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Flutracking: A weekly Australian community online survey of influenza-like illness in 2006, 2007 and 2008

Craig Dalton, David Durrheim, John Fejsa, Lynn Francis, Sandra Carlson, Edouard Tursan d'Espaignet, Frank Tuyl

Abstract

Surveillance for influenza is an important public health function as it allows initiation and evaluation of public health measures. Flutracking is a weekly online survey of influenza-like illness (ILI) completed by community members that has been trialled in the 2006, 2007, and 2008 winter influenza seasons. The online survey allows participants to record their past and current influenza immunisation status and they receive a weekly email prompt to answer questions on the previous week's experience of cough, fever and time absent from normal activities. The weekly survey takes participants less than 15 seconds to complete. Symptom rates of Flutracking participants were compared by influenza vaccination status to estimate the incidence and severity of influenza and the field effectiveness of influenza vaccine. Participation rates increased from 394 in 2006 to 982 in 2007 and 4,827 in 2008. In 2008, 56% of participants were from New South Wales and 26% were from Tasmania. Greater than 70% of respondents replied within 24 hours of the survey being sent in 2007 and 2008. The 2008 influenza season appeared milder than 2007 with the peak weekly rate of cough and fever among all unvaccinated participants at 7% in 2008 compared with 15% in 2007. The peak week of influenza activity detected by Flutracking in 2008 was the week ending 31 August, which was contemporaneous with the peak week in other syndromic and laboratory influenza surveillance systems. Participation in the survey continues to grow and appears sustainable. A more balanced recruitment across jurisdictions will provide a more national perspective. *Commun Dis Intell* 2009;33(3):316–322.

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

Background

There are approximately 3,000 deaths per year due to influenza and its complications in Australia.[1] Community-based surveillance of influenza-like illness (ILI) is recommended by the World Health Organization (WHO) as part of a comprehensive surveillance system during inter-pandemic and pandemic periods.[2,3] Surveillance for influenza can serve the following public health objectives:

1. early detection of epidemics to enable the implementation of public health measures, such as the vaccination of high risk groups, outbreak control campaigns, enhanced laboratory testing and infection control measures, and provision of clinical services;
2. characterisation of the nature of the epidemic;
3. isolation and antigenic characterisation of circulating influenza viruses to assist in the formulation of the following season's vaccine and to provide new vaccine strains; and
4. evaluation of the impact of the epidemic and associated public health measures.[4]

In Australia, surveillance for influenza is conducted through sentinel general practices and locum services, emergency department surveillance for ILI, worksite absenteeism and laboratory surveillance for influenza infection.[4] These systems complement each other by drawing information from different parts of the surveillance pyramid.

To contribute broader population information on ILI, we piloted an online community survey and assessed its acceptability and feasibility for detecting inter-pandemic and, potentially, pandemic influenza in a regional health service with a population of 800,000 in south-eastern Australia during 2006 and expanded the project nationally in 2007 and 2008.

The main aims of Flutracking are to develop a system that will:

1. compare ILI syndrome rates between vaccinated and unvaccinated participants to determine the utility of Flutracking for detection of influenza activity and early confirmation of vaccine effectiveness or failure;
2. determine whether Flutracking provides earlier warning of influenza activity than existing surveillance systems, including emergency department and general practice ILI surveillance, and laboratory testing for influenza infections.

Methods

In June 2006, an invitation to participate in the online survey was sent to approximately 7,000 email addresses on the Hunter New England area health service network with a clickable link to the survey. A media release was sent to all major newspapers and radio stations in the area health service region, which has a population of approximately 800,000 people. A short domain name (www.flutracking.net) was used to assist the memory of people hearing or reading the recruitment messages. Emails were sent to colleagues and friends of investigators and participants were able to forward the invitation email on to acquaintances to consider joining the study. Potential participants were directed to a web page providing information about the study and an online consent form. A confirmatory email response from the participant's email address was required to complete enrolment in the study.

In 2007, similar recruitment promotion activities were undertaken except that approval was received from the Hunter New England Human Research Ethics Committee to expand recruitment nationally within Australia. We received approval to allow a household member to respond to the survey on behalf of other members of their household of any age, and for children 12 years of age and above to complete their own survey online.

Every Monday morning from 19 June to 23 October 2006, from 4 June to 15 October 2007, and from 5 May to 20 October 2008 participants received an automatically generated weekly email link to the online questionnaire asking about their symptoms and absence from usual activities in the previous week. This questionnaire was modified slightly each year (Table 1), with the choice of symptoms based on a review of case definitions and predictors of influenza infection.[5–7] Participants who reported not being vaccinated against influenza in the current season were asked if they had received vaccination in the previous week during each weekly survey and if they responded in the affirmative the question was automatically deleted from their subsequent weekly surveys. Participants were allowed to join at any time during the surveillance period.

In the first online questionnaire participants were asked about:

1. month and year of birth;
2. receipt of influenza vaccine in the current and the preceding year;
3. working face to face with patients in hospitals, nursing homes, doctors' surgeries or as community health workers; and
4. postcode of residence.

Participants then received a weekly email, which contained a link to an online survey form asking about the presence of the typical flu-like symptoms listed in Table 1. The survey usually took less than 15 seconds to complete.

To explore the difference between vaccinated and unvaccinated participants, the weekly proportion of participants with ILI symptoms was calculated by vaccination status. These proportions were compared with influenza activity recorded in 2007 and 2008 by established influenza surveillance systems in New South Wales, including emergency department ILI presentations, and laboratory influenza A antigen tests (polymerase chain reaction and direct immunofluorescence) (NSW Department of Health unpublished data).

Table 1: Symptoms asked about in the weekly online survey, jurisdictional and respondent age restriction changes from 2006 to 2008

	2006	2007	2008
Fever	Y	Y	Y
Cough	Y	Y	Y
Number of days absent from normal duties	Y	Y	Y
Muscle aches	N	Y	N
Sudden onset of fever, muscle aches, and cough	Y	Y	N
Jurisdictions	Area health service	National	National
Respondent's age	18 years +	18 years +	12 years+*

* Parents could respond on behalf of children of any age in their household.

More information about the survey, including screenshots of the survey forms, is available from: www.flutracking.net

Results

Participants

Participation in 2008 increased more than 10-fold compared with 2006, and almost 5-fold compared with 2007 (Table 2).

During 2006, for the weeks ending 18 June to 22 October a total of 394 respondents completed at least 1 weekly survey (Table 2). Among the 162 participants who joined in the first 4 weeks of the survey, the median weekly participation rate was 93% and 58 (36%) did not miss a single weekly survey.

Recruitment appeared most effective via email invitations with clickable links to the online study consent and information page. Based on an analysis of email domain names, at least 222 of 394 respondents in 2006 were Hunter New England Area Health Service employees.

During 2007, for the weeks ending 3 June to 14 October a total of 982 respondents completed at least 1 weekly survey. Although national recruiting was undertaken in 2007, 770 (79%) participants were from New South Wales. In 2007, 93% of those who ever responded to the weekly email, responded within 7 days of the email dispatch and of these, 50% of participants answered the survey within 3 hours and 80% answered within 24 hours. Among the 412 participants who joined in the first 4 weeks of the survey, the median weekly participation rate was 95%, and 159 (38%) did not miss a single weekly survey.

During 2008, for the weeks ending 4 May to 19 October a total of 3,279 respondents completed at least 1 weekly survey for themselves and on behalf of 1,548 other household members – a total of 4,827 participants. Among the 3,649 participants who joined in the first 4 weeks of the survey, the median weekly participation rate was 96% and 1,416 (39%) did not miss a single weekly survey.

In 2008 the Flutracking survey further expanded participation in all Australian states and territories. Although New South Wales had the highest participant counts for 2008, Tasmania had the highest participation rate in 2008, followed by the Australian Capital Territory (Table 3).

Of the 4,827 who participated at least once in 2008, 283 first participated in 2006, another 509 first participated in 2007. The remaining 4,035 first participated in 2008.

Table 2: Comparison of 2006, 2007, and 2008 Flutracking participants

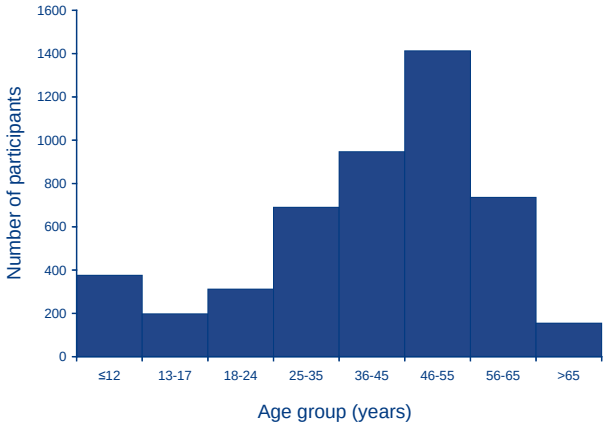
	2006	2007	2008
Number participating one or more times	394	982	4,827
Number of weeks survey conducted	19	20	25
Median number of surveys completed by participants	10	11	22
Number of participants withdrawing	14 (3.5%)	7 (0.7%)	72 (1.5%)
Peak weekly participation number	346	863	4,183
Number (%) working directly with patients	174 (44.0%)	285 (29.0%)	1,393 (28.9%)
Number (%) vaccinated within the calendar year	253 (64.0%)	505 (51.0%)	2,406 (49.8%)

Table 3: Number of Flutracking participants who responded to at least 1 survey, 2008, by state or territory

State or territory	Number of respondents	%	Rate per 100,000
ACT	159	3.3	46.4
NSW	2,689	55.7	38.7
NT	2	0.0	0.9
Qld	158	3.3	3.7
SA	52	1.1	3.3
Tas	1,235	25.6	248.3
Vic	404	8.4	7.7
WA	128	2.7	6.0
Total	4,827	100.0	22.7

Figure 1 shows that of participants who responded to at least 1 survey in 2008, 78.4% were aged 25 to 64 years. In 2008, persons aged under 18 years could participate for the first time. There has been a positive response to this initiative, with 11.9% of participants aged less than 18 years in 2008. In 2007, participants aged less than 18 years were not eligible to participate and 4.1% were aged 65 years or over.

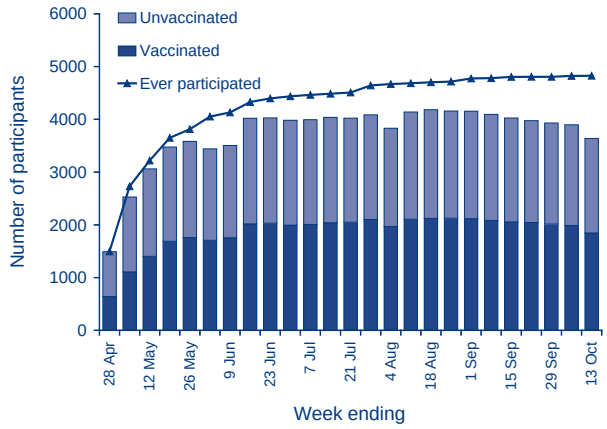
Figure 1: Age distribution of participants who responded to at least 1 survey in 2008



The mean weekly proportion of participants vaccinated against influenza in 2008 across all weeks in 2008 was 49.8% (Figure 2) – 70.1% among participants who worked with patients and 41.5% among those who did not.

In 2008, 95% of responses were received within 7 days of the email survey dispatch and of these 40% of participants answered the survey within 3 hours, while 73% answered within 24 hours.

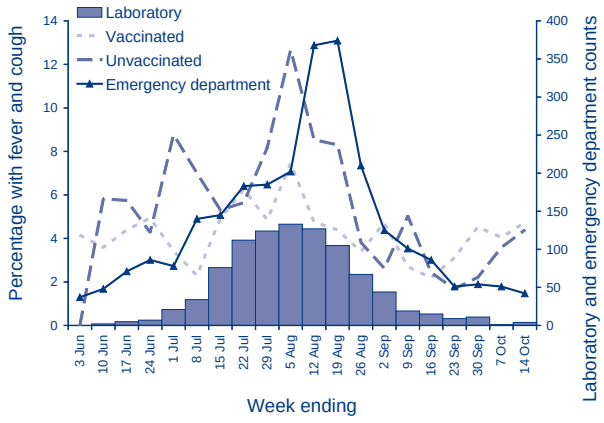
Figure 2: Number of participants who had ever participated in the survey in 2008 and weekly number of participants, by influenza vaccination status



Detection of influenza-like illness

Participant numbers in 2006 were considered insufficient to identify a relationship between influenza vaccination status and ILI symptoms (data not shown), however, in 2007 there was a marked divergence between cough and fever rates in influenza vaccinated and unvaccinated participants that was contemporaneous with the pattern of New South Wales laboratory influenza antigen test results and ILI reports from New South Wales emergency departments (Figure 3). Unvaccinated participants reported a peak of ILI of 13% in the week ending 5 August 2007 (Figure 3).

Figure 3: Comparison of fever and cough in influenza vaccinated and unvaccinated Flutracking participants compared with counts of positive influenza antigen test from laboratories and influenza-like illness counts in emergency departments, New South Wales, 2007



In 2008, the national data show a steady symptom rate of approximately 4% for fever and cough until 10 August when fever and cough rates increased for the season. The fever and cough rates diverged by vaccination status most markedly for the weeks ending 24 and 31 August with a peak of ILI of 7% in unvaccinated participants (Figure 4).

The divergence in rates of ILI between vaccinated and unvaccinated participants was most marked in New South Wales, which had the highest number of participants (Figure 5) and the divergence in symptom rates between influenza vaccinated and unvaccinated participants was contemporaneous with the rise in New South Wales influenza laboratory notifications and emergency department presentations for ILI.

Figure 4: Comparison of fever and cough in influenza vaccinated and unvaccinated Flutracking participants, Australia, 2008

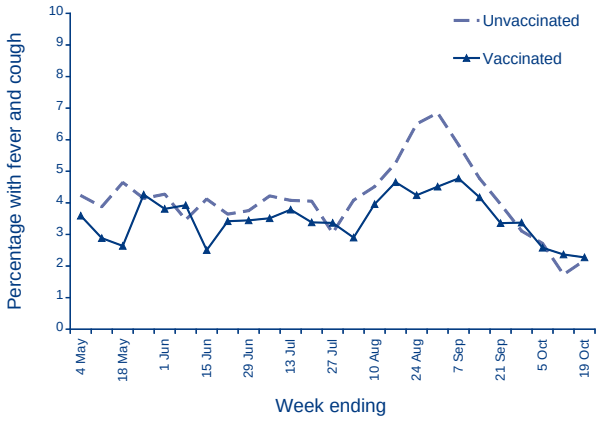
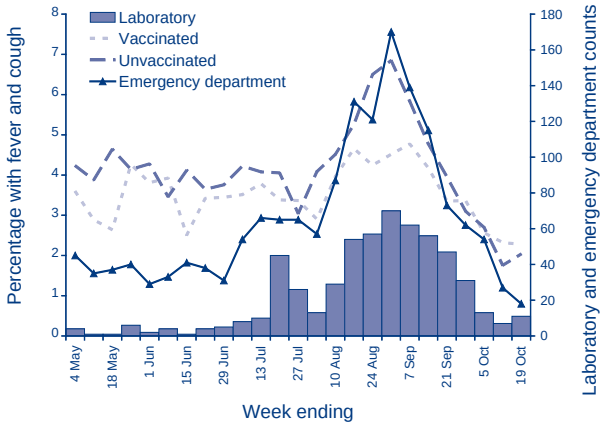


Figure 5: Comparison of fever and cough in influenza vaccinated and unvaccinated Flutracking participants compared with counts of positive influenza antigen tests from laboratories, and influenza-like illness counts in emergency departments, New South Wales, 2008



Discussion

This study confirms that a rapidly completed weekly online survey of ILI is feasible and appears acceptable to participants. Participation and retention rates were encouraging but may be improved in subsequent years through enhanced feedback to participants and support from large organisations to distribute invitations via employee email systems.

Recruitment was most successful when participants received an email with a clickable hyperlink leading them to the study information web site, perhaps because interested participants could immediately act upon the invitation rather than having to remember the web address to access at a later time.

These first years of the study were designed to test the methodology and we did not expect to recruit sufficient participants to identify influenza activity with any confidence. However, the following findings lend face validity to a relationship with actual influenza activity:

1. similar rates of illness among vaccinated and unvaccinated respondents prior to and after the 'influenza season' as defined by the laboratory surveillance data;
2. a divergence in rates occurring during the influenza activity period; and
3. the elevation in the proportion with symptoms among the unvaccinated compared with the vaccinated participants.

The finding that the absolute peak for unvaccinated participants and the peak difference in symptom prevalence between the vaccinated and unvaccinated respondents occurred contemporaneously with existing New South Wales influenza surveillance systems, provides reassurance that they are monitoring the same condition. Time series analysis of the relationship between 2007 Flutracking and New South Wales influenza laboratory notifications controlling for autocorrelation within the data, also support the premise that Flutracking is detecting actual influenza activity with the greatest cross correlation between the systems occurring in the same week.[8]

Although syndromic reporting has limited sensitivity and predictive value for influenza, the inclusion of information on vaccination status in this survey has the potential to enhance specificity. Findings from studies of the predictive value of influenza symptoms may differ due to different settings and subject populations. The presence of cough and fever is usually a core component of ILI case definitions. The positive predictive value of cough and fever together may exceed 70% and is sometimes improved with the addition of symptoms such as myalgia or fatigue.[5–7]

This surveillance system addresses needs in routine influenza surveillance and potentially in surveillance for pandemic influenza. It complements laboratory confirmed influenza and general practice and emergency department ILI surveillance with the potential to rapidly detect influenza activity and provide a prompt to enhance infection control in institutions or rapidly vaccinate or exclude unvaccinated staff from high risk settings. Influenza surveillance may also provide prior warning of a community-wide influenza epidemic to allow clinical services to prepare for an increase in respiratory admissions. By directly monitoring community incidence of ILI, it may provide more reliable estimates of community attack rates compared with systems that may be biased by health seeking behaviour.

These findings suggest that Flutracking may provide a unique opportunity for monitoring seasonal vaccine efficacy or failure. Vaccine failure would be suggested by unvaccinated and vaccinated participants ILI symptom rates failing to diverge despite laboratory notification rates suggesting an influenza epidemic is underway. If the methodology is proven and broader community participation is sustained it may allow rapid monitoring of other syndromes to provide rapid assessment of illness from contaminated water supplies, new and emerging infectious diseases or bioterrorism related events. Response to the survey is rapid with 70% to 80% of participants responding within 24 hours and it is possible to vary the surveillance case definitions rapidly throughout the season if required. Data can be quickly analysed and a report can be finalised within 2 days of the end of the surveillance week; the email link is sent to survey participants on a Monday asking about symptoms up to and including the day before (Sunday) and a report is completed by Tuesday.

The impact of different recruitment settings and strategies, age related participation, regional variations, and biases due to surges in recruitment during periods of influenza activity will be examined in future analyses. Because influenza spreads across different regions over many months, comparing symptom rates in unvaccinated and vaccinated participants in different and disparate regions in the same week may artificially dilute the impact of influenza vaccination and suppress the divergence that would be seen in the geographic epicentres of influenza activity for that week.

Flutracking is the first online community ILI surveillance system in the Asia Pacific region and is similar to an influenza surveillance project being conducted in The Netherlands, Portugal, and Belgium which follows a combined cohort of over 20,000 participants throughout the winter months.[9,10]

The recruitment strategy in Tasmania in 2008 was extremely effective with more participants recruited in 4 weeks than were recruited during the first 2 years of Flutracking operation in all jurisdictions. Recruitment was enhanced by the circulation of an email memo from the Director of Public Health to all staff in the Tasmanian Department of Health and Human Services and through reinforcement with an internal newsletter article. With support from other jurisdictions and corporate entities it is likely that Flutracking could achieve more than 10,000 participants nationally by 2011.

Future analyses will focus on comparison of signals of influenza activity from other surveillance data sets and exploring measures of field vaccine effectiveness from Flutracking data to determine if the data can provide early warning of vaccine failure or early reassurance of its effectiveness. The analysis of vaccine effectiveness will be particularly important in 2009 due to the emergence of novel H1N1 influenza.[11] Jurisdictional data will be provided to jurisdictions with greater than 1,000 participants to support local surveillance, encourage collaborative analyses of data and explore new methods of analysis.

Flutracking appears to provide important ILI surveillance intelligence and situational awareness, complementing current national influenza surveillance systems in Australia. Influenza surveillance information will be best interpreted when all available information is integrated into public health decision making.

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Author details

Dr Craig Dalton, Public Health Physician
Dr David Durrheim, Public Health Physician, Service Director Health Protection
Mr John Fejsa, Applications Developer
Dr Lynn Francis, Statistician
Ms Sandra Carlson, NSW Health Biostatistical Trainee
Dr Edouard Tursan d'Espaignet, Service Director Health Intelligence
Dr Frank Tuyl, Statistician

Hunter New England Population Health, Wallsend, New South Wales

Corresponding author: Dr Craig Dalton, Hunter New England Population Health, Locked Bag 10, WALLSEND NSW 2287. Facsimile: +61 2 4924 6490. Email: Craig.Dalton@hnehealth.nsw.gov.au

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