Pandemic (H1N1) 2009 influenza vaccination coverage in Western Australia

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ABSTRACT

Objective: To assess pandemic (H1N1) 2009 influenza vaccination coverage in Western Australians, up to 31 January 2010.

Design, setting and participants: Vaccination data for Western Australians aged 10 years and older were obtained from two sources: the WA Pandemic Influenza Vaccination Database (PIVD; which collected reports of pandemic influenza vaccinations from vaccination providers statewide) for the period 30 September 2009 to 31 January 2010, and the WA Health and Wellbeing Surveillance System (HWSS; a continuous population-based telephone survey) for the period 1 December 2009 to 31 January 2010. Data from the PIVD was used to impute vaccination coverage estimates for at-risk subpopulations not assessed in the HWSS interviews.

Main outcome measures: Vaccination coverage of Western Australians aged 10 years and older and of subgroups targeted by the national pandemic (H1N1) 2009 influenza vaccination campaign.

Results: A total of 171 789 pandemic influenza vaccinations were reported to the PIVD by 31 January 2010 and 88% of these were administered by 1 December 2009. Based on HWSS data, vaccination coverage of persons aged 10 years and older was 14.5% (95% CI, 12.6%–16.6%) and of persons aged 18 years and older was 15.3% (95% CI, 13.3%–17.6%). Based on PIVD data, coverage in adults ranged from 10.3% in pregnant women to 52.8% in health care workers.

Conclusions: Our estimate of pandemic influenza vaccination coverage in the adult population of WA is comparable to the national estimate of 19%, but it did not reach levels considered sufficient to interrupt community transmission. Future influenza vaccination programs should target groups at increased risk of severe influenza, such as pregnant women.

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The first Australian case of pandemic (H1N1) 2009 influenza was identified on 9 May 2009, and infection quickly spread to all states and territories. By 28 May 2009, the Australian Government had ordered 21 million doses of pandemic influenza vaccine, initially with the aim of vaccinating 50% of the population (assuming a two-dose regimen) to contain community transmission and thereby protect those most at risk of severe disease.[1,2] When the vaccine was registered, it had been shown that a single dose was adequate for people aged 10 years and older.[3] Thus, there was sufficient vaccine for the entire population and all Australians aged 10 years and older were encouraged to be vaccinated, with particular efforts being paid to vaccinating vulnerable groups at high risk of severe influenza.[4]

We aimed to assess the level of vaccination coverage achieved by 31 January 2010 in Western Australians aged 10 years and older.

METHODS

Data collection

Vaccination coverage of Western Australians aged 10 years and older, and for subgroups targeted by the national 2009 pandemic influenza vaccination campaign, was estimated using data from: (i) the WA Pandemic Influenza Vaccination Database (PIVD), which recorded demographic and medical risk factor data (including pregnancy but not obesity) for each person who received the pandemic influenza vaccination (for the period 30 September 2009 to 31 January 2010 [data provided by vaccination providers]); and (ii) the WA Health and Wellbeing Surveillance System (HWSS), a continuous data collection system based on computer-assisted telephone interviews of a stratified random sample from the White Pages telephone directory to monitor the health and wellbeing of residents of WA (for the period 1 December 2009 to 31 January 2010).[5] Vaccination data regarding children younger than 10 years of age were excluded from the analysis because, during the study period, pandemic influenza vaccination had not been available for sufficient time for our data sources to provide valid estimates.

1 Pandemic influenza vaccinations of Western Australians aged ⩾ 10 years reported to the PIVD up to 31 January 2010, by demographic and risk factor characteristics not collected by the HWSS

Characteristic	Proportion of vaccines administered*	Estimated number of people vaccinated† (n = 113 949)
Indigenous status		
Aboriginal and/or Torres Strait Islander	4.1%	4 709
Not Aboriginal and/or Torres Strait Islander	80.8%	92 039
Not reported	15.1%	17 201
Indication for vaccination		
Pregnant‡	0.9%	1 019
Health care worker‡	11.1%	12 610
Medical risk factor for severe influenza‡§	36.2%	41 229

PIVD = WA Pandemic Influenza Vaccination Database. HWSS = WA Health and Wellbeing Surveillance System. * Based on data that were submitted and entered into the PIVD. † Calculated by applying proportions for entered data to total number of vaccinations submitted for entry into the PIVD. ‡ These categories are not mutually exclusive. § Diabetes mellitus, morbid obesity, haemoglobinopathy, immunosuppression or chronic respiratory, cardiac, metabolic or neurological condition. ◆

2 Estimates of pandemic influenza vaccination coverage in Western Australians aged ⩾ 10 years up to 31 January 2010, based on the HWSS and PIVD data

Characteristic	Proportion vaccinated (95% CI) based on HWSS data ($n = 1724$)	Proportion vaccinated based on PIVD data
Total	14.5% (12.6%–16.6%)	9.0%*
Sex		
Male	12.0% (9.6%–15.0%)	12.6%†
Female	17.0% (14.2%–20.1%)	16.8%†
Age		
10–19 years	6.5% (3.2%–12.9%)	6.4%†
20–39 years	6.4% (4.0%–10.3%)	8.8%†
40–64 years	16.5% (13.5%–20.1%)	15.4%†
⩾ 65 years	37.5% (32.3%–43.0%)	35.6%†
Indigenous status		
Aboriginal and/or Torres Strait Islander	Insufficient data	20.0%‡
Not Aboriginal and/or Torres Strait Islander	Insufficient data	12.1%‡
Residential location		
Metropolitan	13.4% (11.2%–15.9%)	No data
Non-metropolitan	11.2% (9.1%–13.7%)	No data
Medical condition		
Medical risk factor for severe influenza	No data	17.4%§
Has, or has had, ⩾ 1 of the following: arthritis, asthma, osteoporosis, stroke, cardiac condition or chronic respiratory condition	20.7% (17.5%–24.3%)	No data
Has none of the above conditions	8.3% (6.4%–10.7%)	No data
Body mass index		
BMI < 30 kg/m^2 (not obese)¶	13.1% (11.0%–15.5%)	No data
BMI ⩾ 30 kg/m^2 (obese)¶	17.3% (13.2%–22.3%)	No data
Pregnant woman	No data	10.3%**
Health care worker	No data	52.8%††

HWSS = WA Health and Wellbeing Surveillance System. PIVD = WA Pandemic Influenza Vaccination Database. * Raw PIVD estimate of pandemic influenza vaccination coverage = 0.983 × (total vaccinations reported to PIVD as administered by vaccine providers from 30 September 2009 to 31 January 2010) ÷ (estimated resident population of WA for 2008). The relative difference between this estimate and the HWSS estimate (61% = 1 −9.0 ÷ [14.5 −9.0]) was used to calculate the PIVD estimates of pandemic influenza vaccination coverage in sex and age subgroups. † Adjusted for under-reporting by multiplying raw PIVD estimate by 1.64. ‡ Calculated using estimated numbers of Indigenous and non-Indigenous WA residents for 2008 (Peter Somerford, Epidemiology Branch, WA Health, personal communication, 21 February 2010) as denominators. § Calculated using estimated number of WA residents with diabetes mellitus, morbid obesity, haemoglobinopathy, immunosuppression or chronic respiratory, cardiac, metabolic or neurological condition (Peter Somerford, Epidemiology Branch, WA Health, personal communication, 19 October 2009) as the denominator. ¶ Body mass index was adjusted for over-reporting of height and under-reporting of weight using a correction equation.[7] ** Calculated using estimated number of WA residents who were pregnant (determined by applying the estimated Australian pregnancy rate of 52.8 per 1000 women aged 15–44 years[8] to the WA population) as the denominator. †† Calculated using estimated number of health care workers in WA (determined by applying the estimated number of health care workers per capita [2649 workers per 100 000][9] to the WA population) as the denominator. ◆

HWSS data are derived from interviews with about 550 Western Australians each month regarding health and wellbeing indicators, including influenza vaccination and chronic medical conditions. During the study period, survey respondents were asked whether they had ever received the pandemic influenza vaccine. Only data from the period 1 December 2009 to 31 January 2010 were included in our analysis as the proportion of the population who had received the pandemic influenza vaccination had stabilised to about 17% (unweighted data) during these months.

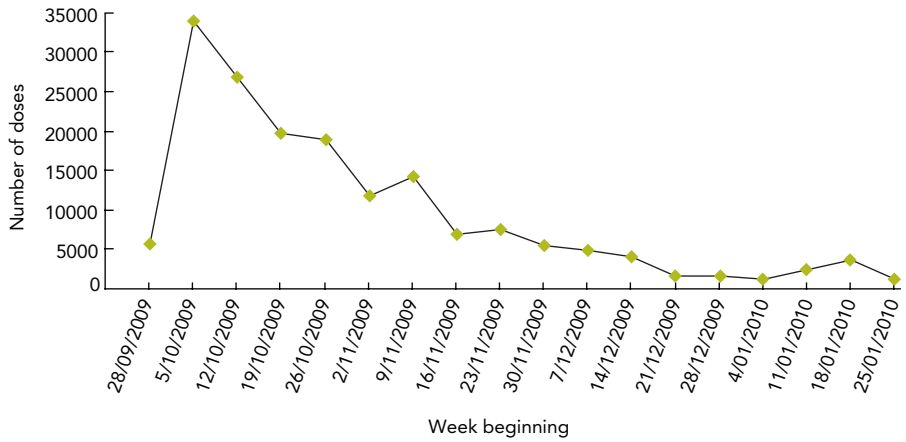
Data analysis

Data were analysed using Microsoft Excel (Microsoft Corporation, Redmond, Wash, USA) and SPSS versions 15.0.1 and 17.0.2 (SPSS Inc, Chicago, Ill, USA). HWSS data were analysed using the Complex Samples module of SPSS, which corrects for sampling strategies and provides adjusted standard errors and binomial confidence intervals based on the correction.[5] HWSS data were weighted for oversampling of non-metropolitan areas and adjusted to the 2008 age and sex distribution of the estimated resident population for WA.[6]

We used HWSS data to estimate pandemic influenza vaccination coverage in WA residents aged 10 years and older, and in groups for which the HWSS could provide valid subgroup analyses.

The HWSS does not collect data about pregnancy, health care worker status or all medical risk factors for severe influenza, and its sampling framework does not include enough Aboriginal and/or Torres Strait Islander respondents to allow subgroup analysis by Indigenous status. Thus, we estimated pandemic influenza vaccination coverage in these groups with PIVD and HWSS data using a three-step process. First, as 98.3% of all vaccinations submitted for entry into the PIVD were for persons aged 10 years or older, and because not all of these vaccinations had been entered into the PIVD, we imputed the total number of people vaccinated in each of the groups. This was done by apportioning the number of vaccinations that were submitted but not entered into the PIVD up to 31 January 2010 according to the proportions observed for the entered vaccinations (Box 1). Second, proportions observed for the entered vaccinations (ie, the proportion that represented persons aged 10 years or older [98.3%] and the proportions for each demographic and risk factor category that the PIVD collects data on) were applied to the total data submitted for entry into the PIVD to estimate the numbers of people vaccinated in each demographic and risk factor category. These estimates were divided by corresponding estimates of numbers of WA residents for each category (see Box 2) to obtain raw PIVD estimates of pandemic influenza vaccination coverage. Third, as reporting to the PIVD was voluntary and incomplete, we adjusted the raw PIVD estimates of pandemic influenza vaccination

3 Pandemic influenza vaccinations administered in Western Australia from 30 September 2009 to 31 January 2010 ($n = 171\,789$)*



* Reported to the WA Pandemic Influenza Vaccination Database, excluding 4876 vaccinations for which date of administration was missing. ◆

coverage by the proportion by which PIVD data were thought to be under-reported. This proportion was estimated by comparing the HWSS estimate of pandemic influenza vaccination coverage in people aged 10 years and older (considered here as the "gold standard") with the corresponding PIVD estimate (see Box 2).

Information was collected as part of routine public health management of a pandemic influenza outbreak. No identified patient information was provided to anyone not already entitled to receive it.

RESULTS

Between 30 September 2009 and 31 January 2010, 171 789 vaccinations were reported to the PIVD. Eighty-eight per cent of these were administered by 1 December 2009 (Box 3). The 113 949 people included in the analysis were aged 10 years and over (median age, 56 years [range, 10–109 years]).

From 1 December 2009 to 31 January 2010, 1724 WA residents aged 10 years and older were interviewed for the HWSS. Based on these interviews, 14.5% (95% CI, 12.6%–16.6%) of Western Australians aged 10 years or older had been vaccinated (Box 2) and 15.3% (95% CI, 13.3–17.6) of those aged 18 years and over had been vaccinated.

Vaccination coverage increased with increasing age and, compared with the HWSS- and PIVD-based estimates of general population coverage, was higher in Indigenous people, and those with medical risk factors for severe influenza or obesity (Box 2). However, vaccination coverage of pregnant women was lower than the HWSS-based estimate for the general population, and only in health care workers did the estimated vaccination coverage reach 50%.

DISCUSSION

Based on HWSS data, 14.5% of the WA resident population aged 10 years and over and 15.3% of the WA resident population aged 18 years and over had received pandemic influenza vaccination by 31 January 2010. These rates are comparable, albeit slightly lower, than a national coverage estimate of 19% for Australians aged 18 years and over, based on the provisional findings of a national computer-assisted telephone survey of 10 231 randomly selected households across Australia,[10] and a United States estimate of 20.3%.[11] The higher rate achieved in the US study is at least partly due to the timing of the respective vaccination programs — approaching winter and a new influenza season in the US, versus the end of an influenza season in Australia.

Groups at increased risk of severe influenza (young children, pregnant women, Indigenous people, and those with chronic medical conditions, including morbid obesity) were targeted in the 2009 national pandemic influenza vaccination campaign.[12,13] WA's coverage of Indigenous people and those with chronic medical conditions was higher than for the national population, but well below the implied national target of 50%. In addition, the estimated coverage for pregnant women in WA was lower than the overall estimate for the WA resident population aged 10 years and over (10.3% v 14.5%).

The low uptake in pregnant women is of particular concern because severe influenza in this group appears to have occurred at a higher rate in 2009 than in previous influenza seasons.[13] In contrast to our findings, vaccination coverage of pregnant women in the US was 38%,[11] indicating that barriers to vaccination in this group (eg, vaccine safety)[14] can be overcome. The addition of pregnant women on the eligibility list for free government-funded influenza vaccine in 2010 will aid this effort.

The WA pandemic influenza coverage estimate for health care workers (52.8%) is similar to rates achieved for seasonal influenza vaccination in WA health care workers in 2008 (> 55% in all but one hospital).[15] However, it is higher than seasonal influenza vaccination rates observed previously in Australian and international health care settings (38% and 42%, respectively[16,17]) and for pandemic influenza vaccination in US health care workers in October to December 2009 (22.3%).[11]

Why were WA and national pandemic influenza vaccination coverage estimates so much lower than the implied 50% target required to contain community transmission?[2,10] Contributory factors may include: the public's and vaccine providers' perceptions that pandemic influenza caused mild illness; negative media reports about vaccine safety and multidose vials; the vaccination campaign occurring outside the usual influenza vaccination season; and vaccine providers delaying vaccination based on knowledge that the trivalent seasonal influenza vaccine for 2010 would cover pandemic influenza.

Both data sources used in our calculations have limitations. First, PIVD reporting was voluntary, so the PIVD data underestimated the number of people vaccinated. However, the large size of the PIVD and its inclusion of data outside the scope of the HWSS allowed vaccination coverage estimation among Indigenous people, pregnant women, people with a medical risk factor for severe influenza, and health care workers. Second, the HWSS sample size was relatively small; therefore information derived from it may be imprecise. Nonetheless, the validity of the process that we used to estimate vaccination coverage is supported by the similarity between adjusted PIVD and HWSS estimates of pandemic influenza vaccination coverage for subpopulations represented in both samples (Box 2).

Both WA and Australian national[10] estimates of pandemic influenza vaccination coverage were considerably lower than the implied national target of 50%.[1] WA's coverage of vulnerable groups at high risk of severe illness was higher than overall coverage, with the exception of pregnant women, for whom coverage was lower. These results underscore the need for health care providers to focus on vulnerable groups during future influenza vaccination programs.

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COMPETING INTERESTS

None identified.

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