# Influenza and pneumococcal vaccine coverage among a random sample of hospitalised persons aged 65 years or more, Victoria

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## Abstract

**This study was undertaken to assess the uptake of influenza and pneumococcal vaccination based on provider records of the hospitalised elderly, a group at high risk of influenza and pneumococcal disease. The study used a random sample of 3,204 admissions at two Victorian teaching hospitals for patients, aged 65 years or more who were discharged between 1 April 2000 and 31 March 2002. Information on whether the patient had received an influenza vaccination within the year prior to admission or pneumococcal vaccination within the previous five years was ascertained from the patient's nominated medical practitioner/vaccine provider. Vaccination records were obtained from providers for 82 per cent (2,804/2,934) of eligible subjects. Influenza vaccine coverage was 70.9 per cent (95% CI 68.9–72.9), pneumococcal coverage was 52.6 per cent (95% CI 50.4–54.8) and 46.6 per cent (95% CI 44.4–48.8) had received both vaccines. Coverage for each vaccine increased seven per cent over the two study years. For pneumococcal vaccination, there was a marked increase in 1998 coinciding with the introduction of Victoria's publicly funded program. Influenza and pneumococcal vaccine coverage in eligible hospitalised adults was similar to, but did not exceed, estimates in the general elderly population. Pneumococcal vaccination coverage reflected the availability of vaccine through Victoria's publicly funded program. A nationally funded pneumococcal vaccination program for the elderly, as announced recently, should improve coverage. However, these data highlight the need for greater awareness of pneumococcal vaccine among practitioners and for systematic recording of vaccination status, as many of these subjects will soon become eligible for revaccination. *Commun Dis Intell* 2005;29:283–288.**

*Keywords: communicable diseases; disease control; influenza; pneumococcal infections; vaccines*

## *Background*

Every Australian aged 65 years or more is considered to be at an increased risk of influenza and invasive pneumococcal disease, with the risk of adverse outcomes likely to be even greater among the hospitalised elderly due to other comorbidities.[1] Influenza and 23-valent polysaccharide pneumococcal vaccines (23vPPV) are both recommended for people in this age group (annually for influenza but only one dose with a single revaccination five years later for 23vPPV).[1] The influenza vaccine has been free for all elderly Australians under the national immunisation program since 1999 while 23vPPV was added to the national program in 2005.[2] Although not nationally funded, a state based program of free 23vPPV for the elderly has operated in Victoria since 1998.[3]

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Two national telephone surveys have estimated influenza and pneumococcal vaccine coverage based on self-report. In 2000, influenza vaccine coverage among persons aged 65 years or more in Victoria was reported at 75 per cent with 40 per cent having received 23vPPV within the previous five years.[4] In the following year, influenza vaccination coverage among elderly Victorians was estimated at 81 per cent.[5]

Since self-reported pneumococcal vaccination status is unreliable[6–9] we aimed to assess the uptake of pneumococcal and influenza vaccines based on provider records. We estimated coverage in Victoria, where both vaccines are publicly funded, among a cohort of hospitalised persons aged 65 years or more.

## *Methods*

We determined influenza and pneumococcal vaccination status from a random sample of persons aged 65 years or more who had been discharged from the Royal Melbourne Hospital or the Western Hospital between 1 April 2000 and 31 March 2002. At the conclusion of each month throughout the study period, subjects were randomly selected (using a random number generator) from a list of persons aged ≥65 years who had been discharged from each hospital in that month. If the subject appeared on the list more than once in any given month (more than one discharge recorded for that month), we selected one admission at random and excluded other admissions. For repeat admissions over numerous months, we retained the first selected admission and excluded all subsequent admissions. We also excluded non-residents of Victoria, those aged <65 years, and day admissions for dialysis or chemotherapy (ICD-10-AM codes Z49.1, Z49.2 and Z51.1).

We contacted each subject or their next of kin by telephone and, after obtaining verbal consent to participate, requested permission to contact the subject's general practitioner or other vaccine providers. We contacted these providers in writing and asked if they had a record of influenza vaccine within the year prior to admission or pneumococcal vaccination within the five years prior to admission. If so, we requested the specific vaccination date.

Our study was a component of a case-cohort study aimed at assessing vaccine effectiveness against community-acquired pneumonia. For this reason we report vaccination coverage of the cohort in terms of protection. Vaccination was considered protective if it was given between 14 days and one year prior to hospital admission for influenza vaccine or 14 days and five years prior for pneumococcal vaccine. Subjects for whom the provider indicated the vaccine was given but gave no vaccination date, an incomplete date or a date within 14 days of admission were excluded.

Since subjects were selected from a monthly list of discharged patients, even if they were selected only once, they were more likely to have been selected if they had been frequently admitted over the study period than if they had been admitted only once. We adjusted for this potential bias at the conclusion of the data collection period by calculating vaccination coverage as a weighted average. The weighting was the inverse of the total number of months where the subject had at least one discharge recorded from the hospital during the study period. We report both weighted and unweighted coverage estimates.

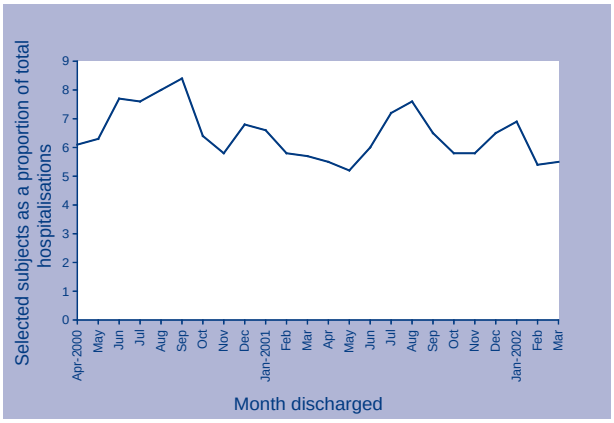
We estimated annual influenza vaccine coverage and 23vPPV coverage within the previous five years. Exact 95 per cent confidence intervals for proportions were calculated using Stata 8.0.[10] We compared 23vPPV coverage by year of vaccination from our study against the number of 23vPPV doses available in Victoria. Vaccine dose data were obtained from two sources: 23vPPV prescriptions issued from 1992 to 2001 by State;[11] and 23vPPV doses distributed through Victoria's publicly funded program (i.e. no prescription required) from 1998 to 2001 (personal communication, Ted Jamieson, Department of Human Services, Victoria, March 2003). Our study was approved by the Human Research Ethics Committee, Royal Melbourne Hospital Research Foundation (ref 2000.022).

## *Results*

There were 83,280 hospital separations coded for persons aged 65 years or more during the two-year study period of which 27,372 (33%) were day admissions for dialysis or chemotherapy and were excluded. A further 6,216 (7%) hospital separations were excluded as repeat separations for the same person in that month. We randomly selected 3,204 (6%) from the remaining 49,692 separations. The proportion of subjects selected from the hospital discharge list each month ranged from 5.2 per cent to 8.4 per cent, with peaks over winter months corresponding to the increase in the number of cases selected in the case-cohort study (Figure 1).

Of the 3,204 randomly selected admissions, 202 (6%) were excluded because they were repeat admissions for previously selected subjects and 68 (2%) were excluded for various other reasons (Figure 2). The median age of the remaining 2,934 eligible subjects was 75 years (range 65–102 years) and 51 per

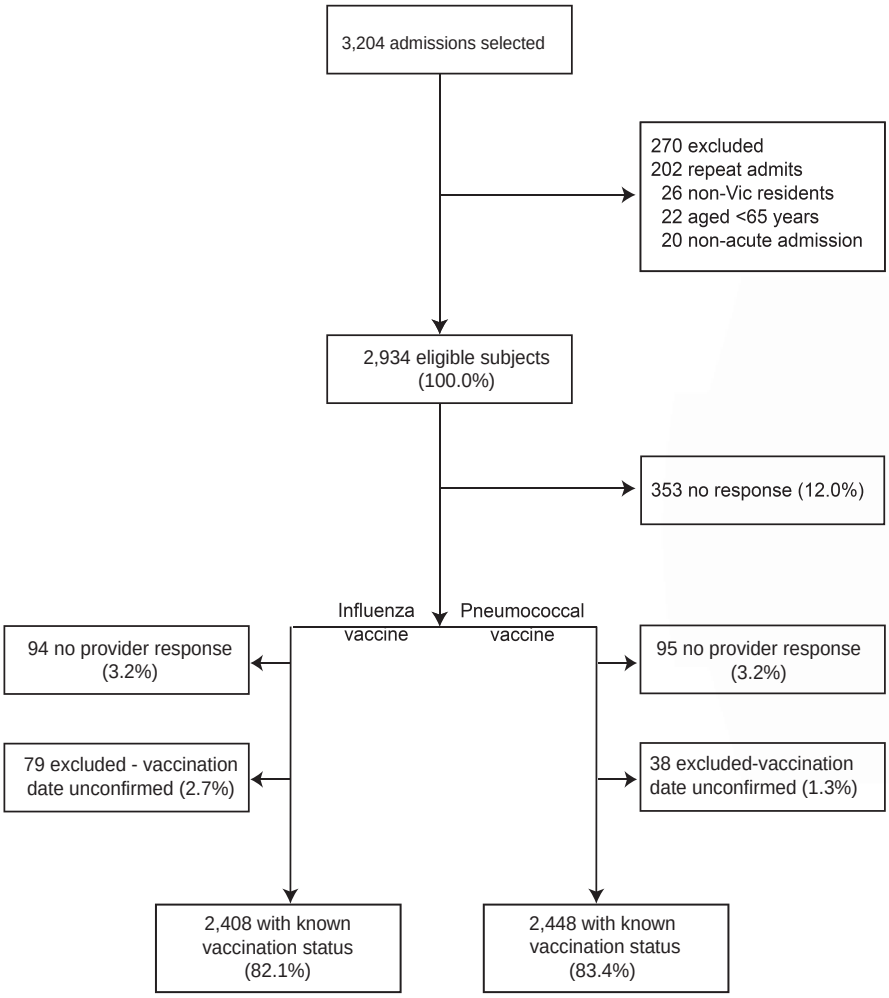
**Figure 1. Proportion of hospitalisations selected from monthly list of discharge diagnoses for persons aged 65 years or more, Victoria, 1 April 2000 to 31 March 2002**




cent were male. We ascertained influenza vaccination status from nominated providers for 82 per cent (2,408/2,934) of subjects, 23vPPV status for 83 per cent (2,448/2,934) and both vaccines for 81 per cent (2,380/2,934). There was no difference in age and sex distribution between those eligible subjects for whom we ascertained vaccination status and those for whom we did not (data not shown).

The weighted estimates of vaccine coverage were 70.9 per cent (95% CI 68.9–72.9) for influenza vaccination within the year prior to admission, 52.6 per cent (95% CI 50.4–54.8) for 23vPPV within five years prior to admission, and 46.6 per cent (95% CI44.4–48.8) for both vaccines. These estimates were virtually identical to unweighted estimates (unadjusted for selection probability), suggesting subjects with repeated admissions over the study period did not bias the coverage estimate (Table).

**Figure 2. Response rate for ascertainment of influenza and pneumococcal vaccination status among hospitalised persons aged 65 years or more, Victoria, 1 April 2000 to 31 March 2002**



Coverage for each vaccine increased from the first study year (April 2000-March 2001) to the second (April 2001-March 2002). Even though influenza vaccine coverage was substantially higher, the overall increase in coverage was similar for each vaccine: 7.1 per cent (95% CI 3.1–11.1) for influenza vaccine, 7.2 per cent (95% CI 2.9–11.5) for 23vPPV and 7.9 per cent (95% CI 2.9–11.5) for those who had received both vaccines (Table). Comparison of vaccine coverage by age group suggests the overall increase was evenly distributed across each five-year age stratum over 65 years for influenza vaccination whereas increases in the point estimates for 23vPPV were limited to those under 85 years (Figure 3). The greatest increase in 23vPPV coverage occurred in 1998 coinciding with the commencement of Victoria's publicly funded program and peak in vaccine availability (Figure 4).

**Table. Influenza and pneumococcal vaccine coverage (weighted and unweighted) among a cohort of hospitalised persons aged ≥65 years, Victoria, 1 April 2000 to 31 March 2002, by year of discharge**

| Vaccination coverage | Influenza vaccine | | 23vPPV | | Both vaccines | |
|---|---|---|---|---|---|---|
| | % | (95%CI) | % | (95%CI) | % | (95%CI) |
| Total (unweighted) | 70.7 | (68.8–72.5) | 52.4 | (50.4–54.4) | 46.4 | (44.4–48.4) |
| Total (weighted) | 70.9 | (68.9–72.9) | 52.6 | (50.4–54.8) | 46.6 | (44.4–48.8) |
| Study year 1 (weighted) | 67.4 | (64.5–70.2) | 49.1 | (46.1–52.1) | 42.8 | (39.8–45.8) |
| Study year 2 (weighted) | 74.5 | (71.7–77.2) | 56.3 | (53.2–59.4) | 50.7 | (47.5–53.9) |
| Increase (weighted) | 7.1 | (3.1–11.1) | 7.2 | (2.9–11.5) | 7.9 | (3.6–12.3) |

Influenza vaccine within the year prior to admission, 23vPPV within five years prior to admission.

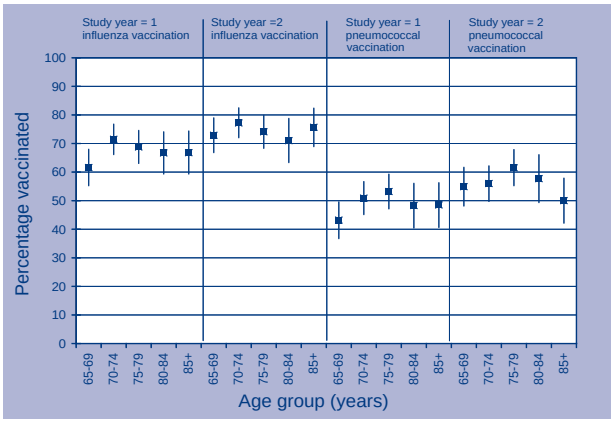
Weighted coverage estimates adjust for probability of selection (see Methods).

Study year 1 = Subjects discharged between 01/04/2000 and 31/03/2001.

Study year 2 = Subjects discharged between 01/04/2001 and 31/03/2002.

Increase refers to increase in coverage between Study year 1 and Study year 2.

**Figure 3. Influenza and pneumococcal vaccine coverage among a cohort of hospitalised persons aged 65 years or more, Victoria, 1 April 2000 to 31 March 2002, by age group and year of discharge**

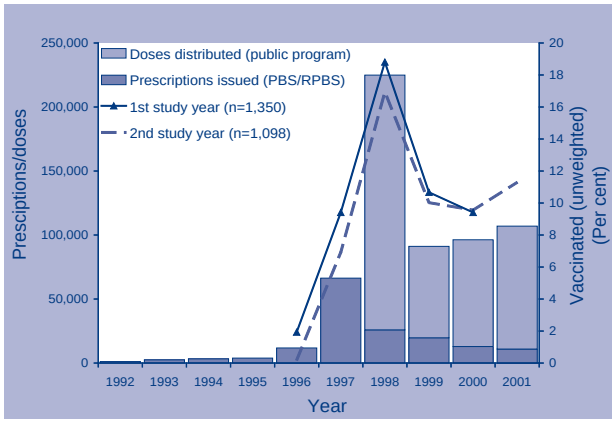



Study year 1 = Subjects discharged between 1 April 2000 and 31 March 2001.

Study year 2 = Subjects discharged between 1 April 2001 and 31 March 2002.

Boxes and vertical lines represent weighted estimate of vaccine coverage with 95 per cent confidence limits.

**Figure 4. Comparison of 23vPPV coverage among a cohort of hospitalised persons aged 65 years or more against total doses of 23vPPV available, Victoria, 1992 to 2001, by study year and year of vaccination**




Study year 1 = Subjects discharged between 1 April 2000 and 31 March 2001.

Study year 2 = Subjects discharged between 1 April 2001 and 31 March 2002.

PBS (Pharmaceutical Benefits Scheme)/RPBS (Repatriation Pharmaceutical Benefits Scheme)[11]

Doses distributed under Victoria's publicly funded program, i.e. no prescription required, (personal communication, Ted Jamieson, Department of Human Services, Victoria, March 2003).

## Discussion

Our study determined influenza and pneumococcal vaccination status using complete vaccination dates from provider records and should therefore be considered minimum coverage estimates among the respondents. Any influenza or pneumococcal vaccinations that were not identified could have only increased coverage among the respondents. We expect that vaccination coverage may be lower among the non-respondents. A similar study among community based elderly in Victoria had a response rate of 72 per cent with the estimated pneumococcal coverage revised from 57.9 per cent (95% CI 52.0–63.6) to 50.5 per cent (44.8–56.1) after accounting for response bias.[8] It should be noted that the response rate in our study was substantially higher with 82.1 per cent of eligible subjects having a known influenza vaccination status and 83.4 per cent having a known pneumococcal vaccination status.

We found influenza vaccine uptake among the respondents had increased by seven percentage points from 68 per cent during the first study year (April 2000–March 2001) to 75 per cent in the second year (April 2001–March 2002). Others have also found evidence of increased influenza coverage in community based surveys in Victoria over a similar time period,[5] although the estimates were higher (78% in 2000 and 81% in 2001) and based on self report. Given that self-reported influenza vaccine status is considered to be reliable,[6] the lower influenza vaccination rates in our study may reflect lower overall coverage among the hospitalised elderly.

Like influenza vaccine, 23vPPV coverage among respondents also increased by seven percentage points between the first study year and the second. The increase was roughly equivalent to the amount of 23vPPV distributed through Victoria's publicly funded program, which may have also influenced the increase in influenza vaccine coverage because persons requiring 23vPPV would almost certainly have been eligible for influenza vaccination. The improvement in coverage appeared to be broad based, with the point estimate increasing across each five-year age stratum over 65 years with the exception of 23vPPV coverage among subjects over 85 years. Our study was limited to a two year observation period but it was encouraging that uptake of both vaccines had increased among the hospitalised elderly in the second year.

Our estimates were consistent with the available doses of 23vPPV each year, the greatest increase in coverage coinciding with the introduction of Victoria's publicly funded program in 1998 when the total number of doses available was greatest. We found the increase in 1998 was consistent for both those subjects discharged during the first study year and those discharged during the second. This is further evidence indicating that the introduction of Victoria's publicly funded program has dramatically increased coverage even though funding has limited the availability of vaccine from year to year.[8,12]

Our results suggest 53 per cent of the hospitalised elderly had received 23vPPV within the five years prior to admission, increasing from 49 per cent in 2000/01 to 56 per cent in 2001/02. In an earlier study, MacIntyre, *et al* reported 23vPPV coverage among a non-random sample of elderly patients at the Royal Melbourne Hospital had increased from four per cent in 1997 to 41 per cent in 1998.[13] As previously noted, a similar population-based survey in Victoria, which also confirmed coverage from provider records, found very similar results to those of our study with 23vPPV coverage among the elderly of 50.5 per cent (95% CI 44.8–56.1) in 2000 after adjusting for response bias.[8] This suggests vaccine coverage among hospitalised patients is similar to but not greater than vaccine coverage in the community. It could be expected that persons regularly admitted to hospital would have more contact with health professionals and therefore be more likely to be vaccinated but we found no evidence of this as demonstrated by the weighted and unweighted coverage estimates being virtually identical.

Victoria's publicly funded 23vPPV program has led to a reduction in the incidence of invasive pneumococcal disease among the elderly in that State.[14] Given that pneumococcal vaccine has been shown to be cost-effective for people aged 65 years or more in other countries[15–17] and is likely to be of similar benefit to influenza vaccine in this age group,[18] our study provides support for the introduction of a fully funded national 23vPPV program for the elderly as announced recently.[2] Our data suggests a national 23vPPV program may also provide further impetus to improve influenza vaccination uptake among the elderly.

The hospitalised elderly are a group at particularly high-risk from influenza and pneumococcal disease. Both vaccines are now available free to all Australians aged 65 years or more. Every opportunity, including hospital admission, should be taken to review vaccination status among this age group and immunise as appropriate.

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