

Influenza in New Zealand 2005

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CONTENTS

<i>Summary</i>	1
<i>Recommendations</i>	1
1. Introduction	2
2. Methods	2
2.1. General Practice Sentinel Surveillance – Consultation and Isolate Data	2
2.2. Laboratory-based Surveillance – Year-round Isolate Data	3
2.3. Hospitalisations	3
2.4. New Zealand Population	3
2.5. Immunisation Coverage	4
3. Results	4
3.1. Sentinel Practices	4
3.2. Disease Burden.....	4
3.3. Geographic Distribution.....	6
3.4. Age Distribution.....	8
4. Immunisation Coverage	12
5. Virus Strain Characterisation	13
5.1. Isolates in 2005	13
5.2. Changes in Isolates 1990-2005	15
5.3. Influenza A(H1N1).....	16
5.4. Influenza A(H3N2).....	16
5.5. Influenza B	16
6. Vaccine Formulation - Southern Hemisphere Trends	16
6.1. Influenza A(H1N1).....	16
6.2. Influenza A(H3N2).....	17
6.3. Influenza B	17
7. Discussion	19
References	23

LIST OF TABLES

Table 1. Health District Codes and Description.....	8
Table 2. Levels of illness at Wellington and Hutt Valley schools, 2005	11
Table 3. Influenza virus isolations by type and subtype, 2005	14

LIST OF FIGURES

Figure 1. Weekly consultation rates for influenza-like illness in New Zealand, 2003, 2004 and 2005.....	5
Figure 2. Total influenza isolates by surveillance type and week specimen taken, 2005	5
Figure 3. Influenza hospitalisation by week admitted, 2005.....	5
Figure 4. Sentinel average weekly consultation rate for influenza-like illness by health district, 2005	7
Figure 5. Cumulative laboratory confirmed influenza isolates from sentinel surveillance by health district, April-September 2005.....	7
Figure 6. Sentinel swabs, sent, received and tested positive for influenza virus by health district, 2005	8
Figure 7. Influenza B Isolates by age group by year, 1992-2005	9
Figure 8. Percentage of ILI consultations from sentinel surveillance and hospitalisations by age group, 2005	10
Figure 9. Percentage of sentinel and non-sentinel influenza isolates by age group, 2005.	10
Figure 10. Sentinel average weekly consultation rate for influenza-like illness by age group, 2005	11
Figure 11. Total influenza isolates by type and week specimen taken, 2005	14
Figure 12. Total influenza virus isolates by type and week specimen taken, 2005	15
Figure 13. Influenza isolates by type, 1990-2005	15

Summary

During the 2005 influenza season, 3929 consultations for influenza-like illness (ILI) were reported from a national sentinel network of 87 general practices. It is estimated that ILI resulting in a visit to a general practitioner affected over 52 104 New Zealanders (1.3% of total population) during the season, compared with an estimated 35 186 in 2004. The national level of ILI in 2005 was relatively high compared with the 1997-2004 period. The highest rates were reported from the Eastern Bay of Plenty and Otago Health Districts. In 2005, 86.9% of influenza isolates were influenza B, and 13.1% were influenza A. Among all typed and subtyped isolates, influenza B/Hong Kong/330/2001 – like viruses were predominant at 65.9%.

Recommendations

1. That the sentinel influenza surveillance system be reviewed 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
 - Other complimentary surveillance approaches for early detections of ILI.
 - Greater use of electronic approaches to data collection and dissemination in order to improve timeliness of ILI reporting
 - Improvement of recording of swabs sent and received so isolation rates can be calculated with greater accuracy
 - Incorporation of the influenza vaccination history in the specimen request form in the 2006 surveillance program
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 2005, 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. However, in 2005, the surveillance started in April, one month earlier than the usual start date. This was due to issues related to the vaccine, Vaxigrip, supplied by Sanofi-Pasteur. At the end of February 2005, the Ministry of Health's medicine regulatory body, Medsafe, was notified that one of three vaccine components, A/Wellington/1/2004 (H3N2), contained only 10 micrograms per dose rather than the 15 micrograms per dose required. In order to source full strength vaccine from alternative vaccine suppliers, the 2005 vaccination programme was delayed from March to mid-April. As a result, the Ministry of Health requested the earlier commencement of sentinel influenza surveillance in order to monitor influenza activity closely.

In 2005, national influenza sentinel surveillance was undertaken from April to September (week 14 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. 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 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 2005 (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 2005 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.^{3,4} The data that medical practitioners provide to Health Benefits Limited to claim reimbursement were used to estimate coverage in 2005 among persons ≥ 65 years of age.

3. Results

3.1. Sentinel Practices

In 2005, 87 sentinel practices were recruited from 22 of the 24 health districts (two health districts did not participate in 2005). All PHSs began reporting by the beginning of May 2005. Some practices did not report every week. The average number of practices participating per week was 79, with an average patient population roll of 311 724.

3.2. Disease Burden

From April to September 2005, a total of 3929 sentinel consultations for influenza-like illness were reported, an average national weekly consultation rate of 52.5 per 100 000 patient population. This rate is higher than the average weekly rates for 2004 (35.5 per 100 000) but lower than that of 2003 (56.6 per 100 000).

Applying these rates to the New Zealand population, it is estimated that ILI resulting in a visit to a general practitioner affected 52 104 New Zealanders during the influenza season (1.3% of total population). This is higher than the estimated 35 186 affected in 2004.

Figure 1 compares the weekly consultation rates for influenza-like illness in 2005 with 2004 and 2003. Influenza consultation activity remained at the baseline level from week 14 to 20, and then increased rapidly to a peak at week 25 (18-24 June). The highest consultation rate was reported during week 25 with 174.4 per 100 000 patient population. This is 14 weeks early than the peak in 2004 (week 38) and two weeks earlier than 2003 (week 27) with rates of 127.5 per 100 000 and 184.7 per 100 000 respectively. Consultation activity then gradually declined, remaining at a moderate level until week 29, and dropping below the baseline in week 30.

Figure 1. Weekly consultation rates for influenza-like illness in New Zealand, 2003, 2004 and 2005

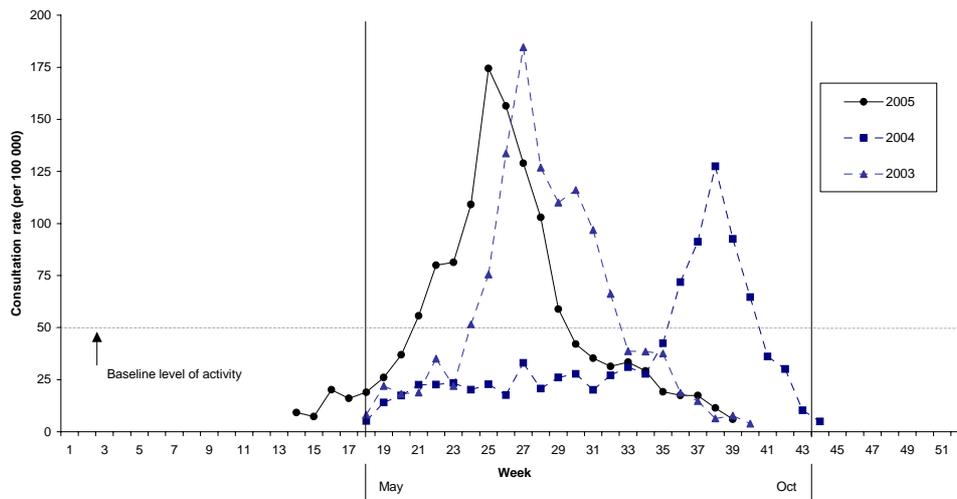


Figure 2. Total influenza isolates by surveillance type and week specimen taken, 2005

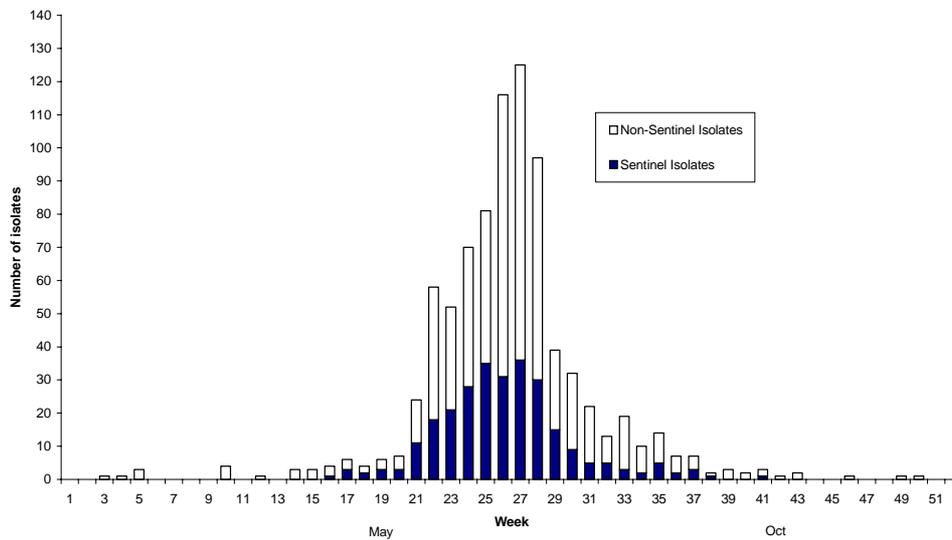
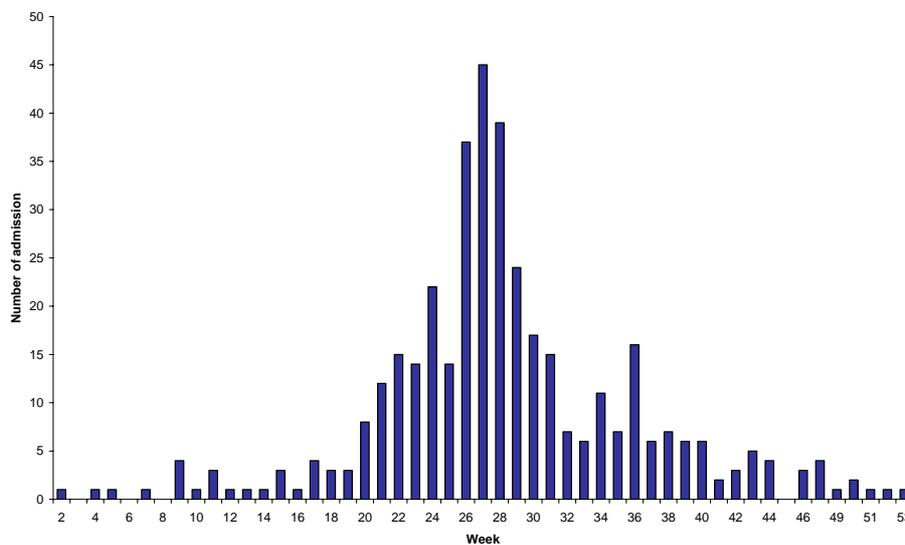


Figure 3. Influenza hospitalisation by week admitted, 2005



A total of 845 influenza isolates were identified in 2005, lower than the 864 and 1108 isolates in 2004 and 2003 respectively. Of the 845 isolates, 273 came from sentinel practice surveillance during April to September. This is higher compared to the 231 sentinel isolates identified in 2004 and 230 isolates in 2003. There were 572 non-sentinel isolates identified in 2005 compared to 633 in 2004 and 878 in 2003.

Figure 2 shows influenza virus isolations each week throughout 2005. The highest number of sentinel isolates (36) came from specimens taken in week 27, two weeks later than the peak in consultation rates. Non-sentinel influenza isolates were identified as early as January, however the vast majority (529, 92%) were from specimens taken during May to August. Non-sentinel isolates also peaked in week 27. Overall influenza isolates in 2005 were detected earlier than that of 2004 but similar to 2003. Most sentinel and non-sentinel isolates (85%) came from the first half of the sentinel period (weeks 21 to 31).

In 2005, there were a total of 390 hospital admissions for influenza. This compares with 430 admissions in 2004 and 580 in 2003. Figure 3 shows these admissions by week, 78% (306) of which occurred during May to August. The highest number of admissions (116) occurred in July. Hospital admissions peaked in week 27, two weeks later than the peak in consultation rates and the same week as the peak of influenza isolates.

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 April to September 2005 (square brackets denotes a health district that did not participate in sentinel surveillance). The health district reporting the highest rate was Eastern Bay of Plenty (146.3 per 100 000 patient population), followed by Otago (131.0 per 100 000), Hutt (90.9 per 100 000), Hawke's Bay (85.7 per 100 000), South Canterbury (81.1 per 100 000), Taranaki (78.9 per 100 000), Wairarapa (76.7 per 100 000), Tauranga (55.8 per 100 000), Nelson-Marlborough (54.8 per 100 000), and Wellington (53.9 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, Waikato, Canterbury, Wellington, and Otago regions. Isolates were not identified in two health districts (Ruapehu no swabs received and Taupo no swabs sent), and swabs for sentinel surveillance were not taken in two health districts. The national isolation rate for 2005, illustrated in Figure 6 was 27.8% (273 isolates from 981 swabs received), which is lower than the 2004 rate of 29.2% (790 swabs) and 2003 rate of 31.9% (721 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, 2005

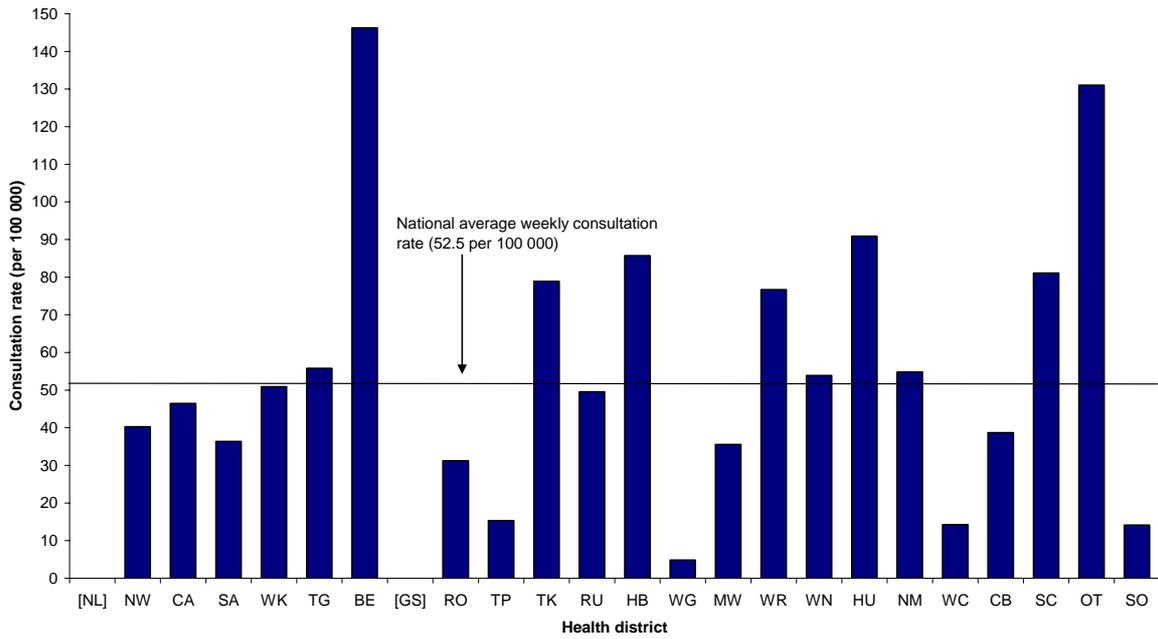
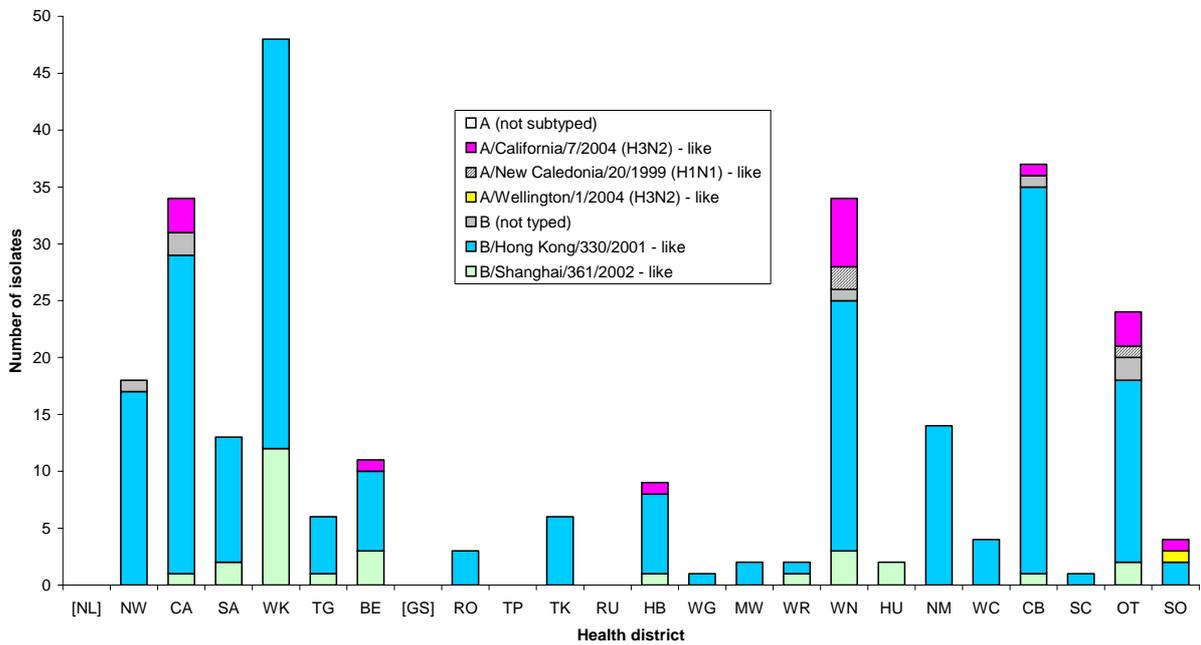


Figure 5. Cumulative laboratory confirmed influenza isolates from sentinel surveillance by health district, April-September 2005

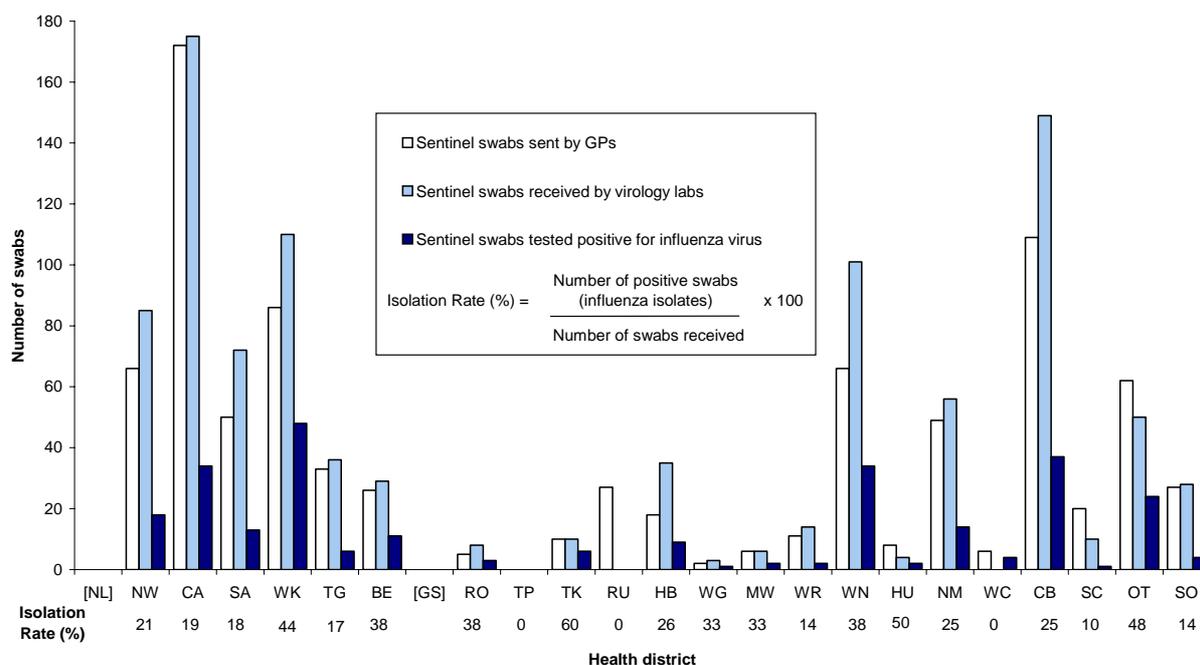


district, April-September 2005

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, 2005



3.4. Age Distribution

In 2005, New Zealand experienced an influenza B epidemic in school age children in the North Island. Influenza B isolations in the 5-19 age group were 4 to 6 times higher than those observed in 1995 and 1997 (Figure 7). In addition, the highest percentage of ILI consultations and isolations were in the 5-19 age group as shown in Figures 8 and 9. The epidemic was associated with significant morbidity, as illustrated by media reports of significant school absenteeism. In some schools, particularly in Wellington and Auckland regions, the school absenteeism rate reached more than 20% in June. One Wellington school was closed due to the high rate of respiratory illness.

During this epidemic, three children died from complications from influenza B/HongKong/330/2001 infections:

- A 7 year-old boy who developed Reye syndrome. This child was on aspirin for another condition.
- An otherwise healthy 16 year-old boy who developed *Staphylococcus aureus* - pneumonia and septicaemia.
- An otherwise healthy 11 year-old boy who developed *Staphylococcus aureus*- pneumonia and septicaemia.

Figure 7. Influenza B Isolates by age group by year, 1992-2005

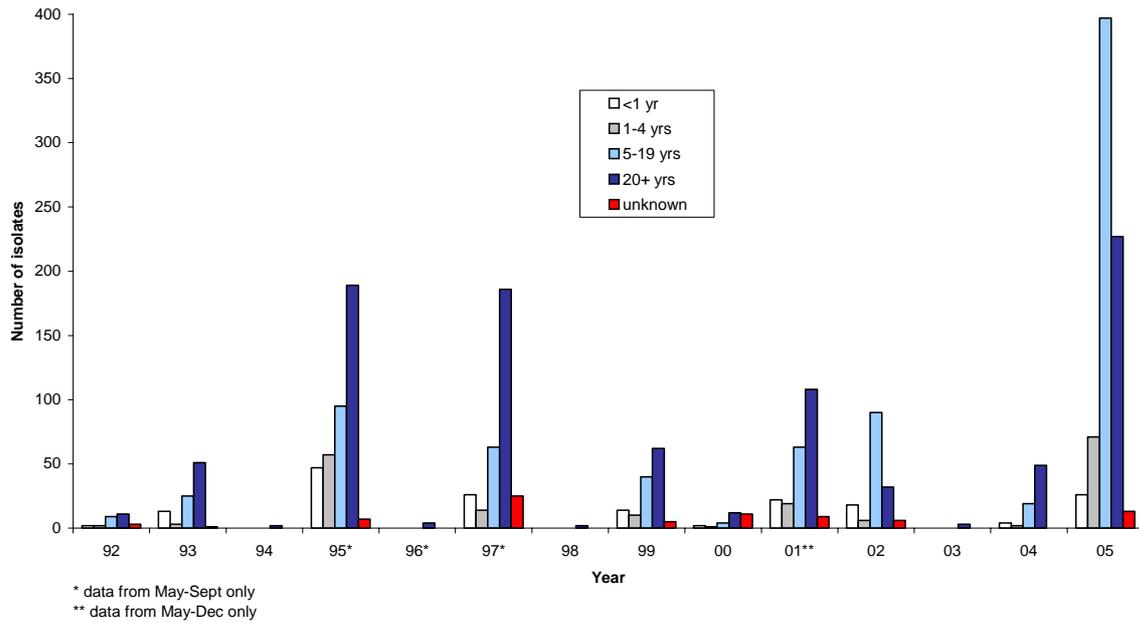


Figure 8 compares the percentage of influenza consultations between sentinel surveillance and hospitalisations for each age group. In 2005, the highest percentage of sentinel consultations (35%) occurred in school-age children aged 5-19 years and the highest percentage from hospitalisations (34%) occurred in the same age group. However, in 2004, the highest percentage (29%) of influenza consultations occurred in young adults (20-34 years) from sentinel surveillance and 23% in elderly (>65 years) from hospitalisations.

Figure 8. Percentage of ILI consultations from sentinel surveillance and hospitalisations by age group, 2005

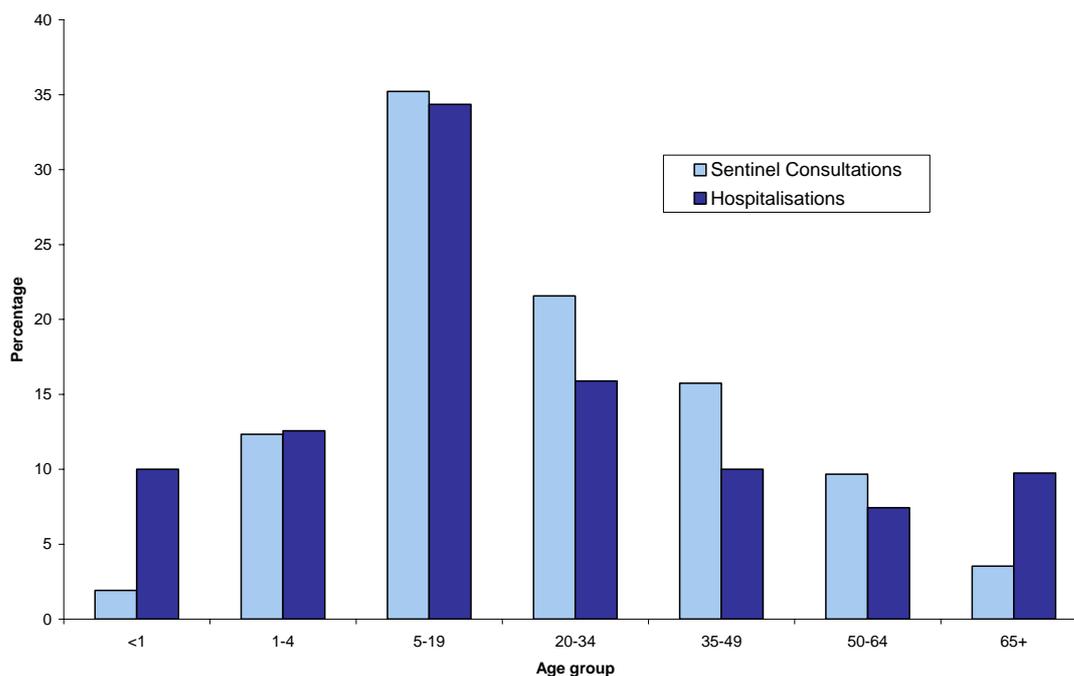
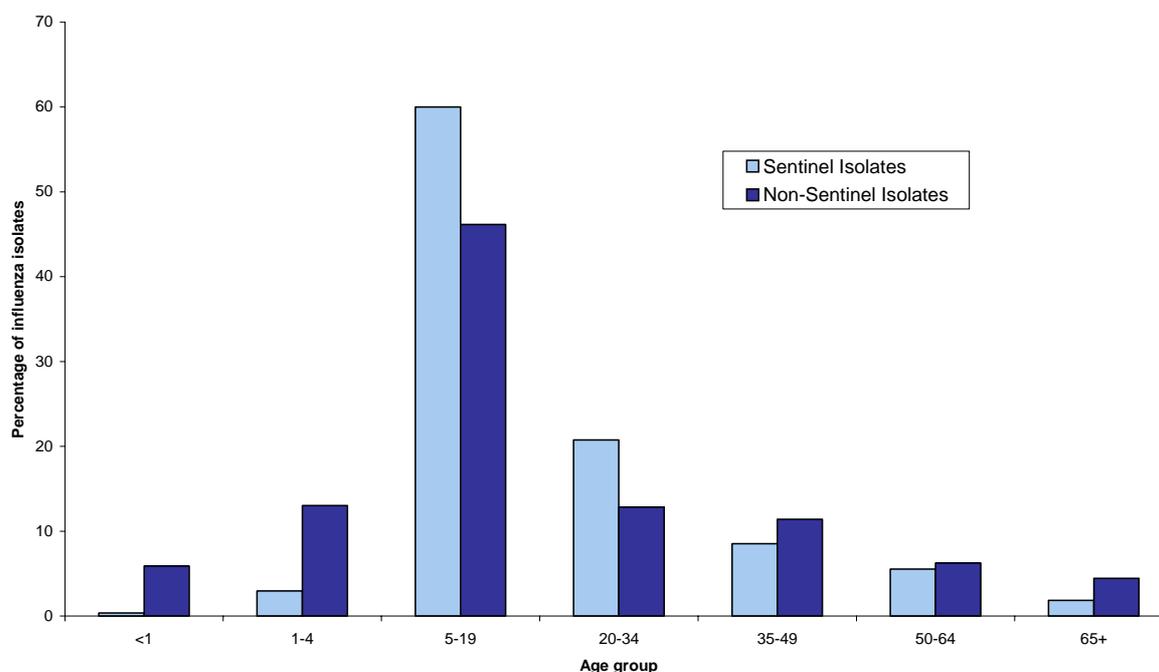


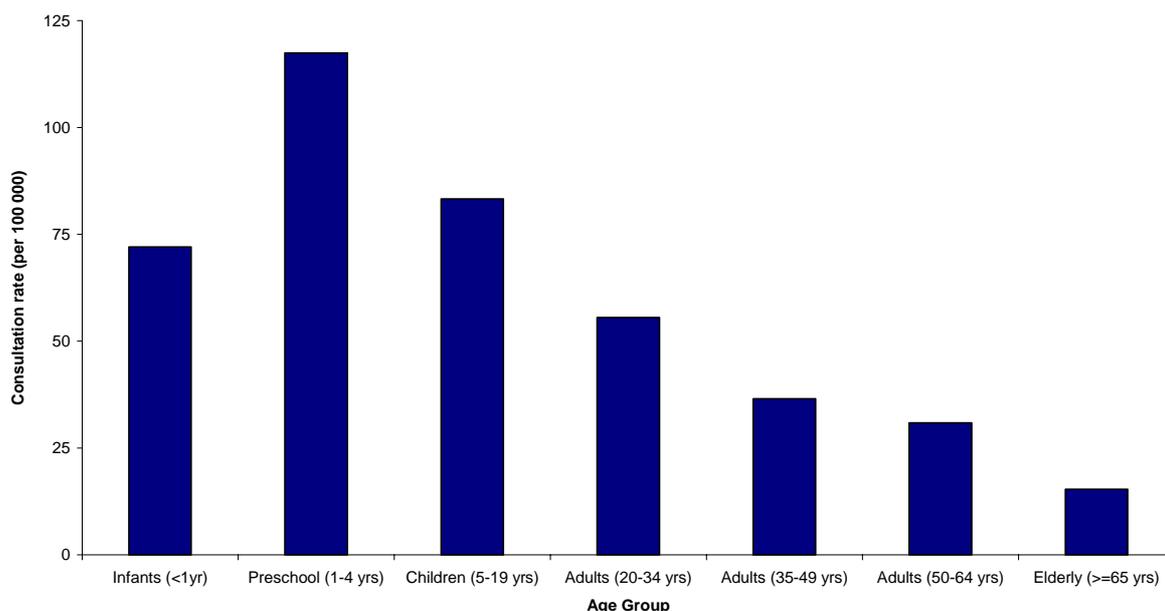
Figure 9 compares the percentage of influenza isolates between sentinel surveillance and non-sentinel for each age group. The highest percentage (60%) of influenza isolations occurred in school age children at 5-19 years for sentinel surveillance and the highest percentage (46%) occurred in the same age group for the non-sentinel surveillance.

Figure 9. Percentage of sentinel and non-sentinel influenza isolates by age group, 2005



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 7.5% 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 10.

Figure 10. Sentinel average weekly consultation rate for influenza-like illness by age group, 2005



The highest consultation rate for influenza-like illness was in pre-schoolers aged 1-4 years and children aged 5-19 years, with an average weekly consultation rate of 117.4 and 83.3 per 100 000 patient population respectively. Infants aged less than one year had a rate of 72.1 per 100 000. Adults aged 20-34 years had a rate of 55.5 per 100 000, and adults aged 35-49 years had a slightly lower rate of 36.6 per 100 000. Adults aged 50-64 years had a rate of 30.9 and elderly people (aged 65 years and over) had the lowest rate of 15.3 per 100 000.

During the influenza B epidemic in Wellington region, Regional Public Health (RPH) surveyed 220 schools in the Wellington and Hutt Valley regions and 139 schools responded (63%). The survey results on the levels of illness at schools are listed in Table 2.

Table 2. Levels of illness at Wellington and Hutt Valley schools, 2005

Level of illness	Percent of schools (Number)
Not aware of any illness	9 (12)
Few extra cases compared to normal	30 (42)
Some extra illness	30 (42)
Large amount of extra illness	27 (38)
Not answered	4 (5)
Total	139

Other findings:

- 18% of schools recorded absenteeism rates of above 20% of pupils.
- 30% of schools reported absenteeism of 10-20% of pupils.
- 50% of schools reported that the sickness continued to increase.
- 70% of schools indicated they had absent staff.
- Symptoms were most commonly reported to be a combination of respiratory and gastrointestinal (55%). Mainly respiratory (24%) and mainly gastroenteritis (9%).

On 11 July 2005, an outbreak of influenza A at Metlifecare Coastal Villas in Paraparaumu was notified to Regional Public Health. The Coastal Villas is a 630-resident village with a 30-bed long-term care facility (LTCF). These largely dementia cases were looked after by 30 staff. The outbreak was confined to the LTCF.

RPH interviewed 2 ill staff, and 5 ill residents (whose illness history was provided by nurses). These revealed symptoms were mainly respiratory and suggestive of influenza. Nasopharyngeal swabs were obtained from 3 residents (subsequently 2 more swabs were obtained) and sent to ESR Virology Laboratory. The causal agent was identified as Influenza A/California/7/2004 (H3N2) like – low reactor.

During the outbreak 11 residents and 7 staff became ill with influenza. Among them, two cases were laboratory-confirmed as influenza. One resident died of a complicating pneumonia. The duration of illness ranged from 2+ to 6+ days, with a median of 4+days. The first case was a staff member, an outlier with onset of symptoms on 25 June 2005. The next case was a resident with onset of symptoms 11 days later on 5 July 2005. The last case was a resident with onset of symptoms on 13 July 2005. All resident cases were housed in one wing of the LTCF, apart from 1 case who mixed with other residents in the lounge.

RPH recommended Tamiflu as treatment for residents and prophylaxis for residents and staff. None of staff members were treated with Tamiflu due to rapid recovery but 22 received Tamiflu prophylaxis. Four ill residents were treated with Tamiflu and nine well residents were given Tamiflu as prophylaxis. The remaining were not treated due to being either post-illness or having refused the anti-viral drug. RPH also collected influenza vaccination histories and found that 20% of vaccinated residents became ill despite being vaccinated.

4. Immunisation Coverage

The uptake of influenza vaccine in New Zealand in 2005 among persons 65 years and over is estimated at 61%. 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 2005 season was 174 doses per 1000 population.

Due to vaccine failure 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.

Information on vaccination history was available in 280 out of 981 ILI cases (28.5%). Among them, 26 had influenza vaccination in the same year as the onset of ILI and 254 had none. Three vaccinated patients had specimens that yielded influenza viruses (2 with influenza B/HongKong/330/2001-like viruses and 1 with B/Shanghai/361/2002-like virus). The antigenic analysis for B/Shanghai/361/2002-like virus isolated from a 23-year old vaccinee showed no drifting trend, i.e., the virus had the same titre compared with the homologous virus.

5. Virus Strain Characterisation

5.1. Isolates in 2005

Figure 11 shows influenza virus isolations by type and subtype for each week throughout 2005, and the total percentage contribution of each. Table 3 shows influenza virus isolations by type and subtype for 2005.

The majority of influenza isolates (734/845 or 86.9% of all isolates) were characterised as influenza B. Influenza A made up 13.1% (111/845) of all isolates in contrast to 91.4% in 2004.

Figure 12 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 27 (beginning of July). The majority of A isolates occurred in the late season. The influenza B isolates were mostly identified as B/Hong Kong/330/2001 – like. This was the predominant strain of influenza isolates in 2005 overall.

A total of 550 B/Hong Kong/330/2001 – like isolates were identified in 2005, which represented 65.9% of typed and subtyped isolates (835) and 65.1% of all influenza isolates (845). Influenza B/Shanghai/361/2002-like viruses co-circulated with B/Hong Kong/330/2001-like viruses representing 14.9% of the typed and subtyped isolates and 14.7% of total isolates. Influenza A(H3N2) represented 9.9% (83/835) of the typed and subtyped isolates and 9.8% (83/845) of the total isolates. Influenza A(H1N1) represented 2.2% (18/835) of the typed and subtyped isolates and 2.1% (18/845) of the total isolates. In contrast to influenza B, influenza A(H1N1) co-circulated with A(H3N2) from week 27 to week 46.

Table 3. Influenza virus isolations by type and subtype, 2005

Virus	All isolates n=845 (%)	Typed/Subtyped n=835 (%)
Influenza A		
A(H3N2)	83 (9.8)	83 (9.9)
A(H1N1)	18 (2.1)	18 (2.2)
A (not typed)	10 (1.2)	
Subtotal	111 (13.1)	101 (12.1)
Influenza B		
B Hong Kong	550 (65.1)	550 (65.9)
B Shanghai	124 (14.7)	124 (14.9)
B (not typed)	60 (7.1)	60 (7.2)
Subtotal	734 (86.9)	734 (87.9)
Total	845 (100)	835 (100)

Figure 11. Total influenza isolates by type and week specimen taken, 2005

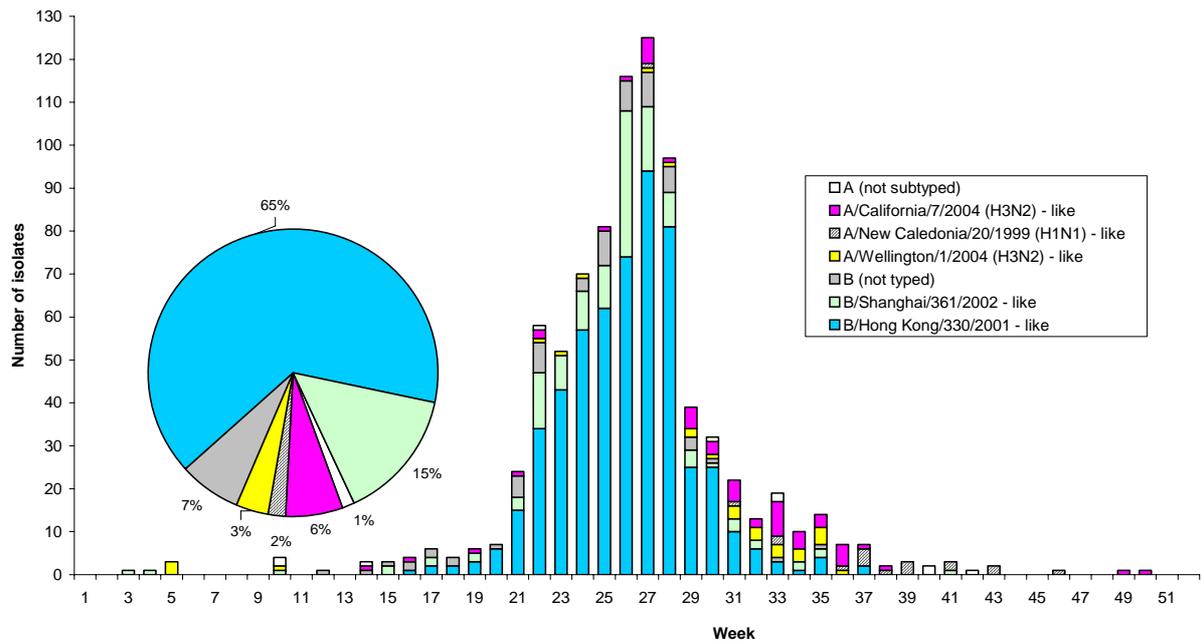
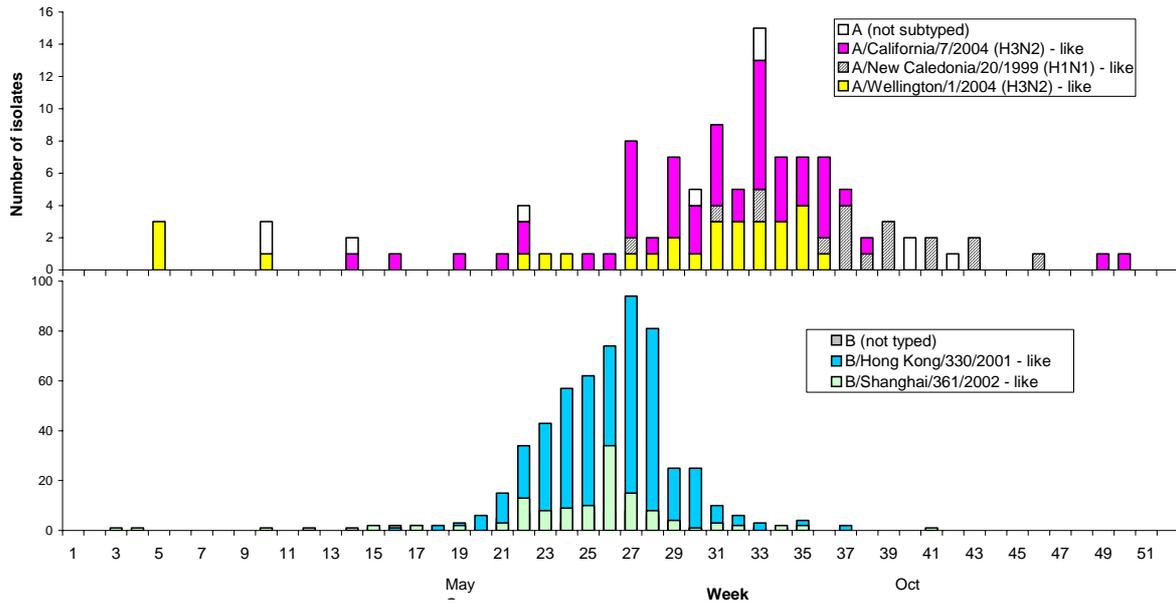


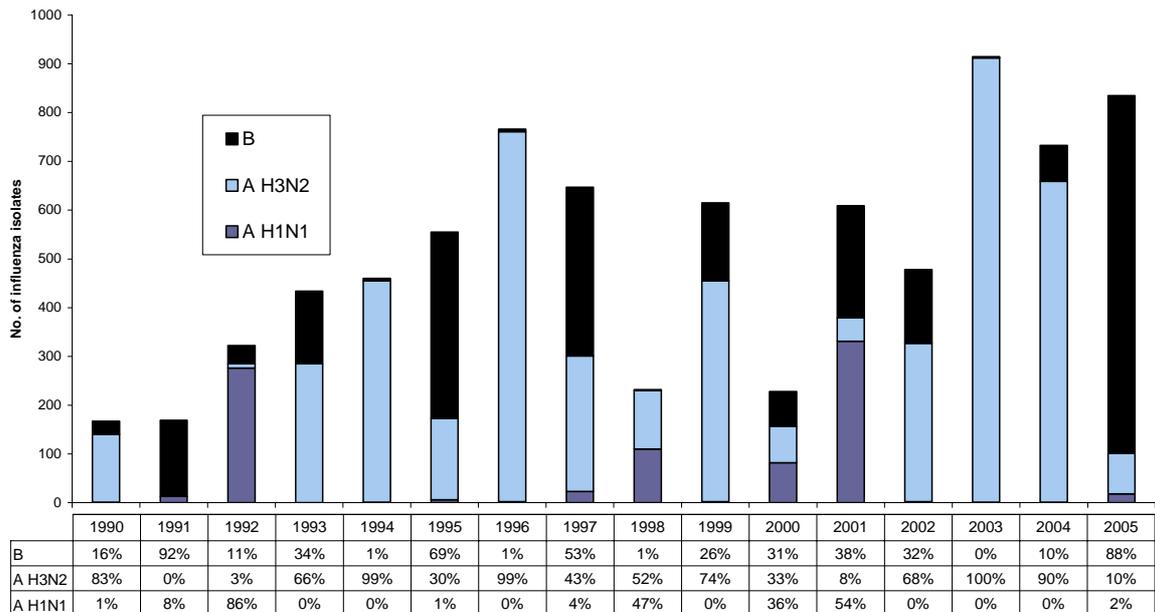
Figure 12. Total influenza virus isolates by type and week specimen taken, 2005



5.2. Changes in Isolates 1990-2005

Figure 13 shows the number and percentage of typed and subtyped (not total) influenza isolates from 1990 to 2005. There are three noticeable changes in terms of predominant patterns:

Figure 13. Influenza isolates by type, 1990-2005



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. In 2005 there were 18 isolates in which A(H1N1) was detected (2%).

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.⁵ During 1993 to 2000, A(H3N2) had been the predominant circulating influenza A strain, 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 strain in 2005 but it co-circulated at lower levels (10%) with influenza B throughout the winter season.

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 9% (62) in 2004. In 2005, influenza B was the predominant strain 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%).

6. Vaccine Formulation - Southern Hemisphere Trends

In October 2005, 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 Caledonia/20/99 lineage viruses have completely replaced A/Bayern/7/99-like strains.

The Australian WHO Collaborating Centre showed that most A(H1N1) isolates from the Southern Hemisphere in 2005, including New Zealand, were A/New Caledonia/20/99.

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. Two factors still remain true for the recommendation of A/New Caledonia/20/99-like virus for the year 2005 vaccine formulation:

- Increasing incidence of viruses of this type, and
- Evidence that in humans, vaccines containing viruses of A/New Caledonia lineage induce similar antibody responses against both the homologous virus and the A/Bayern-like strains whereas the converse is not true.

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. Australia experienced predominance of influenza A(H3N2) in its 2005 winter months but this was not the case in New Zealand.

The WHO Collaborating Centre for Influenza in Melbourne has analysed 850 A(H3N2) isolates from 12 countries since January 2005. These viruses made up the majority (45.9%) of all viruses analysed at the Centre. A majority of influenza A(H3N2) viruses were still related to A/Wellington/1/2004 and A/California/7/2004. A small proportion of viruses had reduced reactivity (8 fold or greater) with the A/Wellington/1/2004 and A/California/7/2004 antisera. However, antigenic and genetic analyses did not reveal the emergence of a clearly definable antigenic variant. As a result, A/California/7/2004 was recommended by WHO and the Australia Influenza Vaccine Committee to be the H3 component of the influenza vaccine for southern hemisphere in 2006.

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.

The Australian WHO Collaborating Centre showed that the majority of B isolates from the Southern Hemisphere in 2005, 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. Based on the southern hemisphere and global data, the WHO consultation group concluded that vaccines for 2006 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 2006 is:

- **A(H1N1)** **an A/New Caledonia/20/1999-like strain**
- **A(H3N2)** **an A/California/7/2004-like strain**
- **B** **a B/Malaysia/2506/2004-like strain**

7. Discussion

Based on sentinel consultation data using a set of threshold values, influenza activity in 2005 is described as relatively high. When weekly consultation rates for influenza-like illness from 1997 to 2005 are compared, 2005 has the fourth highest level of influenza activity, with 1997, 1999, 2003, as the first, second and third highest respectively.

It is estimated that influenza-like illness resulting in a visit to a general practitioner affected over 47 108 New Zealanders in 2005 or about 1.3% 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 2005 (Figures 1-3), they follow a very similar pattern, peaking in mid June to 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. However, in 2005, the sentinel surveillance operation was started a month earlier in April. 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 Eastern Bay of Plenty (146.3 per 100 000 patient population).

In 2005, there were a total of 390 hospital admissions in New Zealand for influenza, the sixth highest number recorded since 1990. The first five highest hospitalisations were recorded in 2003, 1999, 2002, 1996 and 2004 when influenza A (H3N2) was the predominant strain, consistent with the observation that influenza A(H3N2) is more frequently associated with severe disease and excess mortality in high-risk groups. However, among influenza B predominant seasons (1991, 1995, 1997 and 2005), influenza B virus epidemic in 2005 has the highest hospitalisations. The reason for the high rate of hospitalisation associated with this influenza B epidemic is not known.

Although the majority of influenza B infections cause respiratory tract symptoms, some influenza B infections can cause severe illness⁶ and this tends to be underestimated. In outbreaks of influenza B, complications or sequelae outside the respiratory system may be the most significant contributors to morbidity and mortality. During the 2005 winter season, three children, including two healthy school-aged children, died from complications from influenza B/HongKong/330/2001 infections. In addition, during the influenza B epidemic in 2005, gastrointestinal symptoms such as abdominal pain, diarrhoea and vomiting were frequently reported. This is consistent with a previous report.⁷

Figures 8 and 9 shows the influenza age group data from sentinel surveillance and hospitalisations. Note the highest percentage of sentinel GP consultations, admissions to

hospitals, and isolation of virus occurred in school age children (5-19 years). Because influenza B has greater antigenic stability than influenza A, adults may have maintained some immunity due to past exposure to influenza B, while children may not have had any such exposure and were more susceptible. This could be particularly true for B/HongKong/330/2001-like virus since its precursor (B/Victoria/2/87-like virus) disappeared from New Zealand after 1987 and then B/HongKong/330/2001 emerged from 2002 to 2004 with limited circulations. In addition, influenza B produces attack rates that are notably higher among children compared with adults.⁸ These factors may explain why school age children at 5-19 years had the highest percentage of influenza consultations and isolations in 2005.

Even though morbidity caused by influenza was high in children aged 5-19 years measured by the percentage of influenza consultations and isolations (Figures 7-9), the morbidity was also high for pre-schoolers (1-4 years) measured by consultation rates calculated with the assumption that age distribution for general practice population is the same as that of the New Zealand population (Figure 10). This discrepancy may reflect different ways of measurement and it can be improved if general practices are able to provide the data on the precise age distribution for their general practice population. Nevertheless, the high consultation rate for preschoolers is probably due, in part, to children under five being most likely to be seen by a general practitioner when they are suffering from an influenza-like illness.

Adults aged 50-64 years reported the lowest consultation rate followed by those aged over 65 years. This may be due to relatively higher vaccination rates among these groups or previous exposure to B/Victoria/2/87-like viruses (precursor of B/HongKong/330/2001-like viruses). In general, the mortality rate due to influenza is highest in those aged over 65 years. For example, this age group accounted for 94.1% of deaths from influenza recorded for the 1990-98 period.⁵ The data on the number of deaths from influenza in 2005 is not yet available.

Comparing age data for positive influenza virus isolates from sentinel and non-sentinel surveillance (Figure 9), the sentinel system tends to detect less influenza viruses in the under 5's relative to other age groups but comparable to its non-sentinel – laboratory-based, mainly hospital – counterpart for the ≥ 65 year olds. This may reflect a greater reluctance among sentinel GP's to take swabs from very young children. Overall, these data indicate that sentinel and hospital 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 2005 season, some health districts had a small number of swabs or no swabs taken at all which influences the reported rates in those health districts.

For sentinel surveillance from April to September 2005, five virology laboratories tested 981 respiratory specimens for influenza viruses and 273 (27.8%) 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 27.8%. 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, nasopharyngeal washes or aspirates would be the best specimens since they contain a higher cellular content than nasopharyngeal swabs.⁹ 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. nasopharyngeal) 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 epithelial 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 the sentinel practices are not representative. Practices are not randomly selected and consist of GPs who participate through goodwill, usually due to an interest in influenza surveillance. In addition, 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.¹⁰

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.^{11,11} 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.¹² 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 immunisation in primary health providers and those 65 years and older.¹² 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.

The influenza sentinel surveillance system is possibly the only ongoing syndromic surveillance system in New Zealand. Most other surveillance systems are based on collecting data on diagnosed disease. Syndromic surveillance is increasingly being developed as an approach to detecting new emerging pathogens that may initially present as non-specific infectious diseases.¹³ It is also being promoted as a strategy to improve the early detection of bioterrorism attacks.¹² Improving influenza surveillance is also a key strategy for improving New Zealand’s preparedness for pandemic influenza.¹⁴ The action plan derived from the pandemic influenza exercise became the framework for New Zealand’s response to severe acute respiratory syndrome (SARS) in 2003 and highly pathogenic avian influenza (H5N1) in 2004. The influenza surveillance system could be readily adapted to increase its sensitivity and timeliness for detecting cases of H5N1 infection in humans.¹⁵ There is a good case for reviewing New Zealand’s existing influenza surveillance system and considering extensions to it.

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