Flutracking weekly online community survey of influenza-like illness annual report 2011 and 2012

Sandra J Carlson, Craig B Dalton, Michelle T Butler, John Fejsa, Elissa Elvidge, David N Durrheim

Abstract

Flutracking is a national online community influenza-like illness (ILI) surveillance system that monitors weekly ILI activity and field vaccine effectiveness (FVE). This article reports on the 2011 and 2012 findings from Flutracking. There was a 22% increase in participants to 16,046 who completed at least one survey in 2012, compared with 2011 (13,101). By October 2012 (the end of the 2012 season), 54.2% of participants had received the 2012 seasonal vaccine, while by the end of the 2011 season, 55.9% of participants had received the 2011 seasonal vaccine. From 2007 to 2012 the FVE calculation for New South Wales participants demonstrated that the seasonal vaccine was effective except in 2009 when a novel H1N1 virus was dominant. The 2012 Flutracking ILI weekly incidence peaked in mid-July at 4.9% in the unvaccinated group, 1 month earlier than laboratory confirmed influenza. The 2011 Flutracking ILI weekly incidence peaked in mid-August at 4.1% in the unvaccinated group, 1 week later than laboratory confirmed influenza. Similar to laboratory notifications, there was an increase in ILI activity from 2010 to 2012, with the peak weekly ILI prevalence for 2012 Flutracking data, (unstratified by vaccination status), being higher (4.7%) than the peak weekly prevalence for 2011 (3.8%) and 2010 (3.7%). The 2012 Flutracking influenza season showed moderate levels of ILI, compared with lower levels of ILI seen in 2011 and 2010, and consistent with the increase in national influenza laboratory notifications. *Commun Dis Intell* 2013;37(4):E398–E406.

Keywords: influenza, surveillance, syndromic surveillance, influenza-like illness, survey, Flutracking.

Background

There are a number of surveillance methods that contribute to influenza surveillance in Australia each year.[1] Integrating data from each of these systems is vital to create a timely and accurate picture of influenza activity, as each surveillance method has its strengths and limitations. The Flutracking surveillance system makes an important contribution to Australian influenza surveillance by providing weekly community level influenza-like illness (ILI) attack rates that are not biased by health seeking behaviour and clinician testing practices.[2–5] The Flutracking surveillance system has been incorporated into the weekly Australian influenza report since 2009.[1]

The main aims of Flutracking have been to:

1. compare ILI syndrome rates between vaccinated and unvaccinated participants to detect inter-pandemic and pandemic influenza and provide early confirmation of vaccine effectiveness or failure;
2. provide consistent surveillance of influenza activity across all jurisdictions and over time; and
3. provide year to year comparison of the timing, incidence, and severity of influenza.

In 2011 new questions were added to the Flutracking surveillance system to document health seeking behaviour amongst participants. This enabled regular calculation of influenza burden of illness pyramids to examine the proportion of participants with ILI that sought medical care, the type of medical care sought, and the proportion tested for influenza.

This article reports on the 2011 and 2012 findings from the Flutracking ILI surveillance system.

Methods

We report on participation numbers compared with previous years, socio-demographic data, vaccination uptake for the seasonal influenza vaccine amongst participants, field vaccine effectiveness (FVE) estimates, weekly ILI estimates and comparison of these estimates with Australian laboratory influenza notifications.

Survey methodology

The Flutracking surveillance system was in operation for 24 weeks in 2011, from the week ending 8 May to the week ending 16 October 2011, and for 24 weeks in 2012, from the week ending 6 May to the week ending 14 October 2012. The recruitment methods in 2011 and 2012 were similar to those used in 2007–2010.[2] In 2011, the focus of recruitment was state-based government organisations

in Western Australia, Queensland and Victoria, with a view to expanding Flutracking to improve its national representativeness of ILI weekly prevalence comparison across states and territories. In 2012, the focus of recruitment was also to improve state-based representativeness (focusing on Victoria and Western Australia), as well as boost national participation further by contacting large government and private organisations. In 2011 and 2012, 168 and 279 organisations respectively were contacted and requested to participate in Flutracking. Social media tools, including Facebook and Twitter, as well as media releases were also used to communicate with current participants and recruit new participants.

The weekly survey in 2011 and 2012 was similar to that used in 2007 to 2010.[2] However, in 2011 the following questions were added to the initial questionnaire that participants receive upon registration (existing participants were also asked to complete these new questions):

- gender of participant
- highest level of educational attainment (for participants 15 years of age or older).

In 2011, additional questions on health seeking behaviour that allow a surveillance pyramid to be constructed were also added. These findings have been published.[6]

Aboriginal and Torres Strait Islander status was also added to the questionnaire in 2012. In addition, participants selecting both fever and cough for a particular week were asked whether they had experienced a sore throat in the 2012 survey.

Participation and vaccination rate

Peak weekly participation numbers were reported for 2012 at the national and state or territory level and compared with the participation numbers in 2008, the first year that Flutracking was expanded nationally. The participation rate (per 100,000) was calculated using the number of participants in the peak week and the March 2012 estimated resident population for each state and territory from the Australian Bureau of Statistics.[7]

The percentage of participants who completed at least one survey in 2012 and identified as Aboriginal and/or Torres Strait Islander was calculated nationally.

The percentage of participants who completed the final survey of the season and who were vaccinated with the seasonal influenza vaccine was calculated nationally for 2011 and 2012.

The proportion of participants less than 10 years of age whose parents completed the final survey of the season on their behalf and who were vaccinated with the seasonal influenza vaccine, was calculated nationally for 2011 and 2012.

The proportion of participants reporting a sore throat in the national peak week of ILI for 2012 (peak week determined using the number of participants with fever and cough divided by the total number of participants for that week), were compared with the proportion of participants in this same week with fever, cough, and fever and cough.

The proportion of participants with a sore throat in the peak 4 weeks of ILI for 2012 were compared with the proportion of participants in this same 4 weeks with fever, cough, and fever and cough.

Field vaccine effectiveness for influenza-like illness

A FVE analysis for New South Wales participants 18 years of age or older was conducted for 2011 and 2012 using a similar method to 2010.[8]

Vaccine effectiveness (VE) was calculated as follows:

VE = 100 x (1 – relative risk)

= 100 x (1 – (ILI rate in vaccinated group/ILI rate in unvaccinated group))

The peak influenza period was defined as the 4 consecutive weeks with the highest weekly Flutracking ILI rates for unvaccinated participants. Table 1 shows peak influenza periods used in yearly vaccine effectiveness calculations.

Weekly influenza-like illness prevalence and national laboratory influenza notifications

An analysis of the difference in weekly ILI prevalence amongst vaccinated and unvaccinated participants was conducted at both the national

Table 1: Peak influenza periods used in yearly vaccine effectiveness calculations

Year	Peak influenza period (week ending)
2007	29 July – 19 August
2008	17 August – 7 September
2009	5 July – 26 July
2010	15 August – 6 September
2011	22 May – 12 June
2012	27 May – 17 June

level and state or territory level for states and territories with greater than 1,000 participants from 2010 to 2012. Vaccination was defined as having received seasonal vaccine in the year of participation. Weekly ILI prevalence was reported using a definition of fever and cough in the preceding week. The unstratified ILI rates were compared with national laboratory influenza notifications for 2009 to 2012.

Results

Participation in 2011 and 2012

Amongst the 14,467 participants in the first 4 weeks of the survey in 2012, the median weekly participation rate during the 2012 survey period was 96%. Amongst the 12,109 participants who participated in the first 4 weeks of the survey in 2011, the median weekly participation rate during the 2011 survey period was 96%. Nationally, participation has more than doubled from 2008 to 2012 (Table 2). At a state or territory level, increases were most marked in the Northern Territory, South Australia, and Queensland. Tasmania had the highest rate of Flutracking participation per 100,000 persons, followed by the Northern Territory and South Australia. There were 16,046 participants who completed at least one survey in 2012, compared with 13,101 in 2011 (a 22% increase); 12,581 in 2010; 8,546 participants in 2009; 4,827 in 2008; 982 in 2007; and 394 in 2006.

The most successful recruitment strategy in 2012 was through existing participants. A *Welcome back to Flutracking for 2012* email sent to all active participants on 2 May included a suggestion that participants invite 3 people to join the survey using an email link to 'Tell-a-Friend'. There were significant increases in participant numbers on 2 May (1,032 participants enrolled), 3 May (242 participants enrolled) and 4 May (105 participants enrolled). The second successful recruitment strategy was through the first survey email (sent on 7 May), which also included the 'Tell-a-Friend' email recruitment link. Spikes in recruitment of participants with email domains of organisations that had recently distributed Flutracking recruitment invitations via email demonstrate the effectiveness of this strategy (Figure 1). A large increase in recruitment of participants immediately followed an interview discussing the Flutracking surveillance system on national radio in April 2011 (Figure 2).

Socio-demographic data

Amongst Flutracking participants who completed at least one survey each year, 66% and 64% were female in 2011 and 2012 respectively, and 24% of participants had a postgraduate degree (Table 3.)

Of those who completed at least one survey in 2012, 8,800 participants (54.8%) completed the Aboriginal/Torres Strait Islander status question. Of those who completed the question, 102 (1.2%) identified as either Aboriginal, Torres Strait Islander, or both Aboriginal and Torres Strait Islander, and 98.8% (8,698 participants) identified as neither Aboriginal or Torres Strait Islander.

Survey response time

In 2011, 42% of participants responded to the survey by the end of the first business day (5:00 pm AEST), 87% by the end of the second business day, and 93% by the end of the third business day. In 2012, 39% of participants responded to the survey

Table 2: Recruitment to Flutracking, 2008 and 2012, by state or territory

State or territory	Number of respondents (peak week) 2008	Number of respondents (peak week) 2012	Percentage positive change	Rate of Flutracking participation per 100,000 population
ACT	159	371	133	99
NSW	2,689	4,328	61	60
NT	2	587	29,250	252
Qld	158	1,315	732	29
SA	52	2,555	4,813	155
Tas	1,235	1,804	46	352
Vic	404	2,029	402	36
WA	128	718	461	30
Total	4,827	13,707	184	61

by the end of the first business day (5:00 pm), 88% by the end of the second business day, and 93% by the end of the third business day.

Proportion of participants with influenza-like illness

By the end of the 2012 season (week ending 14 October 2012), 54.2% (7,071/13,050) of participants had received the 2012 seasonal vaccine, compared with 55.9% (5,950/10,643) of participants by the end of 2011. Seasonal vaccination levels were similar each year, with 64.8% of participants vaccinated in 2010, 59.5% vaccinated in 2009, 50.7% vaccinated in 2008, and 52.9% vaccinated in 2007. Of the 2,735 participants who identified as working face-to-face with patients in 2012, 2,007 (73.4%) received the vaccine compared with 73.0% by the end of 2011, and 77.5% by the end of 2010. In 2012, 11.6% of participants less than 10 years

Figure 1: Significant recruitment events for Flutracking and impact, 2012

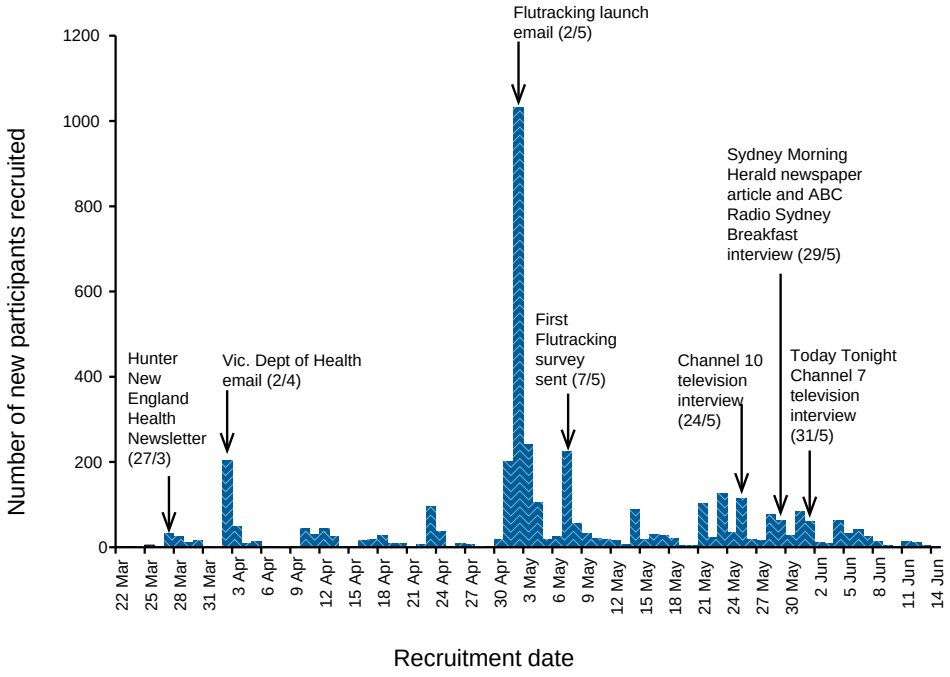


Figure 2: Significant recruitment events for Flutracking and impact, 2011

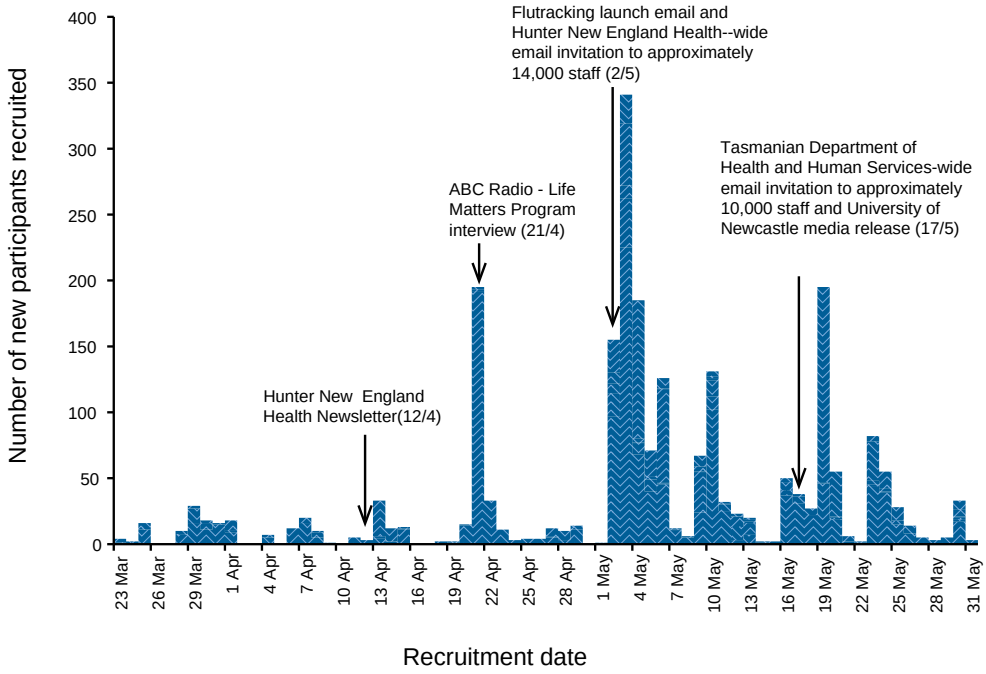


Table 3: Socio-demographic characteristics of Flutracking participants, 2011 and 2012

Age (years)	2011		2012	
	Frequency	Per cent	Frequency	Per cent
0–15	1,404	10.7	1,854	11.6
16–34	2,290	17.5	2,902	18.1
35–49	3,928	30.0	4,544	28.3
50–64	4,722	36.0	5,623	35.0
65 and over	757	5.8	1,123	7.0
Total participants	13,101	100.0	16,046	100.0
Gender				
Male	2,737	33.8	4,882	36.4
Female	5,354	66.2	8,516	63.6
Total reported	8,091	100.0	13,398	100.0
Education				
Year 10 or below (or equiv)	504	6.8	918	7.2
Year 11 (or equivalent)	225	3.1	392	3.1
Year 12 (or equivalent)	500	6.8	912	7.2
Certificate I/II/III/IV	683	9.3	1,211	9.5
Advanced Diploma/Diploma	731	9.9	1,190	9.3
Enrolled Bachelor Degree	208	2.8	428	3.4
Completed Bachelor Degree	1,674	22.7	2,871	22.5
Grad Diploma/Grad Certificate	1,079	14.6	1,762	13.8
Postgraduate Degree	1,782	24.1	3,071	24.1
Total reported (15 years and over only)	7,386	100.0	12,755	100.0
Aboriginal and/or Torres Strait Islander				
Yes	N/A	N/A	102	1.2
No	N/A	N/A	8,698	98.8
Total reported	N/A	N/A	8,800	100.0

Table 4: Count of participants vaccinated with the seasonal influenza vaccine at the final survey of each year, for all participants, participants working face-to-face with patients, and participants less than 10 years of age

Participant group	Year					
	2007	2008	2009	2010	2011	2012
All participants						
Received vaccine	52.9%	50.7%	59.5%	64.8%	55.9%	54.2%
Number of participants	726	3,893	5,216	9,109	10,643	13,050
Participants working face to face with patients						
Received vaccine	73.3%	71.2%	76.8%	77.5%	73.0%	73.4%
Number of participants	221	1,144	1,360	2,059	2,497	2,735
Participants less than 10 years of age						
Received vaccine	N/A	15.8%	18.7%	15.8%	10.6%	11.6%
Number of participants	N/A	202	284	501	623	850

of age whose parents completed a survey on their behalf were vaccinated with the seasonal influenza vaccine by the end of the season, compared with 10.6% in 2011, and 15.8% in 2010 (Table 4).

Proportion of participants with sore throat

Of the 13,707 participants who completed a survey in the national peak week of ILI for 2012 (week ending 15 July 2012), 449 participants (3.3%)

Table 5: 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 four weeks of influenza-like illness, 2012

Influenza-like illness symptoms	Participants who completed survey in national peak influenza-like illness week*	Participants who completed at least one survey during national peak 4 weeks influenza-like illness
Fever, cough and sore throat	3.3%	9.3%
Fever	5.7%	14.9%
Cough	16.4%	32.4%
Fever and cough	4.7%	12.1%

* Week ending 15 July 2012, N= 13,707

† Weeks ending 1 to 22 July 2012, N=14,851

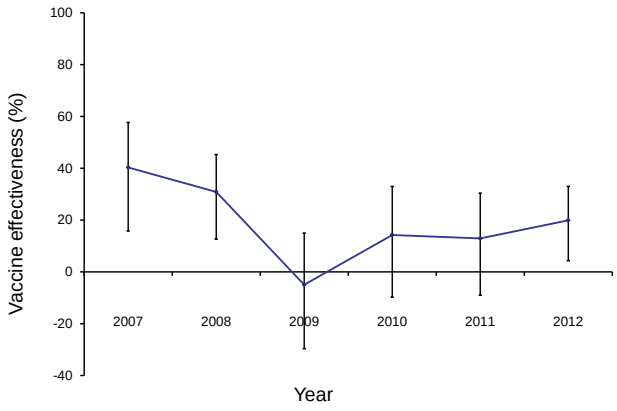
reported fever, cough and sore throat. In this same week, 785 participants (5.7%) reported fever, 2,254 participants (16.4%) reported cough, and 646 participants (4.7%) reported fever and cough (Table 5).

Of the 14,851 participants who completed at least one survey in the national peak 4 weeks of ILI for 2012 (weeks ending 1–22 July 2012, 1,377 participants (9.3%) reported fever, cough and sore throat. In the same peak 4 weeks, 2,206 participants (14.9%) reported fever, 4,814 participants (32.4%) reported cough, and 1,795 participants (12.1%) reported fever and cough (Table 5).

Field vaccine effectiveness for influenza-like illness

From 2007 to 2012 the FVE calculation for New South Wales participants demonstrated that the seasonal vaccine was effective in reducing the risk of ILI except in 2009 during the pandemic (Figure 3).

Figure 3: Field vaccine effectiveness against all influenza-like illness for peak 4 weeks in New South Wales, participants greater than 18 years of age, 2007 to 2012

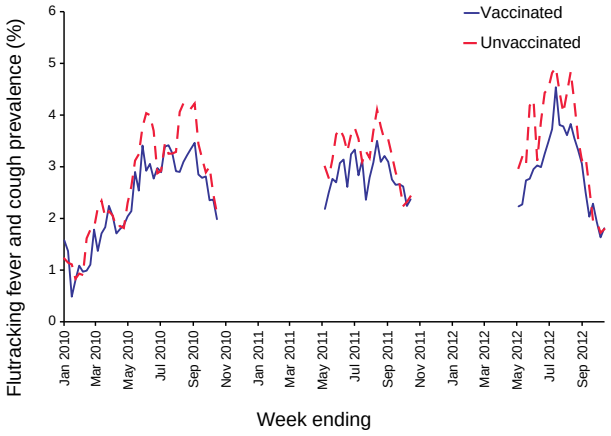


95% confidence intervals are represented by the bars in the figure

Detection of influenza-like illness

Peak ILI activity for 2012 was in mid-July (4.9% in the unvaccinated group) (Figure 4). However, the divergence between ILI prevalence for the vaccinated and unvaccinated participants was highest in early June and mid-August. The 2012 season was moderate, but higher levels of ILI were seen than in 2011 and 2010. Peak ILI activity for 2011 was in mid-August (4.1% in the unvaccinated group). However, the divergence between ILI prevalence in vaccinated and unvaccinated participants was greatest between late May and early June. Peak weekly ILI prevalence in 2011 (4.1% amongst unvaccinated participants) was similar to peak weekly ILI prevalence in 2010 (4.2% amongst unvaccinated participants).

Figure 4: Weekly national fever and cough prevalence, 2010 to 2012, by vaccination status

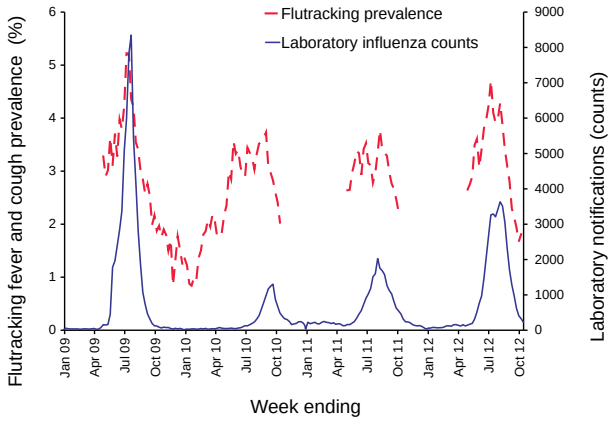


Comparison with national laboratory influenza notifications

There was an increase in the number of laboratory confirmed cases of influenza between 2010 and

2012 (from 1,301 in the peak week of 2010 to 2,026 in the peak week of 2011 to 3,631 in the peak week of 2012). The peak weekly ILI prevalence for 2012 Flutracking data unstratified by vaccination status was also higher (4.7%) than the peak weekly prevalence for 2011 (3.8%) and 2010 (3.7%). However, the increase in Flutracking ILI prevalence was not as large between 2010 and 2011 as it was for laboratory confirmed cases of influenza (Figure 5).

Figure 5: Flutracking weekly national fever and cough prevalence, April through October 2009 to 2012, compared with national influenza laboratory notifications



Discussion

With each additional year of Flutracking surveillance, the number of participants has steadily grown. Media releases are useful and high profile media programs can result in significant recruitment as demonstrated by the increase in participant numbers seen in 2011, but an invitation email to a potential participant has the advantage of being immediately clickable to initiate the enrolment process. While media coverage on television and radio does provide enhanced awareness of Flutracking, unless a potential participant is actually at a computer during the program they cannot immediately enrol and must remember the Internet address for later enrolment. Newspapers that include online coverage with hyperlinks to the Flutracking web site (Flutracking.net) may be more effective.

Flutracking participants have high levels of educational attainment with 60.4% of Flutracking participants aged 15 years or over holding a bachelor's degree or higher post school qualification compared with 25.4% of Australians aged 15–64 years.[9]

In 2011 and 2012, Flutracking was the only surveillance system providing weekly updates of vaccination uptake. Although the Flutracking sample may not be representative of the Australian population, results from this system are still useful for monitoring long term trends or detecting changes in vaccine uptake. The decreased influenza vaccination coverage of participants under 10 years of age after 2010 may be due to decreased concern about influenza after a relatively mild influenza pandemic or increased concern about adverse reactions to the vaccine following media coverage of adverse events in 2010 associated with the CSL Biotherapies Fluvax and Fluvax Junior vaccines.[10]

Sore throat was asked about amongst those who reported cough and fever. The addition of sore throat as a separate question in the survey is being further evaluated but our preliminary analysis is that it is not justified.

The FVE for influenza vaccine preventing ILI calculated amongst Flutracking participants is much lower than the pooled influenza vaccine efficacy estimate of 59% in those aged 18–65 years, from a recent meta-analysis.[11] The FVE calculated for 2011 and 2012 nevertheless demonstrated a greater protective effect than during the 2009 influenza pandemic year and the 2012 estimate was higher than the estimates for 2011 and 2010. A symptom based case definition cannot be expected to provide the same quantitative estimates of FVE provided by a laboratory confirmed outcome as the cases are a mixture of both influenza and other pathogens.[12] A sister system in the United Kingdom, however, found that vaccination with the 2010 seasonal influenza vaccine was significantly protective against ILI during the 2010–2011 influenza season with a vaccine effectiveness of 52% (95% CI 27–68).[13] Their markedly higher estimate may be due to the greater number of symptom questions and recording of temperature in the European Influenzanet system, which likely allows a more specific case definition for influenza. It will be interesting to follow their assessment of vaccine effectiveness in subsequent years. The main benefit of Flutracking's FVE calculations are that they can provide a rapid qualitative indication of FVE as was provided during the pandemic. While increasing the number of symptoms reported through our survey could optimise the case definition for calculating FVE, it may negatively impact on participation numbers and frequency of response.

Based on Flutracking data, the community attack rates in the 2012 season were higher than the attack rates in the 2011 and 2010 seasons, which were lower than most other Flutracking surveillance

years. National influenza laboratory notifications showed an increase in cases of influenza from 2010 to 2011. However, consistent with Flutracking data, the number of cases was still much lower than 2009. This suggests the 2010 and 2011 influenza seasons have been mild—perhaps due to higher rates of influenza vaccination in the community since 2009 and widespread exposure and subsequent immunity to the influenza A(H1N1) pdm09 virus. The 2012 influenza season was a more moderate influenza season, perhaps due to a returning dominance of the H3N2 influenza strain and influenza B.[1]

Flutracking and other syndromic surveillance systems can provide situational awareness to assist with the interpretation of the more specific influenza surveillance provided by laboratories; the latter being subject to changes in testing practices by clinicians and laboratories. Flutracking's surveillance method was unaffected by the changes in testing practices during the 2009 influenza pandemic and was able to demonstrate that the pandemic was not as severe as first anticipated.[5]

Online surveillance of influenza is a relatively young methodology. At the second International Workshop on Participatory Surveillance held in Amsterdam in April 2013, Influenzanet Europe, Flutracking Australia, and FluNearYou in the United States of America signed an agreement to share data on a standard platform internationally and to standardise methods and case definitions where possible to compare data internationally.[14,15]

Competing Interests

All authors declare that they have no competing interests.

Authors' contributions

Sandra Carlson led the writing of the manuscript and the statistical analysis, Craig Dalton conceived and designed the Flutracking program, oversaw the statistical analysis, and contributed to writing of the manuscript, Michelle Butler contributed to the statistical analysis, John Fejsa, contributed to the design of the project and had primary responsibility for the online software and database development, as well as questionnaire design, Elissa Elvidge contributed to the daily operational running of the system, David Durrheim contributed to the design of the project, statistical analysis, and writing of the manuscript.

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