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ASPREN surveillance system for influenza-like illness

A comparison with FluTracking and the National Notifiable Diseases Surveillance System

Background
General practitioners play an important role in the detection and clinical management of influenza. The Australian Sentinel Practice Research Network (ASPREN) has been collecting data from sentinel GPs on selected conditions, including influenza-like illness (ILI), since 1991 to inform public health authorities of communicable disease activity in the community.

Methods
Weekly incidence of ILI data reported by ASPREN GPs in 2007–2008 was compared with data from two separate surveillance systems: New South Wales data from FluTracking, an online self reporting ILI surveillance system; and national laboratory notifications of influenza reported to the National Notifiable Diseases Surveillance System between 2003 and 2008.

Results
ASPREN recorded peak ILI rates of 47 per 1000 consultations in week 30 (ending 29 July) 2007 and 34 per 1000 consultations in week 36 (ending 7 September) 2008. Similar trends in incidence were seen in FluTracking cough and fever rates, ASPREN data in New South Wales and National Notifiable Diseases Surveillance System laboratory notifications.

Discussion
Data captured by the three separate surveillance systems provide complementary information regarding influenza in the Australian population.

■ **Public health surveillance systems are fundamental to the prevention and control of infectious diseases. Data obtained by sentinel surveillance systems may be used to inform public health decision making, priority setting and subsequent action.[1]**

Seasonal influenza epidemics are a major public health concern globally, resulting in millions of respiratory illnesses and 250 000–500 000 deaths worldwide each year.[2] In Australia, several surveillance systems report on influenza epidemiology on a national and jurisdictional level. The Australian Sentinel Practices Research Network (ASPREN) is a clinically based general practitioner sentinel surveillance system that employs the nationally adopted case definition for influenza-like illness (ILI) of fever, cough and fatigue.[3] Sentinel practice surveillance systems aim to monitor influenza activity in the community by providing timely and geographic information about seasonal viruses.

Other established Australian influenza surveillance systems currently consist of laboratory confirmed cases of influenza; three jurisdictional GP sentinel practice systems in Western Australia, Victoria and Northern Territory; and emergency department hospital admissions. Alternative methods of tracking influenza include telephone surveys[4,5] and internet based systems.[6–9] FluTracking is an online self reporting system that records influenza-like symptoms and vaccination status. The National Notifiable Diseases Surveillance System (NNDSS) reports laboratory notifications of influenza. Both ASPREN and FluTracking track influenza-like symptoms, while NNDSS influenza notifications are a measure of true influenza in the population. It is accepted that a combined surveillance approach has the greatest value.[10–14]

The objectives of this study were to compare the reported incidence of ILI recorded by ASPREN and FluTracking in two influenza seasons (2007–2008), and to compare timing and concordance of

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ASPREN reported ILI with laboratory confirmed influenza reported by NNDSS between 2003 and 2008.

Methods

The ASPREN project was formed in 1991 to provide a rapid monitoring system for infectious diseases that can warn public health officials of epidemics in their early stages, inform public health campaigns, and facilitate research of conditions commonly seen in general practice. Owned and operated by The Royal Australian College of General Practitioners (RACGP), ASPREN is directed through the Discipline of General Practice at the University of Adelaide in South Australia. Influenza-like illness data collected by ASPREN is routinely used by national and state and territory health departments for influenza surveillance and research. Participating GPs receive continuing medical education points via the RACGP and/or the Australian College of Rural and Remote Medicine.

The ASPREN conducts online ILI surveillance across seven states and territories. A total of 102 GPs currently report to ASPREN, with 64%, 22% and 14% reporting from metropolitan, rural and remote areas respectively. Participating GPs enter the age and gender data of persons presenting with an ILI (defined as cough, fever and fatigue) into the ASPREN database, along with weekly consultation totals via a web based notification system. Weekly incidences of ILI per 1000 consultations during 2007 and 2008 were calculated from this data. The week with the highest ILI incidence rate in a year was designated the ILI peak week.

The online FluTracking survey allows participants to record their past and current influenza immunisation status; a weekly email prompt asks participants to answer questions regarding the previous week's experience of cough, fever and time absent from normal activities.[15] Rates of cough and fever among FluTracking participants are compared by influenza vaccination status. FluTracking participants are recruited through email invitations circulated by government and corporate email systems, invitations forwarded by participants to friends, media releases directing prospective participants to the Flutracking.net website and directly through the website. FluTracking is a joint project of the University of Newcastle and Hunter New England Health. Participants from all Australian jurisdictions are involved in FluTracking; however in 2008, 56% of participants were from New South Wales (NSW) – the focus of the comparison with ASPREN. In 2007, participants less than 18 years of age were not eligible to participate, and only 4.1% of participants were aged 65 years or more. Of participants who responded to at least one survey in 2008, 78.4% were aged 25–65 years. 2008 was the first year that persons aged less than 18 years

could participate (11.9% of participants in that year). No information on gender is collected by FluTracking. Substantially elevated rates of cough and fever in unvaccinated participants compared to influenza vaccinated participants are interpreted as indicating increased influenza infection. Of participants across NSW, 77% (578/748) and 66% (1765/2689) were resident in postcodes in the Hunter New England Area Health Service region in 2007 and 2008 respectively.

The NNDSS was established in 1990 under the auspices of the Communicable Diseases Network Australia.[16] The system coordinates the national surveillance of over 60 communicable diseases, including laboratory confirmed cases of influenza. Notifications of laboratory confirmed influenza are reported to the NNDSS by jurisdictional health authorities. Sources of notifications include both public and private laboratories, and hospitals and doctors. The NNDSS notifications may include hospital and general practice patients and other groups such as those tested as a result of disease outbreaks.

For this study we have defined the NNDSS peak notification as the week with the highest number of laboratory confirmed influenza notifications.

In 2007, an average of 21 GPs from NSW reported ILI rates each week to ASPREN; in 2008, it was 19. These rates were then compared to weekly rates of cough and fever reported by 748 and 2689 FluTracking participants in 2007 and 2008 respectively. National influenza notification totals reported to NNDSS were compared to ASPREN ILI rates over the 5 year period from 2003–2008.

Results

ASPREN 2007–2008

An average of 67 doctors across the seven states and territories reported to ASPREN each week in 2007 for a total of 6118 notifications for ILI. In 2008, 80 doctors reported for a total of 4215 notifications. The peak reported ILI rate was 47 per 1000 consultations in week 30 (ending 29 July) in 2007 and 34 per 1000 in week 36 (ending 7 September) in 2008 (*Table 1*). Across jurisdictions there was greater variation in the

Table1. ASPREN peak ILI consultation rates 2007–2008

| State	Peak ILI incidence per 1000 consultations (95% CI)		Week of peak	
	2007	**2008**	**2007**	**2008**
ACT	79 (63, 98)	57 (44, 74)	32	39
NSW	73 (58, 92)	61 (47, 78)	32	36
QLD	40 (29, 55)	47 (35, 63)	31	31
TAS	NA	28 (19, 41)	NA	34
VIC	34 (24, 48)	27 (19, 39)	32 and 33	37
SA	48 (36, 64)	24 (16, 36)	33	37
WA	56 (43, 73)	30 (21, 43)	28	36
All states/ territories*	47 (42.7, 51.8)	34 (30.8, 38.7)	30	36

* No ASPREN GPs report from the Northern Territory

occurrence of the peak ILI week between years: in 2007, it was weeks 28–32 (weeks ending 15 July to 12 August); in 2008, it was weeks 31–39 (weeks ending 3 August to 28 September).

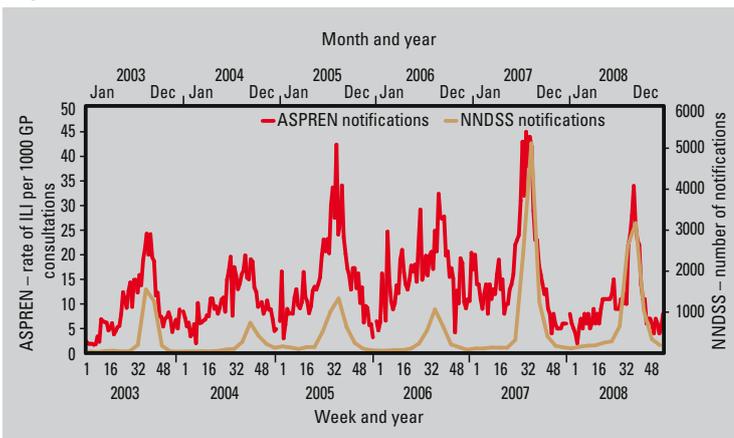Figure 1. ILI rate per 1000 consultations reported to ASPREN 2007–2008
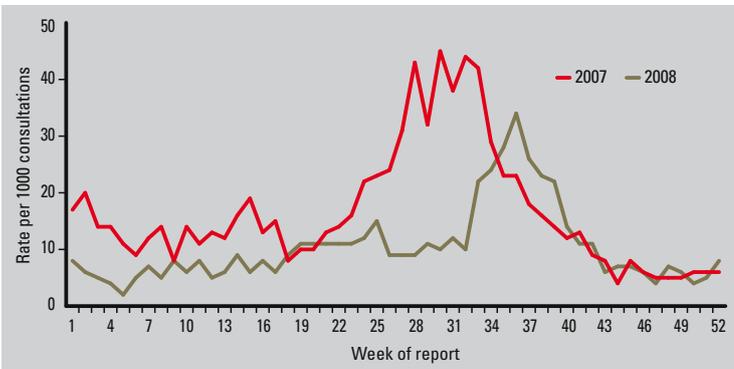
Source: Department of Health and Ageing. National Notifiable Diseases Surveillance System, 2009

Figure 2. ASPREN vs. FluTracking in NSW June to October 2007, May to October 2008
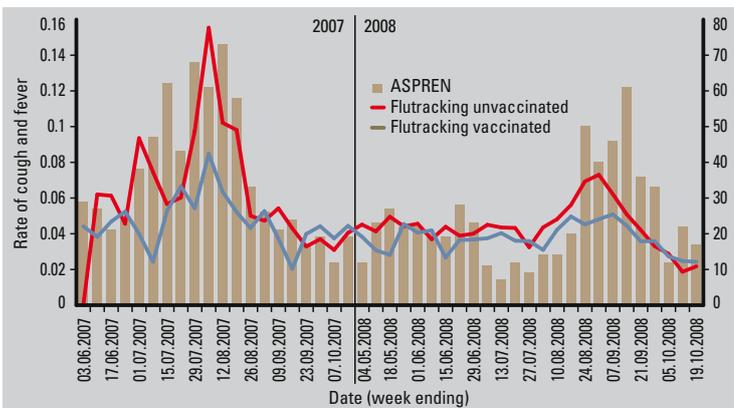
Source: Department of Health and Ageing. National Notifiable Diseases Surveillance System, 2009

Figure 3. ASPREN vs. NNDSS notifications 2003–2008

Source: Department of Health and Ageing. National Notifiable Diseases Surveillance System, 2009

The onset of the season occurred later in 2008 than in 2007 (*Figure 1*). Baseline ILI rates reported between January and July 2008, before the influenza season, were approximately half compared to the same period in 2007. The mean ILI incidence was 15.96 per 1000 consultations in 2007 (95% CI: 15.29–16.66) compared to 7.67 (95% CI: 7.30–8.06) in 2008 (*p*=<.0001). During the season ILI rates remained at higher levels for approximately 8 weeks in 2007 compared to 6 weeks in 2008. The highest proportion of ASPREN ILI cases occurred in patients aged 20–49 years (43% in 2007 and 44% in 2008), followed by patients aged 5–19 years (20% and 21%).

ASPREN compared to FluTracking 2007–2008

In 2007, the weekly incidence of cough and fever in NSW peaked among unvaccinated FluTracking participants in week 31 (ending 5 August) at 14.5%, 1 week before the peak ASPREN ILI rate for NSW (*Figure 2*). In week 32 (ending 12 August), ASPREN recorded a peak ILI incidence in NSW of 73 per 1000 consultations – 1 week after FluTracking.

The first indication of elevated influenza activity in FluTracking appeared in week 26 (ending 1 July) with a divergence in cough and fever rates between unvaccinated and vaccinated participants for 2 weeks. The next major divergences occurred in week 30 (ending 29 July) and week 33 (ending 19 August). These divergences coincide with the increase in ILI reported by ASPREN GPs.

In 2008, the weekly incidence of cough and fever peaked among unvaccinated participants in week 35 (ending 31 August) 2008 at 6.8%, less than half the peak rate in 2007. A peak ILI incidence of 61 cases per 1000 consultations was recorded in NSW by ASPREN 2 weeks later in week 37 (ending 14 September).

The divergence between unvaccinated FluTracking participants and vaccinated participants in weeks 20 and 24 (ending 8 May and 15 June) correlate with isolated peaks in ASPREN consultations. Both ASPREN and FluTracking recorded an upswing in rates from week 31 (ending 3 August). The rise continued in both systems to week 35 (ending 31 August), when the FluTracking peak was observed.

ASPREN compared to NNDSS 2003–2008

Figure 3 presents a comparison of ASPREN ILI rates with the total number of laboratory confirmed cases of influenza reported by the NNDSS from 2003–2008. In each year, both initial increases in ILI and the peak rates reported by ASPREN occurred before increases and peaks in laboratory notifications being observed.

Discussion

The three surveillances systems presented in this study capture different sources of data for ILI and influenza: clinical cases of ILI diagnosed by GPs (ASPREN), online self reports of community recruited participants' influenza symptoms (FluTracking) and national laboratory confirmed notifications of influenza (NNDSS).

The comparison between increases in ILI rates recorded by ASPREN GPs in NSW and rates of cough and fever in unvaccinated

FluTracking participants in NSW show similar trends of influenza activity. The rates of cough and fever in unvaccinated FluTracking participants in 2008 were approximately half compared to 2007; ASPREN rates also followed a similar pattern of decreased ILI rates at both state and national levels. It is possible to infer, as suggested by the NNDSS data, that influenza rates were much higher in 2007 than 2008.

It is important to note that the size of NNDSS notification peaks will be affected by variations in testing practices between years. The peaks may be an indication of increased testing, rather than a larger number of cases of influenza in the community. Thus, the syndromic surveillance systems may assist in the interpretation of year-to-year variability in laboratory and clinical practice that occurs as a result of the availability or likelihood of testing. The correlation between increases in ASPREN ILI rates and increased rates of cough and fever in unvaccinated FluTracking participants suggests that both systems are reliably tracking influenza. Recording influenza vaccination status allows us to discriminate between influenza and other respiratory diseases; however this will depend on a good match between the circulating strains of influenzas and the strains in the vaccine. The recent introduction of the collection of vaccination status in the ASPREN ILI data will allow for a useful comparison between unvaccinated ASPREN and FluTracking patients.

The comparison between laboratory confirmed cases of influenza by NNDSS and ASPREN demonstrates the reliability of GP sentinel ILI surveillance to detect the onset of seasonal influenza before an increase in laboratory notifications is observed. In each of the 5 years, ASPREN signalled the onset of the season before NNDSS. Similar time lags between ILI activity detected by GPs and increases in laboratory confirmed influenza have been reported elsewhere.[9,17–18]

There are several limitations to the data captured by ASPREN and FluTracking regarding population and geographic representation. These include a lack of geographic representation in the ASPREN network;[14] the potential incompleteness of GP recording;[19] and possible under representation of ILI within the community (it has been reported elsewhere that community rates of ILI are much higher than GP detected rates).[9] Currently 41% (42/102) of ASPREN GPs report from Western Australia. With the exception of WA, where nearly all geographic regions within the state are covered, the majority of ASPREN reporters are located in urban areas. More GPs are required to report from rural and remote areas across Australia. It is thought that one sentinel practice for every 200 000 population in metropolitan areas and one practice for every 100 000 population in rural areas are required to adequately represent the Australian population.[20]

The ILI rates recorded by ASPREN need to be interpreted with caution as the absence of confirmed laboratory cases may mean that a proportion of cases are not true cases of influenza but rather of other respiratory viruses. In the ASPREN data, the 20–49 years age group is over represented. This may be due to the age distribution of the general practice population;[21] it may also reflect the requirement for employees to attend general practice to obtain work certificates.

FluTracking participants are primarily located in NSW, with participants in NSW concentrated within the Hunter New England area. FluTracking is in the early phase of its implementation and interpretation of the data is based on only two seasons of influenza. As FluTracking usually operates between May and October, the onset of influenza may be missed outside this surveillance period. Additionally, while FluTracking has the ability to discriminate influenza infection based upon the vaccination status of the participants, a mismatch between the vaccine and the circulating influenza strain would prevent the typical divergence in influenza-like symptoms observed between vaccinated and unvaccinated participants. However, the failure of this divergence accompanied by ILI increases in ASPREN and increases in laboratory confirmed influenza could give an early warning of vaccine failure.

Despite these limitations, ASPREN's results, when compared to influenza laboratory confirmed by NNDSS, demonstrate that it is consistently detecting both temporal and seasonal changes in influenza incidence.

Implications for general practice

- Online technologies to predict influenza outbreaks are beneficial in their potential to capture information on large numbers of people.[6,9,22–23] Information provided by these media is useful when it is compared with other clinical systems that detect increased activity in the community.
- General practitioners play a critical role in diagnosing and managing influenza and potential complications in high risk groups; they also have a critical role in responding to public health alerts in the event of an epidemic or pandemic.[24,25]
- The use of online technology by current ASPREN reporters requires individual GPs to enter data. The potential to capture a higher volume of data may exist in the application of evolving practice software to automatically extract relevant coded data.

Resource
Fortnightly data reports are available from the ASPREN website at www.dmac.adelaide.edu.au/aspren.

Conflict of interest: none declared.

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