Annual report of the National Influenza Surveillance Scheme, 2000

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Abstract

Surveillance of influenza in Australia in 2000 was based on data from national and state-based sentinel general practice consultations for influenza-like illness, laboratory isolations of influenza virus and absenteeism rates from a national employer. The peak in influenza cases was in mid-September. Influenza A was the dominant strain, with the highest proportion being influenza A (H3N2), but with a significant proportion of isolates of influenza A (H1N1) (16%) for the first time since 1995. The influenza A (H3N2) isolates were predominantly related to A/Moscow/10/99 and vaccine strain A/Panama/2007/99. Influenza A (H1N1) was predominantly A/New Caledonia/20/99. The proportion of Influenza B viruses isolated also increased in keeping with a three-yearly cycle of influenza B epidemics in Australia. influenza B isolates showed a progressive drift away from the B/Beijing/184/93 strain with the majority closely related to the B/Sichuan/379/99 strain. In 2000, influenza vaccination levels reached 74 per cent in persons aged over 65 years. *Commun Dis Intell* 2001;25:107-112.

Keywords: influenza, surveillance, vaccine, general practice, strains

Introduction

Influenza is an acute, self-limiting upper respiratory tract infection. Complications however, may occur, including lower respiratory tract infection (in particular primary and secondary pneumonia, exacerbation of chronic obstructive pulmonary disease) and exacerbation of cardio-pulmonary disease.[1] Influenza-related morbidity (measured as excess hospitalisation) and mortality may result from these complications. Although influenza infection affects all age groups, the rates of serious morbidity and mortality tend to be highest among those aged 65 years and over, indigenous Australians and those with chronic medical problems. Young infants and pregnant women are also at increased risk of hospitalisation from influenza.

Outbreaks of influenza usually occur during winter months in temperate climates (peaking between December and March in the Northern Hemisphere and June and September in the Southern Hemisphere), but may occur throughout the year in tropical regions. Even though the complication rate may be low, the overall high attack rate during epidemics leads to a considerable increase in hospitalisations and mortality. In Australia in 1998, pneumonia and influenza accounted for 4,579 deaths (Australian Bureau of Statistics, 2001). Influenza pandemics occur every 10 to 30 years. During these pandemics, a quarter or more of the global population may be affected within a short period and the rates of illness and death from influenza can increase dramatically.

Influenza viruses are successful human pathogens because of their ability to vary their two external proteins, haemagglutinin (H) and neuraminidase (N). Mutations cause a gradual change in these proteins called ‘antigenic drift’, which results in annual epidemics of influenza. The greater the change in these proteins, the less likely it is that the virus will be recognised by immune cells primed by exposure to earlier infections or vaccines, and the greater the epidemic potential. At irregular intervals, there are more dramatic changes in the viral proteins, called ‘antigenic shift’, which are a result of either direct introduction of avian influenza viruses into the human population or a re-assortment of avian viruses in an intermediate host such as pigs. These ‘shifts’ result in the emergence of a new influenza virus. In the absence of immunity to these new viruses, there is rapid spread of influenza with dramatically increased rates of morbidity and mortality. The pandemic of 1918 introduced the H1N1 virus into the human population and the 1968 Hong Kong pandemic introduced the H3N2 virus. There have been no major ‘antigenic shifts’ causing pandemics of influenza since 1968. Since 1977, influenza A (H1N1 and H3N2) and influenza B viruses have been widespread globally, varying in frequency temporally and geographically.[2]

In Australia, influenza vaccines are produced after analysis of the dominant strains in the previous year’s influenza cases. Influenza vaccination is recommended to non-indigenous Australians aged 65 years and above and indigenous Australians aged 50 years and above.[3]

An effective national surveillance system is an essential component of a program for the control of influenza. Influenza surveillance aims to ensure the provision of timely information about levels of influenza activity and circulating strains, to public health departments, health care providers and the general public. The major objectives of such surveillance include:

- early detection of epidemics to enable the implementation of public health measures such as vaccination of the 'at risk' groups, control campaigns and provision of clinical services;
- characterisation of the epidemic;

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- isolation and antigenic characterisation of circulating influenza viruses to assist in the formulation of the following season's vaccine; and
- evaluation of the impact of the epidemic and associated public health measures.

This annual influenza report provides a summary of the surveillance methods and data for 2000.

Surveillance methods

Surveillance of influenza in Australia is based on 4 sets of data:

- laboratory diagnosis including virus isolation and serology by laboratories participating in the LabVISE (Laboratory Virology and Serology) Reporting Scheme);
- data on subtypes found among isolates from LabVISE laboratories, provided by the WHO Collaborating Centre for Reference and Research on Influenza;
- consultation rates for influenza-like illness diagnosed by sentinel general practitioners; and
- absenteeism data of workers from a national employer.

Laboratory-confirmed influenza became nationally notifiable from January 2001. The States and Territories will forward notifications to the Commonwealth through the National Notifiable Diseases Surveillance System (NNDSS), as their legislation and IT systems are updated.

Laboratory surveillance (LabVISE)

LabVISE is a national scheme of Australia-wide sentinel laboratories. In 2000, a total of 12 laboratories contributed to this scheme although not all provided reports each month. Laboratory reports of influenza are sent to LabVISE all year round. Although viral isolation remains the gold standard for influenza diagnosis and surveillance, most reports have relied on the detection of viral antigen and serological markers. Nucleic acid detection by the polymerase chain reaction (PCR) is now in used for diagnosis.[2]

WHO Collaborating Centre for Reference and Research on Influenza

The WHO Collaborating Centre for Reference and Research on Influenza contributes reports on the subtypes and antigenic analysis of influenza viruses isolated throughout the year in Australia. This information is used to monitor the nature of influenza strains present in Australia and the rest of the world, assess suitability of the current vaccine (by measuring the level of matching between circulating strains and the current vaccine) and determine the composition of vaccine for the following influenza season. Influenza viruses are named after the places where they were first identified. For example, A/Sydney/5/97 was first isolated in Sydney in 1997 and was influenza A isolate number 5 for that year.

Sentinel general practitioner surveillance

Sentinel general practitioner surveillance schemes detect and record clinical diagnoses of influenza-like illness. The Australian Sentinel Practice Research Network (ASPREN) collects data at a national level. In addition, data are collected through the New South Wales Sentinel General Practice Scheme, the Victorian Sentinel General Practice Scheme and the Northern Territory Tropical Influenza Surveillance Scheme.

The New South Wales and Victorian schemes report cases of influenza-like illness from the beginning of May to September each year. ASPREN and the Northern Territory schemes report throughout the year. ASPREN is the only sentinel surveillance scheme that reports on influenza-like illness from sentinel general practices located throughout Australia.

Of sentinel general practices contributing to the ASPREN scheme, most are located in capital cities and larger regional centres, mostly on the east coast of Australia. Between 7000 and 8000 consultations are recorded each week. Participation is voluntary in all sentinel general practice surveillance systems, leading to variation in the number of contributors. In 2000 the number of contributing practices varied from 52 to 77 per reporting period for ASPREN, 8 to 41 for the New South Wales scheme, 25 to 47 for the Victorian scheme and from 9 to 14 for the Northern Territory scheme.

The case definition for a clinical diagnosis of an influenza-like illness varies between the different sentinel general practice surveillance schemes (Box).

Absenteeism surveillance

Australia Post, a major nation-wide employer, provided de-identified sick leave absenteeism data during 2000 between weeks 10 and 36 (from March to September). Absenteeism was defined as an absence due to illness for at least 3 consecutive days. This definition was used to increase the specificity for absenteeism related to influenza infection. Absenteeism was reported as the rate per 100 employees and rates were calculated on a weekly basis.

Antigenic analysis of influenza virus isolates

The WHO Collaborating Centre for Reference and Research on Influenza identifies circulating strains of influenza by genetic sequence analysis of the variable region of major surface antigen, (haemagglutinin), and of the minor surface antigen, (neuraminidase) on a sample of isolates forwarded to the centre.

Hospitalisation data

To assess the impact of influenza on hospitalisation, the Australian Institute of Health and Welfare (AIHW) made available hospital separation data and average length of stay data for public and private hospitals. Data for the 1999/2000 financial year was the most recent available at the time of writing this report. Information was assessed by the ICD-10AM code that classifies influenza under 2 categories: cases of influenza where the virus is identified (J10) and cases where the virus is not identified (J11).

During the influenza season, data from laboratories and sentinel GP practices are posted on the Communicable Diseases Australia Website, which includes links to data on influenza activity in New Zealand and information on circulating influenza strains from the WHO Collaborating Centre for Reference and Research on Influenza.

Results

The influenza surveillance data presented here are limited and should be interpreted with caution. Laboratory confirmed influenza are a small proportion of all influenza cases in the year and consequently the estimation of the circulating strains is based on a small sample. Definitions of influenza-

Box. Case definitions of influenza-like illness used in Australian Sentinel Practices

The case definition for ASPREN, and for the Victorian and Northern Territory Sentinel GP schemes is:

- viral culture or serological evidence of influenza virus infection; or
- influenza epidemic, plus four criteria listed below; or
- six of the following criteria:
  - sudden onset (within 12 hours);
  - cough;
  - rigours or chills;
  - fever;
  - prostration and weakness;
  - myalgia, widespread aches and pains;
  - no significant respiratory physical signs other than redness of nasal mucous membranes and throat;
  - influenza in close contacts.

The definition of influenza used by the New South Wales sentinel GP scheme is:

- cough and;
- myalgia; and
- no abnormal respiratory physical signs other than redness of nasal mucous membranes and throat; and
- two of the following:
  - sudden onset;
  - rigours or chills of fever;
  - prostration or weakness; or
  - influenza in close contacts.

like-illness vary between sentinel practices (Box) which make comparisons difficult. In addition definitions of influenza-like illness have varied from year to year, so comparison of data across years is complex. Absenteeism data are currently based on a three-day absence. Data collected before 1996 however, were based on a single day absence. In summary, surveillance data are currently unable to measure severity of annual epidemics or to monitor yearly variations in severity.

Laboratory surveillance (LabVISE)

In 2000, a total of 1916 laboratory isolations of influenza were made in participating laboratories of the LabVISE reporting scheme. These were 1366 reports of influenza A and 550 reports of influenza B. The ratio of influenza A to B was 2.5:1.

Total influenza reports showed a low level of activity until mid-June (week 24) when there was an increase in reports to approximately 50 per week, followed by a major peak in mid-September (week 37), then a decline to baseline by late November (week 47, Figure 1). There were little temporal differences in the peaks of influenza A compared with influenza B activity throughout the year. The peak of influenza activity in 2000 was significantly later in the year than in 1999 (Figure 2).

The seasonal pattern of influenza between 1996 and 2000 is shown in Figure 3. The pattern in 2000 closely resembled that in 1997 when there was also a larger proportion of influenza B isolates (influenza A to B ratio of 1.5:1), and a later peak in disease reporting.

The breakdown of influenza cases by age and sex is shown in Figure 4. The overall male to female ratio for influenza in

Figure 1. Laboratory reports of influenza, Australia, 2000, by type and week of specimen collection

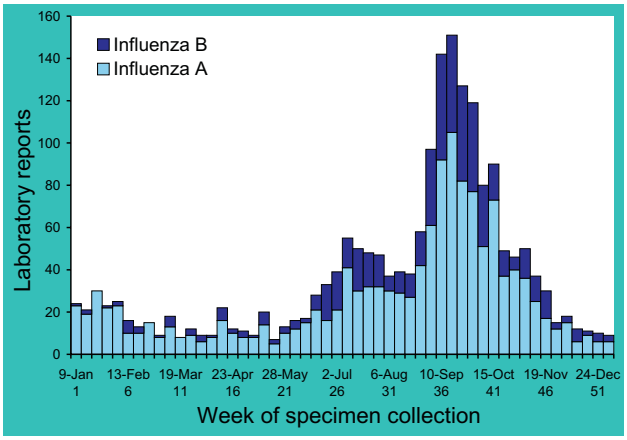


Figure 2. Laboratory reports of influenza, Australia, 1999 and 2000, by month of specimen collection

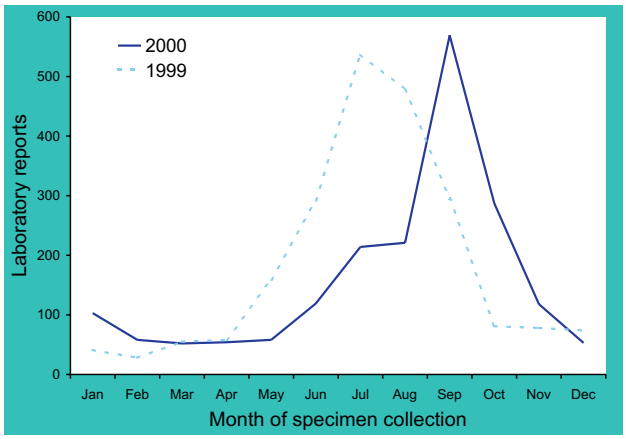


Figure 3. Laboratory reports of influenza, Australia, 1996 to 2000, by type and month of specimen collection

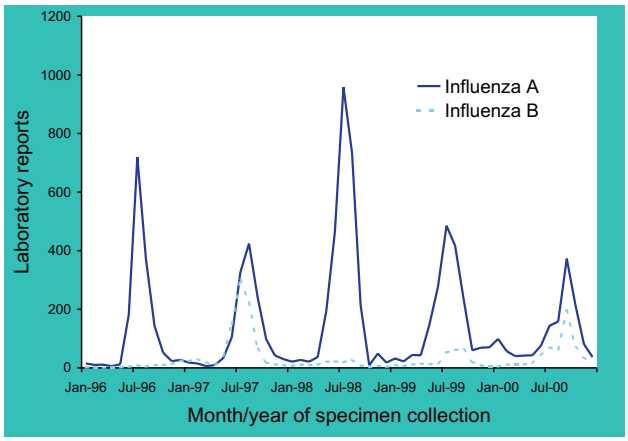
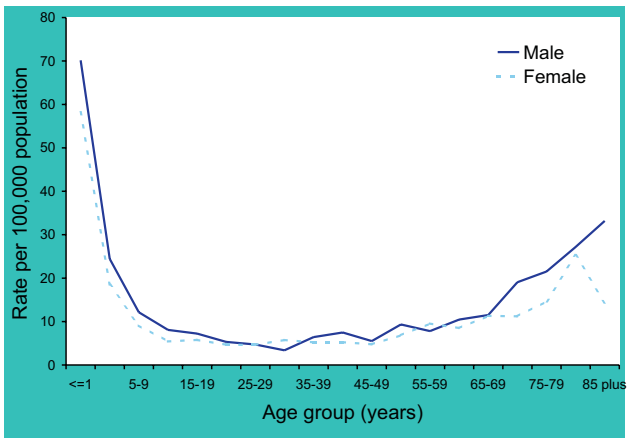


Figure 4. Rates of laboratory-confirmed influenza, Australia, 2000, by age and sex



2000 was 1.2:1. The age- and sex-specific rates were highest among infants and children aged less than 5 years, with a second peak among men aged 70 years or more and women aged 75 years or more.

A breakdown of weekly laboratory reports for influenza A by State and Territory (as defined by postcode) for New South Wales, Victoria and Western Australia is shown in Figure 5. The influenza A activity in the eastern States (New South Wales and Victoria) began to rise in week 34, one week earlier than in Western Australia. Both eastern and western States of Australia reported their peak influenza A notification in week 37.

Sentinel general practice (GP) surveillance

Sentinel surveillance data were available from the Northern Territory, New South Wales and Victoria, in addition to the nation-wide surveillance of ASPREN. The Northern Territory Tropical Influenza Surveillance scheme data showed 2 peaks of influenza activity in weeks 9 (week ending 5 March) and week 42 (week ending 22 October). The ASPREN data and that of the New South Wales and Victorian sentinel schemes (Figures 6 and 7) all showed a single peak in reporting at week 37 (week ending 17 September).

Figure 5. Laboratory reports of influenza A, New South Wales, Victoria and Western Australia, 2000, by week of specimen collection

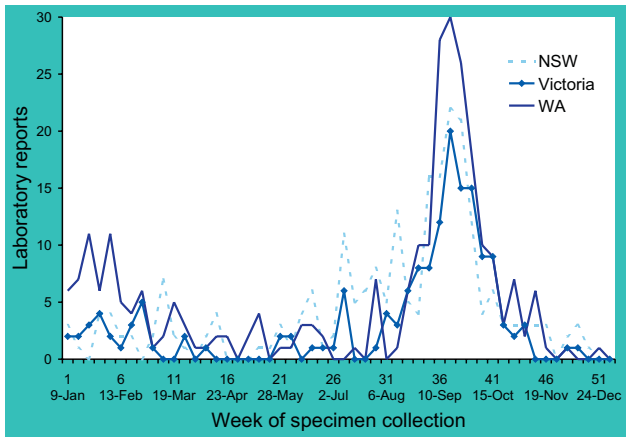


Figure 6. Consultation rates for influenza-like illness, Australia (ASPREN) and Northern Territory, 2000, by week of report

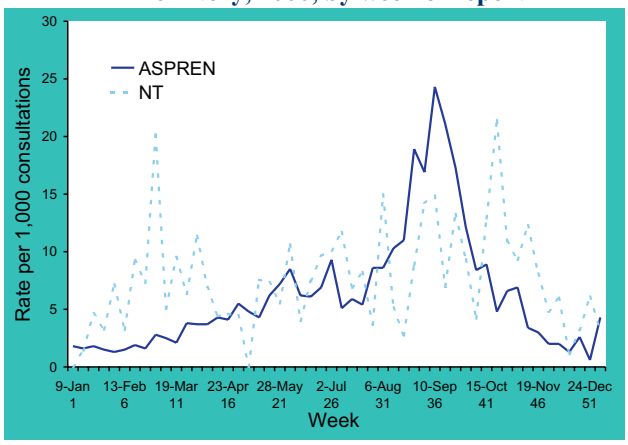
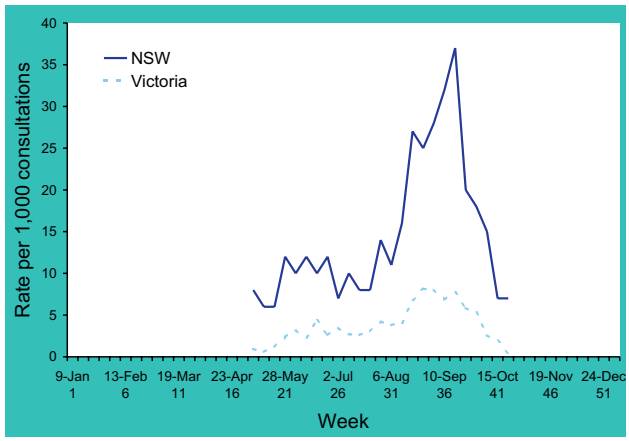


Figure 7. Consultation rates for influenza-like illness, New South Wales and Victoria, 2000, by week of report



Comparison of the ASPREN and LabVISE reports showed a similar pattern of activity, with the peak in laboratory reports one week later than that from general practitioner surveillance (Figure 8).

Figure 8. Laboratory reports of influenza and national consultation rates for influenza-like illness, Australia, 2000, by week of specimen or report

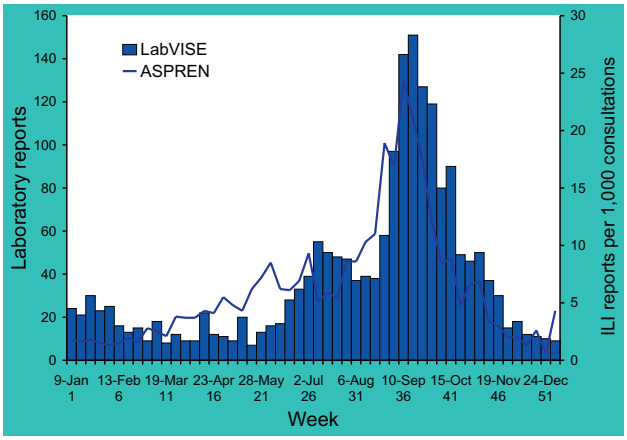
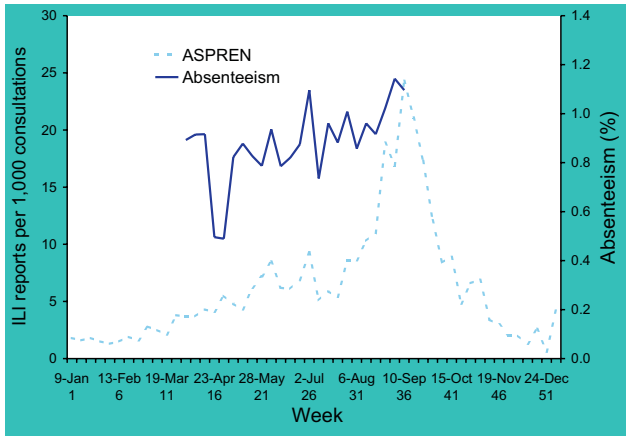


Figure 9. Rates of absenteeism and consultation rates for influenza-like illness, Australia, 2000, by week of report



Absenteeism surveillance

There was little evidence of any association between absenteeism and the peak in influenza activity in the data supplied by Australia Post. Data were only available up to week 36, which was one week before the peak in laboratory notification of influenza in 2000. Absenteeism was highest at 1.1 per cent in weeks 26, 35 and 36 (Figure 9).

WHO Collaborating Centre for Reference and Research on Influenza

The Centre received a total of 1116 influenza isolates of which 922 (83%) were viable and able to be analysed antigenically. For 97 of those isolates, genetic sequence analysis of the variable region of major surface antigen, haemagglutinin, was also undertaken, and for 22, genetic analysis of the minor surface antigen, neuraminidase, was also performed.

Of the viable isolates 518 (56%) were influenza A (H3N2) subtype, 262 (28%) were influenza B and the remaining 142 (16%) were influenza A (H1N1) subtype. The influenza A (H1N1) isolates were predominantly A/New Caledonia/20/99-like viruses (73%) with only 39 isolates characterised as A/Bayern/7/95-like. These 2 separate lineages of viruses have co-circulated for some time. Although 3 sporadic isolates of the A/New Caledonia lineage were isolated in 1999 this is the first year in which viruses of the lineage have been isolated in significant numbers in Australia. All but one of the 39 A/Bayern/7/95-like isolates came from an outbreak in South Australia.

The majority of the influenza A(H3N2) isolates (94%) were most closely related to the reference strain A/Moscow/10/99 and vaccine strain A/Panama/2007/99 and were distinguishable from the previous prototype and vaccine strain A/Sydney/5/97. Nevertheless, serological studies demonstrated that vaccines containing an A/Sydney/5/97-like strain used in the Australian 2000 winter produced similar antibody responses to the Australian 2000 A (H3N2) isolates as did vaccines containing an A/Moscow/10/99-like strain used in the 2000-2001 Northern Hemisphere winter.[4] While some antigenic heterogeneity was observed in the A (H3N2) isolates there was no evidence of significant antigenic drift beyond the A/Moscow/10/99 reference strain. Influenza B strains isolated during the 2000 season showed a progressive drift away from the B/Beijing/184/93 strain. The majority (64%) was most closely related antigenically to the new reference strain B/Sichuan/379/99.

Hospitalisation due to influenza

In 1999/2000, there were a total of 2591 admissions to Australian hospitals for influenza. Six hundred and seventy-three of these were cases in which the influenza virus was identified. Altogether influenza was responsible for 4,583 hospital patient days in 1999/2000. These data do not cover the full period of the 2000 influenza season.

Discussion

Surveillance issues

Surveillance of influenza in Australia depends on a network of different schemes including laboratory notifications, sentinel GP reports (national and state-based) and absenteeism reporting from a major national employer. In any year, changes in the reporting practices in any of these schemes will influence the estimate of influenza disease in Australia. LabVISE provides data on laboratory isolates of the influenza virus. Over the past few years, reporting through this scheme for all diseases has decreased as the number of participating laboratories has declined. In 2000, 12 laboratories reported 1916 isolates compared with 13 laboratories, which reported 3247 isolates in 1999, and 21 laboratories reporting between 1150 and 2943 isolates between 1995 and 1998. The numbers from LabVISE along with all other surveillance schemes must be interpreted as an estimate only of the total influenza incidence in Australia. LabVISE will be reviewed in 2001 and improvements in reporting through LabVISE should enhance the laboratory detection of influenza in Australia thereafter. In 2001, laboratory-confirmed cases of influenza will become notifiable in all Australian States and Territories and will be reported nationally by the NNDSS. This is expected to impact on the total numbers of influenza cases detected in Australia in the coming years.

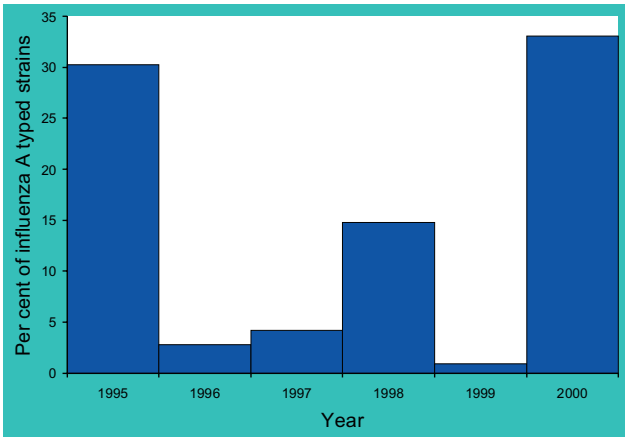
In 2000, there was good agreement between the different surveillance schemes in the temporal trends in influenza throughout the year. Compared to 1999, influenza reports peaked relatively late in the year (mid-September). Both laboratory and sentinel GP reports showed the same time trends and there were little differences in these trends between jurisdictions.

The age-specific rates of laboratory-confirmed influenza showed a high rate in infants and in people aged 70 years or over. In these age groups there is more severe disease and a greater prevalence of co-morbidity, particularly with pneumonia. Age-specific rates should be interpreted with caution since medical attention is more likely to be sought for the very young and the very old, and influenza may be mild in healthy older children and adults.

Trends in strain frequencies

The re-appearance of H1N1 influenza strains in Australia reflects the situation seen in other parts of the world as shown in Figure 10 (FluNet data, WHO). H1N1 strains were a small minority of typed strains worldwide (1995 to 1999), but data from 2000 shows an increase to 30 per cent, in the proportion of H1N1 strains isolated.

Figure 10. Frequency of influenza A/H1N1 strains, worldwide, 1995 to 2000



The clustering of A/Bayern/7/95-like virus in South Australia illustrates the local clustering of various strains occasionally observed. This strain of influenza A has been more widely in circulation in previous years.

Influenza B isolates increased in 2000, which is consistent with a three-yearly cycle of influenza B peaks in Australia. The last peak of influenza B in Australia was in 1997 (Figure 4). Peaks of influenza A and B were within a week of each other (weeks 37 and week 36 respectively, Figure 2).

Influenza vaccine use in Australia 2000

In 2000 the Centre for Population Studies in Epidemiology, South Australian Department of Human Services, performed a review of influenza vaccine uptake on behalf of the Commonwealth Department of Health and Aged Care. Telephone interviews conducted from August to November 2000 with 10,505 Australians showed 74 per cent of Australians aged 65 years and above had been vaccinated in 2000. The level of vaccination has increased from 61 per cent in 1998 and 70 per cent in 1999. The report showed some significant differences in levels of vaccination in elderly Australians in 2000 between jurisdictions, with the Australian Capital Territory having the highest coverage (82.4%) and Queensland the lowest (69.6%). The rates of vaccination in each of the past 3 years for elderly Australians was 57.4 per cent - this varied from 47.5 per cent to 64.7 per cent in different States and Territories. Ninety-five per cent of elderly Australians received influenza vaccination free of charge in 2000.[5]

Other influenza reports in Australia, 2000

In the late-summer of 2000, there was a report of an outbreak of influenza A on a trans-Tasman cruise ship.[6] In this outbreak, 8 per cent of passengers and 4 per cent of the crew presented with influenza-like illness (a total of 108 presentations). Only 2 throat swabs were positive for influenza A, which was identified in one of the cases as an H3N2 strain. This report complements other reports of influenza outbreaks among passengers on cruise ships in the Northern Hemisphere.

An analysis of laboratory-supported influenza surveillance in Victoria, which examined the relationship between influenza-like illness and laboratory-confirmed influenza, was published in 2000.[7] The proportion of patients presenting to sentinel GP practices with laboratory-confirmed influenza- like illness varied from 49 to 54 per cent in 1998 and 1999 respectively.

World trends

The 1999-2000 influenza season in the USA was dominated by influenza A (H3N2), most commonly the influenza A/Sydney/05/97-like strains. This was the third consecutive year in which this was the dominant virus strain and is well matched to the influenza vaccine strain.[8] In Europe, the influenza A (H3N2) strain circulated widely and caused one of the 3 largest epidemics in the past 10 years in France, Great Britain and Italy.[9]

The WHO has recommended the content of the Northern Hemisphere influenza vaccine for the 2001/2002 influenza season contain an A/New Caledonia/20/99 (H1N1)-like virus, an A/Moscow/10/99 (H3N2)-like virus and a B/Sichuan/379/99-like virus.[4] This same recommended vaccine will be in use in Australia for the 2001 influenza season.

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