Pharmacy, workplace or primary care? Where Australian adults get their influenza vaccines

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Abstract

Objective: To estimate the proportion of influenza vaccines administered in non-medical settings in Australia in 2019 and identify factors associated with vaccination site.

Methods: We surveyed 1,444 Australian adults online in October 2019. To identify factors associated with vaccination site, we used Pearson's chi-square test. We used thematic analysis to describe responses to the question, 'Please explain why you chose to get vaccinated there'.

Results: Most participants (73%) received the influenza vaccine in a medical setting, while 13% received it at a pharmacy and 14% at their workplace. Being vaccinated in pharmacy was associated with being under 65 years of age ($p<0.01$), marital status ($p=0.01$), and not having a high-risk comorbidity ($p<0.01$). Workplace vaccination was associated with being under 65 ($p<0.01$), household income ($p<0.01$), not having a regular general physician/practice ($p=0.01$), having private insurance ($p<0.01$), and not having a high-risk comorbidity ($p<0.01$). There was no association between site of vaccination and first-time vaccination ($p=0.71$, $p=0.22$).

Conclusions: Despite new policies allowing pharmacists to administer influenza vaccines, most Australian adults are still vaccinated in medical settings. Pharmacy and workplace vaccination settings were more common among younger adults without high-risk comorbidities.

Implications for public health: Workplaces, pharmacies and other non-medical settings may provide an opportunity to increase influenza vaccination among healthy, working-age adults who might otherwise forego annual vaccination. Pharmacies may also provide a convenient location for the rollout of the COVID-19 vaccine, particularly in medically underserved areas.

Key words: influenza vaccines, community pharmacy, pharmacists, workplace vaccination; Australia

Every year, influenza causes thousands of hospitalisations and hundreds of deaths in Australia.[1-3] Vaccination is one of the most effective ways to prevent influenza, yet only 40% of Australian adults receive the vaccine each year.[4-6] While the reasons for low influenza vaccination uptake are complex, for some adults it may be an issue of access or convenience.[6-9]

Pharmacies provide a low-cost, convenient option for vaccination. They are often conveniently located, have extended opening hours, and do not typically require appointments for vaccination services.[10] Furthermore, they may increase access to vaccines in medically underserved regions.[11-13] To increase vaccine uptake, all states and territories in Australia modified their legislation between 2014 and 2016 to allow pharmacists to administer influenza vaccines.[14] Early evaluations in Australia have shown pharmacist vaccination to be safe and acceptable to consumers.[10,15-18] Studies in other countries suggest that allowing pharmacists to vaccinate can result in a modest increase in vaccination coverage, particularly among younger adults.[13,19-21]

The introduction of pharmacy vaccination in Australia has not been without controversy. There is concern that it will make it more difficult for physicians to engage with patients about other health issues or keep track of their health records.[22,23] There have also been claims that some pharmacies release influenza vaccinations too early in the season, which could reduce their effectiveness.[24,25]

In this study, we surveyed Australians to determine the proportion of adults being vaccinated in pharmacies compared to medical settings in 2019, as well as to identify factors associated with the site of vaccination. We also assessed whether the proportion of adults vaccinated for the first time in 2019 varied between sites of vaccination.

Methods

Study design

We administered a cross-sectional survey to a nationally representative sample of Australian adults in October of 2019. This analysis includes participants who self-reported vaccination for influenza in 2019. The Human Research Ethics Committee at the University of New South Wales granted approval (HC #190617) for this study.

Data collection

Lucid (https://luc.id/), a consumer research marketplace, provided the sample. They promoted the survey on their marketplace, then participating probability-based research panels distributed the survey to a random sample of their panel members via email. Research panels sampled by Lucid are regularly reviewed to ensure data quality

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Submitted: September 2020; Revision requested: January 2021; Accepted: February 2021
The authors have stated the following conflict of interest: Dr C. Raina MacIntyre is receiving funding from Sanofi for influenza burden of disease research. Dr Daniel Salmon has had consulting and/or grant support from Merck, Walgreens and Pfizer.

Aust NZ J Public Health. 2021; 45:385-90; doi: 10.1111/1753-6405.13094

and minimise sampling bias. Panel members who opened the survey were screened for eligibility. They were eligible to participate if they were 18 years or older and were currently living in Australia. The sample was stratified (based on estimates from the Australian Bureau of Statistics) to ensure it would be nationally representative in terms of age, gender and state/territory of residence. Before beginning the survey, eligible participants provided informed consent. To prevent missing data, all fields in the survey were required, but sensitive questions included the option 'prefer not to answer'.

Survey questions

To determine influenza vaccination status in 2019, we asked, 'Did you get the flu jab in 2019?' with the response options 'yes', 'no' and 'not sure'. We asked vaccinated participants to specify which month they received the vaccine and whether this was their first influenza vaccine. To identify site of vaccination, we asked, 'Where did you get the flu jab this year?' with the following response options: GP's office/surgery, medical centre, chemist/pharmacy, workplace, hospital, Aboriginal medical service (AMS), other (write in), and don't know. To understand participants' choices of vaccination site, we asked the following open-ended question: 'Please explain why you chose to get vaccinated there'.

To understand participants' health status and healthcare-seeking behaviours, we asked a series of questions regarding healthcare utilisation and their health history. We also asked a series of demographic questions, including age, gender, state/territory of residence, level of education completed, annual household income (based on Australian income tax brackets for 2019), country of birth, marital status and Aboriginal or Torres Strait Islander (ATSI) status. Details on survey questions can be found in Supplementary File 1.

Data analysis

Quantitative data analysis

Vaccination sites were grouped into three categories: medical settings, pharmacy and workplace. Medical settings included GP office/surgery, medical centre, hospital and AMS. Respondents who wrote in 'midwife', 'nursing home', or 'retirement village' were also included in this category.

To identify factors associated with site of vaccination, we used Pearson's chi-square test. We made two comparisons: medical settings compared to pharmacy and medical settings compared to workplace. A *p*-value of 0.05 or less was considered statistically significant. For the purpose of this analysis, we categorised age into three groups: under 45 years, 45 to 64, and 65 and over. We dichotomised annual household income (under $90,000 vs. $90,000 and over), country of birth (Australia vs. elsewhere), and marital status (married vs. not). We also tested the association between income and site of vaccination using $37,000 as a cut-off. We categorised education level into three levels: Year 12 or lower, TAFE/technical diploma and tertiary degree. All analysis was performed using Stata 14.[26]

Qualitative data analysis for open-ended questions

To understand individuals' reasons for choosing their site of vaccination, thematic analysis was used to describe data from the open-ended question, 'Please explain why you chose to get vaccinated there'.[27] We reviewed responses and assigned one or more codes to each. The codes that emerged from the data were categorised into broader thematic units. Thematic units were reviewed to ensure they were distinct and coherent. Where appropriate, thematic units were broken into sub-themes. Codes or thematic units were not defined *a priori*.

Results

The survey completion rate was 84%, for a total of 1,444 respondents. Of these, 747 (51.8%) reported that they received the influenza vaccination in 2019. Two participants answered 'don't know' for their site of vaccination and were excluded from this analysis, giving us a final sample of 745 adults.

Demographic and clinical characteristics by site of 2019 vaccination

In our sample, 543 (73%) participants were vaccinated in a medical setting, 95 (13%) were vaccinated in pharmacy, and 107 (14%) were vaccinated at their workplace. Table 1 compares participant characteristics by their site of vaccination. To account for confounding by age, Table 2 compares these characteristics by site of vaccination among participants under the age of 65.

Pharmacy vs. medical settings

There was a significant association between age and pharmacy vaccination ($p<0.01$), with a greater proportion of pharmacy vaccination occurring in those under age 65 compared to those over 65 (Figure 1). Pharmacy vaccination was associated with gender ($p<0.01$), having an annual household income of at least $90,000 ($p<0.01$), having a regular GP or medical practice ($p=0.03$), and not having a high-risk chronic comorbidity ($p<0.01$). Annual household income was still associated with pharmacy vaccination when using a cut-off of $37,000 ($p=0.01$, data not shown).

Among participants aged under 65, pharmacy vaccination was associated with being married ($p=0.01$) and not having a chronic medical condition ($p<0.01$).

Workplace vs. medical settings

There was a significant association between age and workplace vaccination ($p<0.01$), with a greater proportion of workplace vaccination occurring in those under age 65 compared to those over 65 (Figure 1). Workplace vaccination was significantly associated with gender ($p<0.01$), state/territory of residence ($p=0.04$), education level completed ($p<0.01$), having a household income of at least $90,000 ($p<0.01$), not having a regular GP or practice ($p<0.01$), having private health insurance ($p<0.01$), and not having a high-risk chronic comorbidity ($p<0.01$). We also found that income was associated with workplace vaccination when using a cut-off of $37,000 ($p<0.01$, data not shown).

Among participants under age 65, being vaccinated in the workplace was associated with an annual household income of at least $90,000 ($p<0.01$), having a regular GP or practice ($p=0.01$), having private insurance ($p<0.01$), and not having a high-risk chronic health condition ($p<0.01$). Income was still associated with workplace vaccination when using a cut-off of $37,000 ($p<0.01$, data not shown).

Previous influenza vaccination by site of 2019 vaccination

Among the 747 participants who reported being vaccinated in 2019, 89 (12%) reported it was the first time they had received the influenza vaccine and 599 (81%) had been vaccinated the previous year in 2018. There was no association between site of 2019 vaccination and self-reported vaccination

in 2018 in either the full sample or among those aged under 65. Similarly, there was no association between vaccination site and first-time vaccination in either the full sample or participants under 65.

Timing of vaccination by site

For all three sites, the majority of vaccinations were received in April or May (Supplementary Figure 1). In medical settings, 9.2% of vaccinations occurred in March, 29.3% occurred in April, 34.6% occurred in May, 12.7% occurred in June, and 9.1% occurred in July. Among vaccinations received in a pharmacy, 2.1% occurred in March, 32.6% occurred in April, 30.5% occurred in May, 17.9% occurred in June and 8.4% occurred in July. For vaccinations that were received in the workplace, 7.5% were received in May, 34.6% were received in April, 30.8% were received in May, 13.1% were received in June and 8.4% were received in July.

Reasons for choosing site of vaccination

Medical settings

We received a broad range of responses to our open-ended question 'Why did you choose to be vaccinated there?' among participants vaccinated in medical settings. Thematic analysis yielded eight thematic units, some of which were broken down into sub-units (Supplementary Table 1). Some responses included more than one thematic unit.

The most frequent thematic unit (23.8% of responses) was 'Preference to do all medical procedures at the same place', which was broken down into three sub-units: 'Combined vaccination with check-up or other procedure' (14.6%); 'Provider has their records/will keep record of flu vaccination' (5.9%); and 'Prefer to have it done by provider because they know their health history' (3.3%). The second most frequently mentioned thematic unit was 'Familiarity with provider' (22.0% of responses), which was broken down into two specific sub-themes, 'Feels familiar with the provider or location' (11.1%); and 'Always gets jabs there' (10.9%). The third most frequently mentioned thematic unit was 'Convenience' (20.6% of responses), which was then broken down into two sub-themes, general convenience (14.0%) and the location being close/accessible (6.6%). The fourth thematic unit was 'Cost' (15.5% of responses), which was broken into three sub-themes: 'The

Figure 1: Number of vaccinations by age group and vaccination provider.

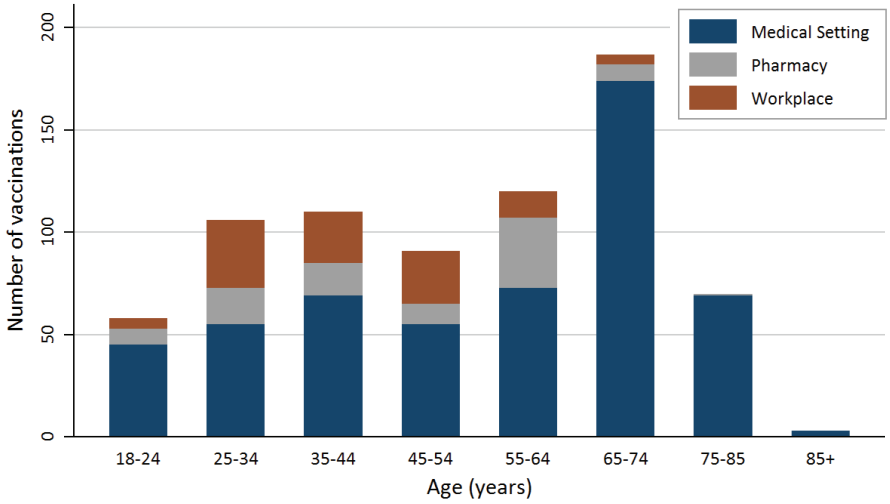

Table 1: Demographic and clinical characteristics by site of vaccination in 2019 (n=745).

	Medical setting (n=543)	Pharmacy (n=95)	*p*-value[a]	Workplace (n=107)	*p*-value[b]
Gender			**<0.01**		**<0.01**
Female	243 (67%)	56 (15%)		66 (18%)	
Male	297 (79%)	38 (10%)		40 (11%)	
Non-binary/third gender	2 (50%)	1 (25%)		1 (25%)	
Age			**<0.01**		**<0.01**
<45	169 (62%)	42 (15%)		63 (23%)	
45-64	128 (61%)	44 (21%)		39 (19%)	
65+	246 (95%)	9 (4%)		5 (2%)	
Education level completed			0.68		**<0.01**
Year 12 or less	179 (78%)	28 (12%)		23 (10%)	
TAFE/Technical diploma	184 (76%)	32 (13%)		26 (11%)	
Tertiary degree	176 (65%)	35 (13%)		58 (22%)	
Annual household income			**<0.01**		**<0.01**
<$90,000	383 (80%)	51 (11%)		43 (9%)	
$90,000+	129 (58%)	38 (17%)		56 (25%)	
Born in Australia			0.82		0.48
Yes	423 (73%)	75 (13%)		80 (14%)	
No	120 (72%)	20 (12%)		27 (16%)	
Married			0.19		0.44
Yes	337 (71%)	66 (14%)		71 (15%)	
No	203 (76%)	29 (11%)		36 (13%)	
Private health insurance			0.33		**<0.01**
Yes	294 (68%)	57 (13%)		79 (18%)	
No	244 (79%)	38 (12%)		27 (9%)	
Has regular GP or practice			**0.03**		**<0.01**
Yes	522 (75%)	86 (12%)		92 (13%)	
No	19 (45%)	8 (19%)		12 (36%)	
At least 1 high-risk comorbidity			**<0.01**		**<0.01**
Yes	198 (90%)	7 (3%)		14 (6%)	
No	345 (66%)	88 (17%)		93 (18%)	
Vaccinated for influenza in 2018			0.56		0.28
Yes	443 (83%)	75 (81%)		81 (79%)	
No	90 (17%)	18 (19%)		22 (21%)	
First influenza vaccine			0.06		0.96
Yes	60 (11%)	17 (18%)		12 (11%)	
No	478 (89%)	77 (82%)		94 (89%)	

Notes:

a: Pearson's χ^2 test comparing individuals vaccinated at pharmacy against individuals vaccinated by their GP or medical centre

b: Pearson's χ^2 test comparing individuals vaccinated at their workplace against individuals vaccinated by their GP or medical centre

vaccine was free/cheapest at this provider' (9.2%); 'Preference for bulk billing' (2.6%); and 'Entitled to free NIP vaccine at this provider' (3.7%).

Other thematic units included 'Trust in the provider' (11.4%), 'Prompted by provider' (9.4%), 'Vaccines at GP are "better" than those at pharmacy' (1.5%); and 'No reason/just because' (2.8%).

Pharmacy

Analysis among those vaccinated in a pharmacy yielded six thematic units (Supplementary Table 2). The most frequently mentioned thematic unit was 'Convenience' (52%), which was broken down into four distinct sub-themes: 'It is easy/convenient to get vaccinated at this provider' (19%); 'The location of this provider is close to home/easy to get to' (15%); 'Bookings are not required or can be made online' (10%); and 'Was already in the area for another reason' (8%). The second most frequently mentioned thematic unit was 'Cost' (30.5%), which was broken down into two distinct sub-themes: 'The vaccine was cheap at this provider' (26.3%); and 'Vaccine was reimbursed by employer' (5.3%). The third most frequently mentioned thematic unit was 'Needed to have the vaccination done quickly' (12.6%). Other thematic units that were mentioned included 'Trust in the provider' (7.4%); 'Prompted by provider' (1.1%); and 'No reason/just because' (2.1%).

Workplace

Two thematic units emerged from the open-ended question among participants who were vaccinated at their workplace (Supplementary Table 3). The most frequently mentioned thematic unit was 'Cost' (56.1%), followed by 'Convenience' (55.1%).

Table 2: Demographic and clinical characteristics of adults under 65 (n=485) by site of vaccination in 2019 .

	Medical setting (n=297)	Pharmacy (n=86)	*p*-value[a]	Workplace (n=102)	*p*-value[b]
Gender			0.64		0.31
Female	161 (59%)	48 (18%)		64 (23%)	
Male	133 (64%)	37 (18%)		37 (18%)	
Non-binary/third gender	2 (50%)	1 (25%)		1 (25%)	
Education level completed			0.86		0.10
Year 12 or less	81 (63%)	25 (20%)		22 (17%)	
TAFE/Technical diploma	91 (63%)	28 (19%)		25 (17%)	
Tertiary degree	123 (58%)	33 (16%)		55 (26%)	
Annual household income			0.19		**<0.01**
<$90,000	173 (67%)	45 (18%)		39 (15%)	
$90,000+	102 (53%)	37 (19%)		55 (28%)	
Born in Australia			0.65		0.44
Yes	235 (62%)	70 (18%)		77 (20%)	
No	62 (60%)	16 (16%)		25 (24%)	
Married			**0.01**		0.08
Yes	167 (56%)	62 (21%)		68 (23%)	
No	128 (69%)	24 (13%)		34 (18%)	
Private health insurance			0.23		**<0.01**
Yes	162 (55%)	54 (18%)		76 (26%)	
No	130 (70%)	32 (17%)		25 (13%)	
Has regular GP or practice			0.35		**0.01**
Yes	276 (63%)	77 (18%)		87 (20%)	
No	19 (45%)	8 (19%)		15 (36%)	
At least 1 high-risk comorbidity			**<0.01**		**<0.01**
Yes	90 (82%)	6 (5%)		14 (13%)	
No	207 (55%)	80 (21%)		88 (24%)	
Vaccinated for influenza in 2018			0.22		0.54
Yes	216 (74%)	68 (81%)		76 (78%)	
No	74 (26%)	16 (19%)		22 (22%)	
First influenza vaccine			0.71		0.22
Yes	50 (17%)	16 (19%)		12 (12%)	
No	243 (83%)	69 (81%)		89 (88%)	

Notes:

a: Pearson's χ^2 test comparing individuals vaccinated at pharmacy against individuals vaccinated by their GP or medical centre

b: Pearson's χ^2 test comparing individuals vaccinated at their workplace against individuals vaccinated by their GP or medical centre

Discussion

This is the first Australia-wide survey on site of influenza vaccination since the introduction of pharmacist vaccination. We found that most adults were vaccinated in a medical setting; only 13% were vaccinated in a pharmacy and 14% at their workplace. A survey of Australian adults in 2014 found that 69% of influenza vaccines were given in a GP's office, while 21% were given in workplaces and 7% in community clinics.[6] Thus, the proportion of influenza vaccinations given in medical settings does not appear to have decreased since the introduction of pharmacist vaccination, but the proportion of vaccinations given in workplaces decreased. Many participants in our study that were vaccinated in pharmacy stated that they were vaccinated there because their employer offered to reimburse the cost. Thus, pharmacy vaccination may have provided a more cost-effective way for employers to encourage vaccination compared to onsite vaccination.

In the US, pharmacists have been allowed to vaccinate in all fifty states since 2009 and about 20% of all influenza vaccines are given in pharmacies and other stores.[28,29] Vaccination by pharmacists is relatively new in Australia and may become more common as people become more familiar or comfortable with the service.[30] However, it is important to note the proportion of Australians that have a regular GP or practice for primary care is higher in Australia than it is in the US, and this appears to play a role in choice of vaccination provider.[31]

Adults under 65 years of age without chronic health conditions were more likely to get vaccinated in non-medical settings compared to those with chronic conditions or aged 65 and over. This is not surprising, given that those over 65 and those with high-risk conditions can receive the vaccine free of charge in medical settings and they are more likely to be engaging regularly with healthcare providers.[32,33] Workplace vaccination was more common among those with a higher annual household income and those without a regular GP or practice. Similarly, in the US, vaccination of younger adults in non-medical settings is more likely among those without a regular primary healthcare provider and those with higher education levels.[28] This could reflect different health-seeking behaviours but may also reflect differences in access; workplace vaccination may favour higher-income

professions.[28] Since those vaccinated in their workplaces were less likely to have a regular doctor, vaccination in workplaces and other non-medical settings may provide an opportunity to increase vaccination among working-age adults who are not regularly engaging with a primary healthcare provider.

The main objective of allowing pharmacists to vaccinate is to increase the overall uptake of influenza vaccines in Australia. In our study, 12% of those vaccinated in 2019 reported that this was the first time they were vaccinated for influenza, but the proportion did not differ significantly between sites of vaccination. Thus, based on our data, pharmacy vaccination may not be increasing the number of people vaccinated for the first time. However, it is important to note that the proportion that were first-timers was greater in the pharmacy setting than in medical settings, and we may have lacked statistical power to detect a difference. A systematic review and meta-analysis on the effect of pharmacist involvement on vaccination found that when pharmacists act as vaccine administrators, it consistently results in increased vaccination rates.[19] However, many of the studies reviewed specifically targeted higher-risk individuals, and thus the results may not be applicable to the general population.[19] Studies in the US have found that influenza vaccination rates are slightly higher when states allow pharmacists to vaccinate,[20,34,35] but this effect is not always statistically significant, varies by state, and increases over time.[20,35] Therefore, it could be too early to observe changes in vaccine coverage. Furthermore, even if national vaccine coverage does not increase considerably, some regions or localities may benefit more than others, so further research at the state or local level may be useful.

Regardless of whether pharmacy vaccination significantly impacts vaccine coverage, it may make it faster, cheaper and easier to get vaccinated. Several participants stated that they were vaccinated in a pharmacy because they needed it done quickly due to travel or surgery, and they could get it sooner at a pharmacy than at their doctor's office. Many respondents also mentioned lower costs and increased convenience. Other surveys in Australia and abroad have found both cost and convenience to be common reasons for getting the influenza vaccine in a pharmacy.[10,36-38] Thus, provision of vaccines in non-medical settings such as pharmacies and workplaces may be an enabler of vaccination by making it accessible to working people who may not feel they have time to see a doctor for vaccination. However, convenience and cost were also common reasons why participants were vaccinated in medical settings. Thus, the factors that determine where an individual receives their influenza vaccine are likely to be context dependent.

There has also been concern that pharmacies may release influenza vaccines too early, after some pharmacies encouraged people to get vaccinated in March in response to the high inter-seasonal influenza activity in 2019.[23] There is evidence that vaccine effectiveness against clinical outcomes may wane within three months of vaccination; thus releasing influenza vaccines too early in the season may hinder their overall effectiveness.[36] In Australia, influenza vaccinations are generally recommended to begin in March or April, but modelling has shown that June may be the optimal month of vaccination in terms of vaccine effectiveness throughout the season.[37] In our survey, we did not find any notable differences in the timing of vaccination between different sites of vaccination. For all three sites, most vaccinations took place in April and May, with smaller proportions getting vaccinated in March and June. There were no vaccines given prior to March in pharmacies in our study, and the peak occurred in April.

In addition to their role as immunisers against seasonal influenza, pharmacists can play an important role as immunisers in pandemic situations. Modelling studies in the US have found that, assuming high pandemic influenza vaccine demand, including pharmacists as immunisers can decrease the time needed to reach 80% national vaccine coverage by seven weeks and can potentially prevent millions of influenza cases.[39,40] The importance of a rapid response during a pandemic situation cannot be overstated. While there is no effective vaccine for COVID-19 at time of writing, pharmacists should be included in plans for future vaccine administration.

Our study design was not without limitations. We experienced some sample size constraints. For example, because our sample was stratified by state population, we had very small numbers from certain states, which precluded us from conducting state-by-state comparisons. However, we have included this data in Supplementary Table 4 for interest. The sample was potentially subject to selection bias because participants had to 'opt-in' to the survey. We were unable to collect data on participants who did not complete the survey, and thus we cannot determine if they differed from our study sample. For example, participants who are interested in influenza or vaccination may have been more likely to fill out the survey, which may have caused our estimate of vaccine uptake to be biased. Furthermore, participants in consumer panels may or may not be truly representative of the general population in Australia.[41] Given that surveys are completed online, panel members tend to have greater internet access and higher socioeconomic status compared to the general population, particularly among older adults.[41] To minimise this bias, panel members are provided with a mobile phone and SIM card if they do not have internet access. However, we compared the demographics of our sample to previous estimates from the Australian Bureau of Statistics and the Australian Institute for Health and Welfare and found that they were similar on several measures, such as the proportion who were born in Australia, identify as Aboriginal or Torres Strait Islander, have a tertiary degree, visited a GP in the previous 12 months and have private health coverage.[42,43] These comparisons have been described elsewhere.[44] Lastly, our primary outcome variable, influenza vaccination in 2019, was self-reported and is therefore at risk of recall or response bias. Given these limitations, our estimates should be interpreted with caution.

This study offers valuable data on where Australians receive their influenza vaccinations after all states and territories began allowing trained pharmacists to administer vaccines. While pharmacies and workplaces may offer convenient, low-cost alternatives for vaccination, the majority of Australians are still being vaccinated for influenza in a GP's office or medical centre. Further research is needed to determine how to best promote influenza vaccination in all three settings, as they appear to cater to different populations with different motivations.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Supplementary Figure 1: Number of vaccinations received in 2019 by month and provider.

Supplementary Table 1: Frequencies and examples of reported reasons for choosing to be vaccinated at GP office or medical centre.

Supplementary Table 2: Frequencies and examples of reported reasons for choosing to be vaccinated at pharmacy.

Supplementary Table 3: Frequencies and examples of reported reasons for choosing to be vaccinated at the workplace.

Supplementary Table 4: Site of influenza vaccination in 2019 by state/territory of residence.