

## Evaluation of the Canterbury under-18 seasonal influenza vaccination programme

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### Abstract

**Aim** To evaluate the performance of the 2013 Canterbury under-18 seasonal influenza vaccination programme (Christchurch, New Zealand).

**Methods** Routinely collected under 18 influenza vaccination uptake data were analysed to determine levels of vaccination uptake and equity of uptake across ethnic groups (NZ European, Māori and Pacific) and by level of deprivation. Qualitative data were collected to identify strategies that helped to achieve high uptake in primary care practices and schools.

**Results** Overall uptake of influenza vaccination in 2013 was 32.9%, (compared to 18.5% in 2012), close to the target of 40%. Overall uptake in primary care was higher than in the school-based programme (29.2% versus 19.7%).

Māori students had higher uptake than NZ European students in the school-based programme. In primary care, uptake for both Māori and Pacific children was lower than overall uptake and there was a marked gradient in uptake by socioeconomic quintile, with 30.2% uptake in the least deprived quintile compared to 21.9% uptake in the most deprived quintile.

**Conclusions** The cumulative effect of 3 years' consistency in offering the under-18 influenza vaccination in primary care practices, assisted by a timely media campaign and additional awareness generated by the school-based programme, has resulted in a marked increase in uptake of the vaccine in primary care in 2013. However, this was not equitably distributed. The school-based programme achieved better equity of uptake by deprivation and ethnicity. The challenge is to achieve both high and equitable uptake.

Vaccination is the most effective method of preventing influenza in any age group. There is a large literature on effectiveness and safety of the various types of influenza vaccines including those used in New Zealand.<sup>1-3</sup> Influenza is a major cause of illness among infants and children.

School children, including adolescents, have high attack rates for influenza, ranging between 25–43%.<sup>4</sup> Compared to adults, children shed more of the influenza virus and for a longer time, so they are important primary transmitters of infection to at-risk populations, including the elderly.<sup>5,6</sup>

Universal influenza vaccination of children, rather than targeting vaccination only at children with chronic illness, is now recommended in a number of countries. For example, in the United States, influenza vaccination is recommended for all children except those aged under 6 months, and all adults.<sup>7</sup>

In New Zealand, influenza vaccination is funded for people aged 65 years and over, younger people with certain chronic health conditions, and for pregnant women. In 2013, eligibility for the funded vaccine was extended to include children aged under 5 years who had been hospitalised for respiratory illness or who, in the opinion of their general practitioner, had a history of significant respiratory illness.

Following the February 2011 Christchurch earthquakes the Canterbury District Health Board (CDHB) explored strategies to reduce admissions to its hospitals in Christchurch which had been extensively damaged by the earthquakes and had significantly reduced capacity as a result.

The evidence suggested that a targeted seasonal influenza vaccination programme for under-18 year olds could potentially reduce the number of people with seasonal influenza and this in turn would reduce the number of hospital admissions over winter in Christchurch.<sup>4,6</sup>

Since 2011, the Canterbury District Health Board has provided free influenza vaccine for all children up to the age of 18 living within the area served by the Board. Based on the evidence of the effects of childhood influenza vaccination on population incidence of influenza,<sup>4</sup> a target uptake of 40% was set for influenza vaccination of the under-18 population and a vaccination programme was planned and has been carried out in each of the last 3 years (2011–2013). As far as the authors are aware, offering a population-based influenza vaccination programme in response to post-disaster social disruption is a novel public health strategy, at least in the New Zealand context.

Due to the wide age range covered by the programme, capacity of existing services and the tight timeframe to deliver this programme, a combined targeted approach was chosen to achieve the 40% target. A mixed model of delivery was selected for seasonal influenza vaccination for under-18 year olds. This included vaccination in general practice, as primary care staff are trained and have systems in place to deliver vaccination to their enrolled population.

In 2012, school-based vaccination was also included as a targeted approach within two school clusters, selected by location, size and ability to support delivery. These schools were all located in the eastern part of the city, which was among the worst affected in the 2011 earthquakes. In 2013 it was decided to continue the mixed model of delivery. However, the school-based programme was offered through high schools across all of Christchurch, rather than primary schools as in the previous year. The rationale for offering the vaccination in high schools was based on several factors: the primary care sector in Christchurch was beginning to recover capacity following the disruption caused by the earthquakes; primary care practices have more frequent and regular contact with younger school children and already deliver National Immunisation Schedule vaccinations to this age group; secondary school aged children have less frequent contact with primary care and it was thought that offering the vaccine in high schools would boost overall coverage, particularly among older children.

## Methods

A mixed methods approach to data collection was used. Routinely collected under-18 influenza vaccination uptake data were provided by Pegasus Health, Rural Canterbury Primary Health

Organisation and the Christchurch Primary Health Organisation. These data were obtained by the PHOs from the patient management systems of their constituent practices and supplied to the evaluators without practice identifiers. The proportion of uptake in primary care was determined by the total number of children vaccinated, divided by the enrolled population in the target age group for each PHO which provided data. Uptake by ethnic group was calculated similarly. The CDHB Public Health Nursing and Vision Hearing Services provided uptake data from the school-based programme. The proportion of uptake in schools was determined by dividing the total number of children vaccinated in participating schools by the combined rolls for these schools. School roll data were obtained from the Ministry of Education. Overall vaccine uptake was calculated using age specific census data as a denominator.

Vaccination uptake data were provided in Microsoft Excel format and were analysed using SPSS (version 17.0) software to determine levels of uptake and equity of uptake across ethnic groups (NZ European, Māori and Pacific) and by level of deprivation. These data were also used to identify individual primary care practices and schools with the highest uptake of vaccination to enable selection of potential interviewees.

Qualitative data were collected through interviews and a focus group to identify strategies that helped to achieve high uptake in primary care practices and schools.

Representatives of five primary care practices and five schools were interviewed for the evaluation in 2013. The practices and schools with the highest vaccination uptake were purposely selected with consideration being given to covering a range of geographic and socioeconomic areas across Christchurch, uptake rate, and equity aspects. The selected practices and schools were asked to nominate for interview the person who had the most involvement with the vaccination programme. The primary care interviewees were all practice nurses. The school interviewees included two deputy principals, two health teachers and one administrator. A focus group was conducted involving ten PHNs.

Potential interviewees were contacted from July onwards and interviews were completed by the end of August 2013. Interviews were conducted face-to-face at the school or primary care practice. The interviews were semi-structured using open-ended questions based on areas of interest derived from the literature and the programme evaluation carried out in 2012. Interviews also explored any other issues brought up by the interviewees. The focus group was also conducted using a similar semi-structured interview schedule.

All interviews and the focus group were recorded and transcribed. The transcripts were read, re-read and coded by two members of the evaluation team who then conducted a thematic analysis.

## Results

The overall under-18 influenza vaccine uptake in 2013 was 32.9% of the eligible Canterbury population, compared with the target of 40%. This was higher than the uptake achieved in previous years (18.5% in 2012 and 21% in 2011). In 2013 there was a significant difference in uptake between models of care with higher overall uptake achieved in primary care. In 2012 there was also a significant difference in uptake between models of care with higher overall uptake achieved in the school-based programme.

A comparison of uptake by model of care is shown in Table 1. However, the schools in which the programme was delivered differed in each year. In 2012 there were 13 participating schools: nine primary schools, one intermediate and three secondary schools. In 2013 there were 31 schools participating: 25 high schools and six schools with both primary and secondary age students. In these six schools, the primary school aged students were also offered the vaccine. No primary schools were part of the school-based programme in 2013.

**Table 1. Comparison of uptake for each model of delivery 2012 and 2013**

Mode of delivery	Overall uptake 2012	P value	Overall uptake 2013	P value
Schools	29.4%		19.7%	
Primary care	16.8%	<0.001	29.2%	<0.001

In 2013, there was no statistically significant difference in uptake for Māori students and Pacific students (18.6% and 16.7% respectively) in the school-based programme compared to non-Māori and non-Pacific students (17.8% and 17.9%). However, in primary care, Māori and Pacific children (17.1% and 15.6% respectively) had a significantly lower uptake than non-Māori and non-Pacific (29.5% versus 28.6%) (Table 2).

**Table 2. Comparison of uptake by ethnicity for each model of delivery in 2012 and 2013**

Mode of delivery	Ethnic group	Overall uptake 2012	P value	Overall uptake 2013	P value
Schools*	Māori	32.9%	<0.05	18.6%	0.46
	Non-Māori	28.3%		17.8%	
	Pacific	34.2%	<0.05	16.7%	0.47
	Non-Pacific	28.8%		17.9%	
Primary care	Māori	10.9%	<0.05	17.1%	<0.001
	Non-Māori	17.5%		29.5%	
	Pacific	17.1%	0.62	15.6%	<0.001
	Non-Pacific	16.7%		28.6%	

\*Includes schools where the whole school was offered the programme (including pupils younger than secondary school age).

In 2012, Māori and Pacific students had significantly higher vaccination uptake (32.9% and 34.2% respectively) than non-Māori and non-Pacific students (28.3% and 28.8%) in the school-based programme. However, in primary care, Māori children had significantly lower uptake than non-Māori (10.9% vs 17.5%). There was no significant difference in uptake between Pacific and non-Pacific children.

**School-based delivery**—Vaccination uptake in the school-based programme was lower in 2013 than in 2012 (19.7% compared to 29.4%).

The school-based vaccination programme was predominantly delivered in high schools in 2013 compared with the school-based programme in 2012 which was delivered predominantly in primary schools.

In 2013, there was no significant difference in uptake between Māori and non-Māori students in the school-based programme whereas in 2012 there was a significantly higher uptake for Māori students, compared to non-Māori (note that the non-Māori ethnicity category includes all ethnic groups other than Māori, not just NZ European).

There was a statistically significant difference in uptake between Māori and NZ European students, with NZ European students having a lower uptake than Māori students in the school-based programme.

In the school-based programme in 2013, there was no significant difference in uptake between Pacific and non-Pacific students, while in 2012 there was a significantly higher uptake for Pacific students, compared to non-Pacific.

**Primary care-based delivery**—Overall vaccination uptake in primary care was higher in 2013 than in 2012 (29.2% of those eligible compared to 16.8%). Vaccination uptake in primary care was higher than in the school-based programme in 2013, although the reverse was true in 2012. In 2013, uptake in Māori and Pacific children was lower than overall coverage in primary care, in contrast to 2012 where Pacific uptake was higher than overall coverage (Table 3).

**Table 3. Primary care under-18 influenza vaccine uptake by ethnicity**

Influenza vaccine uptake	2012 (%)	2013 (%)
Overall uptake	16.8	29.2
Māori uptake	10.9	17.1
Pacific uptake	17.1	15.6

Vaccination uptake also varied by NZDep 2006 quintile with a higher uptake in the least deprived quintiles, with uptake decreasing significantly with decreasing deprivation (Table 4).

**Table 4. Primary care under-18 influenza vaccine uptake by NZDep 2006 quintile**

Influenza vaccine uptake	2012 (%)	2013 (%)
Overall uptake*	16.8	29.2
Dep 1 uptake	16.4	30.2
Dep 2 uptake	16.2	29.2
Dep 3 uptake	16.4	26.6
Dep 4 uptake	16.2	24.3
Dep 5 uptake	17.1	21.9

\*Excludes patients with no deprivation data

**Primary care practices' response to the under-18 influenza vaccination programme**—As influenza vaccination of under-18 year olds appears to have become more “business as usual” for primary care in Canterbury, the key factors leading to high uptake in practices also seem to have changed. Practice staff believed that less effort is now needed to promote the vaccine to families, and the emphasis has been on team work within the practice to ensure all those who are eligible are offered the vaccine when they attend the practice.

There has also been a cumulative effect over 3 years that the vaccine has been offered, as practice staff perceived that parents are now much more aware that the vaccine is

available free of charge for children under 18 and appear to be more likely to look for the opportunity to have their children vaccinated. In contrast to 2012, practice staff mentioned the media campaign promoting the vaccination programme as having more of an impact, and they also believed that the school-based programme was responsible for increasing awareness of the influenza vaccine and its availability to all children under 18.

While the practices were very supportive of the under-18 influenza vaccination programme, it clearly still created a significant extra workload and stretched their resources. A number of practices reported deferring less urgent work or extending hours to cope with the demand.

**The school-based programme**—All secondary schools in Christchurch were notified via email in mid-January 2013 that their school was eligible to have free influenza vaccination for their students provided at school. Follow-up contacts were made by the public health nurse (PHN) who normally had responsibility for the particular school.

Only three (out of 34) schools declined to participate in the school-based vaccination programme. Two of these schools were decile 6 with ethnically mixed rolls and one decile 10 with a predominantly NZ European roll (decile ranking are based on the socioeconomic status of the school's catchment, and higher decile corresponds to lower deprivation). The primary reason given by two of them was that they saw it as the responsibility of parents, rather than the school, to have their children vaccinated.

The timing of the vaccination carried out by the PHNs was also key issue for schools. Although well aware that the vaccine is best offered early in the season, the PHN staff resources available meant that the programme was spread across several months, with the final vaccination dates not being until late June and early July. The 2012 school-based programme ran from the third week in May until the end of June. Another key practical issue was finding a suitable venue within the school for the vaccination to take place; some had to make do with a venue that was less than ideal.

Participating schools differed in the degree to which they promoted the vaccination programme; some saw their role as simply providing an opportunity if parents and students wished to take it up, whereas others took a much more active role in promoting the programme.

Overall, relationships with the PHNs were seen by schools as very positive, particularly in schools where the liaison PHN had had a previous contact there and was known to the staff.

The most significant issue for the PHNs in the 2013 programme was the lateness of the approval for the school programme to go ahead. The PHNs also highlighted timing, venue, and information as issues that were relevant to the receptiveness of schools to the programme.

## **Discussion**

Canterbury primary care practices have now had 3 years of offering the influenza vaccine free-of-charge to under-18 year olds. It seems to have become something that is now expected and factored into their planning.

The major change noted by practices in 2013 was the increased number of families that sought out the vaccination proactively. This appeared to be due to a combination of factors: awareness of the availability of the free vaccination has built up year by year; the media campaign appeared to have been better timed and more effective than in 2012; and the school-based programme appeared to have further raised awareness among parents and motivated them to bring their younger children to practices to be vaccinated as well. In conjunction with this externally generated demand, all of the practices interviewed reported taking every opportunity to vaccinate children and young people who were visiting the practice for other reasons.

While primary care practices seem now to have settled into “business as usual” for influenza vaccination of under-18 year olds, the school-based programme posed new challenges for the public health nurses.

In 2012, a school-based programme was offered to a targeted group of low decile mainly primary schools and a small number of high schools in the east of Christchurch. In 2013, the PHNs were asked instead to offer the programme in all high schools in Christchurch. As such, they were faced with implementing the programme in schools with very different cultures, organisation and demands on their timetables.

It was a major undertaking to offer the school-based influenza vaccination programme to every high school in Christchurch, and to every student in every school that decided to participate, and to do this within a short time frame with limited resources.

The factors that made for higher uptake of vaccination within schools were the timing of the vaccination day, the presence of a motivated and persistent school coordinator, the relationship between the coordinator and the PHN assigned to the school, and the “fit” between the school culture and the approach of the programme as a whole. The PHNs were unable to cover all schools in a short period of time and therefore the programme stretched into June and early July. This was seen by many parents as too late, and therefore these schools were unlikely to achieve a high uptake no matter how favourable the other relevant factors. It is unsurprising that the two high schools with the highest uptake both had their vaccination days at the beginning of Term 2.

As in the previous year, the time, effort and persistence that the school coordinator devoted to the programme was a key factor in achieving high uptake of vaccination within the school. The coordinators actively promoted the vaccination to the staff and students, had developed a good relationship with the PHN assigned to the school, and were persistent in getting the students to return their consent forms.

The selection of high uptake practices and schools was a deliberate strategy to determine factors involved in achieving high uptake, however, this may affect the generalisability of the findings of this evaluation to practices and schools with lower uptake.

In addition, because the school-based programme expanded to include more schools in 2013 and targeted a different age group than in 2012, it is not possible to draw firm conclusions about the reasons for differences in coverage by ethnic group between these years.

## Conclusions

The under-18 influenza vaccination programme in 2013 appears to have had a high level of acceptability amongst staff in both settings in which it was delivered and has achieved close to the target levels of overall uptake.

The cumulative effect of 3 years' consistency in offering the vaccination in primary care practices, assisted by a timely media campaign and additional awareness generated by the school-based programme, resulted in a marked increase in uptake of the vaccine in primary care. However, this was not equitably distributed; with higher uptake amongst the least deprived quintiles (30.2% uptake in the least disadvantaged to 21.9% uptake in the most disadvantaged of NZ Dep 2006).

Uptake by Māori and Pacific under-18 year olds in primary care was also lower than overall uptake. By contrast, and as in 2012, the school-based programme achieved better equity of uptake by deprivation and ethnicity. The challenge is to achieve both high overall uptake and equitable uptake by ethnicity and deprivation. The mixed model of delivery used in the Canterbury programme goes some way towards addressing this.

The interviews with schools highlighted the need to improve partnership and communication between the health and education sectors.

The findings of this evaluation have resulted in the CDHB making an earlier decision about the 2014 school-based programme and communicating this decision to schools during Term 4 of 2013 to enable them to incorporate the vaccination programme into their planning for the following year.

There will also be some additional PHN resources made available in 2014 so that the vaccine can be delivered in a shorter, more concentrated programme before the onset of the influenza season.

**Competing interests:** Nil.

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## References:

1. Jefferson T, Rivetti A, Di Pietrantonj C, et al. Vaccines for preventing influenza in healthy children. *Cochrane Database of Systematic Reviews*. 2012;8:CD004879.
2. Manzoli L, Ioannidis JP, Flacco ME, et al. Effectiveness and harms of seasonal and pandemic influenza vaccines in children, adults and elderly: a critical review and re-analysis of 15 meta-analyses. *Human Vaccines and Immunotherapeutics*. 2012;8(7):851–62.
3. Petousis-Harris H, Poole T, et al. Febrile events including convulsions following the administration of four brands of 2010 and 2011 inactivated seasonal influenza vaccine in NZ infants and children: the importance of routine active safety surveillance. *Vaccine*. 2012;30(33):4945–52.
4. Weycker D, Edelsberg J, Halloran ME, et al. Population-wide benefits of routine vaccination of children against influenza. *Vaccine*. 2005;23(10):1284–93.
5. DiClemente RJ, Painter JE, Sales JM, Gargano LM. "Build it and they will come. Or will they?" Overcoming barriers to optimizing delivery of seasonal influenza vaccine to US adolescents. *Expert Review of Vaccines*. 2012;11(4):387–9.
6. King JC, Jr., Lichenstein R, Cummings GE, Magder LS. Impact of influenza vaccination of schoolchildren on medical outcomes among all residents of Maryland. *Vaccine*. 2010;28(49):7737–42.
7. Centers for Disease Control. Advisory Committee on Immunization Practices (ACIP) recommended immunization schedules for persons aged 0 through 18 years and adults aged 19 years and older--United States, 2013. *Morbidity & Mortality Weekly Report Surveillance Summaries*. 2013;62 Suppl 1:1–19.