WestKids Kidslink – implementing an electronic population-based immunisation register makes the difference.

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Abstract

Aims: To explore the implementation of an electronic immunisation register in West Auckland to enabled identification and subsequent immunisation of more under immunised children and to describe this process.

Methods: Case study design to explore complex process of information technology implementation in healthcare. Key informant interviews elucidated descriptive data about experiences of implementation; developments in processes and relationships in immunisation-related care provision.

Results: For children aged greater than one year (n= 1368), immunisation rates achieved were 95% (6 week); 94% (3 month); 90% (5 month). The pilot faced significant technical challenges. Strengths lay in providers with strong collaborative working relationships. Key informant interviews indicated improvements were achieved in linkages to primary care providers; timeliness, accuracy and completeness of data transfer between maternity and primary care, and effective efficient provision of overdue immunisation follow-up and outreach services. The 'Immunisation Outreach Nurse' demonstrated a greater than 10-fold increase in follow-up activity of overdue six-week immunisations. The role of Immunisation Outreach Nurse' appeared pivotal to the project's success, supporting primary care's technological and immunisation process needs; improving information-sharing between providers, and increasing identification of those requiring outreach services.

Conclusions: Implementation of an electronic, population cohort register in West Auckland enabled identification and immunisation of more under and non immunised children. The processes achieving this success contain lessons of importance in the ongoing adoption of the National Immunisation Register.

Background

Immunisation is a key public health intervention (1, 2). In New Zealand it is carried out principally within the primary health care setting. Previous New Zealand coverage surveys (3) have generally shown low levels of coverage for children at 2 years, with disparities seen when the results are examined by ethnic group (Table 1). Differences in coverage achieved particularly correlate with disparities in health outcomes seen for Maori and Pacific children (3-5) and are well below levels considered necessary to prevent epidemics of vaccine preventable diseases (VPD)(5).

Table 1: Previous Coverage Survey Results

Survey	Maori	Pacific	Other	All
1992 National Coverage Survey	42%	45%		55%
1996 North Health Survey	45%	53%	72%	63%

The potential health gain associated with a national immunisation register is particularly in the immunisation of those children "less likely to be fully immunised at two years of age" (2). For these children, enabling opportunistic immunisation and facilitating linkage with health care services is likely to bring the greatest benefit.

A critical gap in current NZ service delivery is a lack of a reliable source of immunisation history for each child for providers to maximise their opportunistic encounters to give immunisations. A national immunisation register (NIR) supports this delivery of personal health care, and also operates as a key part of public health infrastructure, enabling production of accurate population based coverage reports for improved service delivery planning, and progress assessment in meeting national coverage targets. The development of a NIR is taking place

within the context of several broader health sector initiatives including implementation of the New Zealand Health Strategy and the Primary Care Strategy with formation of Primary Health Organisations (PHO) (6, 7). It is an important component of an integrated approach to infectious diseases, child health and information strategies as well as a priority for Maori health gains (8-14). The current group B meningococcal disease epidemic has taken centre stage and added another level of urgency , with the need for the introduction and monitoring in New Zealand of a strain specific vaccine not used elsewhere in the world (15).

Key aspects of successful immunisation outreach programmes are known and include committed providers, a locally driven systematic approach and good information systems. The ability to form and work in teams is helpful and culturally appropriate workers or linkages important. Registers enable the more efficient identification of children not receiving immunisations and thus more effective home outreach delivery.

Overseas register experience

Although registers have been shown to improve effectiveness of immunisation related activities in the various countries where they have been implemented, (16-18) significant learning curves have been demonstrated. Australia initially struggled with a lack of timely registrations and processing delays within the Australian Childhood Immunisation Register (19, 20). The introduction of parent and provider incentives significantly improved data accuracy and completeness(21). Databases in the Netherlands and UK are arranged as regional feeder systems associated with the return of either cards or sheets (held by the family) when an immunisation is completed, with assertive follow-up funded if they are not received (2, 22, 23).

American legislation has been enacted requiring children to be immunised prior to school entry (or conscientious objection). A national immunisation register was not thought to be practicable,

with experience gained from initial projects demonstrating that for registries to be effective they must be tailored to meet local needs (24). However this approach has led to integration difficulties. Approximately 50% of eligible children now are enrolled on linked registries. To improve this rate involves addressing privacy and confidentiality issues; encouraging provider participation; focusing on technical and operational processes, and providing sustainable funding (25-28).

Reviewing the literature about health IT and immunisation register implementations in other countries identified the need for the actual application to be fast, robust, easy to use and for the project to have addressed broader process concerns like safeguarding the privacy of data (29-31).

Methodology

Evaluations of information system implementations in health predominately look at inpatient scenarios. Consistent approaches to evaluating the success or otherwise of implementations still are being considered and debated in the literature (29, 30). Case study method emerges as a useful approach to capture the interacting complexities of project implementation, technology capabilities and the healthcare environment. Studies have noted that success can vary by stakeholder definition, timing of the review and particularly by organisational issues (31, 32). The implementation of Kidslink by WestKids consisted of a mix of parallel and interrelated changes including successful project management, information technology implementation, immunisation register and outreach programme delivery. From the literature review it seemed clear that in order for more under and non immunised children to be identified and subsequently immunised, implementation of this project had to be successful at three levels:

- Project was successfully managed, including stakeholder engagement
- Information technology was able to be implemented

- A successful immunisation and outreach programme was being delivered and was adequately responsive

Viewed as a system, all components will need to function effectively for the success at the whole programme level. Consequently a systematic sampling approach was used whereby potential interviewees (key informants) were identified to represent a range of stakeholders and professionals, who would each have slightly different views correlating with the contexts in which they were involved in the delivery of care.

Key informants included

- Kidslink project staff and steering group including consumer representative and representative from Te Whanau O Waipareira Trust (the local Maori trust), (n=6)
- Plunket (n=2)
- General Practice including Pasifica (Pacific health service) and Wai Health (Maori health service) (n=6)
- Maternity services (n=1)

These participants represented the following perspectives:

- Project staff and project steering group
- Maori and Pacific providers
- Primary care with differing information technology abilities
- Outreach and maternity service providers

This study was limited in its time and available resources available. Inclusion of a wider stakeholder group (stakeholders from Counties Manukau DHB, Ministry of Health), independent

midwives and consumers would have added to the breadth of information able to be collected and themes considered.

Interview data was gained during March 2003 when the project had been operational a little over a year. The timing of this review was important as this project has not yet reached a maintenance phase when the interviews were done. That the information software and technology was still very much in development was evident in the results.

WestKids and configuration of local services

The implementation of an electronic population immunisation register in West Auckland was enabled by considerable foundation work completed in Rotorua and Hamilton (33). A pilot in Otara, South Auckland; had been an initial testing ground for the early Kidslink applications. That pilot reported significant problems with data quality, provider engagement and reporting functionality(34) and subsequently improvements had been made.

In West Auckland, a key well child service provider, Plunket, provided a home outreach service. In addition, an immunisation outreach service with an emphasis on two-year-old audit was operating out of the local primary care organisation (PCO), to which most general practices (maintaining separate registers) in the area belonged (population 180,000). During the course of the implementation this primary care organisation transitioned into a primary health organisation (PHO) with associated capitation funding arrangements. As demographic recording on PMS registers improved through the processes required for capitation funding, greater accuracy of families contact details was attained.

Initially it was expected that Plunket and the majority of general practices would be able to interface electronically with the Kidslink implementation. However one year into the project just

over 40 percent of practices were able to do so. The remaining practices operated a manual or faxing interface supported by the immunisation outreach nurse.

The immunisation outreach nurse role provided technical support for practices. The role was essentially one of communication and coordination. The data administrator manages the Kidslink application on a day-to-day basis. Additional part-time staff were recruited to augment these roles as the day-to-day requirements of running the project and ensuring good data became evident. Parents are informed about Kidslink in the prenatal period predominantly by maternity caregivers. They had the opportunity to opt-off both then and after registration. At birth the baby's details were entered onto a maternity information system. A record is automatically compiled and forwarded to a 'hub' server. Children also can be enrolled when they present to a primary health care provider if they have shifted into the district. Information was transferred via messaging servers such as the Health Intranet and Secure Healthlink messaging.

Overview of processes

A 'hub and spoke' model for a national immunisation register was piloted in South and West Auckland from 2002. The spoke (WestKids) data administrator accesses downloads of new baby registrations for processing and links with provider/s nominated by the caregiver. A 'welcome' letter is sent to the family. As immunisations are completed, notification messages are sent from primary care to the hub server. If a child does not receive an immunisation they appear on an overdue report generated by the spoke data administrator. The liaison outreach nurse contacted primary care providers to ascertain the child's status and efforts already made to remind/recall the child about immunisation. Once primary care has made two or three unsuccessful attempts, the liaison outreach nurse takes over the process of attempting to make contact and offer immunisation in liaison with other outreach and home visiting agencies.

Results

For children aged greater than a year (n= 1368), rates of 95% immunised for the six week, 94% for the three month and 90% for the five-month immunisations were achieved with no significant disparity by ethnicity. 'Gone no address' children are included in these rates but not children who have moved out of area.

For reporting purposes the year is divided into quarters and rates for children born in each quarter reported as a cohort. Cohort one was slightly smaller as the pilot started in February 2002. Figure two compares the rates achieved by the children aged six months (cohort four) who are just becoming overdue their five month immunisations and follow-up and coordination services have been in place for the shortest amount of time; with the oldest children, cohort 1, all aged greater than one year now,

Project Management

Generally respondents expressed satisfaction with local project management and organisation. The project staff were perceived to have engaged well with both primary care and maternity stakeholders with communication being described positively. When some providers were not able to attend project-oversight meetings other processes were put in place to engage them. The project staff actively visited provider sites to enable this engagement and tailored messages to what the providers found relevant.

Information Technology

Key implementation challenges were both the implemention of a new application as well as the interfaces and use of those already existing in Maternity, Primary Care and Plunket. For the project staff this meant a more labour intensive process of general practice visiting and liaison was necessary to provide adequate technological support and to ensure accurate data was gained.

However this liaison had benefits including improved relationships, increased identification of problems with practice management system utilisation for immunisation audit and recall, and increased opportunity for communication about Kidslink. Maternity issues around data entry quality were raised and improvements made. It also made maternity services examine how well they were linking families back with primary (and Well Child) care. For Plunket the reporting available from Kidslink was seen as extremely helpful as they improved their own in house technology capabilities.

There were mixed responses to questions regarding involvement in Kidslink application development, which appeared to have fluctuated over time. Although frustrations were expressed with the technology development, overall satisfaction with use of the application was high. At the time the interviews were conducted all issues around speed and robustness of the application had effectively been resolved. Some areas of duplicative data entry were identified along with their impacts on the day-to-day operating efficiency of the register. Informants appeared comfortable with privacy and informed consent processes although the lack of written information available in different languages was raised.

Frustrations around the difficulties of generating management reports was explicit at this time. These were related to earlier connectivity issues, and the large number of practices not interfacing electronically and the loss of reporting functionality on version upgrade in the previous November.

Immunisation Outreach

As far as immunisation outreach achievements go, both the infrastructure and the relationships existed prior to the implementation of Kidslink and were thought to be relatively successful. Key informants felt that the Kidslink implementation in West Auckland was able to build on this

foundation enabling all of the West Auckland providers (including after-hours clinic, Plunket, Pasifica and Wai Health) to work more closely together. These working relationships had become more tangible to these providers.

Improvements in data quality and linkages between providers enabled these improvements. The shift in emphasis to targeting the initiation of outreach services once the six-week immunisation had been missed meant that contact was more likely to be able to be made with the family than when the emphasis had been at two years, as was the focus of the prior general practice audit. For primary care improvements in timeliness, completeness and accuracy of data transfer about births revolutionised their ability to start recalls on time and understand whom they were responsible for.

Once the key linkages in processes (each family nominating a general practice for immunisation care) and technology were happening well from Maternity services then the role of the Liaison Outreach Nurse became key enabling greater follow up of overdue children at six weeks of age. To verify this, a query was undertaken to compare the raw referral levels to the immunisation outreach nurse for birth cohorts pre and post implementation. A greater than tenfold increase in activity for the six week immunisation in the cohort born a year later (after the project had been operating for eight months) was revealed – as well as the evolution in complexity of the reporting database (see Table 2).

This role of the Immunisation Outreach Nurse evolved to encompass coordination of information flows and verification of data to ensure that the list of children overdue immunisations was accurate, their contact details were correct, and that contact regarding immunisation was necessary. The establishment of a register alone, has been shown to improve immunisation rates by bringing together the information held by different providers (16, 17). This was borne out in

this project with the immunisation outreach nurse playing a key role enabling the linkage of information held at different practices. The degree to which people utilised multiple providers became explicit although this is expected to change as the new PHO environment heralds the era of enrolment with a specific provider.

Discussion

Firstly, the history of having worked together before successfully, and having developed trust as a provider group was important. Many of the key informants were able to walk in and out of each other's organisations with ease and comfort. The group included Maori representatives at governance level and Maori and Pacific health professionals in the delivery of services, working together with mainstream.

To start processes of identifying all the children overdue at six weeks, they need to have been previously linked with a primary care provider from soon after birth, with this provider doing initial follow up and recall. Getting accurate, timely and complete information on birth registration messaging was described as revolutionary by primary health care informants (and was the main thrust of the NZ National Health Committee report (2)).

Attempting to implement the technology to enable this uncovered both data entry and process issues most of which have been resolved over time, but is also likely to require ongoing effort and communication. It also required the addition of 4-6 hours staff time a week for the project to be able to monitor and coordinate this process with Maternity Services. The timely accurate communication of birth information enabled a shift in focus to remaining in contact with that person when address details are most likely to be correct and getting the recall reminder system underway from primary care. In turn this meant that the six-week immunisation was more likely to occur on time and prompt intervention was provided if this didn't occur.

Coincidentally both national clean up processes on national health index numbers by the New Zealand Health Information Service, and local provider register implementation, improved the quality of demographic data held by practices. Utilising PHO data and widening the range of data able to be accessed to include A&Ms and secondary care acute contacts, all resulted in more timely accurate information available for the people coordinating and delivering outreach services. The literature and key informants also pointed out that to increase rates in under immunised children requires maximising the opportunities for opportunistic immunisation . The development of browser (or remote) access to the Kidslink database by providers and outreach workers should add significantly to efficiency of service delivery for this group.

This implementation was able to build on the earlier work done for kidZnet and the Otara pilot. District Health Board resources were accessed to aid with the privacy and opt-off issues, and the consumer representative on the project steering committee had this as a focus. WestKids did struggle with connectivity issues to the hub server and the functionality of the initial version of the application . However the application is described as being intuitively easy to use and over time, with upgrades, most of the responsiveness issues were addressed and generally informants were much more satisfied by the end of the research period. All software development seems to take far longer than anticipated, and refinements are ongoing.

For almost all the providers involved in this project the implementation highlighted difficulties in current information system usage. Primary care needed support to install the Kidslink utility and a trusted timely resource to help overcome problems when they arose. Also they needed support with their own practice management systems to make sure they were carrying out immunisation recording and reminder processes correctly (and doing them regularly). In retrospect piloting in an area with a large number of Macintosh practice management systems in primary care was less than ideal. The Macintosh interface with Kidslink was expected but had not materialised by this

review point in the project. The project implemented ‘common sense’ solutions to make sure practices utilising manual feeder methods remained engaged.

Plunket were involved with their own in-house reconfiguration of information systems separate from trying to integrate with Kidslink. The secondary care maternity system found there was considerable room for improvement in ethnicity data collection methods and provider linkage and recording processes. Generally preceding implementation with a review of provider current immunisation delivery practices, computer and telecommunications capabilities would seem sensible, as is done in the USA (25).

The use of a key linkage role done by the ‘ immunisation outreach nurse’ enabled technological support and education, communication about the project to primary care, and the improved sharing of information between all providers, in lieu of more electronic sharing at this point. This role by verifying and linking information also improved the efficiency and effectiveness of outreach activity done by Plunket.

Many of the characteristics necessary for the delivery of successful outreach services already existed in West Auckland, including Plunket’s home visiting immunisation service. This was likely integral to the project being successfully implemented because they were able to manage the increased service delivery required. This service has both Maori and Pacific staff and was well integrated with general practice.

The project had good support from the Ministry of Health (MoH) and considerable learning occurred from these Auckland pilots. The two models of implementation in West and South Auckland are subtly different and this local variation in service delivery configuration may enable more successful implementation nationally. The role played by the immunisation outreach

nurse is key to considering local context. Initial findings from this research were fed back into the MoH planning processes for NIR development. As ever more sophisticated information infrastructures are implemented, we need to build the capacity of the sector to reliably use and maintain these to achieve the population health gains desired.

Key recommendations from this experience for the ongoing rollout of the National Immunisation Register included:

- A needs analysis of current service delivery, and technical capabilities within a future implementation district including that the provision of outreach services.
- Consideration given to the key linkage role involving communication, technological support and education undertaken here by the immunisation outreach nurse (particularly with primary care). This role was pivotal to ensuring data quality and reliability. The strong affiliation to the local PHO assisted data collection and sharing. Accessing data from multiple sources was also important.
- Clear definition of roles and responsibilities of the 'hub' and 'spoke' (this model has not continued)

In conclusion, the implementation of an electronic immunisation register almost certainly enabled the identification and immunisation of more hard to reach children. This was principally achieved through improvements in data quality and transfer and linkages between maternity and primary care.

Figure 1

Total Active Enrolments (From Feb 2002 to June 2003)	
Total Enrolments	4604
Opt Off Kidslink	-57
Deceased	-8
Moved Out of Area	-199
Total Active Enrolments	**4340**
Gone No Address	(29)
IMMUNISATION	
Total Active Enrolments	4340
Withdrawn (Immunisation programme)	-110
Active Enrolments	**4230**
On Hold Immunisation only	(342)

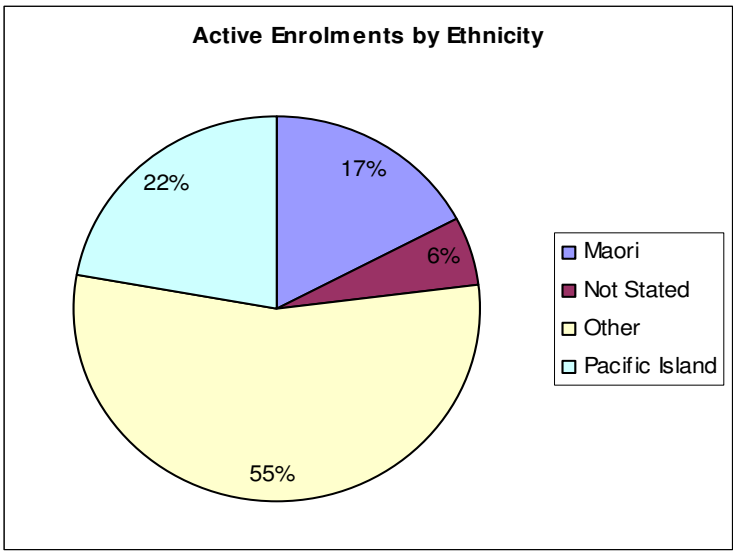
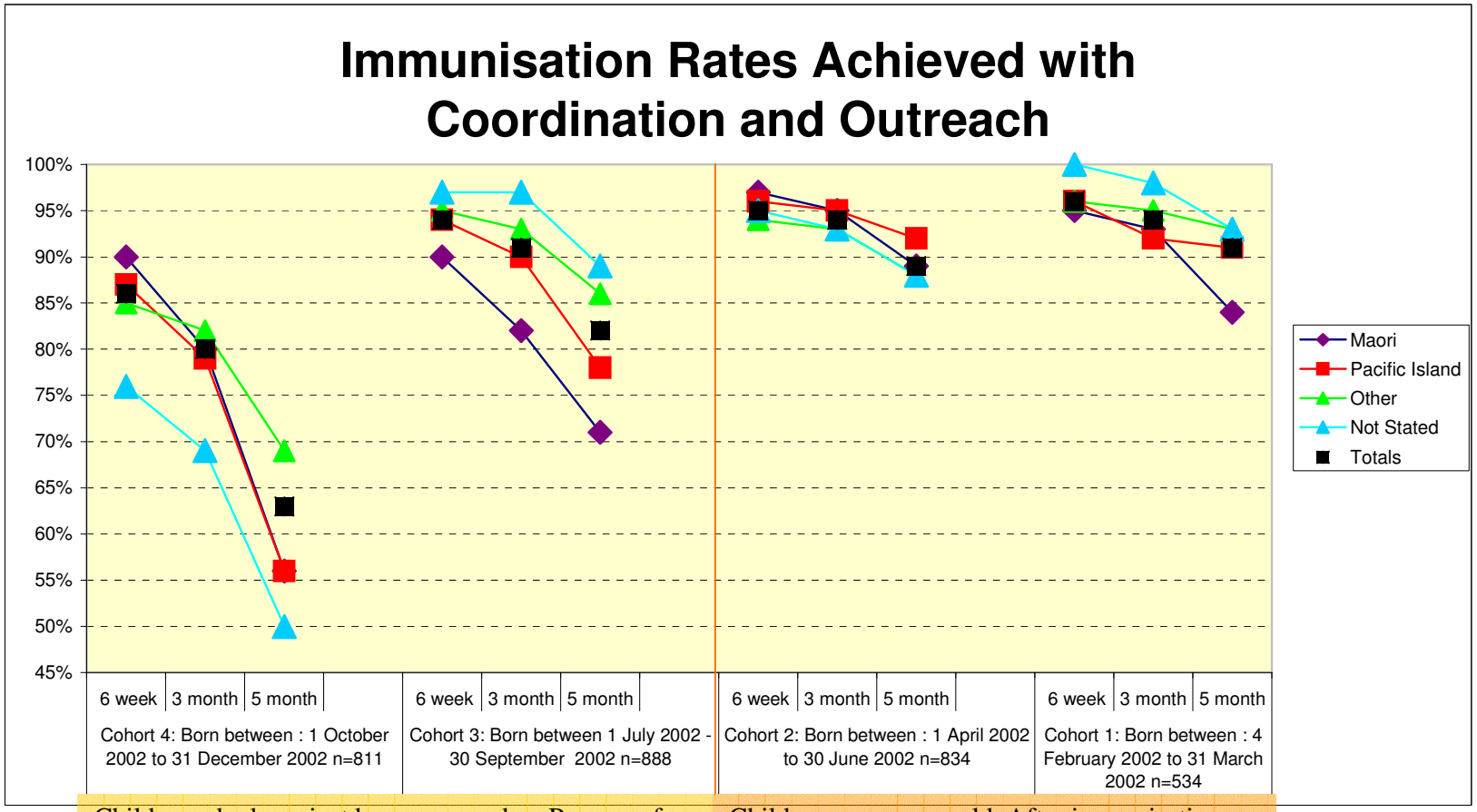


Figure 2: Comparison of Results by Cohort in June 2003



Children who have just become overdue. Process of follow-up and outreach provision started.

Children now a year old. After immunisation and outreach services have been provided.

Table 2: Activity analysis comparing referral rates for missed six week immunisations

1. Children born Oct-Dec 2001 (pre project implementation)Six Week Immunisation Outreach Summary for WestKids for

Date of Birth Range 1 October 2001 to 31 December 2001

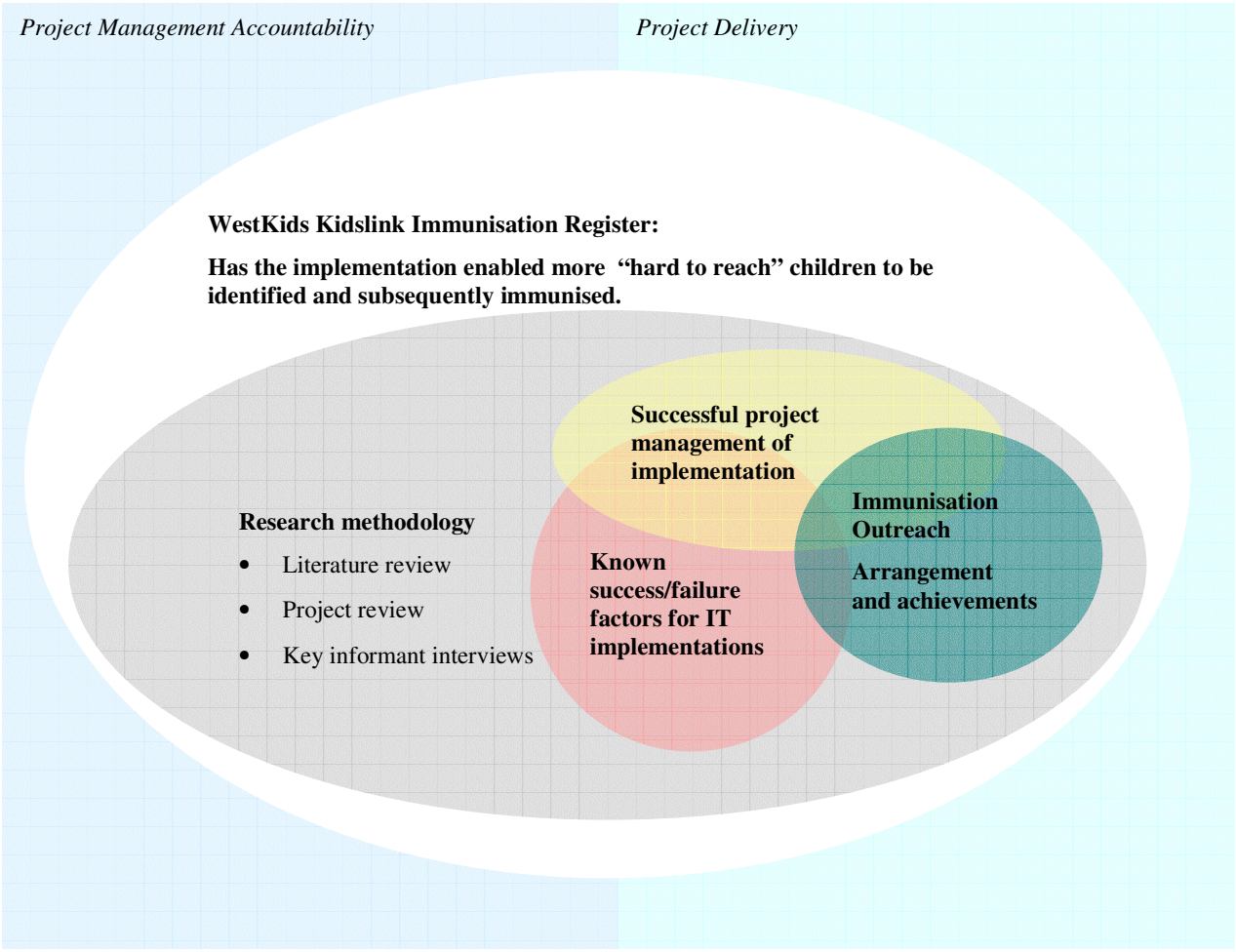
	Final outcome						
Ethnicity	decline	GNA	Plunket vac	practice default	practice vac	vac elsewhere	Total Referred to Outreach
Maori						1	1
NZ European		1		1	3	5	10
other European	1						1
Pacific Islander			1			1	2
Grand Total	1	1	1	1	3	7	14

Key	Meaning
Declined	Declined Immunisation
GNA	Gone No Address
OOA	Moved Out of Area
Plunket Def	Plunket Default - Did not keep multiple appointments for Plunket Bus immunisation
Practice Def	Practice Default - Said would go to Practice for imms but has not done so (8 wks + following home visit)
Practice Vac	Has now been immunised at the nominated practice
Vac Elsewhere	Was immunised at a practice other than the one nominated

2. Children born Oct – Dec 2002 (eight months into project) Six Week Immunisation Outreach Summary for WestKids for Date of Birth Range 1 October 2002 to 31 December 2002

Ethnicity	Declined	GNA	OOA	Plunket Def	Plunket Vac	Practice Def	Practice Vac	Vac Elsewhere	Total Outcomes	Still Tracking	Total Referred to Outreach
Asian	0	0	2	0	0	0	0	4	6	12	18
Indian	0	0	0	0	0	0	0	6	6	2	8
Maori	0	0	2	0	0	0	6	6	14	12	26
NZ European	4	0	10	0	4	0	6	38	62	40	102
Other	0	0	0	0	0	0	0	0	0	0	0
Other European	2	0	0	0	0	0	2	4	8	0	8
Pacific Islander	0	2	8	0	4	0	12	14	40	10	50
Unknown	0	0	0	0	0	0	0	0	0	0	0
Total Outcomes	6	2	22	0	8	0	26	72	**136**	**76**	**212**

Figure 3: Themes explored as part of research methodology



Acknowledgements

This implementation was part of a Ministry of Health 'hub and spoke' pilot in preparation for the National Immunisation Register implementation. It was conducted in conjunction with Counties Manukau District Health Board (the 'hub') utilising .the Kidslink application from Orion systems. The 'spoke', WestKids; involved providers representing Integrated Primary Care Services (IPCS) – now HealthWEST, Te Whanau O Waipareira Trust, Pasifika Fono, Plunket, and the Waitemata DHB, and brought together information from maternity, Plunket and general practice information systems. The project covered issues such as enrolment, privacy, governance, informed consent (consumer representative on project group) and publicity. It also supported the technical implementation and development of Kidslink, and improvements in immunisation processes and outreach delivery. The Ministry of Health provided funding to both South and West Auckland under the auspices of Child Health Information Strategy development.

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