Evaluation of Immunisation Strategies in New Zealand - A Systems Thinking Approach

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ABSTRACT: New Zealand has a poor rate of immunisation in comparison to other OECD countries. Immunisation is a major public health issue as it is one of the most cost-effective health interventions. However, high immunisation rates are required to realise the full benefit of immunisation programmes. In this paper we use Systems Thinking to identify principal dynamics that underlie immunisation system and identify key leverage points for effective intervention strategies. Specifically, four main areas of dysfunction have been identified: strategy fragmentation, disincentives for GPs, lack of tracking system, and lack of performance monitoring and feedback. The proposed intervention strategies highlight the need for a quality management framework which addresses the above leverage points. The strategies will utilise a continuous improvement methodology to create shared vision and ownership, to facilitate co-operation among stakeholders and to establish systems and processes to manage and monitor progress.

Keywords: Healthcare Management, Systems Thinking, Public Health Policy, Immunisation Strategy

INTRODUCTION

Immunisation is one of the most cost-effective of all health interventions. However, high immunisation rates are required to realise the full benefit of immunisation programmes on a population. When a high proportion of the population is immunised, a "herd immunity" effects is invoked in which an epidemic will not occur, even amongst the non-immunised population.

Low rate of immunisation has been a major public health problem in New Zealand. Despite immunisation being one of government's key public health priorities, with the development of detailed strategies to improve uptake, the rate has not increased substantially during the 1990s. Surveys show there has only been a modest increase in immunisation rates of the two-year-olds, from 55% in 1992 to 61% in 1996, compared to a goal of 85% by 1997 and 95% by the year 2000.

In 1993, the government adopted as one of its six key public health goals "To increase to 80% by the year 1995 and to 90% or more by the year 2000, the proportion of New Zealand children with completed early childhood immunisations by the time they are two years old."(Public Health Commission 1993). The newly formed Public Health Commission was charged with the responsibility of meeting the goal and an expert group was formed to develop strategies to increase immunisation coverage. Strategies were presented to the government with the confidence that if they were followed it could be expected that 85% of two-year-olds would be fully immunised by 1997 and 95% by 2000 (Public Health Commission 1994).

However, a 1996 survey in the Northern Region showed that only 61% of children were fully immunised by age 2 (Public Health Report 1998). This was a small but not statistically significant increase on the 55.4% coverage in 1992. More recent surveys of immunisation rates have used a variety of data collection techniques and have produced variable results. These reports show rates higher than the earlier surveys, but show a downward trend in the past three years (ESR Health 1999).

A number of players and factors affect immunisation programmes, including doctors, parents, health agencies, and biological process of vaccination and epidemics. The interactions of these factors lead to

a number of complex dynamics. This paper investigates these dynamics from a Systems Thinking perspective and policy framework. The study reveals key dynamics that underlie immunisation uptake and reasons why the rate has not reached the anticipated levels.

The paper first discusses the key factors impacting the immunisation rates. Then the immunisation strategies (1993-1999) are reviewed and their weaknesses are identified. In response to these weaknesses four intervention strategies are proposed and described using causal loop models. The paper concludes with a discussion of a quality management framework for the integration and implementation of the proposed strategies.

KEY FACTORS IMPACTING IMMUNISATION RATES

The key factors (variables) impacting on immunisation rates are briefly described below.

Provider Incentives

Vaccinating children is financially viable for GPs provided the child is easy to recall. If a child is hard to recall, it is not financially viable. McLeod (1998) reports that "The average annual cost of immunisation to practices in the study exceeded the revenue obtained from the immunisation benefit." Once a child has been vaccinated once, they are more likely to come back for the next vaccination. A "success-to-successful" archetype is at work here in which GPs are drawn to the easy to recall child, who will continue to be a sound investment. The hard to recall child is not only unprofitable but drags down the overall rate of fully immunised children on the GPs register. There is evidence that GPs are actively dropping hard-to-find children off their books.

Strategy Fragmentation

The strategy loop in Figure 1 below shows the destructive influence of organisational fragmentation on the survival of focused strategies within a system. Fragmentation and the associated loss of accountability disempowers people within a system. This prevents 'local champions' from emerging to spearhead a particular strategy. Champions are people who claim ownership of an issue and are willing to put in extra effort and take personal risks on behalf of their project. They are able to turn issues into priorities and gain high level backing for them. Without high level support, issues are destined to remain in the "no accountability" zone. An example of a "local champion" is provided in the Northern Region where an individual sponsored a successful survey of immunisation coverage (Rangers 1999). In contrast, other regions either undertook no survey or relied upon doubtful benefits claim data.

Figure 1 - The Strategy Loop

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Strategy survival loop

Funding levels

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Empowerment

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Figure 1 - The Strategy Loop

Fragmentation

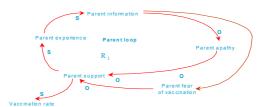
Parent's Role

Parents' decision is the critical success factor in the immunisation process. Thus, apart from issues of safety and biological efficacy, the goal of all strategies and incentives should be to support parents to have their children immunised.

The parent decision loop (Figure 2) is based on extensive research including, Kenealy (1990), Essex et al (1995) and Kljakovic et al (1997). In general, reasons why parents do not immunise their children fall into two main groups, apathy and fear. The levels of apathy and fear are both linked to the levels of information held by the parent. Whether that information is simply a reminder of when to be

vaccinated, a more detailed discussion on medical contraindications or a culturally appropriate explanation of immunisation and why it is important, information is the key ingredient to allaying fear and apathy.

Figure 2 - Parent decision loop



ANALYSIS OF NEW ZEALAND IMMUNISATION STRATEGIES

In 1995, the Ministry of Health announced the national immunisation strategy. The aim was to have at least 95% of New Zealand children aged 2 years to be fully immunised by the year 2000. Table 1 below shows the immunisation strategies first proposed by the Public Health Commission Expert Group in 1993/4, policies put in place in 1995 and those strategies that remained in effect through 1999.

Table 1 - New Zealand Immunisation Strategies (1993-1999)

1993/94: Public Health Commission's Advice to Minister of Health	1995: Public Health Commission's National Immunisation Strategy	Strategies in place 1999
National Immunisation co-ordinator		
Regional immunisation co-ordinators	Local immunisation co-ordination	Local immunisation co- ordination
Linking immunisations with Well Child care		
Policy paper requested for school entry immunisation policies	Immunisation certificate for school/early childhood centres	Immunisation certificate for school/early childhood centres
Assess option for increased provider commitment		
Paper requested to assess cost benefit of training and accreditation for all vaccination providers	Standards for immunisation providers	
Improving access to immunisation (proposals to remove barriers, incentives)		
Changes to immunisation schedule	A simplified immunisation schedule	A simplified immunisation schedule
Vaccine stock management		Improved vaccine stock management
Notified disease schedule modified to include all VPD		
Schedule also altered to include vaccine adverse reactions		
_	Immunisation surveillance	

As the table shows, there has been a marked reduction in the number of strategies first proposed and the strategies finally undertaken. The next causal loop model (Figure 3) shows the effect of the strategies proposed by the Expert Group (1993) and the role of parent decision in this context.

Provider confusion < Nationall Cold chain Confidence Provider co-ordination Media support motivation S management in vaccine S Simplify register Recall system Feeling Vaccine S coverage or progress Parent confusion surveys Parent information S School Parent loop Parent registers Parent apath experience R₁ Institutional ŲΟ S pressure Parent fear Parent of vaccination support Fear of S Vaccine 0 vaccine rate Access dverse reaction s monitoring Fear of S Well Child disease

Figure 3 - Proposed Strategies 1993

The expected effect of the Expert Group recommendations (1993) was to support pro-immunisation choice by supporting provider motivation and improving general information - hence improving supporting access while reducing apathy and fear. The expected outcome of the above strategy was a substantial increase in the immunisation rate.

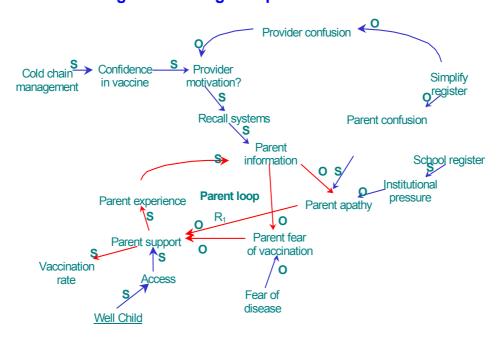


Figure 4 - Strategies in place 1999

The causal loop diagram in Figure 4 models the actual immunisation strategies as they apply in 1999 and how they affect the parent decision loop. As we can see this CLD shows a sparse environment, where there are few key variables, which motivate providers, and few to mitigate the effects of apathy and fear of vaccination. According to this model, the reinforcing loop could revert from a vicious to a virtuous cycle - with more children receiving first vaccinations, making individuals and families more likely to engender a prolonged habit of immunisation.

PROPOSED INTERVENTION STRATEGIES

Leverage points

Leverage points are those areas where a particular intervention can have a substantial effect on outcomes. Based on the dynamics discussed in the foregoing sections, four areas have been identified as leverage points, which could substantially increase the performance of the present immunisation system. They are:

1- Develop a champion (fragmentation)

This intervention relates to the fragmentation variable and to the fragmentation causal loop. It may not be possible to quickly resolve the issue of institutionalised fragmentation, however, individual champions can be recruited, given clear accountabilities and put in positions to lead in a manner which cuts across organisations. In the UK one individual has had an enormous effect on immunisation rates by being an authoritative and popular champion and advocate, providing a clear point of focus and leadership. The role of a champion would include co-ordination of strategies across organisations and developing and maintaining an appropriate public profile for immunisation.

2- Develop quality and financial incentives (provider incentives)

Incentives for providers are at present clearly inadequate, especially for the hard to reach children. International studies have shown that medical practitioners are motivated by quality as well as financial incentives. Quality incentives are easily introduced through benchmarking systems. A general practice network in Rotorua leads New Zealand with more than 90% immunisation rate. This has been achieved by an internal culture of competition to be excellent at immunisation. Maintaining standards in vaccine supply and cold chain monitoring also contribute to the perception of quality programmes. Financial incentives could be tuned to achievement of an end result - full immunisation at age two - rather than for each vaccination, thereby linking a financial goal with a clinical goal.

3- Tracking systems (incentives and parent perception)

This proposal endorses the development of a comprehensive database capable of tracking children and applying quality parameters to the service they are receiving. A tracking system addresses both the provider quality and the parent information issues. The system would support more targeted information to parents by reminding providers of when vaccinations were due and to whom. It would also allow for the widespread use of benchmarking between providers, so providing a quality incentive for higher overall performance.

4- Coverage surveys (government investment)

A fundamental problem with the immunisation system is that there is no reliable method of measuring performance. Since there are no reliable performance measures and monitoring systems, there is a lack of ability to feedback results to the political level. Investment in robust coverage surveys would give the wider system and especially the champions the relevant information to inform the public. This information would ameliorate government's tendency towards short-term outcomes and provides a realistic goal that the system could work towards.

The causal loop model in Figure 5 integrates the above strategies. The model shows how the proposed interventions support a balanced strategy, which introduces a *virtuous* circle of motivation for players at all levels in the system. Parent's information is again the central element of this process.

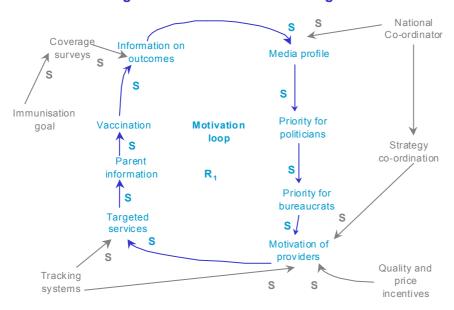


Figure 5 - Intervention Strategies

SUMMARY AND IMPLEMENTATION

In summary, Systems Thinking and Modelling proved to be powerful tools for understanding the dynamics of change and complexity in healthcare policies in general and immunisation strategies in particular. System modelling provided a rigorous approach and deep insights into a fuzzy and highly fragmented environment and allowed a strong set of strategies to emerge. As the systems thinking approach has highlighted, lack of leadership and ownership, poor incentives and ineffective tracking systems are key barriers to achieving national immunisation goals.

A sustainable execution of these strategies will require a systematic and robust implementation programme. At present there is no systematic quality approach applied to the immunisation system. Quality management models lend themselves in this regard. For example, the four leverage points and intervention strategies discussed earlier closely fit within the "Plan-Do-Check-Act" framework of continuous improvement. This framework provides a systematic and tangible tool for implementation of these strategies, as shown in Table 2 below.

Table 2 - A Quality Management Model for Implementation

Action	Plan
Coverage surveys show system performance against goals and priorities for planning function.	National Co-ordinator provides key planning role for the overall system.
Check	Do
Tracking systems monitor performance of providers and service delivery to individual clients.	Provider quality and price incentives support actual service delivery.

Therefore, the development of a quality management approach will lay a solid foundation for building a robust immunisation system. Furthermore, investments are required in the areas of planning, incentives, tracking systems and coverage surveys. However, these investments do not need to be prohibitive, especially when long term gains of reduced human suffering and reduced cost to the health sector are taken into account.

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