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Annual report

Flutracking: Weekly online community-based surveillance of influenza-like illness in Australia, 2017 Annual Report

Sarah Moberley, Sandra Carlson, David Durrheim and Craig Dalton

Abstract

Flutracking participation continued to grow, with a total of 33,947 participants in 2017 (a 9.5% increase from 2016). The majority of participants completed their survey within 24 hours of the email being sent (average 72.5% responses received in 24 hours).

Overall, the rate of influenza-like illness (ILI) in 2017 was higher and remained elevated for a longer period compared to previous years except for the 2009 pandemic.

Flutracking placed the severity and magnitude of the influenza season into historical context. Following the highest number of laboratory-notified influenza cases on record (2.8-fold increase from 2016), Flutracking data demonstrated a large increase in the percent of participants with fever and cough that were tested for influenza (2.9% to 5.0% for 2016 and 2017 respectively) and thus determined it was increased laboratory testing that contributed to the substantial increase in influenza notifications.

Flutracking participants with fever and cough that were tested for influenza have increased each year from 2013 to 2017 at the national level, with a large increase from 2016 (2.9%) to 2017 (5.0%).

The peak weekly fever and cough attack rate occurred in mid-August, with 4.1% ILI in the unvaccinated, compared to 3.1% in vaccinated Flutrackers. In the peak four weeks of ILI, 12.3% of participants experienced an episode of fever and cough. Divergence between the vaccinated and unvaccinated participants' ILI percentages was highest during the week ending 6 August 2017 (4.1% in the unvaccinated group and 2.7% in the vaccinated group).

The timing of the ILI peak amongst Flutracking participants was consistent with peak notifications of laboratory-confirmed influenza.

Keywords: Community-based surveillance, Influenza-like illness, Citizens in science, Influenza surveillance

Introduction

Flutracking provides weekly community-level influenza-like illness (ILI) surveillance that is not biased by health-seeking behaviour, clinician testing practices or differences in jurisdictional surveillance methods.[1–5] Flutracking provides an indication of the differential ILI rates by age and geography, and the impact of illness in the community. The Flutracking surveillance system has been incorporated into the weekly Australian Influenza Surveillance Report since 2009.[6]

The main aims of Flutracking are to provide:

- Community-level ILI surveillance in Australia;
- Consistent surveillance of influenza activity across all jurisdictions and over time; and
- Year-to-year comparison of the timing, attack rates, and seriousness of influenza in the community.

In this report, we:

- Describe the epidemiology of ILI in the community;
- Describe the coverage of influenza vaccination and testing among participants;
- Describe the performance characteristics of the Flutracking system; and
- Compare Flutracking estimates with notifications of laboratory-confirmed influenza.

Methods

The Flutracking surveillance system commenced in the week ending Sunday 30 April and was in operation for 25 weeks, until the week ending Sunday 15 October 2017. The recruitment drive ran from 19 April to mid-May, although participants were able to join at any time during the year. Recruitment methods were similar to those used in 2007–2017, with the weekly survey questions having evolved from 2007–2012.[2,4,5,7,8]

Descriptive statistics were tabulated and summarised for each state and territory, by age group, gender, education level, Aboriginal and Torres Strait Islander status, and vaccination status.

A 'participant' was defined as anyone who had a survey submitted by themselves or on their behalf. A 'respondent' was anyone who submitted a survey either for themselves or on behalf of a household member.

The participation rate for the variables of state and territory, age group, and gender was calculated using the Australian Bureau of Statistics June 2017 Estimated Resident Population.[9] The participation rate for education level was calculated using the 2011 Australian Census data, and the 2016 Australian Census data for Aboriginal and Torres Strait Islander status.[10,11]

We analysed the percentage of vaccinated participants aged less than 10 years of age by whether there was at least one participant in their household who was a healthcare worker with patient contact.

The mean percentage of participants who responded within 24 hours of survey distribution was calculated across all 25 weeks of surveillance. This calculation was also stratified by age group. Response time was calculated for respondents. For participants in Western Australia, two hours were subtracted from their time to respond, and in the Northern Territory and South Australia 30 minutes was subtracted from their time to respond, to account for differences in time zones.

Survey responses submitted less than four hours after the surveys were sent each Monday (5.11 am at the location of the respondents) were excluded from this analysis. This exclusion adjusted for state and territory time zone differences in earliest response times on a Monday morning, and removed 3.1% of all surveys for this particular analysis.

Unless otherwise stated, a participant with ILI was defined as having both self-reported fever and cough. For all ILI analyses any responses of 'don't know' for the 'fever' or 'cough' or 'influenza vaccination status' variables were removed from analysis. This removed 0.7% of all surveys for these analyses.

For ILI percentage calculations, the numerator was all participants who completed a survey for the current week and reported new ILI symptoms, and the denominator was all participants who completed a survey for that week. New

symptoms were defined as the first week of reporting ILI symptoms (where there were consecutive weeks of reporting ILI symptoms).

A participant was considered to be effectively vaccinated two weeks after they reported being vaccinated. This delay was not applied to participants who were already vaccinated at the time of the first Flutracking survey.

Weekly ILI percentages were compared by self-reported vaccination status for participants. The un-stratified (by vaccination status) ILI percentages were also compared with national laboratory-confirmed influenza notifications for 2009 to 2017.

We compared the weekly percentage of participants from 2011 to 2017 who had fever and cough and 1) two or more days off work or normal duties; and 2) visited a general practitioner or emergency department, or were admitted to hospital.

The average weekly percentage of Flutracking participants with ILI that were tested for influenza was compared across states and territories from 2013 to 2017.

Results

Recruitment

An additional 7,785 Flutracking participants were recruited in 2017, which was lower than the previous two years (8,609 and 9,987 new participants for the years 2016 and 2015 respectively).

For 2017, the most successful recruitment strategies were the email asking existing participants to invite two friends, followed by the first Flutracking survey, followed by the Life Matters radio interview (with 2,754, 1,222 and 749 new participants respectively having signed up in the seven days following each of these events, Figure 1).

Additional activities to improve representation of Aboriginal and Torres Strait Islander participation in Flutracking were undertaken in 2017, including a story on Indigenous X and The Guardian,[12] Facebook and Twitter promotions. These activities only resulted in approximately 30 extra Indigenous participants. Likewise, a paid Facebook advertisement targeting seniors had very limited impact, with five to ten participants aged greater than 60 years signing up in the week following.

The number of "likes" on the Flutracking facebook page increased from 4422 (17 April 2017) to 5097 by the end of the Flutracking surveillance period.

Participation

At least one survey was completed by 19,759 respondents and 14,188 household members for a total of 33,947 participants. This represented a 9.5% increase in the number of participants who completed at least one survey in 2017, compared with 30,998 in 2016 (Figure 2). Of the 30,195 participants who completed a survey during the first four survey weeks, 68.6% completed all available surveys, and 82.1% completed more than 90% of available surveys. A total of 25,501 of the 2016 participants (82.3%) completed at least one survey during 2017 and comprised 75.1% of the 2017 participants.

At state and territory level, increases in peak weekly participation were most marked in Victoria, Queensland and the Australian Capital Territory; however, Victoria and Queensland continued to have less than 100 peak-week participants per 100,000 population (Appendix A). Tasmania continued to have the highest rate of Flutracking participation per 100,000 persons (Figure 3, further details in Appendix A).

Socio-demographic characteristics

Of the participants who completed at least one survey in 2017, complete demographic details were available for 92.3% (these participants would have signed up prior to these data being collected). The largest proportion of participants were aged 50 to 64 years (32.9%), followed by

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Figure 1: Significant Flutracking recruitment events and impact, 2017

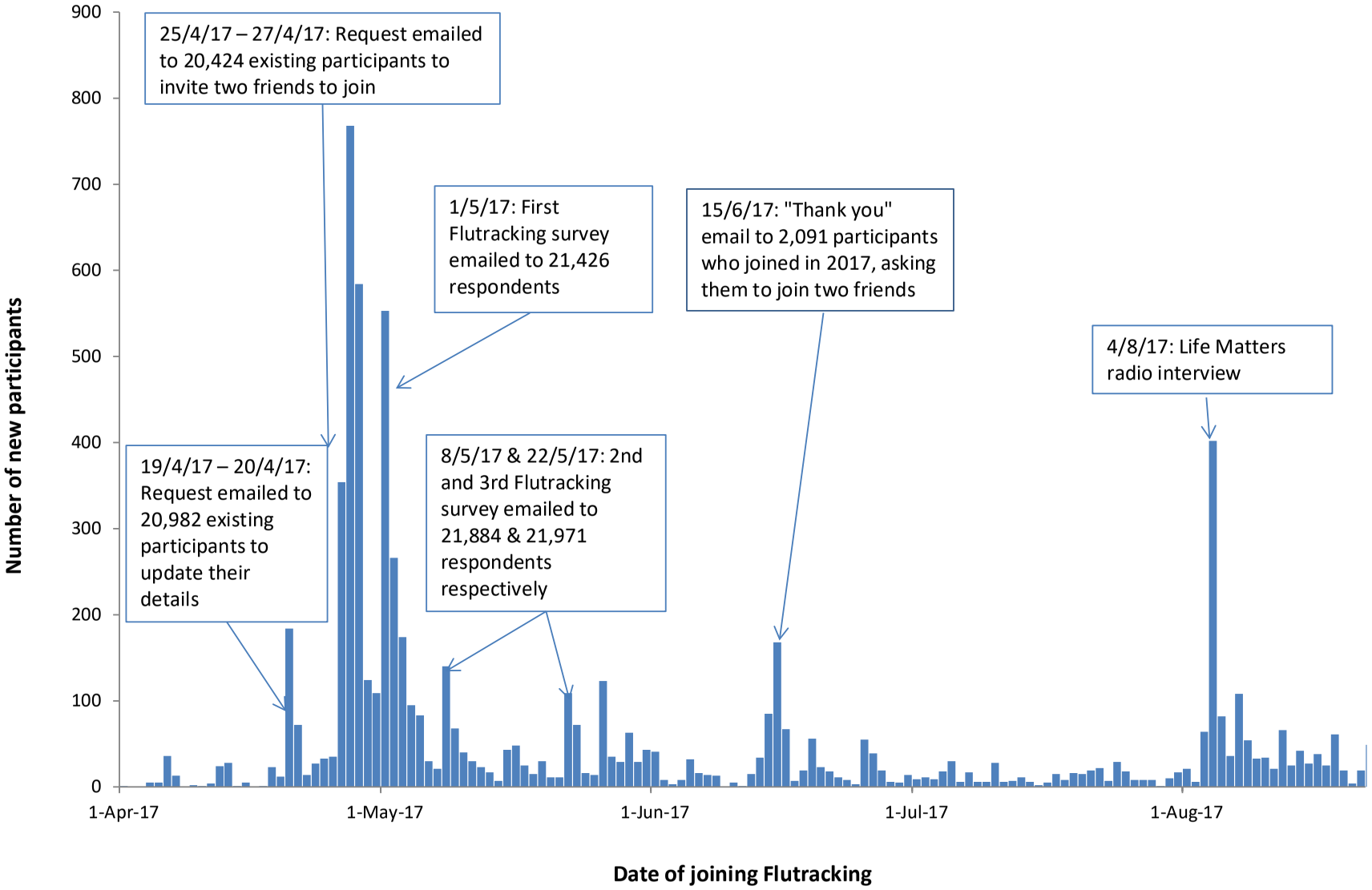


Figure 2: Number of participants who completed at least one survey, 2006 to 2017

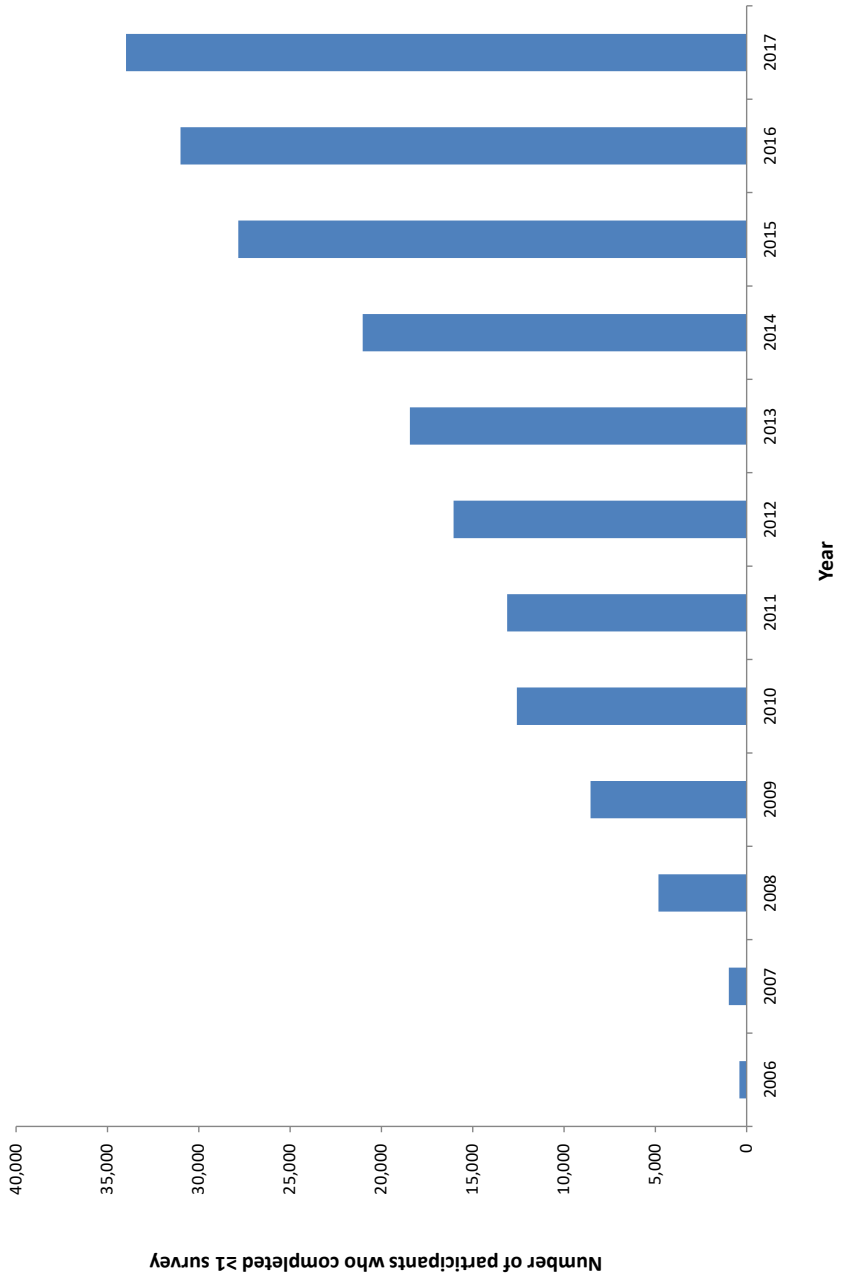


Figure 3. Flutracking participation per 100,000 population, by jurisdiction, 2017

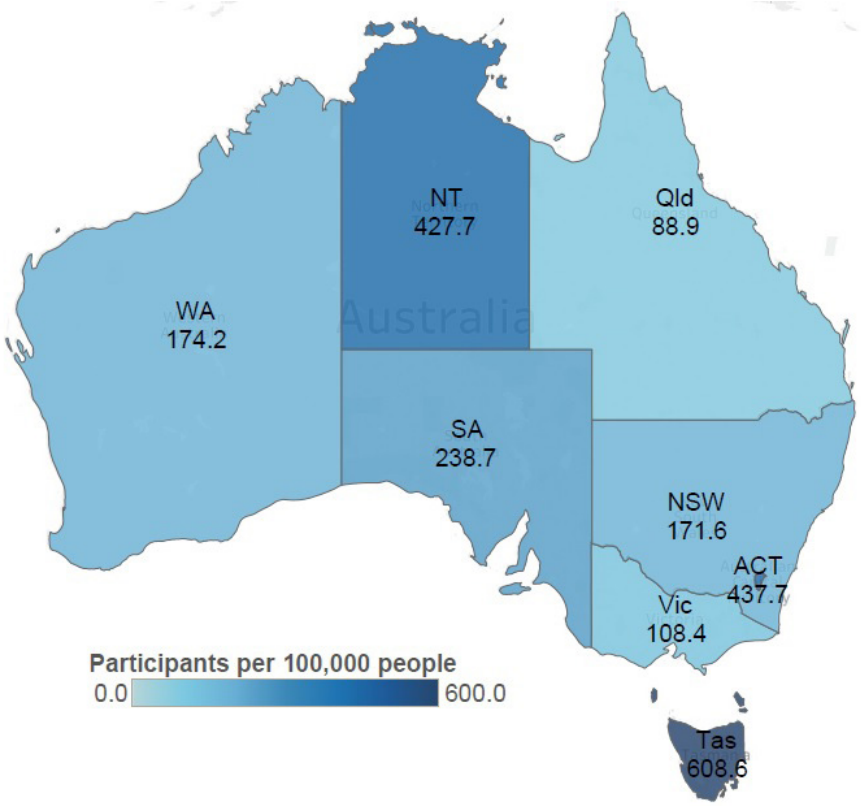
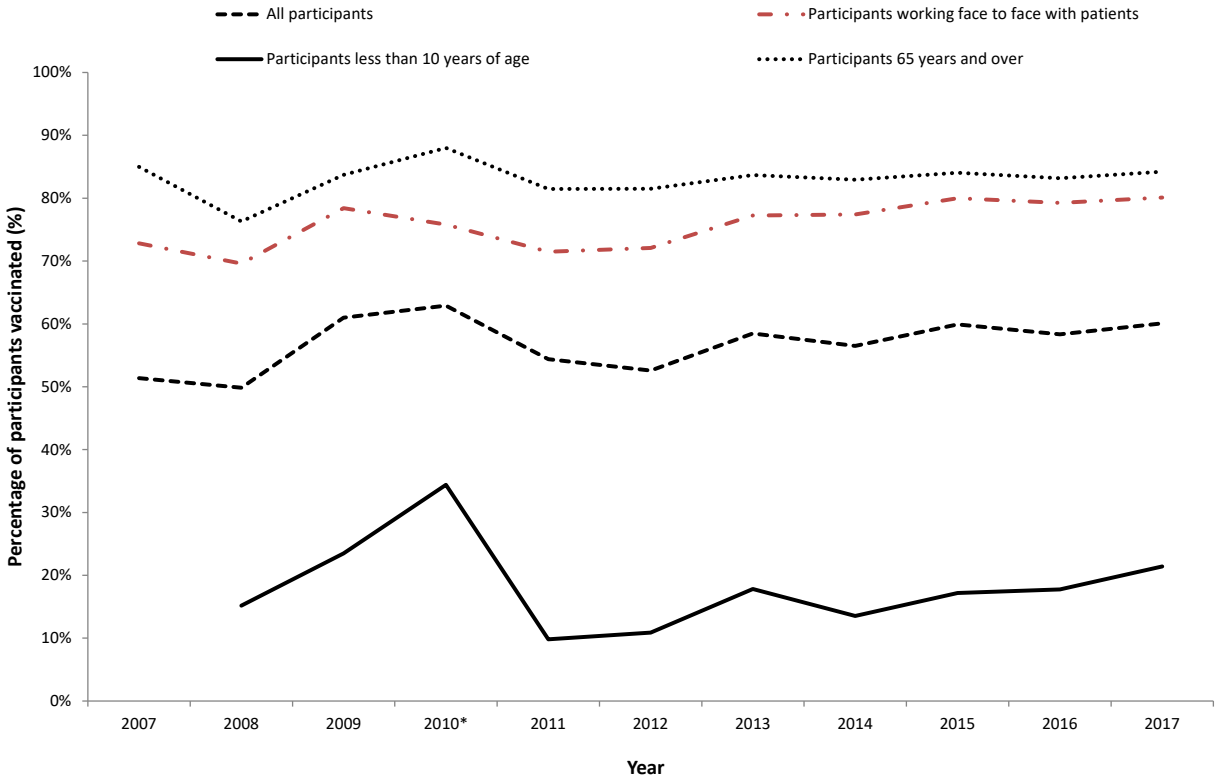


Figure 4: Percentage[a] of participants vaccinated with the seasonal influenza vaccine at the final survey of each participant, by participant characteristics, Australia, 2007 to 2017, by year



a This percentage calculation included participants who received either the monovalent H1N1(2009) influenza vaccine in 2009 or 2010, or received the 2010 seasonal influenza vaccine.

Figure 5: Percent of participants with fever and cough stratified by vaccination status, Australia, 2009 to 2017, by week

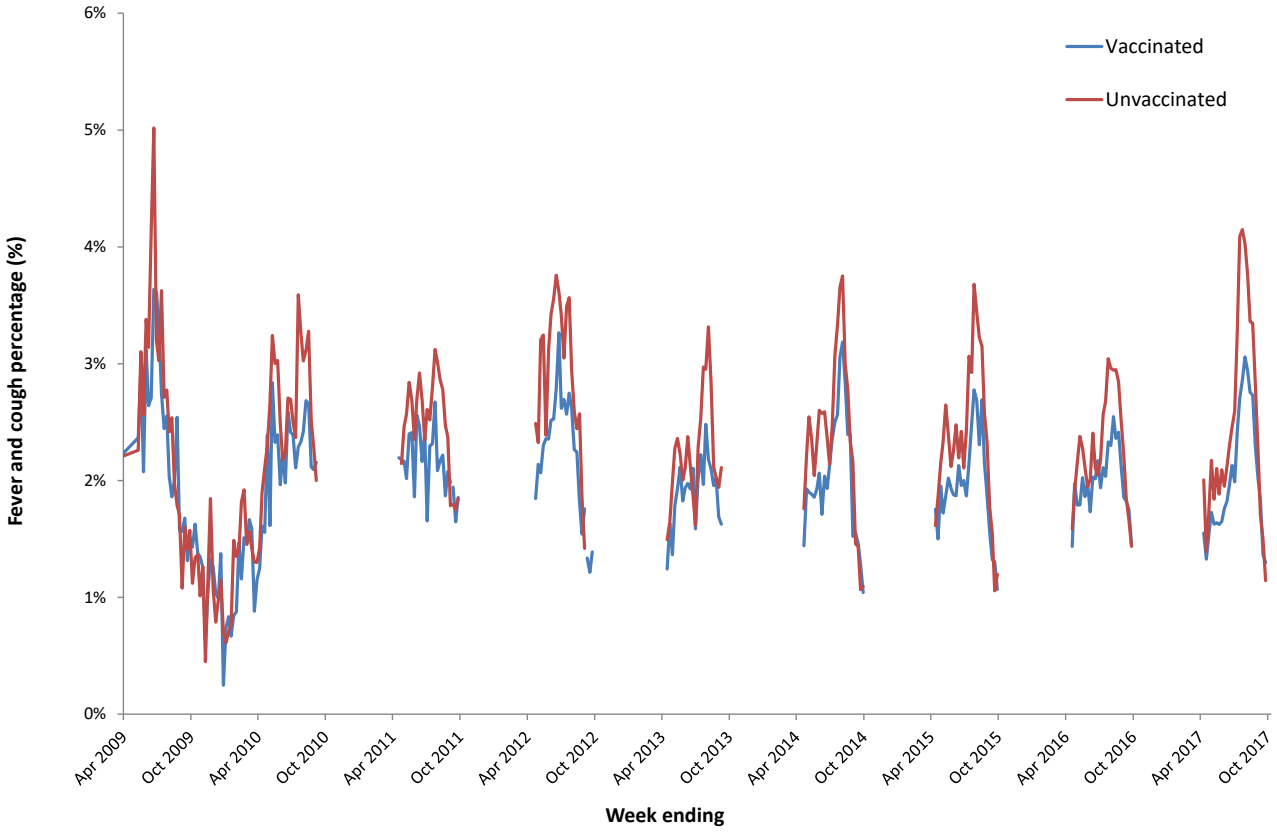
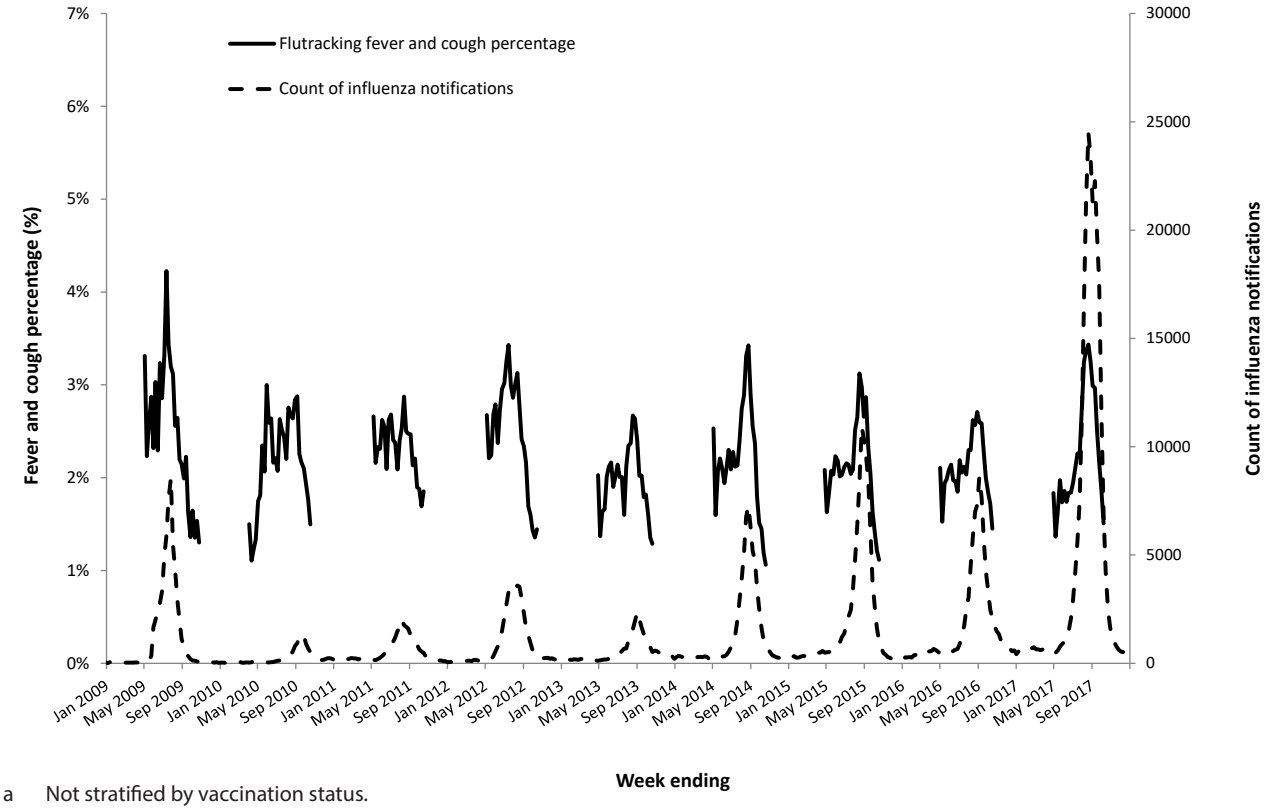


Figure 6: Fever and cough percentage, 1 April to 31 October[a] compared with national influenza laboratory notifications, Australia, 2009 to 2017, by week



a Not stratified by vaccination status.

Figure 7. Average weekly percentage of Flutracking participants with fever and cough that were tested for influenza, by state/territory, 2013–2017

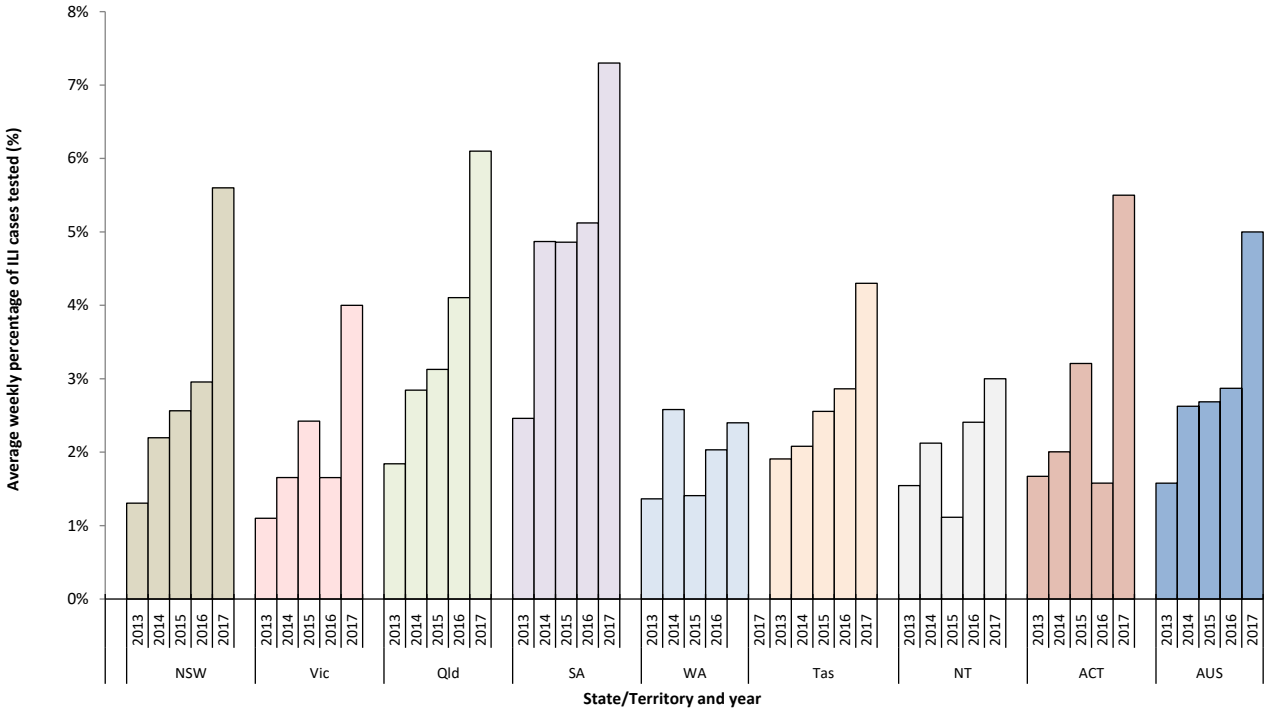
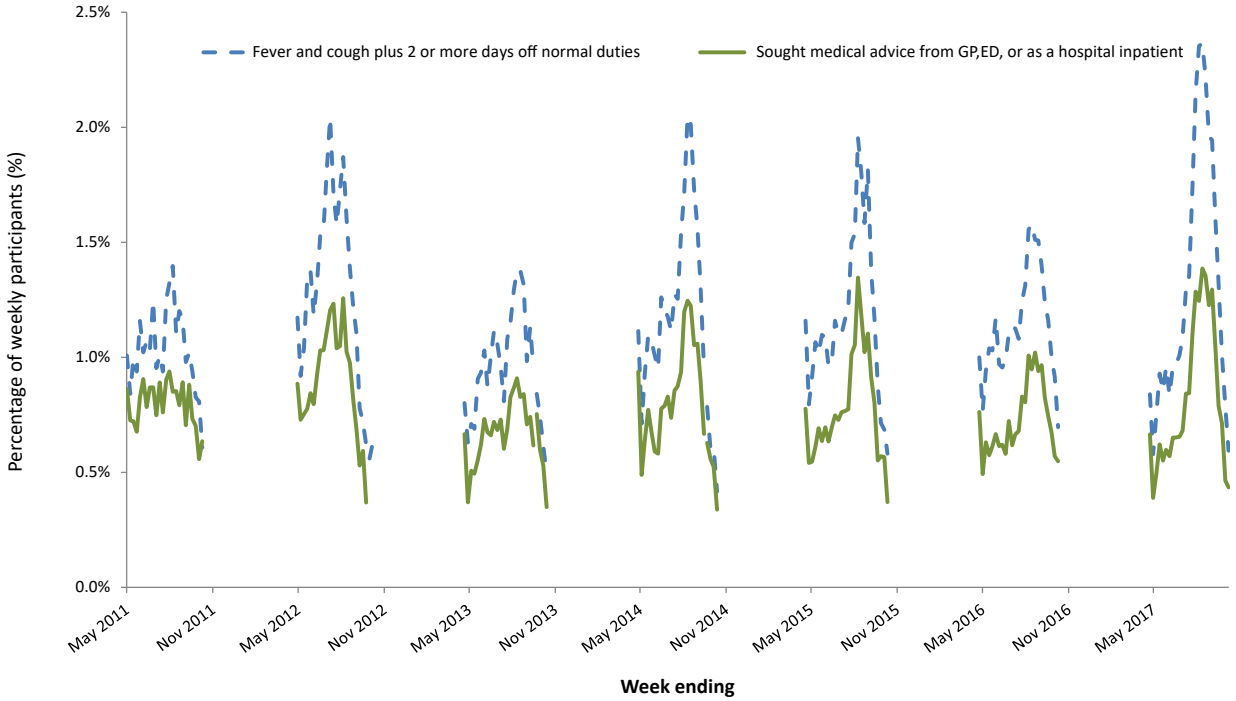


Figure 8: Weekly influenza-like illness severity,[a] Australia, 2011 to 2017



a The denominator is the number of weekly participants.

Figure 9. Burden of Illness pyramid for the peak four weeks of influenza activity in 2016 (weeks ending 15 August – 5 September 2016) and 2017 (weeks ending 6 August – 27 August 2017).

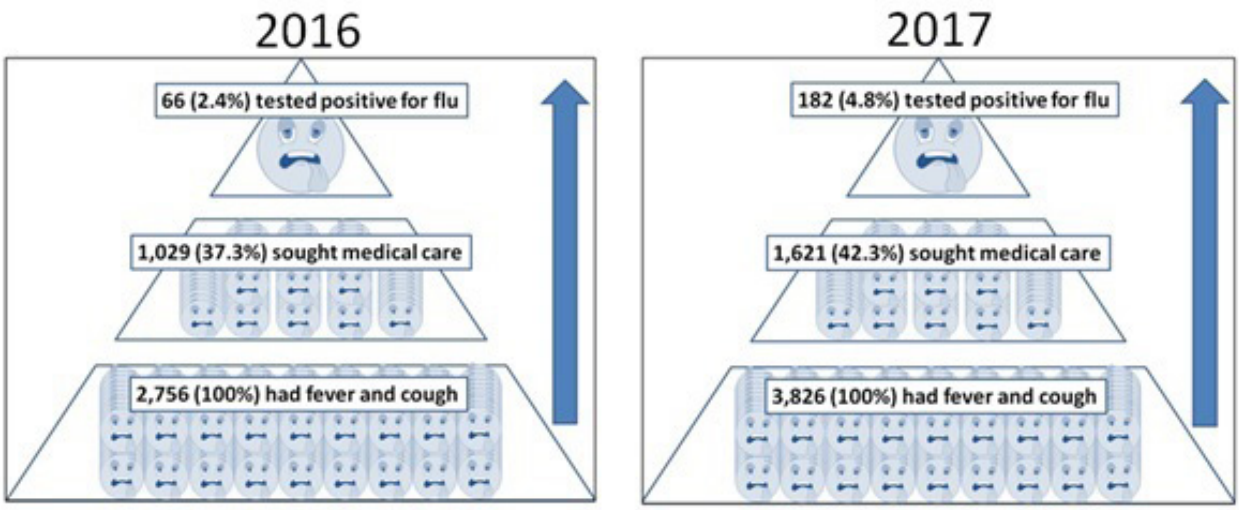
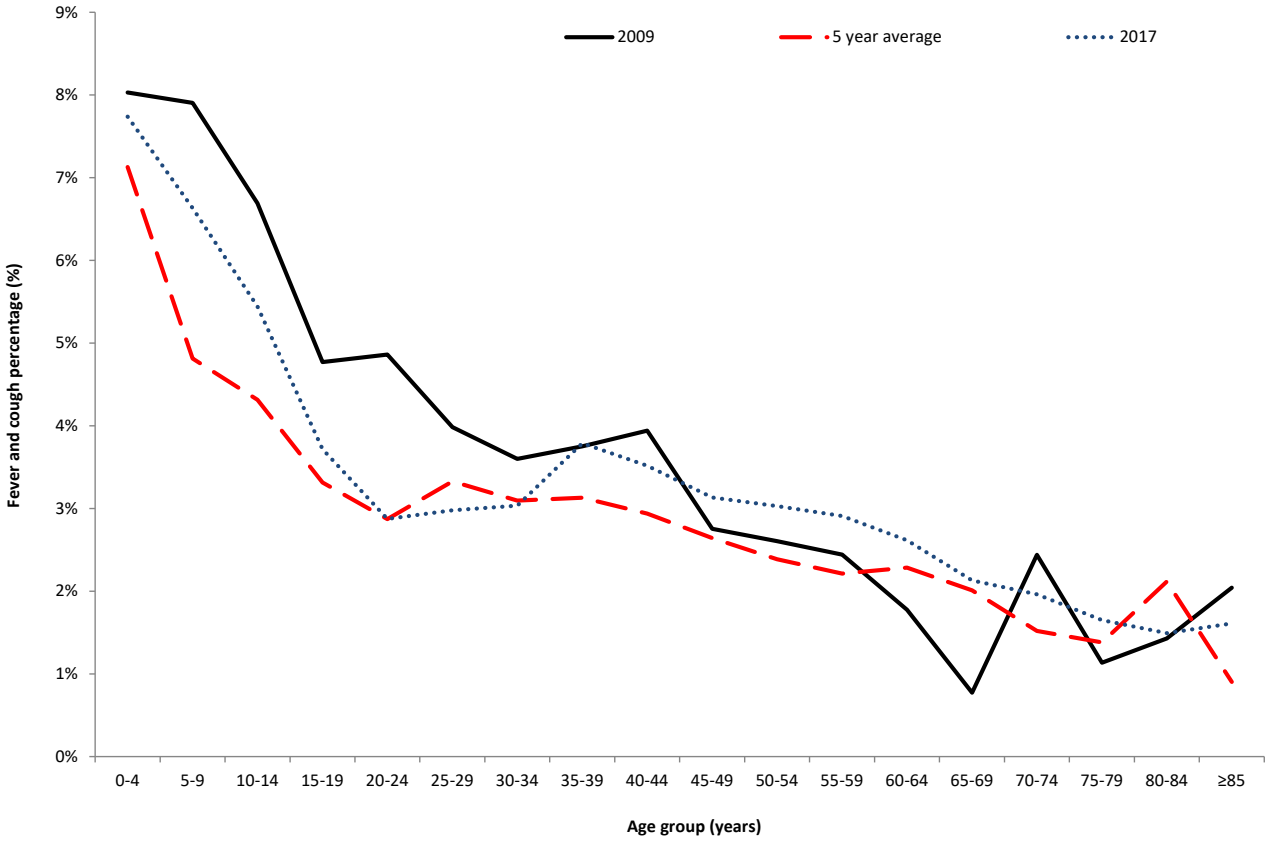


Figure 10: Percentage of participants with fever and cough episodes, for 2009, 2017, and the 2013–2017 five-year average[a]



a Only the 4 peak weeks of fever and cough in Australia for each year were included.

participants aged 35 to 49 years (23.8%), 16 to 34 years (15.7%), 65 and over (14.5%) and zero to 15 years (13.1%, Appendix B). Most participants were female (60.2%), and a high percentage had completed a postgraduate degree (24.9%). In 2017, 1.6% of participants identified as being Aboriginal or Torres Strait Islander (compared to 2.6% of the Australian population).

Time to respond to survey each week

Most participants responded within 24 hours of the survey being sent, with a mean 24 hour response of 72.5% over the 25 weeks. The 65 years or over age group had a mean 24 hour response of 79.1% over the 25 weeks, which was the highest of all age groups.

Percentage of participants vaccinated

By the final survey for 2017, 60.2% (20,421/33,947) of participants had received the 2017 seasonal vaccine, compared with 58.4% (18,088/30,998) of participants vaccinated by the end of 2016. Of the 6,311 participants who identified as working face-to-face with patients in 2017, 5,060 (80.2%) received the vaccine compared with 79.2% by the end of 2016. Vaccination coverage at the end of the 2017 season was 21.4% (565/2,641) in participants less than 10 years of age and 84.2% (4,140/4,916) in participants aged 65 years, compared to 17.8% and 83% in 2016 (Figure 4).

Apart from higher coverage during 2010, the percentage of Flutracking participants vaccinated appears to have remained fairly consistent over the previous 10 years.

Percentage of participants with influenza-like illness symptoms

Of participants who completed a survey in the national peak week of ILI for 2017, 3.4% reported fever and cough, compared with 2.7% in 2016 and 3.1% in 2015. Of participants who completed at least one survey in the national peak four weeks of ILI for 2017, 12.3% reported fever and cough, compared with 9.6% in 2016 and 10.7% in 2015 (Appendix C).

Detection of influenza-like illness

Figure 5 shows the 2009 to 2017 weekly ILI percentages by vaccination status. The peak in ILI activity for 2017 occurred during the weeks ending 13 August and 20 August for the unvaccinated (4.1%) and vaccinated (3.1%) participants, respectively. Divergence between the vaccinated and unvaccinated participants' ILI percentages was highest during the week ending 6 August 2017 (1.4% difference; 4.1% in the unvaccinated group and 2.7% in the vaccinated group).

Comparison with national laboratory influenza notifications

Nationally there was a 2.8-fold increase in the number of laboratory-confirmed cases of influenza in 2017 (n=250,165) compared to 90,534 notifications in 2016 (Figure 6). In 2017, the peak Flutracking ILI level was 3.4% (week ending 20 August), which was the same as the peak week of laboratory notifications of influenza.

Percent of self-reported laboratory influenza tests

There was considerable diversity of rates of influenza laboratory testing across jurisdictions. The average weekly percent of Flutracking participants with fever and cough that were tested for influenza has increased each year from 2013 to 2017 at the national level, with a large increase from 2016 (2.9%) to 2017 (5.0%). This trend was also seen across most jurisdictions, although only a small increase in testing was noted in Western Australia, which had the lowest rate of testing in 2017 at 2.4% of ILI cases (Figure 7).

Time off work or normal duties and health-seeking behaviour

The peak weekly percentage of participants taking time off work or normal duties was 2.4% in 2017 and 1.6% in 2016, while the peak weekly percentage of participants seeking health care was 1.4% in 2017 and 1.0% in 2016 (Figure 8).

Burden of illness pyramid

The proportion of Flutracking participants with ILI that tested positive for influenza in the peak four weeks of influenza activity in 2017 was double the proportion that tested positive in 2016. The proportion of Flutracking participants seeking care for ILI was also higher in 2017 than in 2016 (Figure 9).

Percentage of participants with influenza-like illness by age group

The highest percentage of Flutracking participants with cough and fever was in the youngest age group, declining to the oldest age group (Figure 10). This trend was consistently observed in 2017, 2009 (pandemic year) and the five-year average.

Discussion

During 2017, Flutracking continued to engage large numbers of community members to participate in surveillance. We also provided context to the severity and magnitude of the influenza season and provided insight into the community burden of ILI as a complement to other surveillance systems.

Data was shared with health authorities on a weekly basis, showing a later and higher ILI burden in the community compared to previous years. We were able to demonstrate a near doubling of laboratory testing in Flutracking participants over time and the highest burden of ILI in the community since the 2009 pandemic, but not the worst on record (as standard laboratory surveillance suggested). This finding was relatively consistent with other surveillance systems regarding the peak and duration of the influenza season.

Whilst recruitment continued to increase in numbers, we appear to be recruiting the same demographic of persons. The profile of Flutracking participants continued to have higher education, more females and fewer younger and Indigenous Australians (in comparison to the Australian population).

The commitment of the surveillance cohort of Flutracking participants was demonstrated by the large proportion of participants that completed their surveys within 24 hours (average 72.5%) and the high completion rate, with 68.5% and 82.1% of participants completing all and greater than 90% of surveys, respectively.

These completion rates are much higher than other community-based surveillance systems internationally. Flu Near You, the community-based surveillance system in the United States of America reported a median of four and five surveys completed per participant per year for the 2012–13 and 2013–14 seasons respectively. Higher completion rates were even less common, with 10.4% and 21.9% of participants submitted between 16 and 33 reports for the 2012–13 and 2013–14 seasons respectively.[13] The reasons for the difference in these completion rates are unclear, but may be due to the user experience and brevity of the Flutracking survey.

Seasonal influenza vaccination coverage of Flutracking participants has remained stable over the past ten years. Vaccination coverage among Flutracking participants was higher than other available data sources.[14,15] Flutracking participants are more likely to be vaccinated than the general population based on motives to participate in the survey and because unvaccinated participants are asked about their vaccination status each week. However, year to year trends in Flutracking vaccination coverage provide a rapid and important contribution to understanding vaccination coverage given the potential bias of other systems (such as limited numbers and generalisability of the adult vaccination survey and under-reporting to the Australian Immunisation Register).

The low ILI burden in the 65 years and over age group is inconsistent with the high burden of illness seen in this age group in the national laboratory-confirmed influenza notifications.[16]

It is unclear which surveillance data source best describes the burden of ILI in the elderly residing in the community. A fever and cough case definition may have lower sensitivity in the elderly, as there is evidence suggesting the elderly are less likely to experience fever as an influenza symptom.[17] Also, Flutracking participants aged 65 years and older may be of high socio-economic status and retaining their immune competence. Additionally, there could be a bias towards more testing for influenza in the elderly, inflating the number of confirmed influenza notifications in this group, compared to other age groups.

The timing of the peak percent of ILI in Flutracking appeared to be largely consistent with the peak in the notification of laboratory-confirmed influenza cases. Nationally, the number of laboratory-confirmed influenza notifications in 2017 was the highest on record. Flutracking data showed that this may be due to an increase in testing, due to a large increase in the percent of participants with ILI having a test for influenza (1.7-fold increase in 2017 compared to 2016).

During 2018, we aim to continue expanding Flutracking participation in Australia and our near neighbours.

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Appendix A: Recruitment to and peak week participation in Flutracking, 2016 and 2017, by jurisdiction

State or Territory	2016 (participation during peak week)			2017 (participation during peak week)			Percent distribution of Australian population	Percent change 2016 to 2017
	Number of participants	Flutracking participation per 100,000 population	Percent of participants	Number of participants	Flutracking participation per 100,000 population	Percent of participants		
NSW	8,643	109.9	31.9	9,782	124.4	32.8	32.0	13.2
Vic	4,002	63.3	14.8	4,935	78.0	16.6	25.7	23.3
Qld	2,594	52.6	9.6	2,989	60.6	10.0	20.0	15.2
SA	3,471	201.4	12.8	3,400	197.3	11.4	7.0	-2.0
WA	3,604	139.7	13.3	3,583	138.9	12.0	10.5	-0.6
Tas	2,635	505.9	9.7	2,750	527.9	9.2	2.1	4.4
NT	921	374.2	3.4	986	400.7	3.3	1.0	7.1
ACT	1,224	298.3	4.5	1,387	338.0	4.7	1.7	13.3
Total	**27,094**	**110.1**	**100**	**29,814**	**121.2**	**100**	**100**	**10.0**

Appendix B: Socio-demographic characteristics of Flutracking participants who completed at least one survey during 2016 and 2017

	2016			2017			% Distribution of the Australian population
	Frequency	%	Rate per 100,000	Frequency	%	Rate per 100,000	
Age (years)							
0–15	4,100	12.9	83.4	4,454	13.1	90.6	20.0
16–34	5,479	17.3	83.0	5,335	15.7	80.8	26.8
35–49	7,877	24.9	160.4	8,075	23.8	164.5	20.0
50–64	10,576	33.4	241.5	11,167	32.9	255.0	17.8
65 and over	3,635	11.5	95.8	4,916	14.5	129.5	15.4
Total participants	**31,667**	**100**	**128.7**	**33,947**	**100**	**138.0**	**100**
Gender							
Male	11,683	39.3	97.4	13,155	39.7	107.8	49.6
Female	18,015	60.7	148.5	19,935	60.2	160.8	50.4
Total reported	**29,698**	**100**	**120.7**	**33,095**	**100**	**134.5**	**100**
Highest level of education completed by participant							
Year 11 or below (or equiv) or Certificate I/II/III/IV	5,224	21.1	68.3	5,612	20.4	73.3	44.1
Year 12 (or equivalent)	2,016	8.2	69.9	2,241	8.1	77.7	16.6
Advanced Diploma/Diploma	2,311	9.3	165.9	2,544	9.2	182.6	8.0
Completed Bachelor Degree	5,866	23.7	250.6	6,600	23.9	282.0	13.5
Grad Diploma/Grad Certificate	3,296	13.3	1,108.7	3,688	13.4	1240.6	1.7
Postgraduate Degree	6,013	24.3	952.7	6,875	24.9	1,089.3	3.6
Total who nominated an ABS equivalent education level (15 years and over only)	**24,726**	**100**	**142.4**	**27,560**	**100**	**158.7**	**100**
Aboriginal and/or Torres Strait Islander							
Yes	412	1.5	63.5	492	1.6	75.8	2.6
No	27016	98.5	112.8	30,897	98.4	129.0	97.4
Total reported	**27428**	**100**	**111.5**	**31,389**	**100**	**127.6**	**100**

Appendix C: Percentage of participants with influenza-like illness symptoms who completed a survey either in the national peak influenza-like illness week, or completed at least one survey in the national peak 4 weeks of influenza-like illness, Australia, 2015 to 2017

ILI symptoms	Participants who completed a survey in the peak week of ILI nationally						Participants who completed at least one survey during the peak 4 weeks of ILI nationally					
	2015[a]		2016[b]		2017[c]		2015[d]		2016[e]		2017[f]	
	n	%	n	%	n	%	n	%	n	%	n	%
Fever	1,232	5.2	1,223	4.7	1,703	5.8	3,544	14.1	3,637	13.1	4,954	16.0
Cough	3,635	15.2	3,878	14.8	4,821	16.4	7,612	30.3	8,267	29.8	10,009	32.2
Fever & cough	747	3.1	705	2.7	1,008	3.4	2,689	10.7	2,665	9.6	3,826	12.3
Fever, cough & sore throat	586	2.5	567	2.2	766	2.6	2,110	8.4	2,128	7.7	2,965	9.6

a Week ending 16 August 2015, N=23,913
b Week ending 28 August 2016, N=26,117
c Week ending 20 August 2017, N=29,355
d Weeks ending 16 August to 6 September 2015, N=25,129
e Weeks ending 14 August to 4 September 2016, N= 27,765
f Weeks ending 6 August to 27 August 2017, N=31,047