2002;360:1596–9.
10. Wood DL, Haflon N. The impact of the vaccine for children's program on child immunization delivery. *Arch Pediatr Adolesc Med*. 1996;150:577–81.
11. Pruitt RH, Kline PM, Kovaz RB. Perceived barriers to childhood immunizations among rural populations. *J Community Health Nursing*. 1995;12:65–72.
12. Schaffer SJ, Szilagyi PG. Immunization status and birth order. *Arch Pediatr Adolesc Med*. 1995;149:792–7.
13. Swigonski NL, Skinner CS, Wolinsky FD. Prenatal health behaviors as predictors of breast-feeding, injury & vaccination. *Arch Pediatr Adolesc Med*. 1995;149:380–5.
14. Stevens-Simon C, Kelly LS, Singer D. Pattern of prenatal care and infant immunisation status in a comprehensive adolescent-orientated maternity program. *Arch Pediatr Adolesc Med*. 1996;150:829–33.
15. Paterson J, Tukuitonga, C, Abbott, A, et al. The Pacific Islands Families Study. Technical Report Number 1. Auckland, New Zealand: Auckland University of Technology; 2002.
16. Impicciatore P, Bosetti C. Mothers as active partners in the prevention of childhood diseases. *Preventive Medicine* 2000;31:49–55.
17. Ministry of Health. Immunisation Coverage in North Health: Comparative results from North Health's 1996 Immunisation Coverage Survey. Wellington: Ministry of Health; 1997.
18. Marshall S, Swerissen H. A qualitative analysis of parental decision making for childhood immunisation. *Aust N Z J Public Health*. 1999;23:543–5.
19. Harrington PM, Woodman C, Shannon WF. Low immunisation uptake: Is the process a problem? *J Epidemiol Community Health*. 2000;54:394–400.
20. Bailey HD, Kurinczuk JJ, Kusel MM, Plant AJ. Barriers to immunisation in general practice. *Aust N Z J Public Health*. 1999;23:6–10.
21. Bond L, Nolan T, Lester R. Immunisation uptake, services required and government incentives for users of formal daycare. *Aust N Z J Public Health*. 1999;23:368–76.
22. Tsai J.L, Ying Y, Lee PA. The meaning of being Chinese and being American: Variation among Chinese and American young adults. *Journal of Cross-Cultural Psychology* 2000;31:302–32.