Influenza in New Zealand 2006

Prepared as part of the Ministry of Health Contract
(2006/07 Service Description: Person-to-Person Infectious Diseases)

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March 2007

Client Report
FW0723

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ACKNOWLEDGEMENTS

We would like to thank the general practitioners and their staff, the local surveillance coordinators, regional virology laboratories (Auckland, Waikato, Christchurch and Dunedin), and medical officers of health involved in influenza surveillance for their time and cooperation. We would also like to acknowledge the WHO National Influenza Centre at ESR for the provision of laboratory data, Trev Margolin, Hui Chen for their assistance in the running of the electronic flu database, and Dr Bruce Adlam for peer review. A special thanks to Dr Ian Barr from the WHO Collaborating Centre in Melbourne for providing further characterisations on the influenza isolates and vaccine breakthrough isolates. A special thanks to Chris Lewis for providing influenza hospitalisation data and Dr Lance Jennings for providing influenza immunisation coverage data.

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Summary

During the 2006 winter season, 3587 consultations for influenza-like illness (ILI) were reported from a national sentinel network of 90 general practices. It is estimated that ILI resulting in a visit to a general practitioner affected over 41 626 New Zealanders (1.0% of total population) during the season, compared with an estimated 47 108 in 2004. The influenza activity peaked in July and the overall level of ILI in 2006 was low compared with the 1997-2005 period. The burden of influenza in children aged less than one year and those in the 1-4 year age group was significantly higher than previous years from 1995-2005 as measured by the excess morbidity rate. The ILI consultation rates varied greatly among health districts with the highest rates being reported from the Hawke's Bay and Eastern Bay of Plenty Health Districts. In 2006, the majority of the isolates were influenza A (99.2%) surpassing the influenza B isolates (0.8%). Among all typed and subtyped isolates, influenza A(H3N2)-like viruses were predominant at 86.1%. Significant antigenic drift was observed among the A(H3N2) viruses, resulting in an updated seasonal vaccine strain from A/California/7/2004 to A/Wisconsin/67/2005 for 2007.

Recommendations

1. That the sentinel influenza surveillance system be enhanced using standard surveillance system criteria and benchmarked against international best practice. This should include the review of:
   - The case definition for ILI
   - The methods of specimen collection from cases
   - Extension of the system to all year round
   - Greater use of electronic approaches to data collection and dissemination in order to ease workload on PHS and GPs and improve timeliness of ILI reporting
   - Improvement of recording of swabs sent and received so isolation rates can be calculated with greater accuracy
   - Collect the information on antiviral medication in the specimen request form in the 2007 surveillance program
   - Obtain the demographic information for the total patient population from each sentinel GP in order to calculate accurate ILI rates among different age groups.
   - Explore other complimentary surveillance approaches for detecting early cases of ILI.

2. That the sentinel influenza surveillance system be reviewed in terms of its potential during early, peak and late pandemic periods

3. That the sentinel influenza surveillance system be reviewed in terms of its potential for surveillance of other diseases and syndromes of public health importance

1. Introduction

Surveillance of influenza in New Zealand is based on sentinel general practice (GP) and laboratory-based reporting. This surveillance monitors the incidence and distribution of the disease and virus strains. Influenza is not a notifiable disease in New Zealand.

The purpose of influenza surveillance is:

- to understand incidence and distribution of influenza in the community
- to assist with early detection of influenza epidemics within the community and to guide the development and implementation of public health measures
- to identify the predominant circulating strains in the community and guide influenza vaccine composition for the subsequent year[1].

This report summarises results obtained from influenza surveillance in New Zealand for 2006, including some comparisons with previous years. It also includes information on hospital admissions for influenza (obtained from NZHIS) and influenza immunisation coverage data (obtained from Health Benefits Limited).

2. Methods

2.1. General Practice Sentinel Surveillance – Consultation and Isolate Data

The sentinel surveillance system, in its current form, commenced in 1991 as part of the WHO Global Programme for Influenza Surveillance. It is operated nationally by ESR and locally by influenza surveillance co-ordinators in the public health services (PHSs). Normally sentinel surveillance operates from May to September.

In 2006, national influenza sentinel surveillance was undertaken from May to September (week 18 to week 39 inclusive). Local surveillance co-ordinators recruited general practices within their region to participate on a voluntary basis. Where possible, the number of practices recruited was proportional to the size of the population in each health district covered by the Public Health Service (PHS) (approximately 1:50 000 population).

General practitioners (GPs) were required to record the number of consultations for influenza-like illness each week and the age group (current categories as per Figure 8) of each of these suspected cases on a standardised form.

Influenza-like illness (ILI) was defined by a standardised case definition, which was:
"Acute upper respiratory tract infection characterised by abrupt onset and two of the following: fever, chills, headache, and myalgia."

Each practice was also asked to collect respiratory samples (nasopharyngeal swab) from one patient (preferably the first) seen with an ILI on Monday, Tuesday and Wednesday of each week. The swabs were sent to a regional virus diagnostic laboratory and/or ESR for viral isolation and strain identification.

Information on the number of ILI consultations and swabs sent from each health district was forwarded to ESR by local co-ordinators each week (Monday to Sunday). ILI consultation

data was received by the following Monday to Wednesday. Likewise virology laboratories reported to ESR the total number of swabs received from each health district, the influenza viruses identified, together with updated details on type and strain. This data was collated, analysed and reported on a weekly, monthly and annual basis.

Consultation rates were calculated using the sum of the patient populations, reported by the participating practices, as the denominator. The national level of ILI activity is described using a set of threshold values.[2, 3] A weekly rate below 50 consultations per 100 000 patient population is described as baseline activity. A weekly consultation rate of 50-249 is considered indicative of normal seasonal influenza activity. Within the normal seasonal activity, 50 to 99 is low activity, 100-149 moderate, and 150 to 249 high. A rate of 250-399 indicates higher than expected influenza activity and ≥400 indicates an epidemic level of disease.

2.2. Laboratory-based Surveillance – Year-round Isolate Data

In addition to influenza viruses (isolates) identified from sentinel surveillance, year-round laboratory surveillance of influenza (and other viruses) is carried out by the four regional virus diagnostic laboratories at Auckland, Waikato, Christchurch and Dunedin Hospitals, and by ESR's virology laboratory. Each week, all viral identifications, including influenza, largely from hospital inpatients and outpatients are reported to ESR. ESR in turn collates and reports virology surveillance data nationally. ESR is a WHO-designated National Influenza Centre.

The criteria for laboratory identification of influenza include the direct detection of viral antigen or isolation of the virus (by culture). Virus isolation is the gold standard for influenza diagnosis and surveillance specificity. All influenza isolates are typed and most influenza A isolates subtyped.

2.3. Hospitalisations

Hospital admission data for influenza (ICD-10AM J10-J11) were extracted from the New Zealand Health Information Service's National Minimum Dataset (NMDS) for the year 2006 (by admission date). Influenza-related hospitalisations were conservatively taken to include only those where influenza was the principal diagnosis. Repeat admissions were included, as repeat infections with another influenza A subtype or B virus are possible.

2.4. New Zealand Population

Population data for each age group obtained from the Statistics New Zealand 2006 estimated Census of Population and Dwellings were used.

2.5. Immunisation Coverage

In 1997 influenza vaccination was made available free to those ≥65 years of age, and in 1999 free vaccination was extended to risk groups <65 years.[4, 5] The data that medical practitioners provide to Health Benefits Limited to claim reimbursement were used to estimate coverage in 2006 among persons ≥65 years of age.

3. Results

3.1. Sentinel Practices

In 2006, 90 sentinel practices were recruited from 23 of the 24 health districts (one health district did not participate in 2006). All PHSs began reporting by the beginning of May 2006. Some practices did not report every week. The average number of practices participating per week was 81, with an average patient population roll of 350 593.

3.2. Disease Burden

From May to September 2006, a total of 3587 sentinel consultations for influenza-like illness were reported, an average national weekly consultation rate of 49.6 per 100 000 patient population. This rate is slightly lower than the average weekly rates for 2005 (52.5 per 100 000) but higher than that of 2004 (35.5 per 100 000).

Extrapolating ILI consultations obtained from the GP patient population to the New Zealand population, it is estimated that ILI resulting in a visit to a general practitioner affected 41 626 New Zealanders during the influenza season (1.0% of total population). This is lower than the estimated 52 104 affected in 2005.

Figure 1 compares the weekly consultation rates for influenza-like illness in 2006 with 2005 and 2004. Influenza consultation activity remained at the baseline level from week 18 to 24, and then increased rapidly to a peak at week 27 (3-7 July). The highest consultation rate was reported during week 27 with 99.4 per 100 000 patient population. This is two weeks later than the peak in 2005 (week 25) and 11 weeks earlier than 2004 (week 38) with rates of 174.4 per 100 000 and 127.5 per 100 000 respectively. Consultation activity then gradually declined, remaining at a moderate level until week 33, and dropping below the baseline in week 36.

Figure 1. Weekly consultation rates for influenza-like illness in New Zealand, 2004, 2005 and 2006

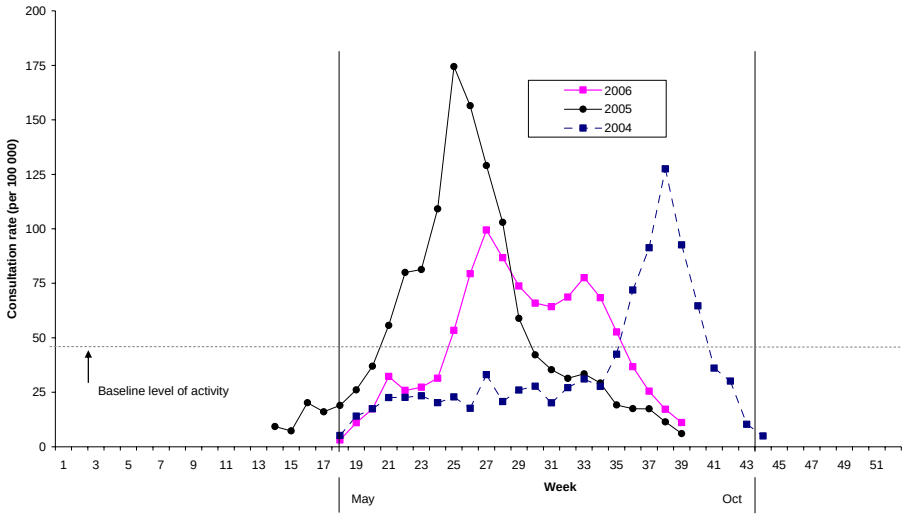


Figure 2. Total influenza isolates by surveillance type and week specimen taken, 2006

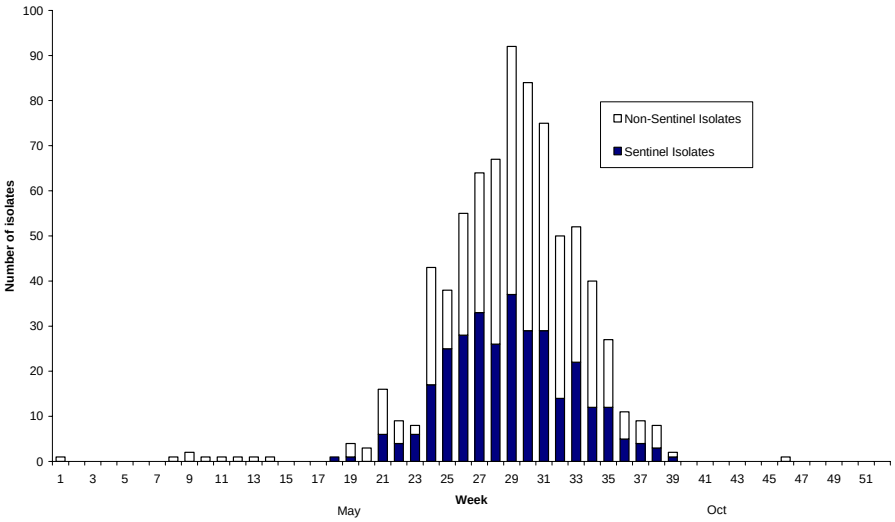
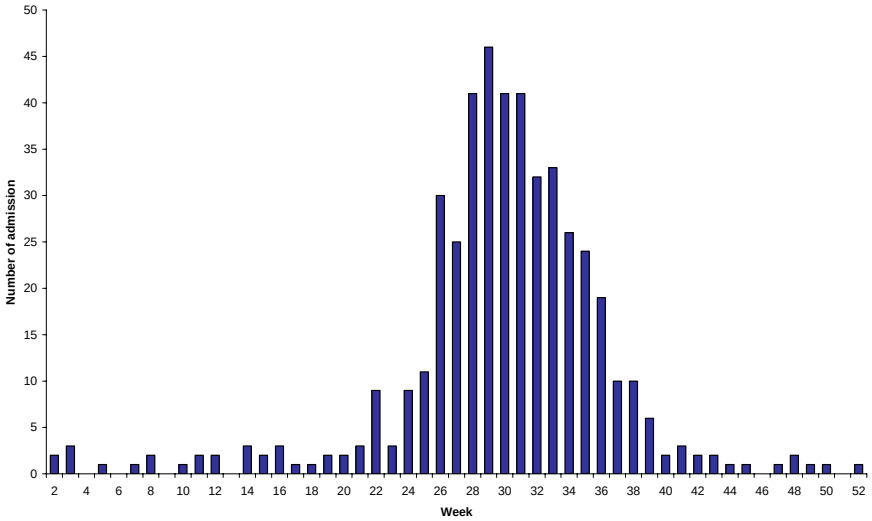


Figure 3. Influenza hospitalisation by week admitted, 2006



A total of 768 influenza isolates were identified in 2006, lower than the 845 and 864 isolates in 2005 and 2004 respectively. Of the 768 isolates, 315 came from sentinel practice surveillance during May to September. This is higher compared to the 273 sentinel isolates identified in 2005 and 231 isolates in 2004. There were 453 non-sentinel isolates identified in 2006 compared to 572 in 2005 and 633 in 2004.

Figure 2 shows influenza virus isolations each week throughout 2006. The highest number of sentinel isolates (37) came from specimens taken in week 29, two weeks later than the peak in consultation rates. Sporadic influenza isolates were identified as early as January during the summer season, however the vast majority (443, 98%) were from specimens taken during May to September. Non-sentinel isolates also peaked in week 29. Overall influenza isolates in 2006 were detected earlier than that of 2004 but similar to 2005. Most sentinel and non-sentinel isolates (95%) came from the first half of the sentinel period (weeks 21 to 36).

In 2006, there were a total of 464 hospital admissions for influenza and this is the fourth highest hospitalisations in the last 17 years from 1990-2006. This compares with 390 admissions in 2005 and 430 in 2004. Figure 3 shows these admissions by week, 88% (407) of which occurred during June to September. The highest number of admissions (178) occurred in July. Hospital admissions peaked in week 29, the same week as the peak in influenza isolates and two weeks later than the peak in consultation rates (week 27).

3.3. Geographic Distribution

In addition to national activity, sentinel surveillance is able to provide an indication of the distribution of influenza-like illness and viral strains within New Zealand.

Figure 4 shows the sentinel average weekly consultation rates for each health district during May to September 2006 (square brackets denotes a health district that did not participate in sentinel surveillance). The health district reporting the highest rate was Hawke's Bay (107.1 per 100 000 patient population), followed by Eastern Bay of Plenty (100.1 per 100 000), South Canterbury (99.7 per 100 000), Hutt (84.4 per 100 000), Taranaki (83.2 per 100 000), Waikato (69.9 per 100 000), Rotorua (62.5 per 100 000), Wairarapa (60.0 per 100 000) and Tauranga (50.2 per 100 000). Table 1 shows health districts codes and description.

Figure 5 shows the distribution of sentinel influenza isolates based on the health district from which the specimen (swab) was taken. Most isolates came from the greater Auckland area, Canterbury, Waikato, Otago, and Wellington regions. Isolates were not identified in two health districts (Ruapehu and Manawatu no swabs received), and swabs for sentinel surveillance were not taken in one health district. The national isolation rate for 2006, illustrated in Figure 6 was 34.1% (315 isolates from 924 swabs received), which is higher than the 2005 rate of 27.8% (981 swabs) and 2004 rate of 29.2% (790 swabs).

With regards to the geographical distribution of received influenza isolates, it is important to take into account that for some health districts there is a discrepancy in the reported number of swabs sent by sentinel GPs in that district, and the number of swabs recorded as received by virology labs.

Figure 4. Sentinel average weekly consultation rate for influenza-like illness by health district, 2006

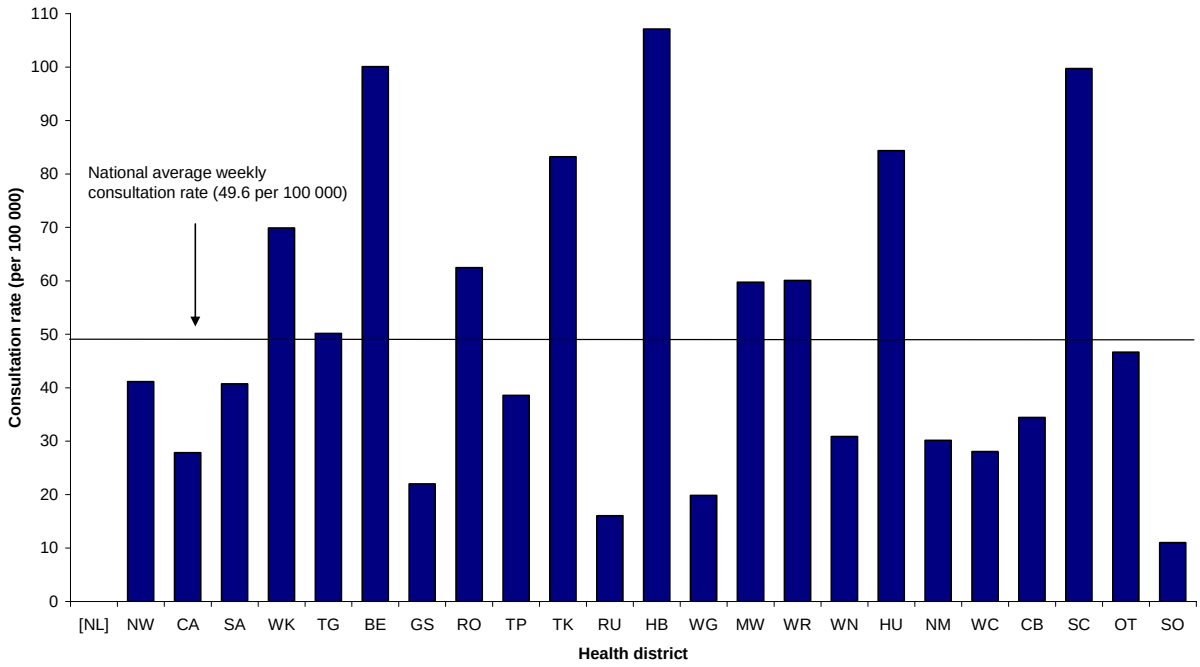


Figure 5. Cumulative laboratory confirmed influenza isolates from sentinel surveillance by health district, May-September 2006

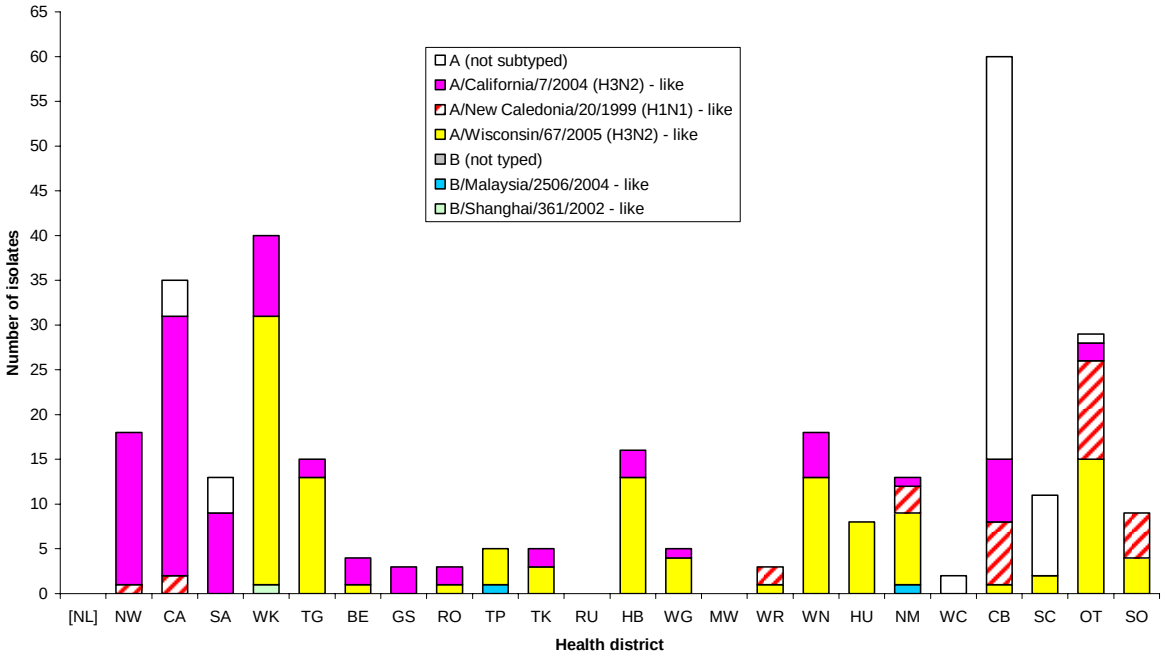
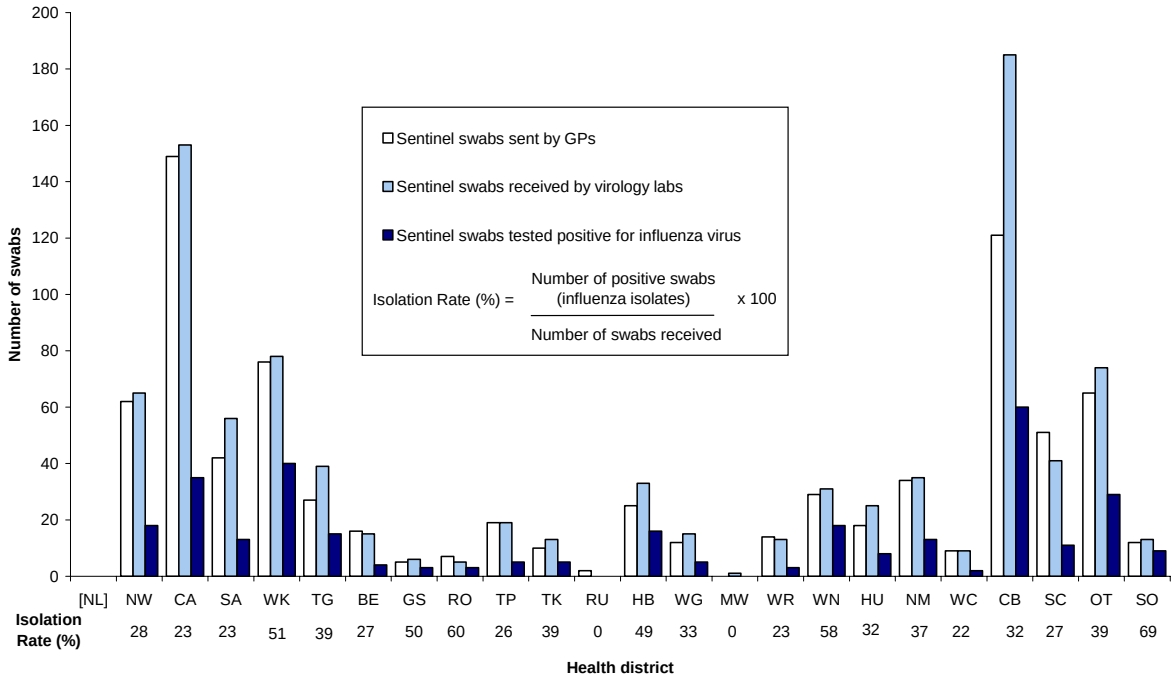


Table 1. Health District Codes and Description

Code	Description	Code	Description
NL	Northland	HB	Hawke's Bay
NW	North West Auckland	WG	Wanganui
CA	Central Auckland	MW	Manawatu
SA	South Auckland	WR	Wairarapa
WK	Waikato	WN	Wellington
TG	Tauranga	HU	Hutt
BE	Eastern Bay of Plenty	NM	Nelson-Marlborough
GS	Gisborne	WC	West Coast
RO	Rotorua	CB	Canterbury
TP	Taupo	SC	South Canterbury
TK	Taranaki	OT	Otago
RU	Ruapehu	SO	Southland

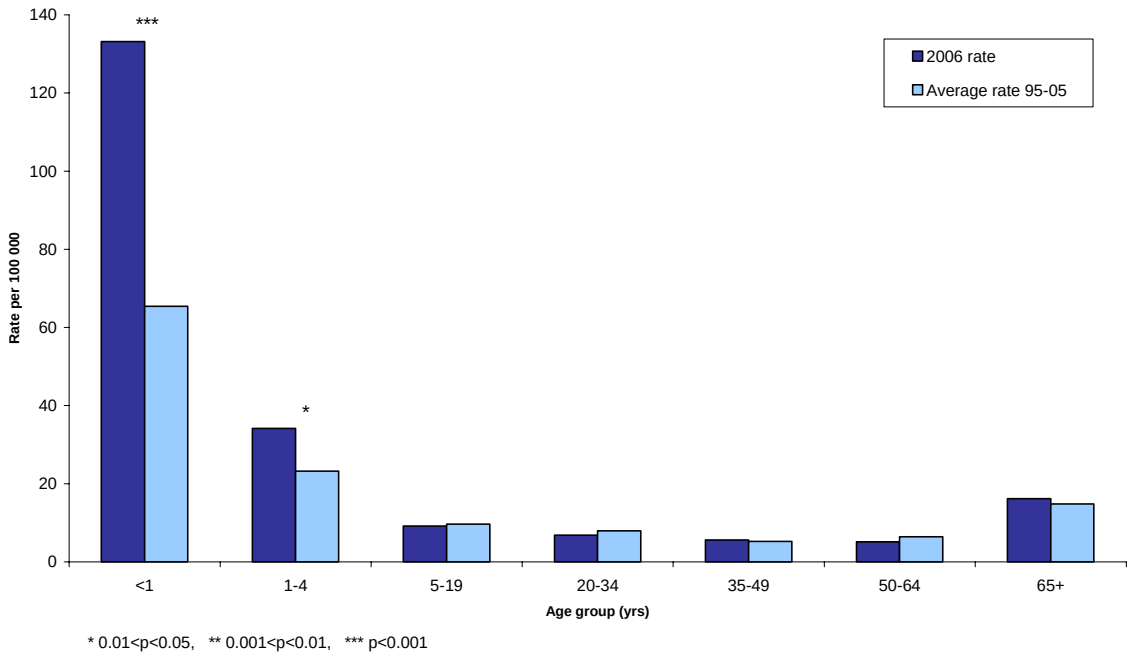
Figure 6. Sentinel swabs, sent, received and tested positive for influenza virus by health district, 2006



3.4. Age Distribution

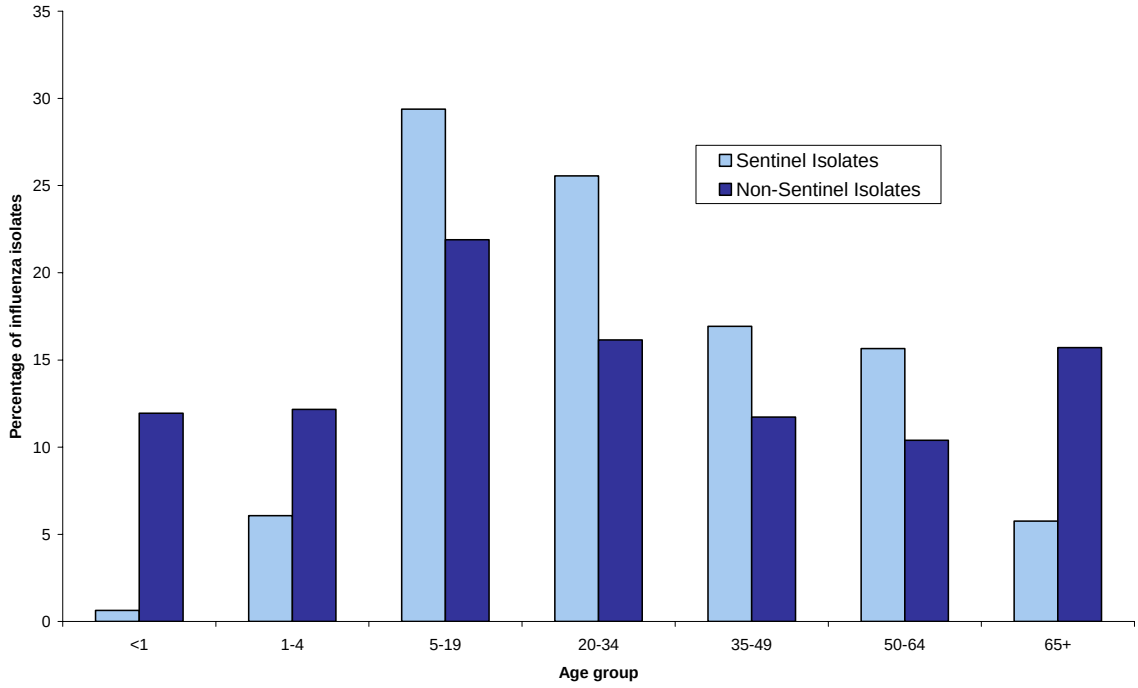
Figure 7 compares the morbidity rates in 2006 and the average rates in 1995-2005 by age group. In 2006, the highest morbidity rates occurred in children aged under one year (133.2 per 100 000), followed by children aged 1-4 (34.2 per 100 000) and adults aged 65+ years (16.2 per 100 000). In addition, children <1 year and those in the 1-4 years age group had a statistically significant increase of the excess morbidity rates ($p<0.05$) compared to the average rates from 1995-2005 for the same age group.

Figure 7. Comparison of the morbidity rate in 2006 and the average rate in 1995-2005 by age group



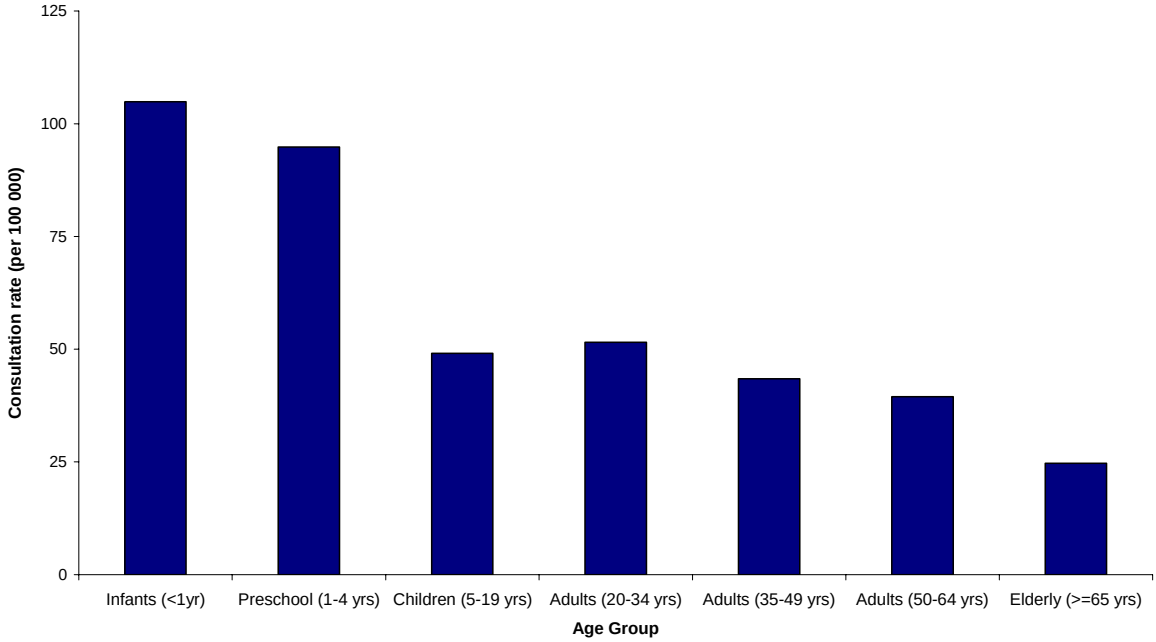
Figures 8 compares the percentage of influenza isolates between sentinel surveillance and non-sentinel for each age group. It is interesting to note that the age group under one year and 1-4 years and patients over 65 years were represented more in laboratory-based surveillance than in sentinel surveillance. This is consistent with the findings from the past 3-4 years.

Figure 8. Percentage of sentinel and non-sentinel influenza isolates by age group, 2006



In addition, rates of ILI by age group were calculated for each age-band used in the sentinel surveillance system. The denominator for rate calculations was based on the knowledge that the total number of patients from the sentinel practices was 8.6% of the New Zealand population. It was assumed that this practice population collectively had the same age distribution as the New Zealand population. These rates are presented graphically in Figure 9.

Figure 9. Sentinel consultation rate for influenza-like illness by age group, 2006



The highest consultation rate for influenza-like illness was in the infants <1 year and pre-schoolers aged 1-4 years, with an average weekly consultation rate of 104.9 and 94.8 per 100 000 patient population respectively. Adults aged 20-34 had a rate of 51.5 and children aged 5-19 years had a rate of 49.1 per 100 000. Adults aged 35-49 years had a slightly lower rate of 43.4 per 100 000 and adults aged 50-64 years had a rate of 39.5. Elderly people (aged 65 years and over) had the lowest rate of 24.7 per 100 000.

4. Immunisation Coverage

The uptake of influenza vaccine in New Zealand in 2006 among persons 65 years and over is estimated at 64% (up 7.5% from 2005 61% coverage). Immunisation coverage for at risk individuals under the age of 65 years is estimated at 35%. The number of doses of influenza vaccine used during the 2006 season was 185 doses per 1000 population (up 6% from 174 doses per 1000 in 2005).

Due to breakthrough cases observed in 2004 (see Influenza Annual Report in 2004), the issue of influenza vaccine effectiveness was raised by health professionals around the country. Wide consultation was conducted among virology laboratories, influenza coordinators in Public Health Units, Medical Officers of Health, general practitioners and practice nurses in the Wellington region. Nearly 100% consensus was obtained. It was agreed that when GPs took swabs from three ILI patients each week, completed the request forms with the necessary demographic data, they would include information as to whether the patient had been vaccinated against influenza in the same year. Influenza vaccination history provides the following important information:

- Virologically, an influenza virus isolated from a vaccinated person is extremely valuable. Full antigenic and genetic characterisation of the isolate could indicate the trend in antigenic drift of the virus. It aids the selection of a vaccine strain.
- Epidemiologically, it gives some indications in terms of the trend of vaccine failure. Sentinel surveillance provides relatively constant pools of ILI patients. Over time, the baseline data for vaccine failure can be determined and deviations detected.

A total of 26 vaccine breakthrough cases were recorded from the national influenza database (Table 2), comprising 3.4% of total isolates (26/768). The clinical effectiveness of influenza vaccines depends on the immunocompetence of the recipient, previous exposure to influenza and influenza vaccines, and the closeness of the match between the vaccine and circulating influenza strains. Of 26 vaccine breakthrough cases, 17 cases (65%, 17/26) occurred in age groups >50 years. Immunological senescence may explain a higher proportion of vaccine breakthrough cases in the elderly population. In addition, three vaccine cases had influenza A/Wisconsin/67/2005 – low reactors. This indicated 12% (3/26) of vaccine breakthrough might be due to the continuing drift of the virus, resulting in a lower match between the circulating virus and the vaccine. Twenty-one out of 26 vaccine breakthrough isolates were referred to the WHO Collaborating Centre (WHOCC) in Melbourne. The HA1 gene of the influenza A(H3N2) isolates were sequenced. It was revealed that these HA1 sequences were similar to a number of influenza A(H3N2) viruses obtained from nursing home outbreaks in Canberra and Sydney in November 2006.

In addition, 265 ILI cases had information on vaccination history from the ESRLab database for sentinel surveillance specimens. Among them, 33 had influenza vaccination in the same year as the onset of ILI and 232 had none. There were 13 (39.4%, 13/33) vaccinated patients whose specimens yielded influenza viruses. Of these, one case (7.7%, 1/13) had an A/California/7/2004 (H3N2) –low reactor.

Table 2. Influenza vaccine breakthrough cases by age group, 2006

Age Group (years)	Influenza A not subtyped	A/New Caledonia/20/99 (H1N1) - like	A/New York/55/2004 (H3N2) - like	Total
<1	0	0	0	**0**
1-4	0	0	0	**0**
5-19	1	0	0	**1**
20-34	1	1	2	**4**
35-49	1	0	3	**4**
50-64	2	0	8	**10**
65+	1	1	5	**7**
Total	**6**	**2**	**18**	**26**

5. Virus Strain Characterisation

5.1. Isolates in 2006

Figure 10 shows influenza virus isolations by type and subtype for each week throughout 2006, and the total percentage contribution of each. Table 3 shows influenza virus isolations by type and subtype for 2006.

The majority of influenza isolates (762/768 or 99.2% of all isolates) were characterised as influenza A. Influenza B made up 0.8% (6/768) of all isolates in contrast to 86.9% in 2005.

Figure 11 shows the general pattern of influenza virus isolations. This indicates the early onset of ILI activity and then a rapid rise to peak in week 29 (middle of July). The majority of A isolates occurred in the middle of the season. The influenza A isolates were mostly identified as A/California/7/2004-like and as A/Wisconsin/67/2005-like. This was the predominant subtype of influenza isolates in 2006 overall.

A total of six influenza B isolates were identified in 2006, which represented 1.3% of typed and subtyped isolates (446) and 0.8% of all influenza isolates (768). Influenza B/Malaysia/2506/2004-like viruses co-circulated with B/Shanghai/361/2002-like viruses representing 0.7% of the typed and subtyped isolates and 0.4 % of total isolates. Influenza A(H3N2) represented 86.1 % (384/446) of the typed and subtyped isolates and 50.0% (384/768) of the total isolates. Influenza A(H1N1) represented 12.6% (56/446) of the typed and subtyped isolates and 7.3% (56/768) of the total isolates. In contrast to influenza B, influenza A(H1N1) co-circulated with A(H3N2) from week 24 to week 38.

Table 3. Influenza virus isolations by type and subtype, 2006

Virus	All isolates n=768 (%)	Typed/Subtyped n= 446 (%)
Influenza A		
A(H3N2)	384 (50.0)	384 (86.1)
A(H1N1)	56 (7.3)	56 (12.6)
A* (not subtyped)	322 (41.9)	
Subtotal	**762 (99.2)**	**440 (98.7)**
Influenza B		
B Malaysia	3 (0.4)	3 (0.7)
B Shanghai	2 (0.3)	2 (0.4)
B (not typed)	1 (0.1)	1 (0.2)
Subtotal	**6 (0.8)**	**6 (1.3)**
Total	**768 (100)**	**446 (100)**

*294/322 A (not typed) isolates were from Canterbury Health Laboratories. These viruses were tested as influenza A positive by direct immunofluorescence or rapid antigen assay. These viruses could not be cultured for additional typing.

Figure 10. Total influenza isolates by type and week specimen taken, 2006

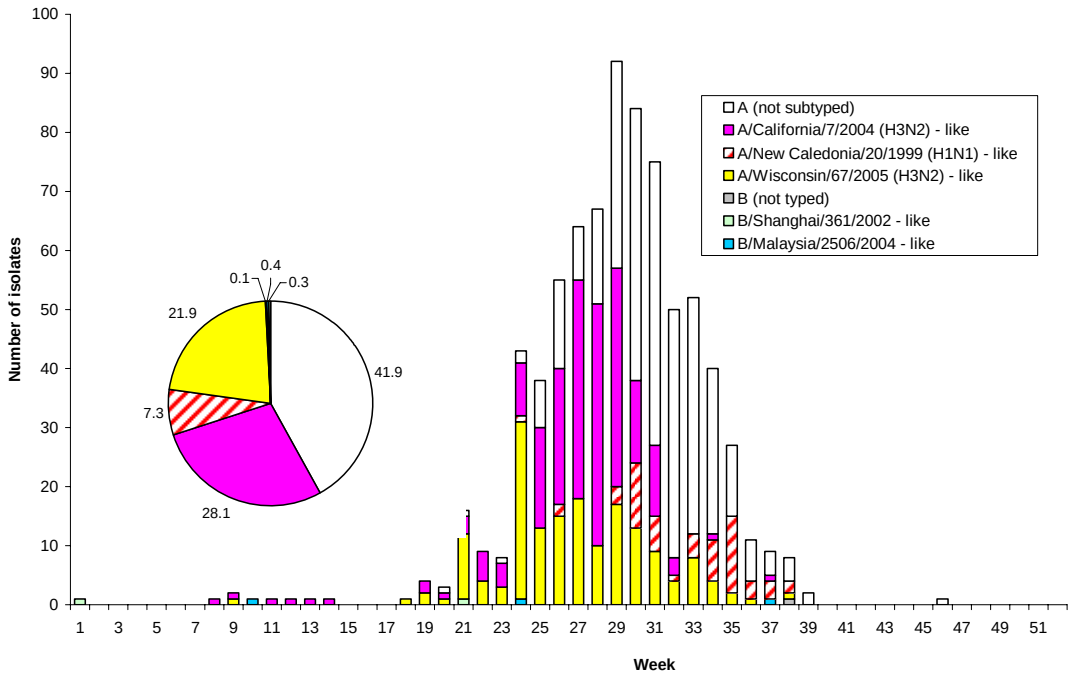
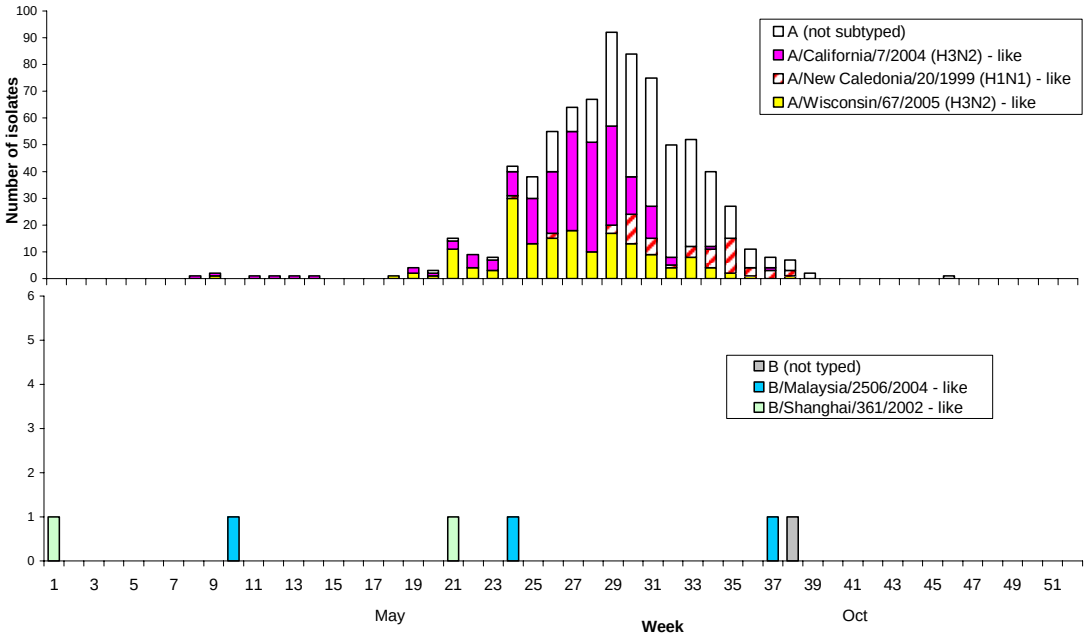


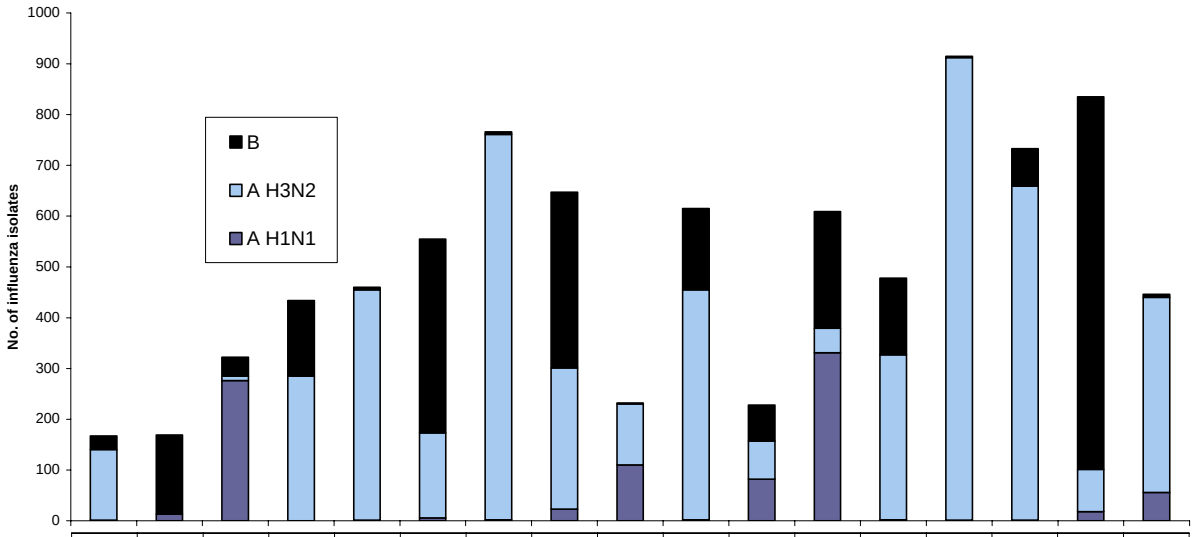
Figure 11. Total influenza virus isolates by type and week specimen taken, 2006



5.2. Changes in Isolates 1990-2006

Figure 12 shows the number and percentage of typed and subtyped (not total) influenza isolates from 1990 to 2006. There are three noticeable changes in terms of predominant patterns:

Figure 12. Influenza isolates by type, 1990-2006



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
B	16%	92%	11%	34%	1%	69%	1%	53%	1%	26%	31%	38%	32%	0%	10%	88%	1%
A H3N2	83%	0%	3%	66%	99%	30%	99%	43%	52%	74%	33%	8%	68%	100%	90%	10%	86%
A H1N1	1%	8%	86%	0%	0%	1%	0%	4%	47%	0%	36%	54%	0%	0%	0%	2%	13%

5.3. Influenza A(H1N1)

During the period from 1990 to 1999 influenza A(H1N1) emerged as predominant circulating strain in 1992 (86%) and six years later in 1998 (47%). However in 2000 and 2001, influenza A(H1N1) featured uncharacteristically in two consecutive years occurring in 36% and 54% of isolates tested. This is in contrast to 2003 and 2004, when only one A(H1N1) was isolated each year. Since 2005, more A(H1N1) viruses were isolated with 18 isolates (2%) and 56 isolates (13%) in 2006.

5.4. Influenza A(H3N2)

Influenza A(H3N2) viruses have often been associated with more severe disease and with excess pneumonia and influenza mortality. For example, the highest number of deaths (94) in 1996 in New Zealand was recorded during an A(H3N2) epidemic.[3] During 1993 to 2000, A(H3N2) had been the predominant circulating influenza A subtype, however in 2001, A(H3N2) constituted only 8% of typed/subtyped isolates. Influenza A(H3N2) percentage of isolates in 2004 was very similar to that in 1994, 1996, and 2003 with over 90% of typed/subtyped isolated as A(H3N2). Influenza A(H3N2) was not the predominant subtype in 2005 but it co-circulated at lower levels (10%) with influenza B throughout the winter season. In 2006, A(H3N2) was the predominant subtype (86% of typed and subtyped isolates).

5.5. Influenza B

It is well documented that influenza B predominates or co-dominates every second year in southern hemisphere. In New Zealand, influenza B predominated or co-dominated in 1991, 1993, 1995, 1997, 1999 and 2001. However, this pattern has changed since 2001. Influenza

B has been the co-predominant strain consecutively in 2001 and 2002, while very low influenza B activity was observed in 2003 and 2004. In 2003, there were only three (0.3%) influenza B isolations but this increased to 10% (74) in 2004. In 2005, influenza B was the predominant type with 734 isolations (88%) the highest percentage of influenza B isolations over the last fifteen years and exceeding levels detected in 1995 (69%) and 1997 (53%). In 2006, influenza B activity was recorded at low level (1% of typed and subtyped isolates).

6. Vaccine Formulation - Southern Hemisphere Trends

In October 2006, the Australian Influenza Vaccine Committee (AIVC), with a New Zealand representative, met to decide on the composition of the influenza vaccine for the 2006 winter season for New Zealand, Australia and South Africa. During these discussions, the following trends were noted:

6.1. Influenza A(H1N1)

Influenza A(H1N1) subtype viruses, which re-emerged in 1977, closely resemble strains that circulated until 1956. Because of this, they initially had little impact in the older population. With further antigenic drift in the subtype, there has been some evidence of increasing impact in the elderly. Two antigenically distinct lines of influenza A(H1N1) have circulated in recent years and these are A/New Caledonia/20/99 and A/Bayern/7/95. In the past few years, however, viruses of the A/New Calendonia/20/99 lineage viruses have completely replaced A/Bayern/7/99-like strains.

The WHO Collaborating Centre for Influenza in Melbourne has analysed 225 A(H1N1) isolates from 11 countries since January 2006. Most viruses reacted well with A/New Caledonia/20/99 antisera. However, an increasing proportion (29%) of low reactors (8 fold or more) were observed. Current vaccines containing A/New Caledonia/20/99 antigen stimulated HA antibodies against recent A(H1N1) influenza isolates, which were of similar titre and frequency to those against the vaccine virus.

Based on the southern hemisphere and global data, the WHO Consultative Group concluded that there was no need to change the vaccine strain from an A/New Caledonia/20/99-like virus.

6.2. Influenza A(H3N2)

Influenza A(H3N2) has been frequently associated with severe disease and excess mortality in high-risk groups. This subtype has also shown the greatest tendency for antigenic drift as illustrated by the frequency of vaccine formulation changes recommended by the WHO and the AIVC.

The WHO Collaborating Centre for Influenza in Melbourne has analysed 657 A(H3N2) isolates from 11 countries since January 2006. These viruses made up the majority (55.8%) of all viruses analysed at the Centre. Approximately half of the viruses reacted well with antisera raised against A/Wisconsin/67/2005. A small proportion of viruses (34%) had reduced reactivity (8 fold or greater) with the A/Wisconsin/67/2005 antisera. However, antigenic and genetic analyses did not reveal the emergence of a clearly definable antigenic variant. As a result, A/Wisconsin/67/2005 was recommended by WHO and the Australia

Influenza Vaccine Committee to be the H3 component of the influenza vaccine for southern hemisphere for 2007.

6.3. Influenza B

Two distinct lines of influenza B have been observed during recent years. This dates back to 1990 when the B/Panama/45/90 variant of influenza B arose whilst strains of the previous B/Victoria /2/87-like viruses continued to circulate in Asia. This strain and its further variants (most recently representative strain-B/Shanghai/361/2002) spread worldwide including New Zealand. Meanwhile strains of the previous B/Victoria/2/87-like viruses (most recently representative strain-B/HongKong/330/2001) continued to circulate in Asia and subsequently underwent independent evolution as an antigenically distinct lineage. For reasons not understood, these strains remained geographically restricted to Asia until 2001.

In May-June 2001 some isolates of the B/Hong Kong lineage were found in Hawaii, but not in other non-Asian countries. Further spread of viruses of this lineage then occurred in the 2001-2002 northern hemisphere winter and they progressively became prominent in some countries, particularly in North America. Prior to 2002, all influenza B isolates from New Zealand belonged to the B/Shanghai/361/2002 lineage. In 2002, they were replaced almost exclusively by B/HongKong/330/2001-like viruses (150, 31% of typed isolates) and B/Shanghai-lineage virus (one isolate). In 2003, three influenza B viruses were isolated (two B/Shanghai-lineage viruses in weeks 40 and week 45 and one B/Hong Kong/330/01-like virus in week 8). In 2004, there were 62 typed influenza B viruses, 51 were B/Shanghai/361/2002-like viruses and one was B/HongKong/330/2001-like virus. In 2005, for the first time, both B/HongKong/330/2001-lineage (550, 66%) and B/Shanghai/361/2002-lineage (124, 15%) viruses were prevalent and co-circulated from week 21 to week 35. In 2006, influenza B activity was recorded at low level (6, 1%).

The Australian WHO Collaborating Centre showed that the majority of B isolates from the Southern Hemisphere in 2006, particularly New Zealand, were B/HongKong/330/2001 lineage viruses. The majority of recent isolates were antigenically similar to B/Malaysia/2506/2004-like virus. Current vaccines containing B/Malaysia/2506/2004 antigen stimulated HA antibodies that were similar in titre to recently isolated B/Malaysia/2506/2004-like viruses. Based on the southern hemisphere and global data, the WHO consultation group concluded that vaccines for 2007 should contain a B/Malaysia/2506/2004-like strain component.

In summary, the AIVC agreed to adopt the recommendations made by the WHO consultation group as per the box below.

The recommended influenza vaccine formulation for New Zealand in 2007 is:

- **A(H1N1)** **an A/New Caledonia/20/1999-like strain**
- **A(H3N2)** **an A/Wisconsin/67/2005-like strain**
- **B** **a B/Malaysia/2506/2004-like strain**

7. Discussion

Based on sentinel consultation data using a set of threshold values, the peak of influenza activity in 2006 is described as low. When the peak of weekly consultation rates for influenza-like illness from 1997 to 2006 are compared, 2006 has the second lowest level of influenza activity, with 2002 as the first lowest.

It is estimated that influenza-like illness resulting in a visit to a general practitioner affected over 41 626 New Zealanders in 2006 or about 1.0% of the population. The number of cases reported through the sentinel network is likely to be a considerable underestimate of the true number, as many people do not consult a general practitioner when they have an influenza-like illness.

When the overall pattern for sentinel consultation rates, isolations and influenza hospitalisations are compared for 2006 (Figures 1-3), they follow a very similar pattern, peaking in July and then declining to the baseline level in early August. The robustness of the sentinel influenza surveillance has been validated externally by another system, GPSURV.[6] The sentinel surveillance usually operates from May through September. Due to the variability of influenza activity from year to year, there is a need for sentinel surveillance to extend beyond the current May to September period, ideally to year-round surveillance.

Consultation rates varied greatly among health districts. The use of a common case definition for the purposes of surveillance should minimise regional differences in the criteria for diagnosis of influenza. However, in health districts where only a single practice or a small number of practices participate, consultation rates are more likely to be subject to variations in individual diagnostic practices. The health district reporting the highest rate was Hawke's Bay (107.1 per 100 000 patient population).

In 2006, there were a total of 464 hospital admissions in New Zealand for influenza, the fourth highest recorded number from 1990 to 2006. The high hospitalisation in 2006 associated with the fact that influenza A(H3N2) was the predominant strain. This is consistent with the observation that influenza A(H3N2) (particularly antigenically drifted A(H3N2) viruses) is more frequently associated with severe disease and excess mortality in high-risk groups. The highest morbidity rates occurred in children aged under 4 years and adults aged 65+ years. In addition, children <1 year and those in the 1-4 years age group had a statistically significant increase of the excess morbidity rates ($p<0.05$) compared to the average rates from 1995-2005 for the same age group.

Figure 9 compares ILI consultation rate in the community among different age groups. Caution is required in interpretation of this data. Because no demographic information on the total patient population is provided from each practice, it was assumed that the total patient population of all sentinel practices collectively had the same age distribution as the New Zealand population. However, individual practices may have differing age distribution of their patient population when compared to census data. Therefore it would be useful to have the demographic information on the total patient population from sentinel GPs in order to obtain the accurate ILI consultation rates among different age groups.

When comparing age data for positive influenza virus isolates from sentinel and non-sentinel surveillance (Figure 8), the non-sentinel system tends to detect more influenza viruses in the under 5's and over 65 years olds than that of the sentinel system. This may reflect the fact that influenza presented more severely in the very young and the elderly populations, resulting in hospitalisations or it may reflect a greater reluctance among sentinel GP's to take swabs from very young children and elderly patients. Overall, these data indicate that sentinel and non-sentinel surveillance complement each other, providing a better description of influenza disease burden for the different age groups.

One of the strengths of the sentinel surveillance system in New Zealand is the combination of disease surveillance (influenza-like illness) and strain surveillance (virological identification). A definitive diagnosis of influenza requires laboratory confirmation, since clinical diagnosis on the basis of clinical symptoms is not highly specific. Consequently, an important part of the sentinel system is for GPs to take throat and/or nose swabs from patients presenting with an influenza-like illness on Monday, Tuesday and Wednesday of each week. During the 2006 season, some health districts had only a small number of swabs or no swabs taken at all which influenced the reported rates in those health districts.

For sentinel surveillance from May to September 2006, five virology laboratories tested 924 respiratory specimens for influenza viruses and 315 (34.1%) specimens were positive for influenza viruses. However, the influenza isolation rate varied among different health districts (Figure 6). Some health districts had an influenza virus isolation rate lower than the national average of 34.1%. Many factors could contribute to low isolation rates, including sampling techniques. Sampling of the respiratory tract for clinical viral isolation should maximise the harvest of virally infected columnar epithelial cells. Ideally, nasopharyneal washes or aspirates would be the best specimens since they contain a higher cellular content than nasopharyneal swabs.[7] By comparison, throat swabs or throat washings are of limited use in the diagnosis of influenza since the majority of cells captured by this technique are squamous epithelia. However, a combined nose (i.e. nasophrayngeal) and throat swab can be a useful specimen for influenza virus isolation and it is selected for influenza surveillance because of its convenience. Nasopharyngeal swabs should be cotton-, rayon- or dacron-tipped, plastic-coated swabs. The swab should be inserted deeply into the nasopharynx, rotated vigorously to collect columnar epithelia cells, removed, replaced into viral transport medium (VTM), chilled and couriered to the virology laboratory without delay.

Since 2001, the five virology laboratories have been using the ESR-designed electronic influenza virus input form for data entry. This process requires the retrieval of the necessary demographic data from the hospital information system and re-keying this information onto ESR virus input form. This is time-consuming system and inevitably creates data error.

Advances in information transfer using systems such as Health-Link would greatly streamline this process.

Overall, the sentinel surveillance system is very useful in measuring disease burden in the community. However, the results of sentinel surveillance need to be interpreted with caution. For example, sentinel data cannot be extrapolated precisely to the rest of the population since not all people suffering from influenza in the community attend their GP. Also, the sentinel general practices are not truly representative. Practices are not randomly selected and consist of GPs who participate through goodwill, usually due to an interest in influenza surveillance. In addition, ILI consultation rates use the number of patients in the practice as the denominator. These data are provided at the beginning of the season and do not take into account the number of patients entering or leaving the practice during that time. GPs may also see "casual" patients who are not part of the practice population. Despite these problems, the system is useful in meeting the purposes of influenza surveillance, as described in the introduction.

As the impact of influenza can be reduced by annual immunisation, this information is particularly important in raising awareness of the disease amongst health professionals and the public, and planning vaccine formulation and delivery. Influenza vaccines are recommended for persons at risk of developing complications following infection because of their age or because of some underlying chronic condition, and are available free each year. [8]

In 1997, New Zealand introduced free influenza vaccination to all New Zealanders aged 65 years and older, and set a target of 75% coverage for the year 2000. In 1999 free vaccination was extended to include those under 65 years with certain chronic medical condition.[8, 9] In late 1999, with coverage of the 65 and over group at 55%, it was obvious that the national target was not going to be met. A new promotion group, the National Influenza Immunisation Strategy Group (NIISG) was established in 2000 with the purpose of improving coverage through public and healthcare provider education. The Group is comprised of members from the Ministry of Health, District Health Boards, the Royal NZ College of GPs, the College of Practice Nurses, the Immunisation Advisory Centre, Communications, and the pharmaceutical company that supplies the free vaccine. It is well documented that health professional enthusiasm and support for immunisation is the single most important predictor of a patient being immunised against influenza.[10] For this reason, significant activities of NIISG have been in the area of healthcare professional education. The "Influenza Kit" and "Education Manual" were specifically developed for this purpose. Other education resources include pamphlets, radio and television advertising, healthcare professional education sessions and developing close links with the National Influenza Pandemic Planning Committee. Media evaluation is in place and research has been initiated into attitudes to influenza immunisation in primary health providers and those 65 years and older.[11] A national approach to promotion, coupled with local initiatives, has been a key to lifting coverage to 65% amongst those at greatest risk, people 65 year and older. Quality coverage data are essential for the continuing development of this programme, while continuing surveillance ensures the provision of effective vaccines to reduce the burden of influenza in New Zealand.

Apart from the Acute Flaccid Paralysis programme, the GP sentinel surveillance system for influenza is possibly the only other ongoing syndromic surveillance system in New Zealand. Most other surveillance systems are passive, based on collecting data on diagnosed disease. Active syndromic surveillance systems are being increasingly to detect emerging and re

emerging pathogens.[12, 13] Enhanced influenza surveillance is also a key strategy for improving New Zealand's preparedness for pandemic influenza.[14] The GP sentinel surveillance system for influenza would readily adapt to monitor the early stages and progress of pandemic influenza, however objectives for detection of the first pandemic case(s) would not be met by a GP sentinel system. Enhancement in light of preparations for pandemic influenza could include age, gender, and ethnicity in the practice register data. In addition, whether or not the patient has been using antivirals or received influenza immunisations could also provide useful information on antiviral resistance and vaccine efficacy. There is therefore a good case for reviewing New Zealand's existing influenza surveillance system in light of these potential enhancements.

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