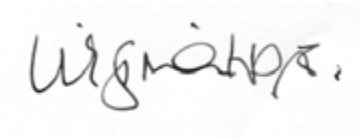
RECOMMENDATION FOR SEASONAL INFLUENZA VACCINE COMPOSITION FOR NEW ZEALAND FOR 2014



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RECOMMENDATION FOR SEASONAL INFLUENZA VACCINE COMPOSITION FOR NEW ZEALAND FOR 2014

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- The SARI surveillance protocol was developed by: Sue Huang, Sally Roberts, Colin McArthur, Michael Baker, Cameron Grant, Deborah Williamson, Adrian Trenholme, Conroy Wong, Susan Taylor, Lyndsay LeComte, Graham Mackereth, Don Bandaranayake, Tim Wood, Ange Bissielo, Ruth Seeds, Nikki Turner, Nevil Pierse, Paul Thomas, Richard Webby, Diane Gross, Jazmin Duque, Mark Thompson and Marc-Alain Widdowson.
- The ILI surveillance protocol was developed by: Sue Huang, Nikki Turner, John Cameron, Michael Baker, Bruce Adlam, Graham Mackereth, Don Bandaranayake, Ange Bissielo, Tim Wood, Ruth Seeds, Barbara McArdle, Tracey Poole, Rosemary Gordon, Sam Wong, Leane Els, Marion Howie, Gillian Davies, Paul Thomas, Richard Webby, Diane Gross, Jazmin Duque and Marc-Alain Widdowson.
- Participants in the National Influenza Surveillance Programme and SHIVERS project.
- Research nurses and clinicians in the SHIVERS project.

Recommendations

The Australian Influenza Vaccine Committee (AIVC) met with a New Zealand representative (Appendix 1) in Melbourne on 10 October 2013 to consult on the influenza vaccine composition for 2014 for New Zealand, Australia and South Africa. The recommended composition was:

- A(H1N1) an A/California/7/2009 (H1N1)pdm09 - like virus
- A(H3N2) an A/Texas/50/2012 (H3N2) - like virus
- B a B/Massachusetts/2/2012 - like virus

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RECOMMENDATION FOR SEASONAL INFLUENZA VACCINE COMPOSITION FOR 2014

It is known that influenza viruses frequently go through antigenic changes in their surface proteins, haemagglutinin (HA) and neuraminidase (NA). Protection by vaccines against influenza infection depends on achieving a good match between the vaccine strains and the circulating viruses, particularly for the HA antigen. A combination of antigenic and genetic analyses is used to identify emergent antigenic variants of potential future epidemic importance and for consideration of their inclusion in vaccines. Antigenic relationships among contemporary viruses and vaccine strains are of prime importance in determining vaccine composition. These relationships are evaluated mainly in haemagglutination-inhibition (HI) tests using post-infection ferret sera against egg and/or cell grown reference and vaccine viruses using red blood cells principally from turkeys but also from other species, as appropriate. Virus neutralisation tests provide complementary data. Antigenic cartography is used as an additional analytical tool to visualise and integrate antigenic data. Phylogenetic analyses of HA and NA genes help to define the genetic relatedness of antigenic variants to their predecessors and to elucidate the molecular basis for antigenic drift. The spread of antigenic variants associated with influenza outbreaks in different countries is also an important criterion for selection of epidemiologically relevant vaccine candidates.

The World Health Organization (WHO) makes twice-yearly recommendations to guide national/regional authorities on the formulation of influenza vaccines. One recommendation is made in February for the northern hemisphere winter and another recommendation is made in September for the southern hemisphere winter. The recommendation for the southern hemisphere is published in the 11 October issue of the *Weekly Epidemiological Record, 2013 88(41):437-448 (Appendix 6)*.

It should be noted that the WHO recommendations are made with respect to reference strains which may or may not be suitable for vaccine production. Thus, even where the WHO recommendation is adopted, it is necessary for country/regional authorities to approve the specific vaccine strains to be used and this, in turn, requires the preparation of specific reagents for vaccine standardisation.

Since 1969, the Australian Influenza Vaccine Committee (AIVC), with representatives from New Zealand, Australia and South Africa, has met annually in October to approve or update the WHO recommended formulation for influenza vaccines intended for the following winter (March to September of the following year) for these countries. New Zealand uses the influenza vaccine strains recommended by AIVC in the subsequent year.

The AIVC met with a New Zealand representative (Appendix 1) on 10 October 2013 to consult on the seasonal influenza vaccine composition for New Zealand, Australia and South Africa for 2014. The recommended composition (Table 1) was:

- A(H1N1) an A/California/7/2009 (H1N1)pdm09 - like virus
- A(H3N2) an A/Texas/50/2012 (H3N2) - like virus
- B a B/Massachusetts/2/2012 - like virus

Table 1. Influenza Vaccine Recommendations for New Zealand, 1991-2014

Formulation Recommendations		Vaccine used for	A H3N2	A H1N1	B
NZ & WHO*	2013	2014	A/Texas/50/2012	A/California/7/2009	B/Massachusetts/2/2012
NZ & WHO*	2012	2013	A/Victoria/361/2011	A/California/7/2009	B/Wisconsin/1/2010
NZ & WHO*	2011	2012	A/Perth/16/2009	A/California/7/2009	B/Brisbane/60/2008
NZ & WHO*	2010	2011	A/Perth/16/2009	A/California/7/2009	B/Brisbane/60/2008
NZ & WHO*	2009	2010	A/Perth/16/2009	A/California/7/2009	B/Brisbane/60/2008
NZ & WHO*	2008	2009	A/Brisbane/10/2007	A/Brisbane/59/2007	B/Florida/4/2006
NZ & WHO*	2007	2008	A/Brisbane/10/2007	A/Solomon Islands/3/2006	B/Florida/4/2006
NZ & WHO*	2006	2007	A/Wisconsin/67/2005	A/New Caledonia/20/99	B/Malaysia/2506/2004
NZ & WHO*	2005	2006	A/California/7/2004	A/New Caledonia/20/99	B/Malaysia/2506/2004
NZ & WHO*	2004	2005	A/Wellington/1/2004	A/New Caledonia/20/99	B/Shanghai/361/2002
NZ & WHO*	2003	2004	A/Fujian/411/2002	A/New Caledonia/20/99	B/Hong Kong/330/2001
NZ & WHO*	2002	2003	A/Moscow/10/99	A/New Caledonia/20/99	B/Hong Kong/330/2001
NZ & WHO*	2001	2002	A/Moscow/10/99	A/New Caledonia/20/99	B/Sichuan/379/99
NZ	2000	2001	A/Sydney/5/97	A/New Caledonia/20/99	B/Beijing/184/93
WHO*	2000	2001	A/Moscow/10/99	A/New Caledonia/20/99	B/Beijing/184/93
NZ & WHO*	1999	2000	A/Sydney/5/97	A/Beijing/262/95	B/Beijing/184/93
NZ	1998	1999	A/Sydney/5/97	A/Bayern/7/95	B/Beijing/184/93
WHO**	1997-98		A/Wuhan/359/95	A/Bayern/7/95	B/Beijing/184/93
NZ	1997	1998	A/Wuhan/359/95	A/Texas/36/91	B/Beijing/184/93
WHO**	1996-97		A/Wuhan/359/95	A/Singapore/6/86***	B/Beijing/184/93
NZ	1996	1997	A/Johannesburg/33/94	A/Texas/36/91	B/Beijing/184/93
WHO**	1995-96		A/Johannesburg/33/94	A/Singapore/6/86	B/Beijing/184/93
NZ	1995	1996	A/Guangdong/25/93	A/Texas/36/91	B/Panama/45/90
WHO**	1994-95		A/Shangdong/9/93	A/Singapore/6/86	B/Beijing/184/93
NZ	1994	1995	A/Beijing/32/92	A/Texas/36/91	B/Panama/45/90
WHO**	1993-94		A/Beijing/32/92	A/Singapore/6/86	B/Panama/45/90
NZ	1993	1994	A/Shanghai/24/90	A/Texas/36/91	B/Panama/45/90
WHO**	1992-93		A/Beijing/353/89	A/Singapore/6/86	B/Yamagata/16/88 or B/Panama/45/90
NZ	1992	1993	A/Beijing/353/89	A/Victoria/36/88	B/Yamagata/16/88 or B/Panama/45/90
WHO**	1991-92		A/Beijing/353/89	A/Singapore/6/86	B/Yamagata/16/88 or B/Panama/45/90
NZ	1991	1992	A/Beijing/353/89	A/Victoria/36/88	B/Yamagata/16/88
WHO**	1990-91		A/Guizhou/54/89	A/Singapore/6/86	B/Yamagata/16/88

* WHO recommendations are for the Southern Hemisphere winter;
* * WHO recommendations are for the Northern Hemisphere winter
*** USA selected the variant A/Texas/36/91

1. INFLUENZA EPIDEMIOLOGY

1.1. World-wide influenza activity, February to September 2013

Between February and September 2013, influenza was active worldwide and reported in Africa, the Americas, Asia, Europe and Oceania. Activity in individual countries was low or moderate to high and was due to circulation of influenza A(H1N1)pdm09, A(H3N2) and B viruses.

In the northern hemisphere, influenza activity was moderate to high from February to April and started to decline from April onwards. For the southern hemisphere in general, activity increased from May and had declined by September. In tropical areas, activity was variable throughout the period.

Influenza type A(H1N1)pdm09
Influenza A(H1N1)pdm09 activity was variable in Africa, the Americas, Asia, Europe and Oceania. Regional and widespread outbreaks occurred in Europe between February and March and activity decreased after April. In Africa, widespread outbreaks occurred in Algeria and Tunisia in February and March. Regional and widespread outbreaks occurred from June until August in Madagascar and South Africa. A(H1N1)pdm09 predominated in Argentina, Brazil, and Chile from May through August. Regional to widespread outbreaks were reported in Australia in July and August. Sporadic to local activity was reported in New Zealand from May through August. In general, sporadic to local A(H1N1)pdm09 activity was reported in Asia and North America.

Influenza A(H3N2)
Influenza A(H3N2) activity was variable in Africa, the Americas, Asia, Europe and Oceania. In Africa, sporadic activity was reported between February and August. In the Americas, sporadic to local activity was reported in Canada and Mexico in February and March, and local to regional activity was reported in the United States of America during the same period. Local to regional activity was reported in El Salvador from February through August and in Argentina and Panama from May through August. In Asia, regional to widespread outbreaks were reported in Japan in February and March. Activity was local in China and remained low in the rest of the region during this period. In the European region, from February to April many countries reported sporadic activity, although regional and widespread outbreaks were reported in some countries including Croatia, the Czech Republic, Germany, Hungary, Ireland, Netherlands, the Russian Federation and Ukraine. In Oceania, sporadic activity occurred from February until June and increased in July with regional outbreaks reported in Australia.

Influenza B
Widespread and regional outbreaks associated with influenza B viruses were reported in Europe and parts of Africa, the Americas, Asia and Oceania. In northern Africa, regional and widespread outbreaks were reported in Algeria and Tunisia in February and March. In southern Africa, local activity was reported in Madagascar from April until July. In the Americas, regional outbreaks were reported in the United States of America during February through April, and sporadic to local activity was reported in Canada and Mexico during the same time period. Activity was generally low in South America except Brazil where regional outbreaks were reported in May through August. In Asia, regional outbreaks were reported in Japan in March through June. Local to regional activity was reported in China, Hong Kong Special Administrative Region in March and April. Regional to widespread outbreaks were reported in the majority of countries in Europe in February, and activity remained high through April. In Oceania, influenza B activity was sporadic in February through June and increased to regional activity in July and August. *(Abridged from the Weekly Epidemiological Record, 2013 88(41):437-448).*

Zoonotic influenza infections
From 19 February to 23 September 2013, 16 confirmed human cases of A(H5N1) infection, 6 of which were fatal, were detected in Cambodia, Egypt, Indonesia and Viet Nam where highly pathogenic avian influenza A(H5N1) is present in poultry. Since December 2003, a total of 637 cases with 378 deaths have been confirmed in 15 countries. To date there has been no evidence of sustained human-to-human transmission.

Between February and 23 September 2013, 135 cases of A(H7N9) infection, including 44 deaths, were reported in China again with no evidence of sustained human-to-human transmission.

Eighteen cases of A(H3N2) variant (v) infection were detected in the United States of America from 21 June to 9 September 2013 with a total of 339 confirmed cases and one death since August 2011. No human cases of influenza A(H9N2) were detected during the period 23 February to 18 September 2012. *(Abridged from the Weekly Epidemiological Record, 2013 88(41):437-448)*.

The WHO Collaborating Centre for Reference and Research on Influenza in Melbourne, Australia (Melbourne WHOCC) analysed influenza isolates received from 1 February to 18 September 2013. Influenza A(H1N1)pdm09 virus was the predominant strain which accounted for 41.5% (616/1485) of isolates, while 34.4% (511/1485) were influenza B and 24.1% (358/1485) were A(H3N2) (Table 2.1 and Figure 2.1 in Appendix 2).

1.2. Influenza activity in Australia, February to September 2013

Influenza activity in Australia in 2013 was low with some regional variations in types/subtypes. There are 10 influenza surveillance systems in Australia, which can be divided into three categories.

- **Influenza-like-illness surveillance**
    - **Australian Sentinel Practice Research Network (ASPREN).** This system has general practitioners (GPs) who report influenza-like illness (ILI) presentation rates in New South Wales, South Australia, Victoria, Queensland, Tasmania, Western Australia and the Northern Territory. As jurisdictions joined ASPREN at different times and the number of GPs reporting has changed over time, the representativeness of ASPREN data in 2013 may be different from that of previous years. The national case definition for ILI is presentation with fever, cough and fatigue. Overall, there was a late increase and lower peak in ILI consultation rates compared with the seasonal peaks reported in 2011 and 2012.

    - **Emergency department surveillance.** Emergency departments across New South Wales, Western Australia and the Northern Territory participated in influenza surveillance. Overall these emergency department surveillance systems indicated that there was a late increase in influenza activity in 2013 which was lower than a similar increase in 2012.

    - **FluTracking.** FluTracking is an online health surveillance system to detect influenza epidemics. It involves participants from around Australia completing a simple online weekly survey, which collects data on the rate of ILI symptoms in communities. Overall, FluTracking activity in 2013 was lower than in 2012.
- **Laboratory surveillance:**
    - **National Notifiable Disease Surveillance System (NNDSS).** In Australia, laboratory-confirmed cases of influenza became notifiable to state and territory health departments from 1 January 2001. . From January to 13 September 2013, there have been 17,990 laboratory-confirmed notifications of influenza diagnosed and reported to NNDSS. Of these,

63% cases were reported as influenza A (41% influenza A (unsubtyped), 6% A(H3N2) and 16% A(H1N1)pdm09) and 37% were influenza B. In addition, most influenza B notifications occurred in those aged less than 15 years, while influenza A infections peaked in the 0-4 and 30-34 years age groups. Consistent with A(H1N1)pdm09 dominant years, there are very few notifications of this subtype in those aged 65 years and over. Overall, the 2013 notification data were lower than that of 2012.

- **WHOCC Laboratory Surveillance.** This is conducted by the Melbourne WHOCC. A total of 603 influenza viruses from Australia were received for analysis at the Melbourne WHOCC from 1 January to 9 September 2013. 40% were A(H1N1)pdm09 viruses, 21% influenza A(H3N2), 35% B/Yamagata lineage and 4% B/Victoria lineage viruses. Regarding oseltamivir-resistant viruses, three influenza A(H1N1)pdm09 viruses (out of 605 tested) have shown resistance to NA inhibitor oseltamivir by enzyme inhibition assay.

- **Sentinel Laboratory Surveillance.** Laboratory testing data are provided weekly directly from the three National Influenza Centres (PathWest (WA), VIDRL (VIC) and ICPMR (NSW) and also from Tasmanian laboratories. Additionally, approximately 30% of all ILI patients presenting to ASPREN-based sentinel GPs are swabbed for laboratory testing, and the results of ASPREN ILI laboratory respiratory viral tests now include Western Australia. From the report during a period of 3 August to 13 September 2013, 15% of the specimens have been positive for influenza.

- **Severity Surveillance:**
  - **Influenza hospitalisations.** The Influenza Complications Network (FluCAN) collects detailed clinical information on all hospitalised cases of influenza and pneumonia from a sample of four sentinel hospitals across Australia. Overall, the majority of admissions have been with influenza A, with 35% of cases due to influenza B. Around 32% of the cases are aged 65 years and over (median age 61 years) and 78% of all cases have known medical co-morbidities.

  - **Queensland public hospital admissions (EpiLog).** EpiLog is a web based application developed by Queensland Health. This surveillance system generates admission records for confirmed influenza cases through interfaces with the inpatient information and public laboratory databases. Records are also generated manually. Admissions data reported are based on date of reported onset. Up to 15 September 2013, there were 254 admissions of confirmed influenza this year, including 31 to intensive care units. The age distribution of confirmed influenza admissions in 2013 showed a bimodal distribution peaking in the 0-9 and the 70 years and over age groups.

  - **Australian Paediatric Surveillance.** This surveillance system reports on hospital admissions of children aged 15 years and under to intensive care units (ICUs) around Australia following complications due to influenza infection, and was initiated at the start of June 2009 through the Australian Paediatric Surveillance Unit (APSU). Details of admissions are reported weekly. From 1 January to 13 September 2013, there have been 12 hospitalisations associated with severe influenza complications in children. Of the six cases for which there is further information, two required ICU admissions and two were associated with influenza A infections and all but one was aged less than three years.

  - **Death associated with influenza and pneumonia.** Nationally reported influenza deaths are notified by jurisdictions to the NNDSS. So far in 2013, 20 influenza-related deaths

have been notified to this system with a median age of 75 years. Seventeen of these cases were reported as having an influenza type A infection. The number of influenza associated deaths reported to the NNDSS is reliant on the follow up of cases to determine the outcome of their infection and most likely is an underestimate of the true mortality impact associated with this disease.

(Abridged from the Australian Influenza Surveillance Report 2013, No.7, Department of Health and Ageing, Australia and a report by Dr Ian Barr, WHO Collaborating Centre for Influenza, Melbourne).

1.3. Influenza activity in South Africa, February to September 2013

Influenza surveillance in South Africa has been expanded significantly during 2013 and includes three main active surveillance programmes and one passive surveillance system.

- **Viral watch programme** – A total of 246 doctors and primary health care nurses have been recruited across the country to participate in the ILI sentinel surveillance programme from all nine provinces. This programme focuses on mild infections seen mainly by GPs as well as a few paediatricians and primary health care clinics across the country.

- **Enhanced viral watch programme** – This programme was established following the emergence of the influenza A(H1N1)pdm09 with the aim of expanding the "viral watch" to include hospitalised patients. This programme includes 11 hospitals covering all nine provinces and focuses on hospitalised patients with severe acute respiratory-tract infection (SARI) across the country.

- **SARI surveillance programme** - The SARI surveillance programme was established in 2009 and monitors cases of more severe disease in hospitalised patients. Detailed epidemiologic data are collected on all patients. This programme currently includes 5 hospitals as 4 sentinel sites covering 4 provinces: Chris Hani Baragwanath Hospital (CHBH), an urban setting hospital situated in Gauteng Province with a well-defined population (Soweto); Edendale Hospital (EH) a semi-urban setting hospital situated in KwaZulu-Natal Province, Klerksdorp and Tshepong Hospitals (KH) situated in a semi-urban setting in the Northwest Province and Mapulaneng and Matikwana Hospitals (MMHs), rural setting hospitals in Mpumalanga Province. In addition the respiratory consultations and hospitalisations surveillance system collects anonymous influenza- and pneumonia-associated outpatient consultations and hospitalisations data from one private hospital group in 7 provinces (Gauteng, North West, Free State, Mpumalanga, Eastern and Western Cape and KwaZulu-Natal). These data on the number of consultations and hospitalisations are compared to the influenza season as described by the viral watch and SARI programmes.

- **Passive surveillance system**: Apart from these active surveillance sites, the National Institute for Communicable Diseases (NICD) also offers support to National Health Laboratory Service laboratories that routinely test for respiratory virus disease across the country.

In 2013, a total of 4123 suspected influenza specimens were processed up to week 31. Of which, 844 influenza viruses were detected. This gave an overall detection rate of 20% compared with 15.9% in 2012. Among all detected influenza viruses, influenza A was detected in 809 and influenza B in 34. Influenza A(H1N1)pdm09 was the predominant strain (85.5%, 722/844) followed the A(H3N2) strain (10.8%, 91/844) and influenza B (4%, 34/844) including 6 B/Wisconsin/1/2010.

A total of 9 seasonal influenza A(H3N2) viruses were sequenced and they were clustered genetically in group 3 subgroup 3C. A total of 3 A(H3N2) virus isolates could be characterised antigenically by hemagglutination inhibition assay (HIA) and almost all showed normal reactivity to the A/Perth/16/2009 reference antiserum.

In the 2013 season 70 influenza A(H1N1)pdm09 viruses were sequenced and most of them were clustered genetically in group 6. A total of 40 A(H1N1)pdm09 virus isolates could be characterised antigenically by hemagglutination inhibition assay (HIA) and almost all showed normal reactivity to the A/California/7/2009 reference antiserum.

A total of 7 influenza B viruses were sequenced and they were clustered genetically in group 2 of B/Yamagata lineage viruses. Six influenza B viruses were characterized by reactivity to reference antisera raised against vaccine or other reference antigens and all reacted similar to the control antiserum to the influenza B/Yamagata lineage, B/Wisconsin/1/2010.

No neuraminidase inhibitor resistant influenza viruses have been detected for 24 tested viruses by using phenotypic assay against oseltamivir and zanamivir.

(Abridged from a report by Dr Marietjie Venter, National Institute for Communicable Diseases, South Africa).

2. INFLUENZA ACTIVITY IN NEW ZEALAND IN 2013

The national influenza surveillance system in New Zealand is an essential public health tool for assessing and implementing strategies to control influenza. The surveillance system includes community-based surveillance (ESR's sentinel general practitioners (GP) surveillance, HealthStat GP surveillance), SHIVERS surveillance system (SARI and ILI surveillance), hospital-based surveillance (ICD-based hospitalisation and non-sentinel laboratory surveillance), and event-based surveillance (telephone health advice service – Healthline).

2.1. Community-based surveillance

2.1.1. ESR's sentinel GP-based surveillance

The New Zealand sentinel GP surveillance system was established in 1991 as part of the World Health Organization (WHO) global program for influenza surveillance. The system is operated nationally by the Institute of Environmental Science and Research (ESR) and locally by surveillance coordinators in the public health units of the country's 20 District Health Boards (DHB). Surveillance is conducted during May–September (the southern hemisphere winter) by volunteer sentinel GP's distributed across New Zealand.

The sentinel system defines a case of ILI as *an acute respiratory tract infection characterized by an abrupt onset of at least two of the following: fever, chills, headache, and myalgia*. Each participating GP records the daily number of patients consulted for ILI, along with the patient's age. These data are collected by local district coordinators each week. Total crude national ILI consultation rates are calculated weekly using the sum of the GP patient populations as the denominator. As age group–specific GP patient population data are not provided by the participating practitioners, the denominator for age group–specific ILI consultation rates is based on New Zealand census data with the assumption that the age group distribution for GP patient populations is the same as the distribution for the entire New Zealand population.

Each participating GP also collects three respiratory samples (nasopharyngeal or throat swab) each week from the first ILI patients examined on Monday, Tuesday, and Wednesday. The GP's forward these samples to the WHO National Influenza Centre at ESR or to hospital virology laboratories in Auckland, Waikato, or Christchurch for virus characterization. Laboratory identification methods include molecular detection by polymerase chain reaction (PCR), isolation of the virus, or direct detection of viral antigen. Influenza viruses are typed and subtyped as influenza A, B, seasonal A (H1N1), seasonal A (H3N2), or pandemic (H1N1) 2009. The virus identification data are forwarded by hospital laboratories to ESR each week. ESR compiles and reports national epidemiologic and virologic data on influenza to WHO and also publishes these data on the ESR website (http://www.esr.cri.nz/virology/virology_weekly_report.php)

In 2013, 70 sentinel practices were recruited from 18 of 20 DHBs under ESR's sentinel GP-based surveillance. Some sentinel practices did not report every week. The average number of practices participating per week was 67, with an average patient population roll of 370,685 approximately 8.4% of the New Zealand population. From week 18 (the week ending 5 May 2013) through week 34 (the week ending 25 August 2013), a total of 1048 consultations for ILI were reported from the 18 DHBs. It is estimated that ILI resulting in a visit to a general practitioner affected over 12 533 New Zealanders (0.28% of total population). The cumulative incidence of ILI consultation during this period was 282.7 per 100,000 population. The average weekly ILI consultation rate during this period was 17.0 per 100,000 population.

Weekly national ILI consultation rates for the study period were compared with the same period in 2008 and 2012. From week 18 (ending 5 May 2013) through week 34 (ending 25 August 2013), the weekly ILI consultation rate remained below the baseline level of 50 consultations per 100,000 patient population (Figure 1). The ILI rate peak in week 31 (27.5 per 100,000 patient population) which is lower than the peaks recorded in 2012 (week 31, 154.1 per 100,000) and 2011 (week 30, 66.1 per 100,000). The peak ILI rate in 2013 was the lowest during the period 1992-2013 (Figure 2).

Figure 1. Weekly Consultation Rates for Influenza-like Illness in New Zealand, 2008-2013

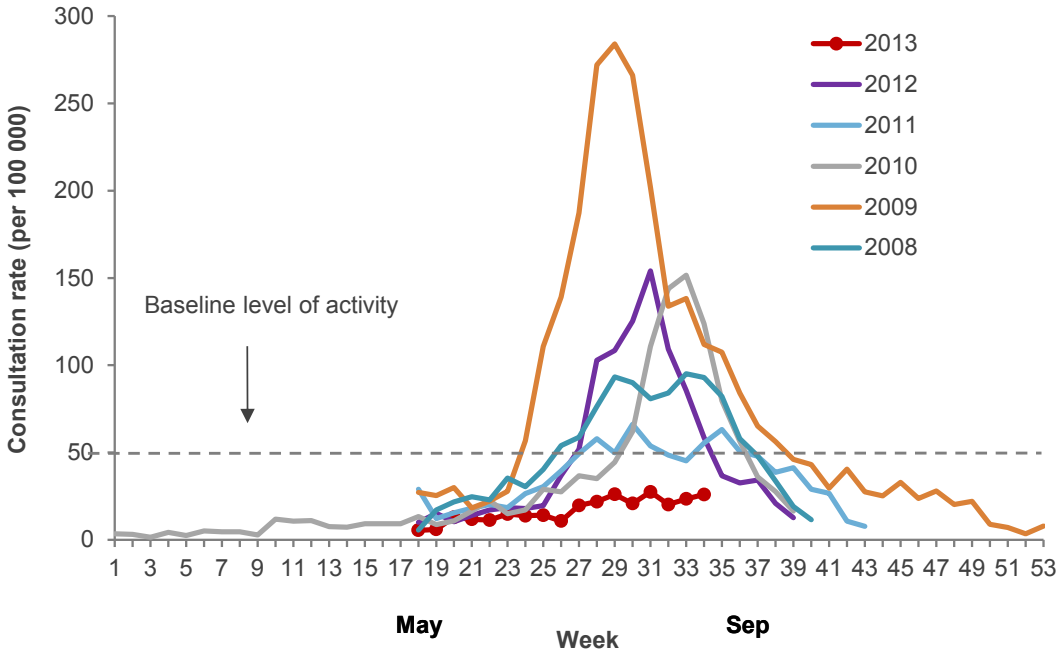
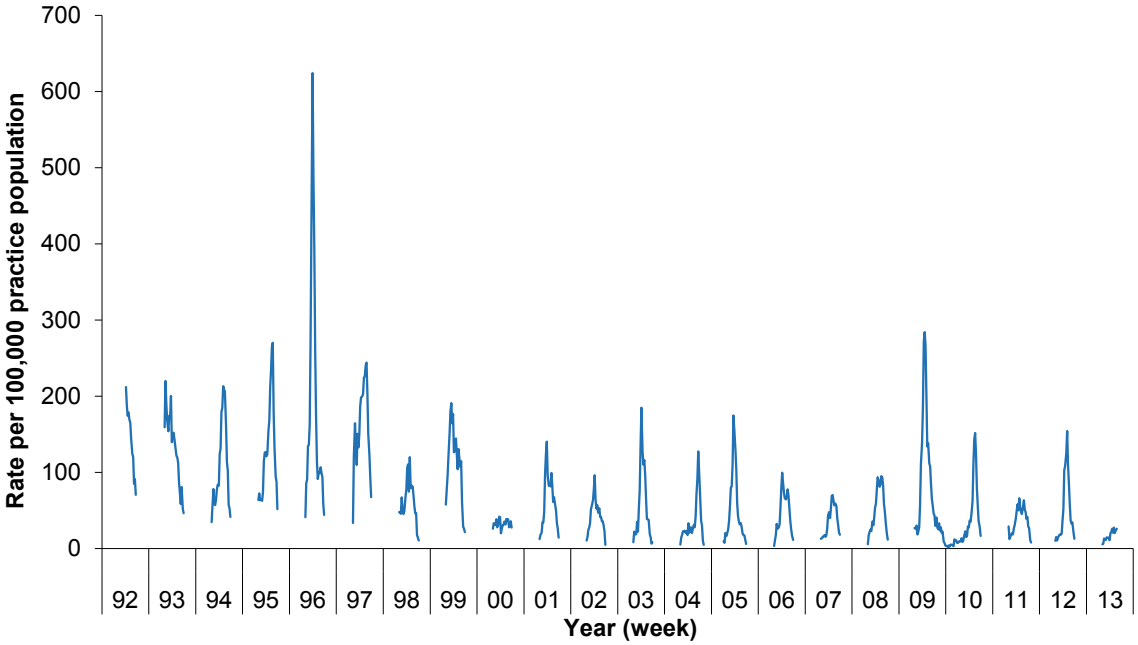


Figure 2. Weekly Consultation Rates for Influenza-like Illness in New Zealand, 1992-2013



As in previous years, 2013 consultation rates for ILI varied greatly among DHBs (Figure 3). From week 18 (the week ending 5 May 2013) through week 34 (the week ending 25 August 2013), South Canterbury DHB had the highest consultation rate (46.0 per 100,000), followed by West Coast (32.2 per 100,000), and Lakes (31.1 per 100,000).

Figure 3. Average weekly consultation rate for influenza-like illness by District Health Board, 2013

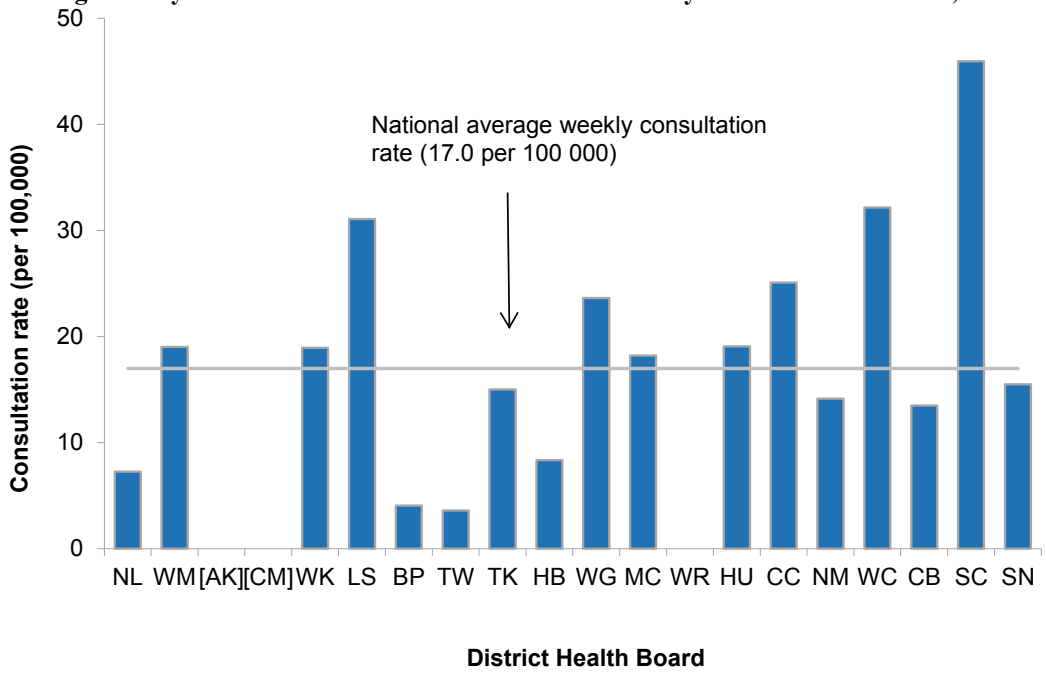
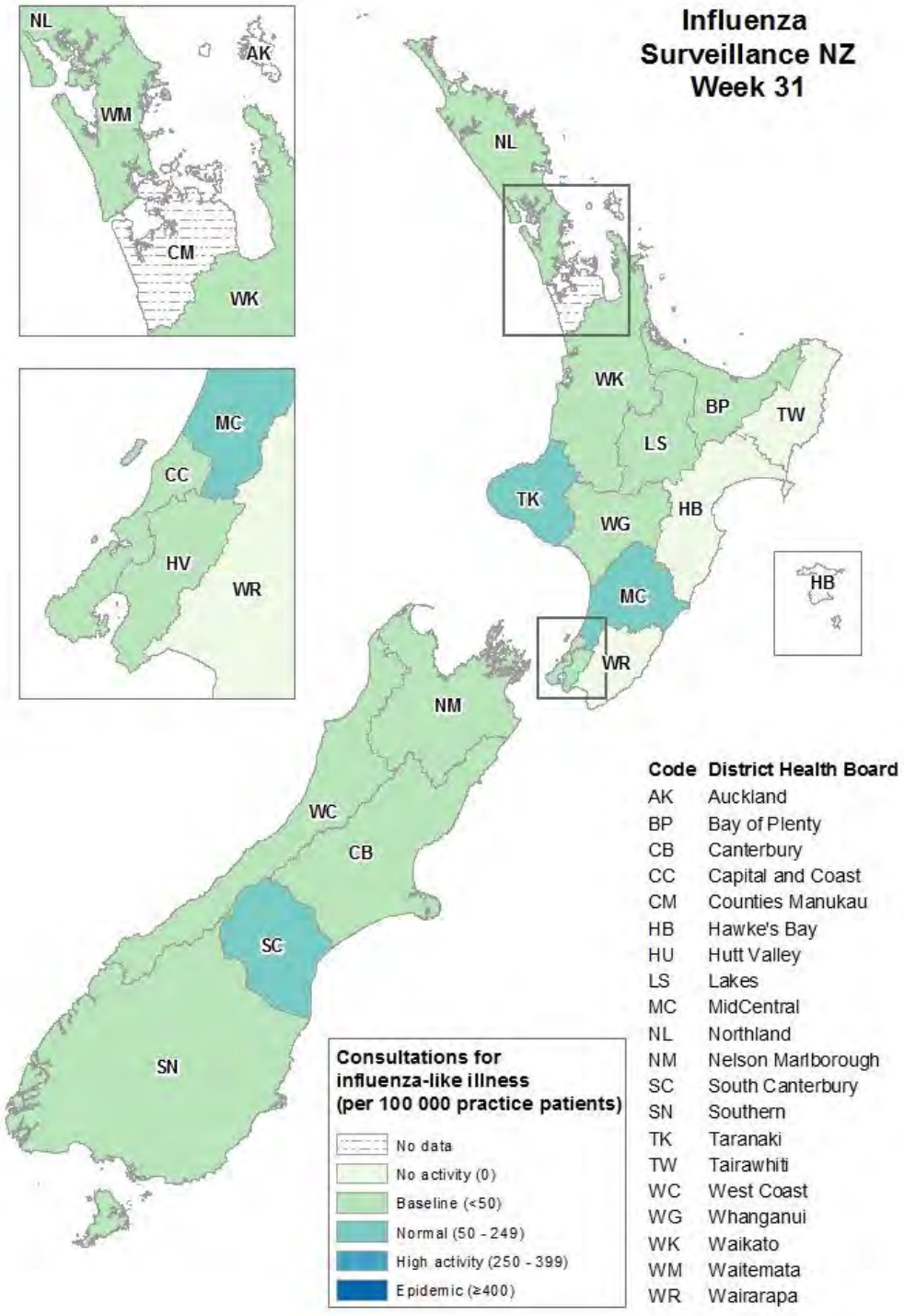


Figure 4 shows ILI consultations among DHBs during the peak week 31 (29 July – 4 August 2013). South Canterbury DHB had the highest consultation rate (86.8 per 100,000, 6 cases), followed by Taranaki (59.8 per 100,000, 11 cases), and MidCentral (53.1 per 100,000, 11 cases).

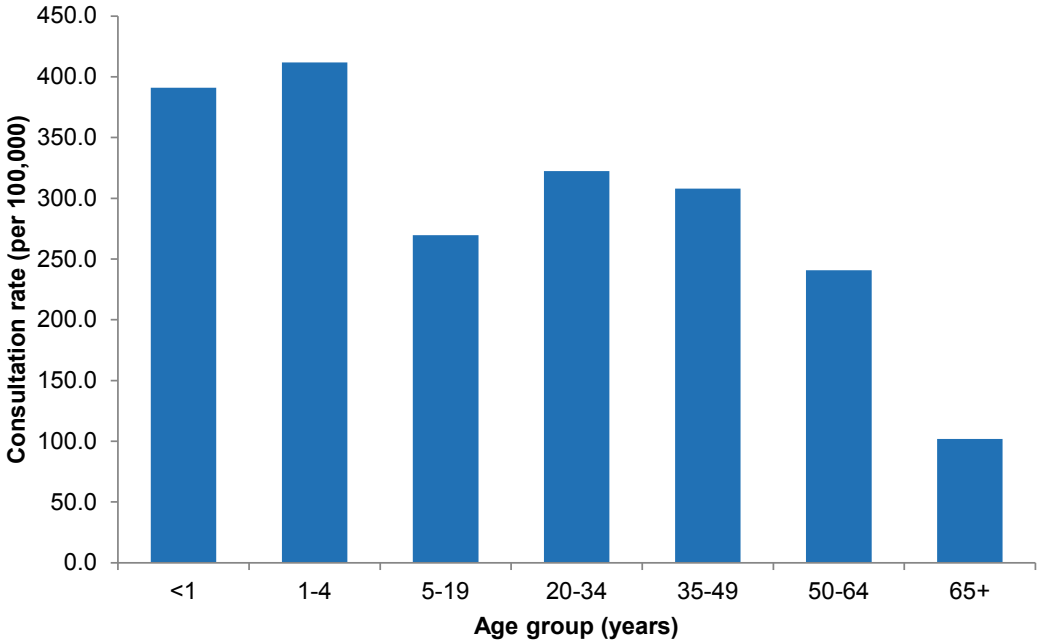
Figure 4. ILI consultation rates by District Health Board for the peak week 31 (29 July–4 August 2013)



A weekly rate <50 ILI consultations per 100,000 patient population is considered baseline activity. A rate of 50–249 is considered indicative of normal seasonal influenza activity, and a rate of 250–399 indicative of higher than expected influenza activity. A rate ≥400 ILI consultations per 100,000 patient population indicates an epidemic level of influenza activity.

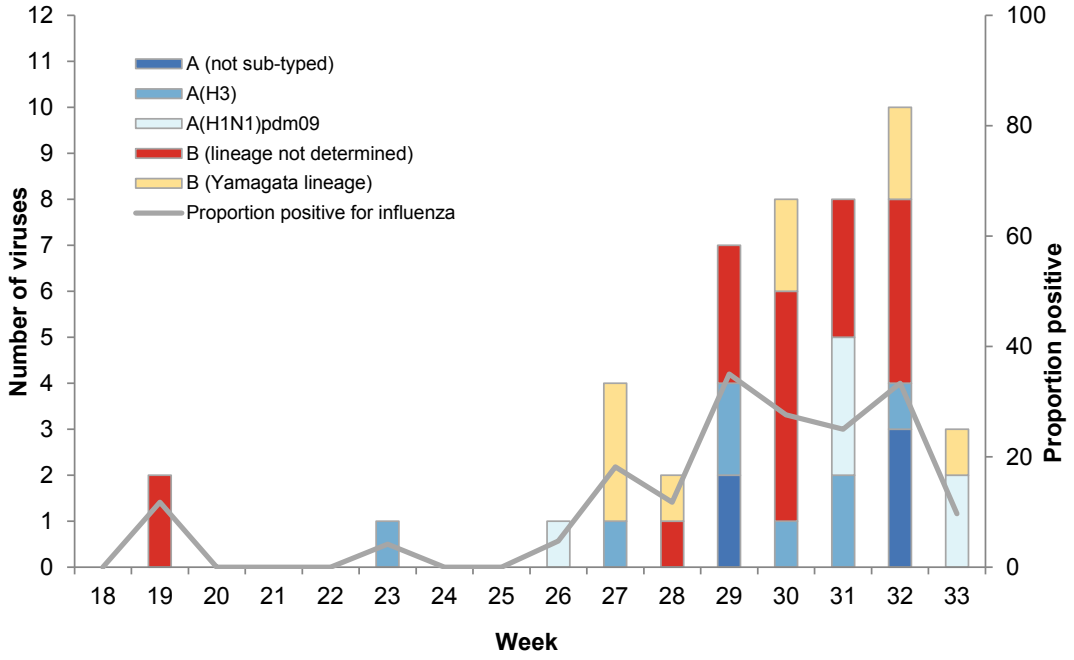
From week 18 (the week ending 5 May 2013) through week 34 (the week ending 25 August 2013), the highest cumulative ILI consultation rates were recorded among children and aged 1-4 years (411.7 per 100,000 age group population) and those aged <1 year (391.0 per 100,000) (Figure 5). The lowest rates were in the ≥65 years (102.0 per 100,000) and those in the 50-64 years (240.9 per 100,000).

Figure 5. Sentinel Average Cumulative Consultation Rates for ILI by Age Group, 2013



A total of 334 swabs were sent to virology laboratories from sentinel GPs during week 18 (ending 5 May 2013) through week 34 (ending 25 August 2013). From these swabs, 46 influenza viruses were identified. This gave an overall detection rate of 13.8%. The predominant strain was influenza B (27) including nine B/Wisconsin/1/2010-like viruses (belonging to the B/Yamagata lineage), eight A(H3N2) including two A/Victoria/361/2011 (H3N2), six A(H1N1)pdm09 including one A/California/7/2009 (H1N1)-like virus, and five A (not sub-typed) (Figure 6). Influenza B viruses have been the predominant strain for the most of the winter season in 2013.

Figure 6. Number of influenza viruses reported by type and week from sentinel surveillance



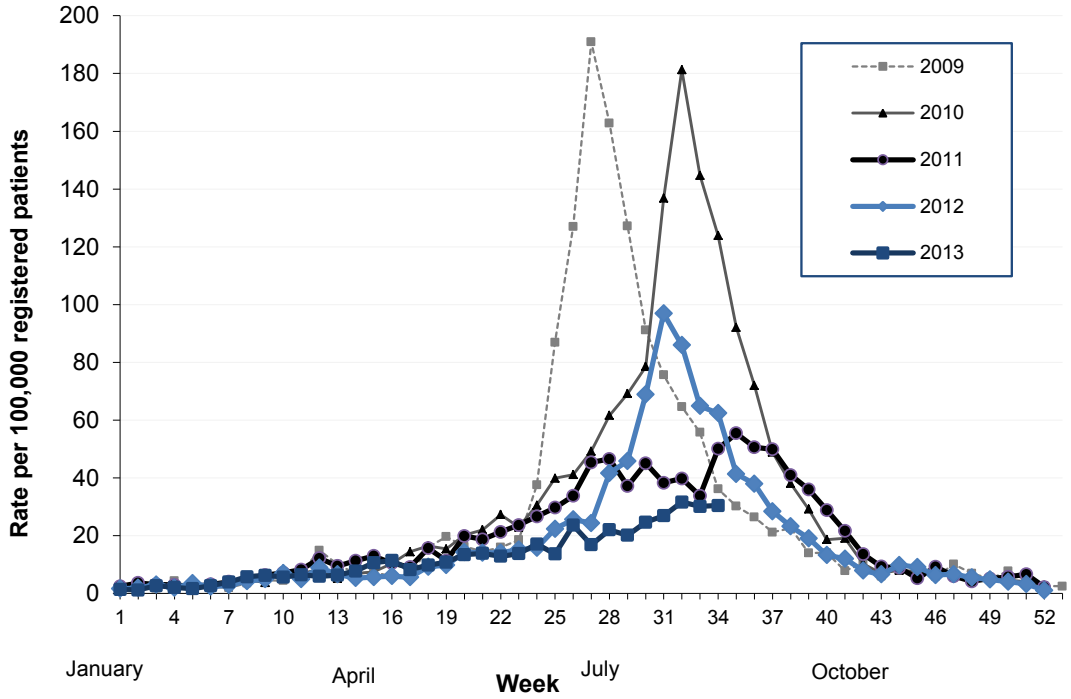
2.1.2. HealthStat GP-based surveillance

HealthStat is a computer-based routine surveillance system of a nationally representative random sample of approximately 100 general practices that code for influenza-like-illness (ILI). The case definition used for ILI by HealthStat is: "acute URTI, with abrupt onset of 2+ symptoms from chills, fever, headache and myalgia". This surveillance system monitors the number of people who have primary care (GP) consultations. HealthStat is based on the automated downloads from GP practice management computer systems. This service is provided to ESR by CBG Health Research Ltd. HealthStat GP-based surveillance does not contain a component of the virological surveillance.

Analysis is frequency based with alarms raised by identifying statistical deviations (aberations) from previous counts. The analysis of the ILI count is based on the cumulative summation (CUSUM) algorithm implemented in Early Aberration Reporting System (EARS) application developed by the Centres for Disease Control and Prevention (CDC), Atlanta, United States. EARS has three sensitivity thresholds (high, medium and low). Any daily call count exceeding a threshold a flagged.

Figure 7 below shows the weekly rate of ILI per 100,000 registered population, 2009-2013. The 2009 and 2010 data shows major differences compared to other surveillance systems, probably reflecting low sensitivity of the coding practices in 2009. It appears that the coding practices have been improved since 2010.

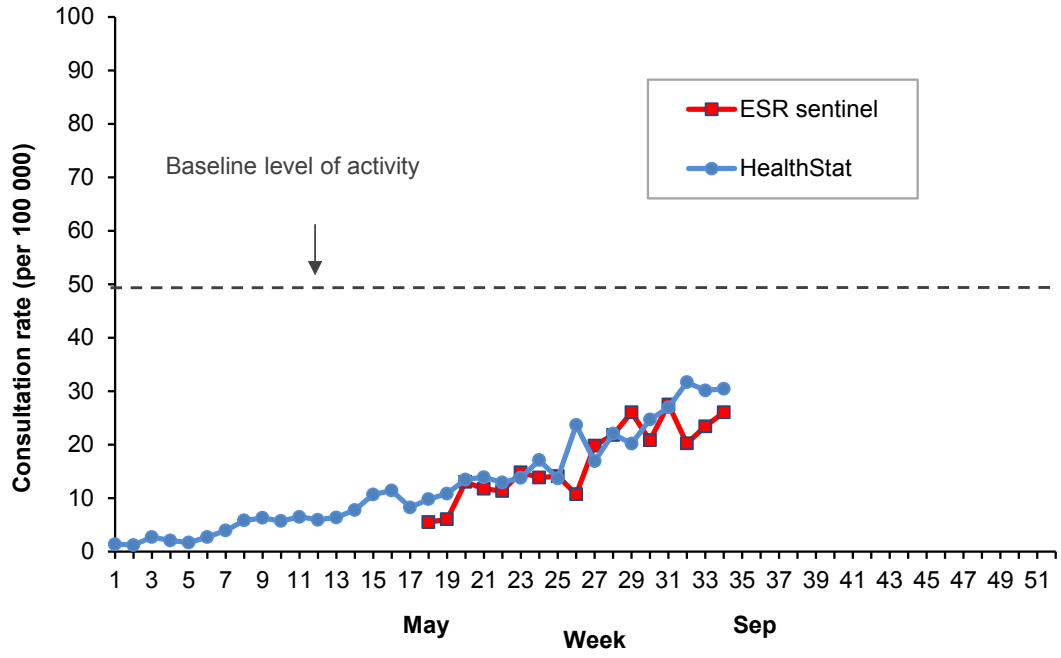
Figure 7. HealthStat ILI consultation rates by week, 2009-2013



Data source: From responding practices of Original HealthStat GP practice panel

Overall, the trend of the 2013 data is similar to ESR's sentinel GP surveillance (Figure 8 below). It is not clear if activity has peaked in either surveillance systems.

Figure 8. ESR and HealthStat sentinel GP-based ILI rates comparison, 2013



2.2. SHIVERS study (SARI and ILI surveillance)

Recent global experience with pandemic influenza A(H1N1)pdm09 highlights the importance of monitoring severe and mild respiratory disease to support pandemic preparedness as well as seasonal influenza prevention and control. Two active surveillance systems were established in New Zealand in central, east and south Auckland with a population of 838,000.

1) hospital-based surveillance - enhanced, prospective, continuous, population-based surveillance for severe acute respiratory infection (SARI) cases including ICU admissions and deaths caused by influenza and other respiratory pathogens;

2) community-based surveillance - enhanced, prospective, sentinel general practice surveillance for influenza-like illness (ILI) caused by influenza and other respiratory pathogens;

The aims of SARI and ILI surveillance are: 1) to measure the burden of severe and mild disease caused by influenza and other respiratory pathogens; 2) to monitor trends in severe and mild disease caused by influenza and other respiratory pathogens; 3) to identify high risk groups that should be prioritized for prevention and treatment; 4) to monitor antigenic, genetic and antiviral characteristics of influenza viruses associated with severe and mild disease. 5) to provide a study base to estimate the effectiveness of influenza vaccine.

SARI surveillance involves daily screening of all inpatients with suspected respiratory infections who are admitted overnight to the public hospitals in each of the Auckland and County Manukau District Health Boards: Auckland City Hospital with associated Starship Children's Hospital and Middlemore Hospital with associated Kidz First Children's Hospital. An overnight admission is defined as: "A patient who is admitted under a medical team, and to a hospital ward or assessment unit". The case definition being used is the World Health Organisation (WHO) SARI case definition: "an acute respiratory illness with a history of fever or measured fever of ≥38°C, and cough, and onset within the past 10 days, and requiring inpatient hospitalisation". If a patient with suspected respiratory infection has met the SARI case definition, a respiratory specimen (nasopharyngeal swab or aspirate) is collected to test for influenza and other respiratory pathogens. In addition, patient information is captured via a case report form which collects data that describe demographics, history of presenting illness, co-morbidities, disease course and outcome, and possible risk factors including host and environmental factors.

ILI surveillance involves 18 ILI sentinel general practices with 103,884 enrolled patients, covering roughly 14% of the ADHB and CMDHB population. The sentinel general practitioners (GPs) screen all patients with influenza-like illness who seek medical consultations. The ILI case definition is: "An acute respiratory illness with a history of fever or measured fever of ≥38°C, AND cough, AND onset within the past 10 days, AND requiring GP consultation". If a patient with suspected respiratory infection has met the ILI case definition, a respiratory specimen (nasopharyngeal swab or throat swab) is collected to test for influenza and other respiratory pathogens. In addition, patient information is captured via the practice management system (PMS) which collects data that describe demographics, history of presenting illness, co-morbidities, vaccination history and regular medication list.

This report summarises data obtained from SARI surveillance from 29 April (week 18) to 25 August (week 34) in 2013. This includes incidence, demographic characteristics, clinical outcomes and aetiologies for SARI & ILI cases and preliminary analysis for vaccine effectiveness.

2.2.1. SHIVERS study (SARI and ILI surveillance)

From 29 April 2013 to 25 August 2013, there were 45783 acute admissions to ADHB and CMDHB hospitals. A total of 2676 patients with suspected respiratory infections were assessed in these

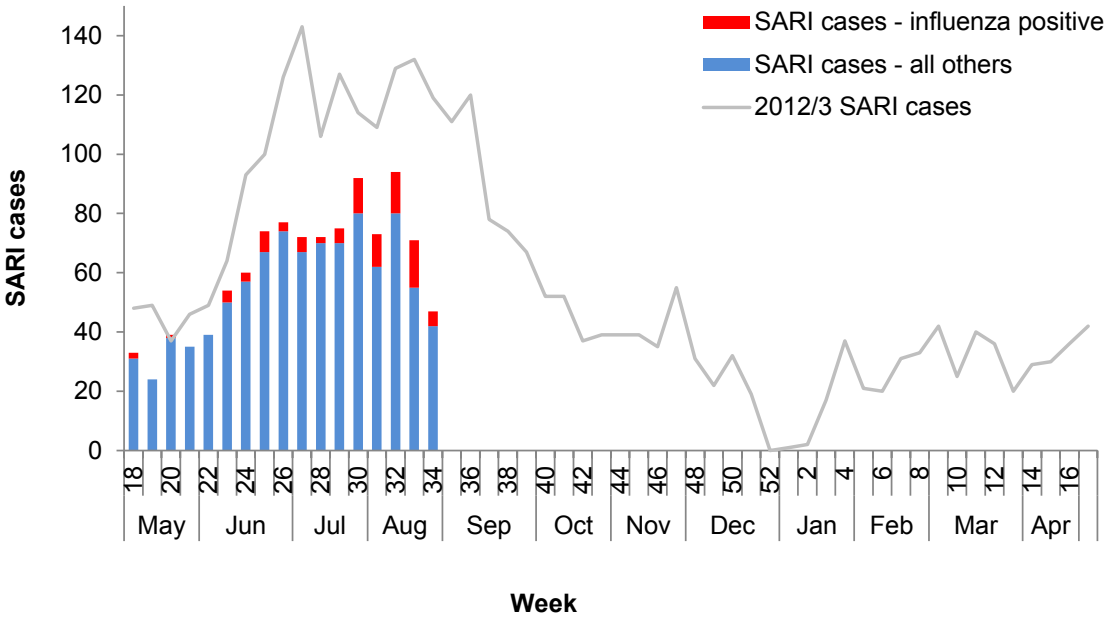
hospitals. Of these, 1234 (46.1%) patients met the SARI case definition. Among these SARI patients, 97 (7.9%) had influenza viruses detected. Table 2 shows the admission diagnoses/syndromes of the suspected respiratory infections and SARI cases and influenza positive cases since start of the SARI surveillance.

Table 2. Admission diagnoses/syndromes of suspected respiratory infections and SARI cases

Conditions	Acute respiratory infection cases				SARI cases			Non-SARI cases		
	SHIVERS assessed cases (%)	Non-SARI cases	SARI cases	Prop SARI	Tested SARI	Flu +ve	Prop flu +ve of tested (%)	Tested non-SARI	Flu +ve	Prop flu +ve of tested (%)
Admission Diagnosis/Syndrome										
Suspected acute upper respiratory tract infection[1]	315	153	162	51.4	149	50	33.6	71	4	5.6
Suspected croup	30	16	14	46.7	13	5	38.5	3	0	0.0
Suspected bronchiolitis	1087	584	503	46.3	461	44	9.5	395	7	1.8
Suspected pneumonia	1916	835	1081	56.4	905	137	15.1	152	13	8.6
Exacerbations of asthma	716	514	202	28.2	153	31	20.3	55	2	3.6
Exacerbations of childhood chronic lung disease[2]	98	72	26	26.5	24	4	16.7	17	1	5.9
Exacerbations of adult chronic lung disease[3]	942	698	244	25.9	211	29	13.7	59	5	8.5
Respiratory failure	67	50	17	25.4	15	5	33.3	7	0	0.0
Febrile illness with respiratory symptoms[4]	623	243	380	61	355	81	22.8	48	9	18.8
Other suspected acute respiratory infections	1200	896	304	25.3	245	62	25.3	149	10	6.7
Not provided	184	160	24	13	19	5	26.3	20	0	0.0

Of 1234 SARI cases identified from 29 April 2013 to 25 August 2013, 1031 were residents of ADHB and CMDHB. 90 of the 804 tested resident SARI cases had influenza viruses. Figure 9 shows the weekly SARI cases and influenza positive cases in ADHB and CMDHB residents.

Figure 9. Weekly resident SARI and influenza positive cases since 29 April 2013 and previous season (2012/3) SARI cases



Since 29 April 2013, a total of 1234 SARI cases were identified. This gives a SARI proportion of 27.0 per 1000 acute hospitalisations (Table 2). Of these SARI cases, 33.2% were children aged less than 5 years and 23.2% were adults 65 years and older. 56 SARI cases have been admitted to ICU and seven deaths were reported during this period.

Of the 1234 SARI cases, 1031 were ADHB and CMDHB residents, giving the SARI incidence rate of 123.1 per 100,000 population (Table 2). Among the 804 tested SARI cases who were ADHB and CMDHB residents, 90 (11.2%) had positive influenza virus results. This gives a SARI related influenza incidence of 10.7 per 100,000 population.

Table 3. Demographic characteristics of SARI cases and related influenza cases, 29 April 2013 to 25 August 2013

Characteristics	Admissions	Assessed	SARI & influenza cases among all hospital patients			SARI & influenza cases among ADHB & CMDHB residents			
			SARI Cases (%)	Cases per 1000 hospitalisations	Influenza positive (%)	SARI cases	SARI incidence (per 100 000)	Influenza Cases	Influenza incidence (per 100 000)
Overall	**45783**	**2676**	**1234 (46.1)**	**27.0**	**97 (10.4)**	**1031**	**123.1**	**90**	**10.7**
Age group (years)									
<1	1784		227	127.2	9 (4.9)	210	1601.1	9	68.6
1 to 4	3574		183	51.2	6 (4.2)	160	325.4	6	12.2
5 to 19	5497		70	12.7	9 (17.6)	56	29.4	9	4.7
20 to 34	8372		79	9.4	10 (15.6)	75	38.4	9	4.6
35 to 49	7157		110	15.4	13 (15.5)	105	54.9	13	6.8
50 to 64	7770		161	20.7	16 (13.3)	157	128.8	16	13.1
65 to 79	6922		178	25.7	20 (14.8)	163	287.4	19	33.5
80 and over	4702		108	23.0	10 (12.2)	105	519.5	9	44.5
Unknown	5		118		4 (5.6)	0	-	0	-
Ethnicity									
Maori	6177		185	29.9	7 (4.4)	171	176.1	7	7.2
Pacific Peoples	9703		323	33.3	35 (13)	307	239.0	34	26.5
Asians	6413		84	13.1	7 (10.4)	81	50.2	7	4.3
European and others	23139		409	17.7	39 (11.6)	363	89.8	37	9.1
Unknown	337		233	0	9 (8.5)	109	234.5	5	10.8
Hospitals									
ADHB	25486	1224	574	22.5	46 (10.8)	494	122.1	45	11.1
CMDHB	20297	1452	660	32.5	51 (10)	537	124.0	45	10.4
Sex									
Female	24329		549	22.6	45 (10.4)	511	119.0	43	10.0
Male	21448		566	26.4	48 (11.1)	519	127.1	47	11.5
Unknown	6		119		4 (5.6)	1	-	0	-

[1] Includes only SARI cases residing in the study area, ADHB and CMDHB; cumulative incidence calculated for the period between week 18 and week 34 using census 2006 population. Incidence calculated on less than 5 cases should be interpreted with caution.

From 29 April 2013 to 25 August 2013, 1014 SARI specimens have been tested and 109 (10.7%) were positive for influenza viruses: influenza A(H1N1)pdm09 (10) including A/California/7/2009 (4), A(H3N2) (38) including A/Victoria/361/2011 (20), influenza A (not sub-typed) (15) and influenza B (47) including B/Wisconsin/1/2010 (19). There were 12 co-detections of influenza and non-influenza viruses among SARI specimens.

Since 29 April 2013, 619 SARI specimens were tested for non-influenza respiratory viruses (Table 3). Of these, 292 (47.2%) were positive with the following viruses: respiratory syncytial virus (137), rhinovirus (130), parainfluenza virus type 1 (1), parainfluenza virus type 2 (18), parainfluenza virus type 3 (15), adenovirus (72), and human metapneumovirus (33). 227 SARI specimens (77.7%) had single virus detection and 65 (22.3%) had multiple virus detection.

Table 4. Influenza and non-influenza respiratory viruses among SARI cases, 29 April 2013 to 25 August 2013

Influenza viruses	**SARI**		
	Cases	**ICU**	**Deaths**
No. of specimens tested	1014	62	10
No. of positive specimens (%)[1]	109 (10.7)	6 (9.7)	0 (0)
Influenza A			
A (not subtyped)	15	0	0
A (H1N1)pdm09	10	3	0
A (H3N2)	38	1	0
Influenza B			
B (lineage not determined)	28	2	0
B (Yamagata)	19	0	0
B (Victoria)	0	0	0
Influenza and non-influenza co-detection (% +ve)	12 (11)	0 (0)	-
Non-influenza respiratory viruses			
No. of specimens tested	619	19	3
No. of positive specimens (%)[1]	292 (47.2)	9 (47.4)	2 (66.7)
Respiratory syncytial virus (RSV)	137	3	0
Parainfluenza 1 (PIV1)	3	0	0
Parainfluenza 2 (PIV2)	18	2	1
Parainfluenza 3 (PIV3)	15	1	1
Rhinovirus (RV)	130	4	0
Adenovirus (AdV)	40	0	0
Human metapneumovirus (hMPV)	29	1	0
Single virus detection (% of positives)	227 (77.7)	7 (77.8)	2 (100)
Multiple virus detection (% of positives)	65 (22.3)	2 (22.2)	0 (0)

The temporal distribution of the number and proportion of the influenza viruses and non-influenza respiratory viruses is shown in Figures 10 & 11. Influenza B was the predominant strain over A(H3N2) from week 18 (ending 5 May) to week 30 (ending 28 July). Since week 31 (ending 4 August), A(H3N2) became the predominant strain.

Figure 10. Temporal distribution of the number and proportion of influenza viruses from SARI specimens by type and week[1]

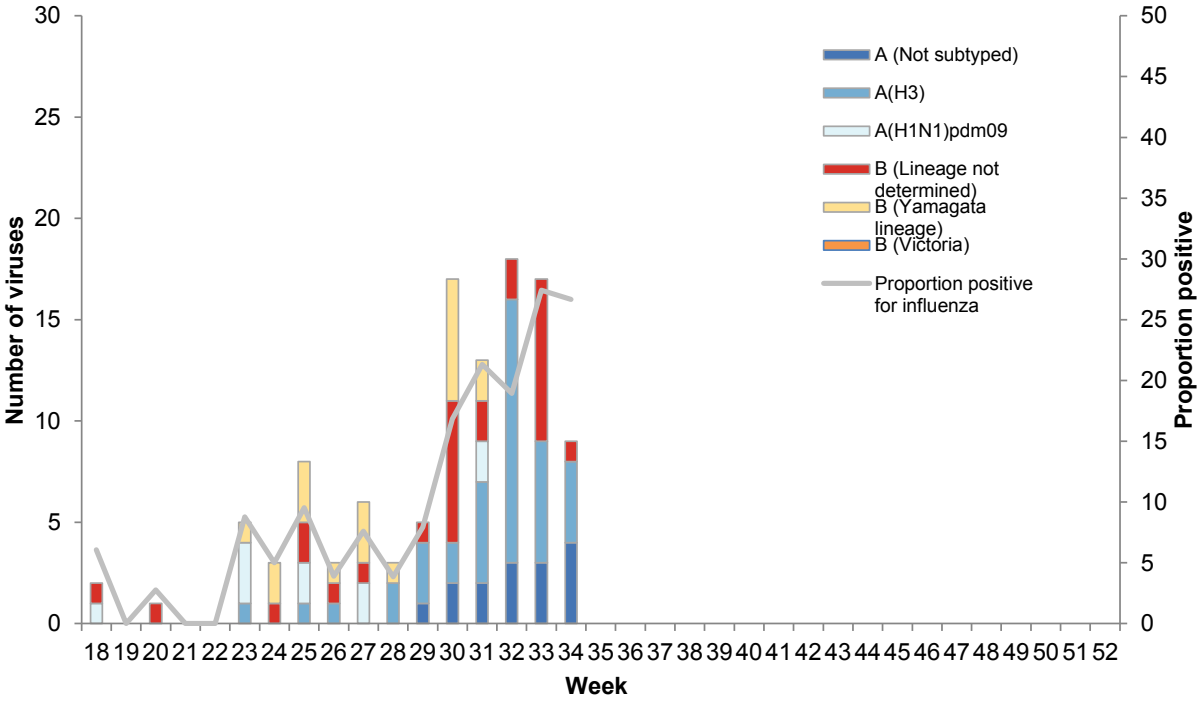
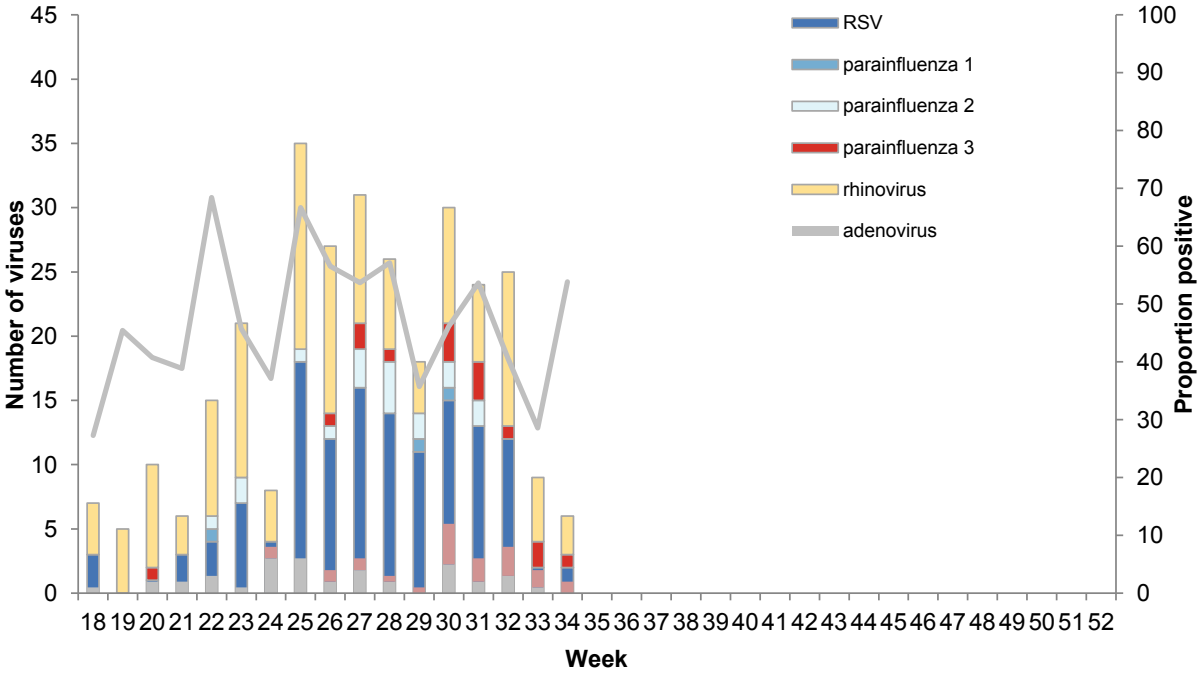


Figure 11. Temporal distribution of the number and proportion of non-influenza viruses from SARI specimens by type and week[1]

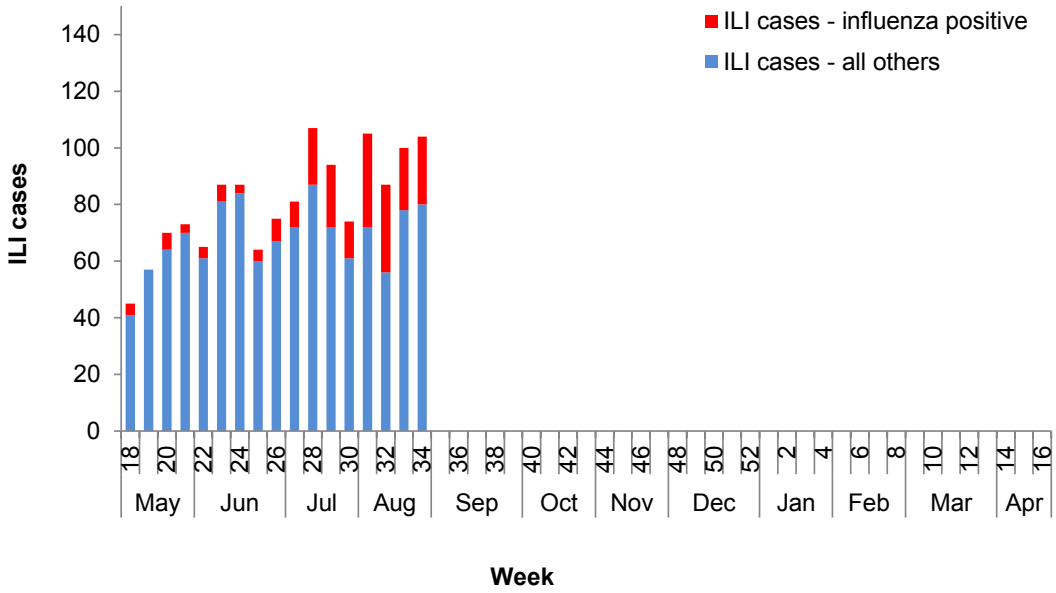


[1] Figures for recent weeks will be underestimates due to time lag in receiving laboratory test results

2.2.2. Influenza-like illness (ILI) surveillance

SHIVERS community-based ILI surveillance has been established and fully operational since 29 April 2013. Figure 12 shows weekly resident ILI and influenza positive cases from week 18 to week 34.

Figure 12. Weekly resident ILI and influenza positive cases since 29 April 2013



From 29 April 2013 to 25 August 2013, a total of 1489 ILI cases were identified. 19.2% were children aged less than 5 years and 5.4% were adults 65 years and older. 1375 were enrolled patients residing in ADHB and CMDHB. This gives a cumulative ILI incidence of 1230.7 per 100,000 patient population (Table 4). Among the 1233 tested ILI cases who were enrolled ADHB and CMDHB residents, 212 (17.2%) were positive for influenza viruses. This gives ILI related influenza incidence of 189.8 per 100,000 patient population.

Table 5. Demographic characteristics of ILI and influenza cases, since 29 April 2013

Characteristics	ILI & influenza cases among sentinel practices			ILI & influenza cases among ADHB & CMDHB residents			
	ILI cases	Influenza cases	Prop Influenza positive (%)	ILI cases	ILI incidence (per 100 000)	Influenza cases	Influenza incidence (per 100 000)
Overall	**1489**	**230**	**17.2**	**1375**	**1230.7**	**212**	**189.8**
Age group (years)							
<1	31	2	6.5	27	1931.3	2	143.1
1 to 4	255	24	9.4	242	2810.7	24	278.7
5 to 19	428	86	20.1	406	1564.5	80	308.3
20 to 34	250	34	13.6	224	948.6	30	127.0
35 to 49	290	56	19.3	265	1056.5	51	203.3
50 to 64	154	21	13.6	136	797.4	18	105.5
65 to 79	73	7	9.6	68	874.4	7	90.0
80 and over	7	0	0.0	7	313.5	0	0.0
Unknown	0	0	-	0	-	0	-
Ethnicity							
Maori	67	6	9.0	62	610.4	4	39.4
Pacific Peoples	307	55	17.9	271	912.1	53	178.4
Asians	235	51	21.7	217	1397.6	47	302.7
European and others	876	117	13.4	824	1466.8	108	192.3
Unknown	0	0	-	0	0.0	0	0.0
DHB							
Auckland	986	157	15.9	970	1614.8	154	256.4
Counties Manukau	427	63	14.8	405	927.1	58	132.8
Sex							
Female	859	121	14.1	804	1365.8	115	195.4
Male	629	109	17.3	571	1080.3	97	183.5
Unknown	1	0	0.0	0	-	0	-

Since 29 April 2013, a total of 1336 ILI specimens were tested for influenza viruses (Table 5) and 230 (17.2%) were positive with the following viruses: influenza A(H1N1)pdm09 (25) including A/California/7/2009 (15), A(H3N2) (67) including A/Victoria/361/2011 (26), influenza A (not sub-typed) (29), and influenza B (111) including B/Wisconsin/1/2010 (50) and B/Brisbane/60/2008 (1). There were 17 co-detections of influenza and non-influenza viruses among ILI specimens.

Since 29 April 2013, a total of 1269 ILI specimens were tested for non-influenza viruses and 451 (35.5%) were positive with the following viruses: respiratory syncytial virus (145), rhinovirus (177), parainfluenza virus type 1 (9), parainfluenza virus type 2 (42), parainfluenza virus type 3 (22), adenovirus (72), and human metapneumovirus (33). 405 SARI specimens (89.8%) had single virus detection and 46 (10.2%) had multiple virus detection.

Table 6. Influenza and non-influenza respiratory viruses among SARI cases, 29 April 2013 to 25 August 2013

Influenza viruses	**ILI**
	Cases
No. of specimens tested	1336
No. of positive specimens (%)[1]	230 (17.2)
Influenza A	
A (not subtyped)	29
A (H1N1)pdm09	25
A (H3N2)	67
Influenza B	
B (lineage not determined)	60
B (Yamagata)	50
B (Victoria)	1
Influenza and non-influenza co-detection (% +ve)	17 (7.4)
Non-influenza respiratory viruses	
No. of specimens tested	1269
No. of positive specimens (%)[1]	451 (35.5)
Respiratory syncytial virus (RSV)	145
Parainfluenza 1 (PIV1)	9
Parainfluenza 2 (PIV2)	42
Parainfluenza 3 (PIV3)	22
Rhinovirus (RV)	177
Adenovirus (AdV)	72
Human metapneumovirus (hMPV)	33
Single virus detection (% of positives)	405 (89.8)
Multiple virus detection (% of positives)	46 (10.2)

The temporal distribution of the number and proportion of the influenza viruses and non-influenza respiratory viruses is shown in Figures 13 & 14. Influenza B was the predominant strain over A(H3N2) from week 18 (ending 5 May) to week 29 (ending 21 July). Since week 30 (ending 28 July), A(H3N2) became the predominant strain.

Figure 13. Temporal distribution of the number and proportion of influenza viruses from ILI specimens by type and week[1]

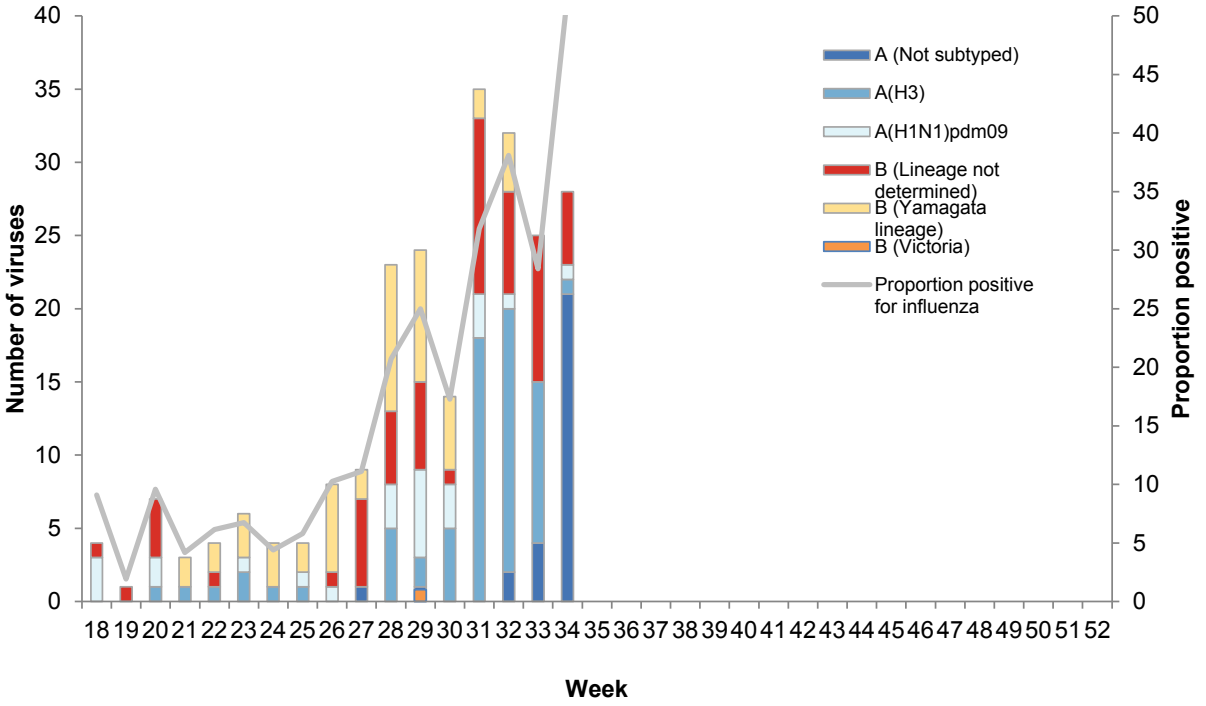
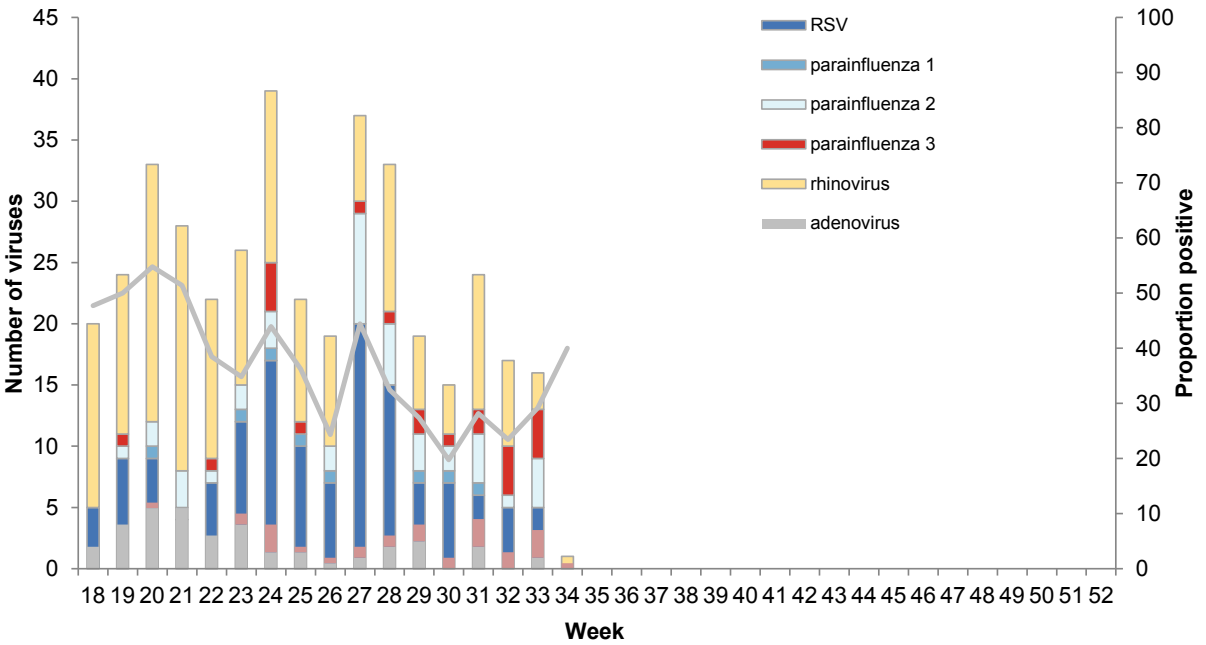


Figure 14. Temporal distribution of the number and proportion of non-influenza viruses from ILI specimens by type and week[1]



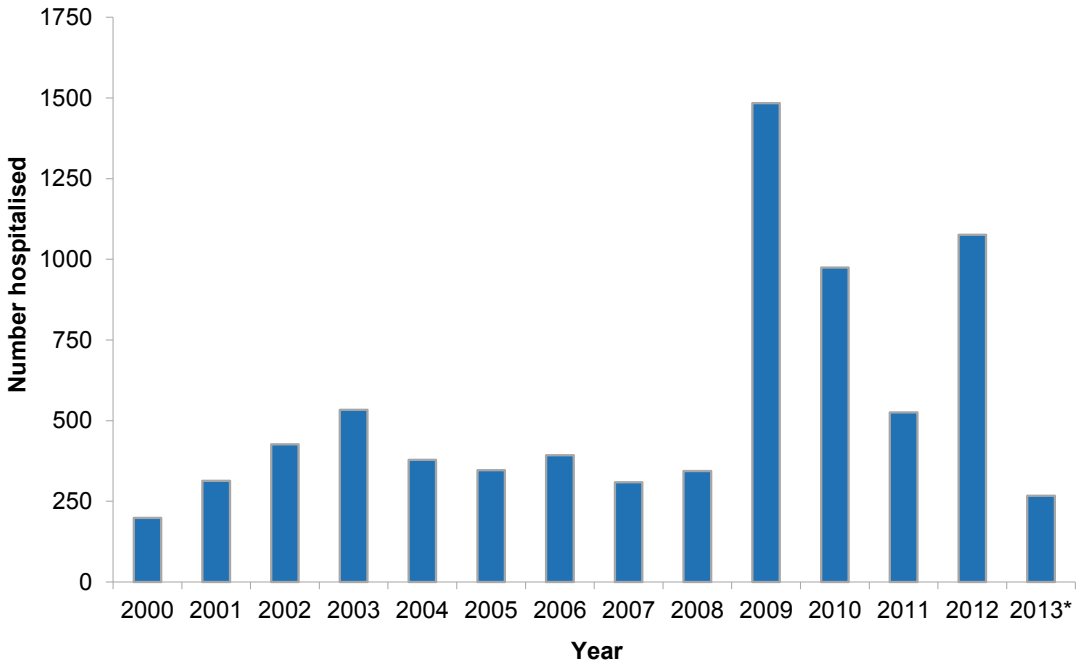
2.3. Hospital-based surveillance

2.3.1. ICD code based hospitalisation surveillance

Hospitalisation data for influenza (ICD-10AM-VI code I (J09-J11) for 2013 which correlate with previous versions of ICD-10AM codes J10-J11, were extracted from the New Zealand Ministry of Health's NMDS (by discharge date). In this dataset, people who received less than 1 day of hospital treatment in hospital emergency departments were excluded from any time series analysis of influenza hospitalisations during 2000–2013. Influenza-related hospitalisations were conservatively taken to include only those cases where influenza was the principal diagnosis. Repeat admissions were included, as infections with influenza A subtype or B virus are possible.

From 1 January to 27 August 2013, there were a total of 267 hospitalisations for influenza (Figure 15). Influenza hospitalisation coding has not been completed for August as yet. So this data only captured a proportion of influenza cases for the winter season of 2013.

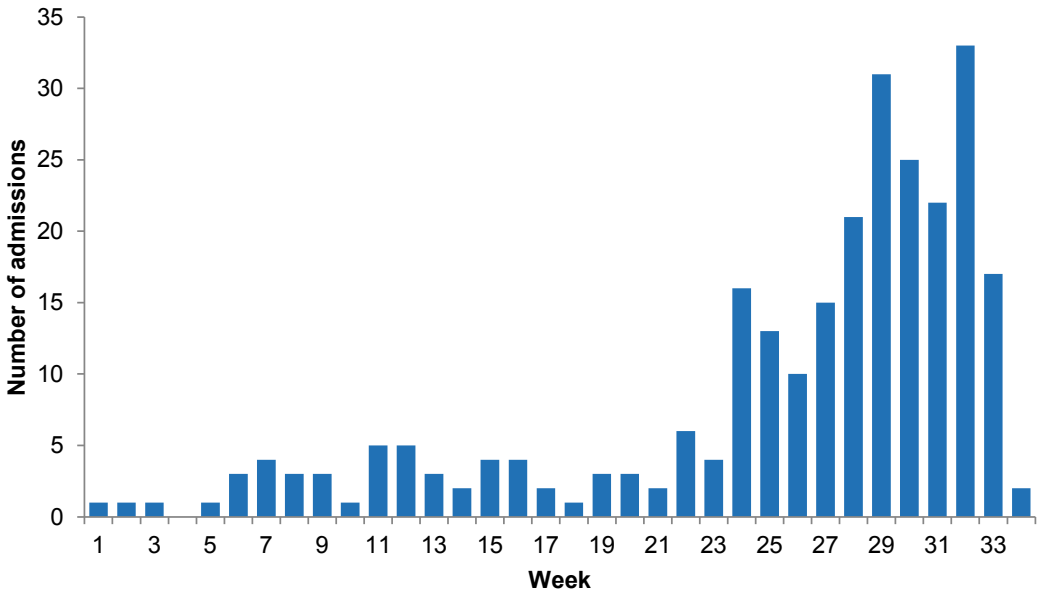
Figure 15. Influenza Hospitalisations, 2000–2013*



*Data from 1 Jan to 27 Aug 2013 only.

Figure 16 shows influenza hospitalisations by week discharged. The highest number of hospitalisations (89) occurred in July. August data is incomplete.

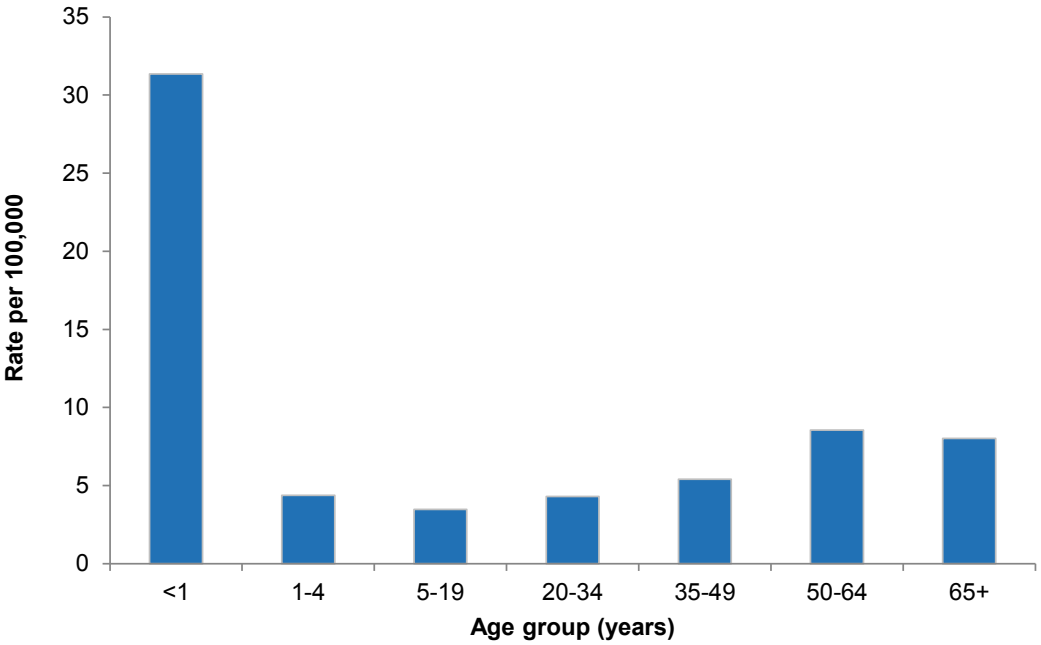
Figure 16. Influenza Hospitalisations by Week Discharged, 2013



*Data from 1 Jan to 27 Aug 2013 only.

From 1 January to 27 August 2013, the highest influenza hospitalisation rates were recorded among young infants aged less than one year old (Figure 17), with rates of 31.4 per 100,000 age group population. This was followed by the 50-64 years old (8.6 per 100,000) and elderly ≥65 years (8.0 per 100,000).

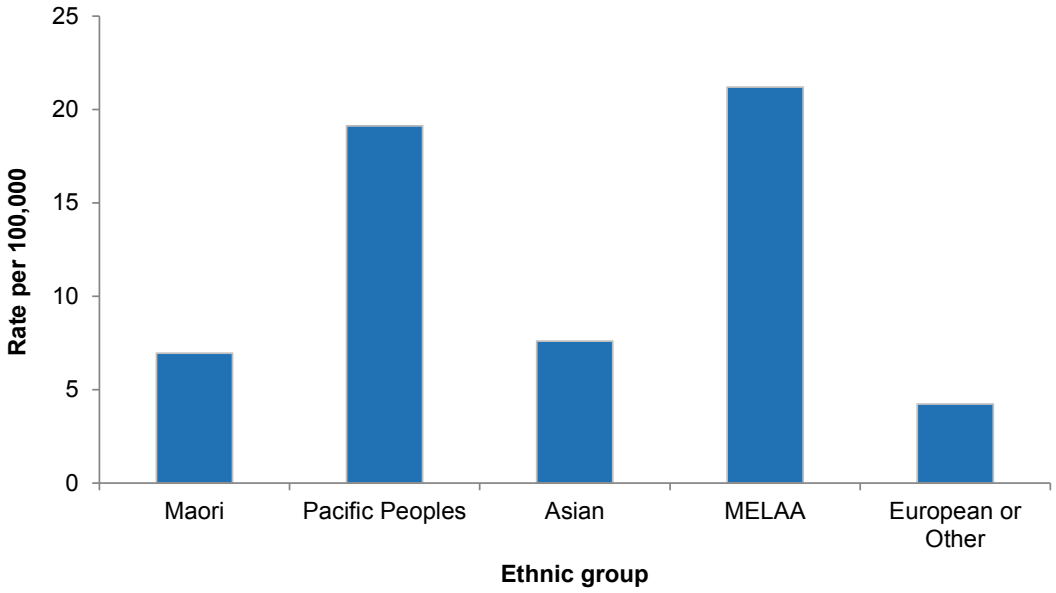
Figure 17. Influenza Hospitalisation Rates by Age Group, 2013*



*Data from 1 Jan to 27 Aug 2013 only.

The ethnic distribution of influenza hospitalisations in 2013 is shown in Figure 18. MELAA had the highest hospitalisation rate (21.2 per 100,000, 8 hospitalisations), followed by Pacific Peoples (19.1 per 100,000, 51 hospitalisations), Asian (7.6 per 100,000, 31 hospitalisations), Maori (7.0 per 100,000, 45 hospitalisations), and European or Other (4.2 per 100,000, 130 hospitalisations).

Figure 18. Hospitalisation Rates by prioritised Ethnic group, 2013*



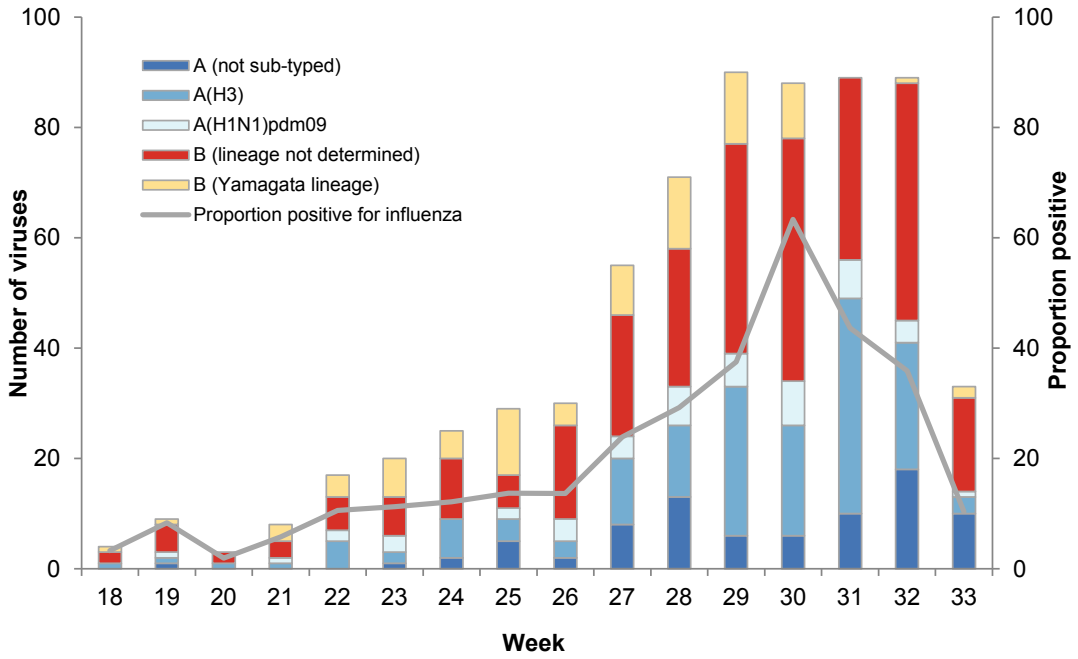
*Data from 1 Jan to 27 Aug 2013 only.
Middle Eastern/Latin American/African (MELAA)

2.3.2. Non-sentinel laboratory surveillance

Non-sentinel laboratory surveillance is conducted by the New Zealand virus laboratory network consisting of the National Influenza Centre at ESR and four hospital virology laboratories in Auckland, Waikato, Wellington, and Christchurch. ESR collates year-round national laboratory data on influenza from hospital in-patient and outpatients during routine viral diagnosis.

A total of 3909 non-sentinel swabs were received during 1 January to 25 August 2013. Among them, 745 influenza viruses were identified. This gave an overall detection rate of 19.1%. The predominant strain was influenza B (392) including 89 of B/Wisconsin/1/2010-like (belonging to the B/Yamagata lineage) and three of B/Brisbane/60/2008-like (belonging to the B/Victoria lineage), A(H3N2) (183) including 29 A/Victoria/361/2011 (H3N2), 65 A(H1N1)pdm09 including 23 A/California/7/2009 (H1N1)-like viruses, and A (not sub-typed) (105) (Figure 19).

Figure 19. Number of influenza viruses reported by type and week from non-sentinel surveillance



*Data is only shown from week 18.

2.4. Event-based surveillance (telephone health advice service – Healthline)

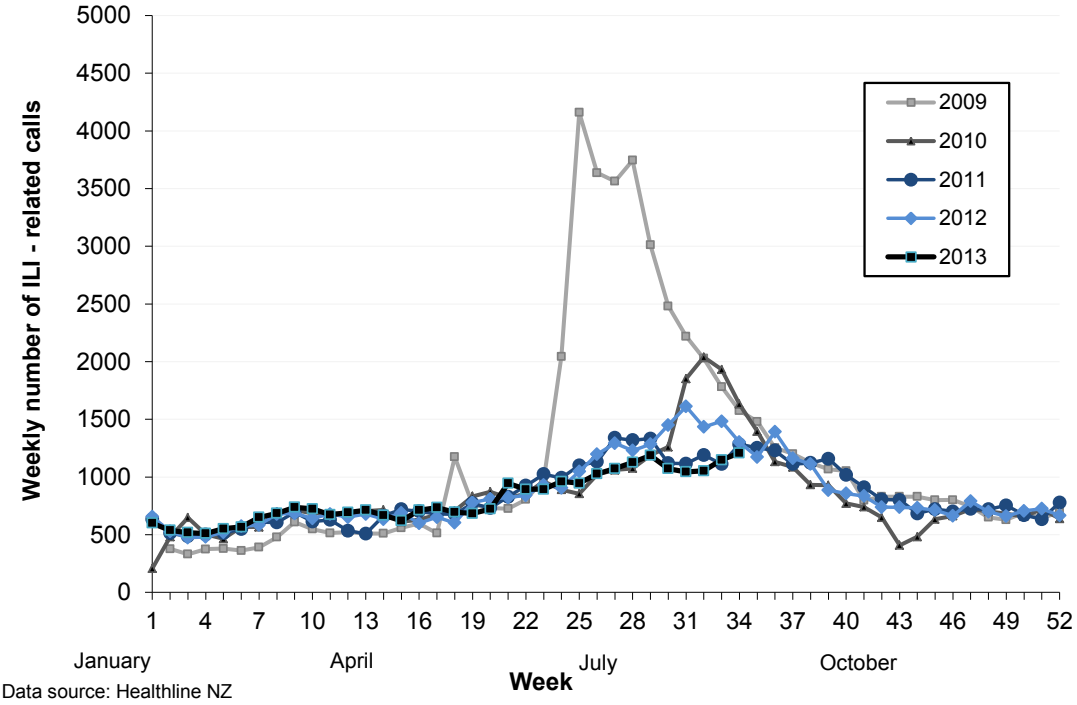
Healthline is the free national 0800 24 hour telephone health advice service funded by the Ministry of Health. About 70% of all calls to Healthline are symptomatic (other calls not part of this analysis include queries for information. Calls made to Healthline are triaged using electronic clinical decision support software. Data collected are daily counts of all symptomatic calls made to Healthline and those triaged for Influenza-Like-Illness (ILI). etc).

Analysis is frequency based with alarms raised by identifying statistical deviations (aberations) from previous calls. Data are reported for all ages and in five age bands (0–4, 5–14, 15–44, 45–64, 65+ years). The analysis of the call frequency is based on the cumulative summation (CUSUM) algorithm implemented in Early Aberration Reporting System (EARS) application developed by the Centres for Disease Control and Prevention (CDC), Atlanta, United States. EARS has three sensitivity thresholds (high, medium and low). Any daily call count that exceeds a threshold is flagged.

Cases of ILI are defined as those that are recorded in the Healthline database as having one of the following 18 guidelines: adult fever; breathing problems; breathing difficulty – severe (paediatric); colds (paediatric); cough (paediatric); cough – adult; fever (paediatric); flu-like symptoms or known/suspected influenza; flu like symptoms pregnant; influenza (paediatric); headache; headache (paediatric); muscle ache/pain; sore throat (paediatric); sore throat/hoarseness; sore throat/hoarseness pregnant; upper respiratory tract infections/colds; upper respiratory tract infections/colds – pregnant.

Figure 20 shows the weekly number of calls to Healthline for ILI during 2009-2013. Healthline calls in 2013 were slightly lower than in years 2010 - 2012. In 2013, it is uncertain whether ILI related Healthline calls have peaked.

Figure 20. Weekly number of ILI-related calls to Healthline, 2009-2013



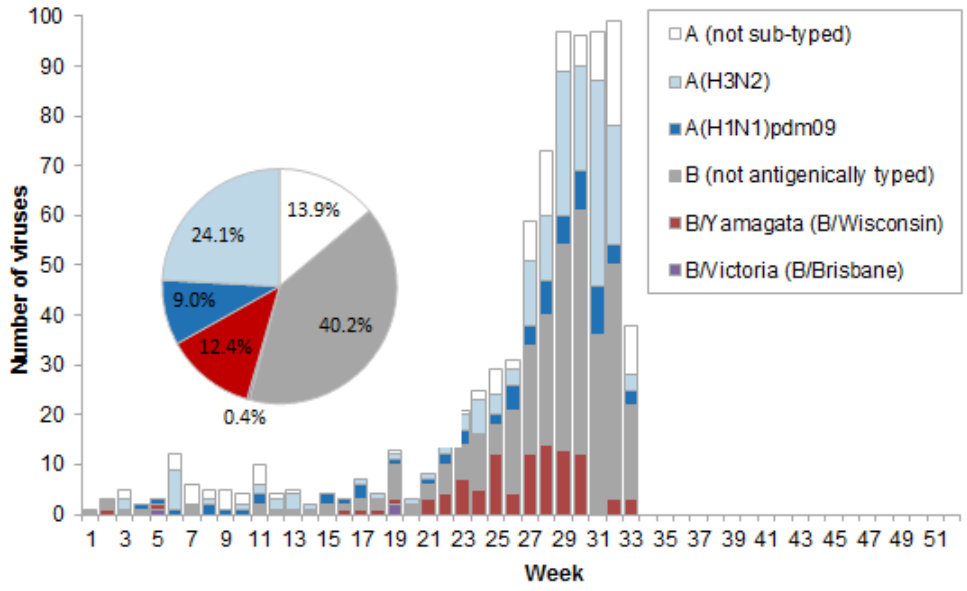
Data source: Healthline NZ

3. NEW ZEALAND STRAIN CHARACTERISATIONS

3.1. Circulating strains in 2013

A total of 791 influenza viruses were detected from sentinel and non-sentinel surveillance in 2013 from week 1 (7-13 January 2013) to week 34 (19-25 August 2013) (Figure 21). The predominant strain was B (419) including 3 of B/Brisbane/60/2008-like (belonging to the B/Victoria lineage) and 98 B/Wisconsin/1/2010-like viruses (belonging to the B/Yamagata lineage), A(H3N2) (191) including 31 A/Victoria/361/2011 (H3N2), A(H1N1)pdm09 (71) including 24 A/California/7/2009 (H1N1)-like virus, and A (not sub-typed) (110).

Figure 21. Total influenza viruses by type and week specimen taken, 2013



The influenza virus detections by type and subtype for weeks 1 to 34, 2013 is shown in Table 6.

Table 7. Influenza viruses by type and subtype, 2013

Viruses	All viruses (%)	typed/sub-typed (%)
Influenza A		
A (not sub-typed)	110 (13.9)	
Influenza A(H1N1)pdm09	**71 (9.0)**	**71 (10.4)**
A(H1N1)pdm09 by PCR	47 (5.9)	47 (6.9)
A/California/7/2009 (H1N1)-like	24 (3.0)	24 (3.5)
Influenza A(H3N2)	**191 (24.1)**	**191 (28.0)**
A(H3N2) by PCR	160 (20.2)	160 (23.5)
A/Victoria/361/2011 (H3N2)	31 (3.9)	31 (4.6)
Influenza B	**419 (53.0)**	**419 (61.5)**
B by PCR	318 (40.2)	318 (46.7)
B/Victoria lineage	3 (0.4)	3 (0.4)
B/Yamagata lineage	98 (12.4)	98 (14.4)
Total	**791 (100.0)**	**681 (100.0)**

A total of 791 influenza viruses were detected and reported in 2013. Influenza B viruses (419/791 or 53.0% of all viruses) co-circulated with influenza A viruses (372/791 or 47.0% of all viruses). The seasonal influenza A(H3N2) strain represented 24.1% (191/791) of all viruses and 28.0% (191/681) of all typed and subtyped viruses. The influenza A(H1N1)pdm09 virus represented 9.0% (71/791) of all viruses and 10.4% (71/681) of all typed and subtyped viruses.

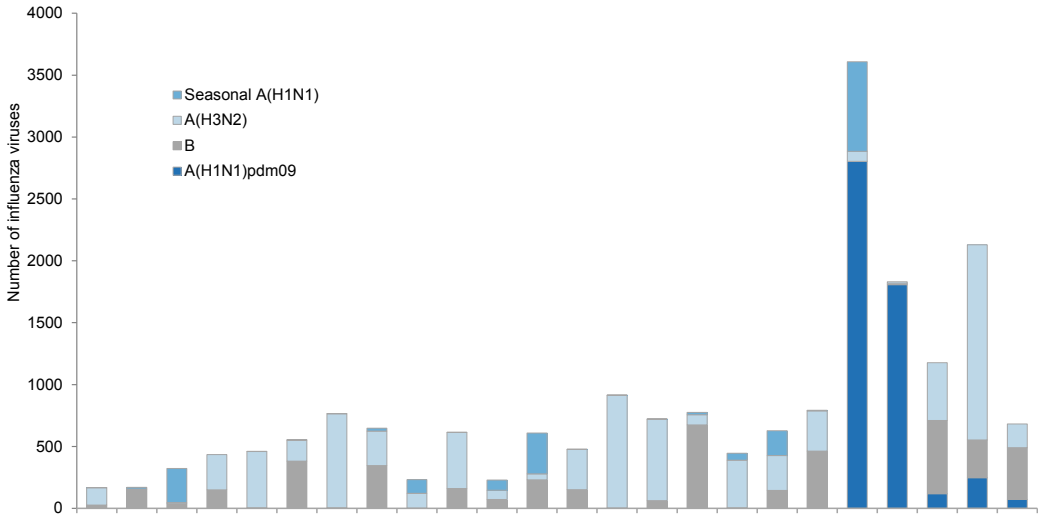
3.2. Predominant strains during 1990-2013

Overall, the patterns of the predominant strains during 1990-2013 are described below:

- Influenza A(H1N1)pdm09 strain has become the predominant strain in 2010 and 2009.
- Seasonal influenza A(H1N1) strain predominated in three seasons (1992, 2000 and 2001) with associated relatively low hospitalisations (193 in 1992, 228 in 2000 and 379 in 2001). It has not been detected in New Zealand since 2010.
- Seasonal influenza A(H3N2) strain predominated for 12 seasons (1990, 1993, 1994, 1996, 1998, 1999, 2002, 2003, 2004, 2006, 2007 and 2012). A/Fujian/411/02 (H3N2)-like strain predominated in 2003 with the highest recorded hospitalisations during 1990-2008. A/Wuhan/359/95 (H3N2)-like strain predominated in 1996 with associated 94 deaths (93 of these deaths were in people aged ≥65 years).
- Influenza B strains predominated for six seasons (1991, 1995, 1997, 2005, 2008, and 2011). In 2005, the disease burden was high in children aged 5-19 years with associated deaths in 3 children.
- Since the introduction of the B-Victoria lineage viruses into New Zealand in 2002, this strain predominated over the B/Yamagata lineage viruses in every three years in New Zealand (2002, 2005, 2008 and 2011).

Figure 22 shows the number and percentage of typed and subtyped (not including A not subtyped) influenza viruses from 1990 to 2013.

Figure 22. Influenza viruses by type and subtypes, 1990-2013

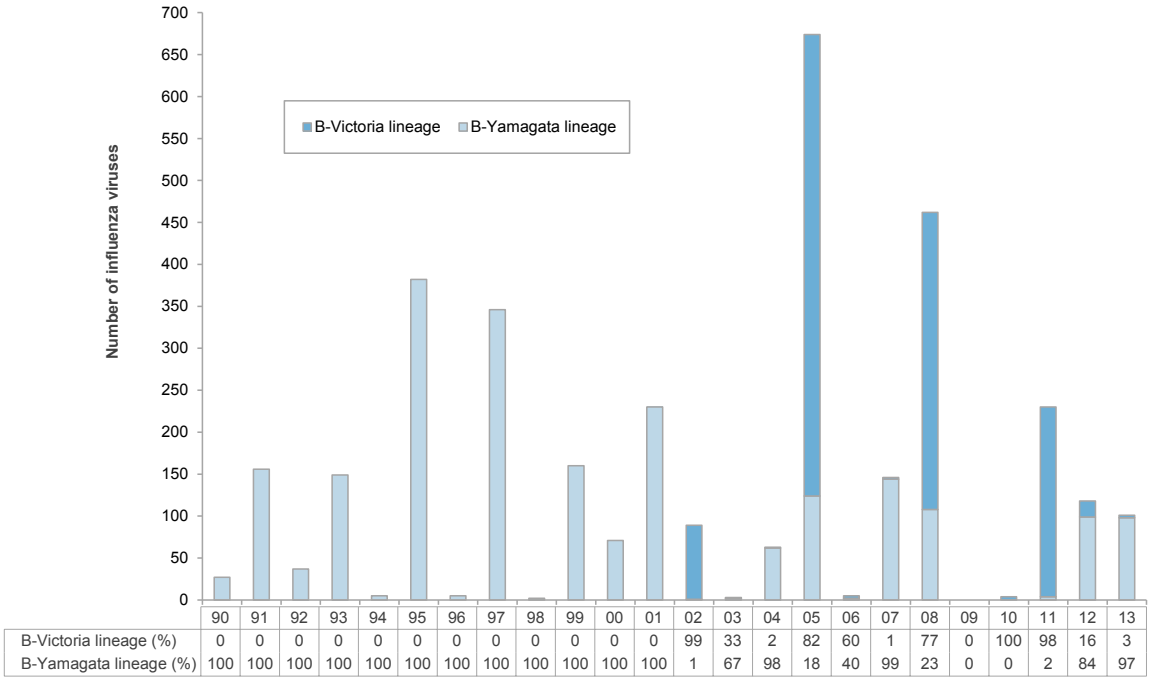


	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Seasonal A(H1N1)(%)	0.6	7.7	85.7	0.0	0.2	1.1	0.3	3.6	47.4	0.3	36.0	54.4	0.4	0.1	0.1	2.3	12.6	32.1	0.8	20.1	0.0	0.0	0.0	0.0
A(H3N2)(%)	83.2	0.0	2.8	65.7	98.7	30.1	99.1	43.0	51.7	73.7	32.9	7.9	68.0	99.6	91.3	10.7	86.3	45.0	41.0	2.2	0.7	39.6	74.0	28.0
B(%)	16.2	92.3	11.5	34.3	1.1	68.8	0.7	53.5	0.9	26.0	31.1	37.8	31.6	0.3	8.6	87.0	1.1	23.0	58.3	0.0	0.5	50.3	14.4	61.5
A(H1N1)pdm09(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.7	98.8	10.0	11.6	10.4

*2009-2013 A(H1N1) is influenza A(H1N1)pdm09

Figure 23 shows the number and percentage of all antigenically typed B viruses from 1990 to 2013. Since the introduction of the B-Victoria lineage viruses into New Zealand in 2002, this strain predominated over the B/Yamagata lineage viruses in every three years in New Zealand in 2002, 2005, 2008, 2011.

Figure 23. Influenza B antigenic types, 1990-2013



	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
B-Victoria lineage (%)	0	0	0	0	0	0	0	0	0	0	0	0	99	33	2	82	60	1	77	0	100	98	16	3
B-Yamagata lineage (%)	100	100	100	100	100	100	100	100	100	100	100	100	1	67	98	18	40	99	23	0	0	2	84	97

3.3. Influenza A(H1N1)pdm09

Representative of influenza A(H1N1)pdm09 isolates (24) were antigenically subtyped at the WHO National Influenza Centre at ESR using sheep/rabbit antisera supplied by the WHO Collaborating Centre (WHOCC) in Melbourne. Some of these isolates were also sent to WHOCC-Melbourne. Results indicated that New Zealand isolates were antigenically closely related to the A(H1N1)pdm09 reference strain A/California/7/2009 (H1N1)pdm09.

3.4. Seasonal influenza A(H3N2)

Representative seasonal influenza A(H3N2) isolates (31) were antigenically subtyped at the WHO National Influenza Centre at ESR using HAI typing kit supplied by the WHO Collaborating Centre (WHOCC) in Melbourne. Some of these isolates were also sent to WHOCC-Melbourne. Results indicated that New Zealand isolates reacted well antigenically to the reference strain A/Victoria/361/2011 (H3N2). The sequenced viruses showed that they fell into the genetic group 3C within the A/Victoria/316/2011 genetic clade.

3.5. Influenza B

Representative seasonal influenza B/Victoria lineage isolates (B/Brisbane/60/2008 – like) (3) and B/Yamagata lineage isolates (B/Wisconsin/1/2010-like) (98) isolates were antigenically typed at the WHO National Influenza Centre at ESR using HAI typing kit supplied by the WHO Collaborating Centre (WHOCC) in Melbourne. Some of these isolates were also sent to WHOCC-Melbourne. Results indicated that B/Victoria lineage viruses were antigenically and genetically closely related to B/Brisbane/60/2008 like virus. The majority of the B/Yamagata lineage viruses were antigenically related to the B/Massachusetts/02/2012 like virus.

3.6. Oseltamivir resistance

The WHO National Influenza Centre at ESR employed a phenotypic method (fluorometric neuraminidase inhibition assay) for the surveillance of anti-viral drug resistance in influenza viruses. In addition, NIC at ESR employed a molecular method (PCR and sequencing) to monitor the H275Y mutation (histidine-to-tyrosine mutation at the codon of 275 in N1 numbering) which is known to confer resistance to oseltamivir.

In 2013, fluorometric neuraminidase inhibition assay was used to test a total of 355 influenza viruses against oseltamivir and 354 against zanamivir. All viruses were sensitive to both oseltamivir and zanamivir (Tables 7 & 8).

A brief summary of antiviral susceptibility for influenza A(H1N1): During 2006-2007, all influenza A(H1N1) viruses tested were sensitive to oseltamivir. In 2008, six seasonal A(H1N1) viruses (0.8%) were detected, of which, only four were available for antiviral susceptibility testing and were all resistant to oseltamivir. The results of the fluorometric neuraminidase inhibition assay indicated that the four viruses had highly reduced sensitivity to oseltamivir with IC50 values in the range of 500-1700 nM, typical of the recently global emerging oseltamivir-resistant A(H1N1) viruses. Genetic analysis of the neuraminidase gene confirmed that the four viruses had the H275Y mutation (histidine-to-tyrosine at codon 275 in N1 nomenclature), conferring resistance to oseltamivir. None of the patients or their close contacts had received Tamiflu prior to sample collection. In 2009, 25 seasonal A(H1N1) virus were phenotypically tested and all were resistant to oseltamivir. However, all pandemic A(H1N1)pdm09 tested between 2009-2011 were sensitive to oseltamivir. In 2011, two influenza B viruses were resistant to oseltamivir. In 2012, one oseltamivir resistant A(H1N1)pdm09 virus was detected by both phenotypic and genetic methods.

Table 8. Antiviral susceptibility to oseltamivir for influenza viruses, 2006-2013

Influenza type/sub-type	2006	2007	2008	2009	2010	2011**	2012**	2013
Influenza B								
Number of isolates tested	1	132	306	-	1	244	64	198
Mean IC50 (nM)	-	37.5	26.5	-	-	32.1	11.2	14.0
Standard Deviation (nM)	-	22.5	16.9	-	-	20.2	5.8	8.4
Minimum IC50* (nM)	-	0.9	0.22	-	-	4.1	4.8	0.1
Maximum IC50 (nM)	-	97.4	87.8	-	-	182.7	31.8	51.1
Influenza A(H3N2)								
Number of isolates tested	189	45	120	-	1	224	271	120
Mean IC50 (nM)	0.7	0.38	0.28	-	-	0.4	0.41	0.26
Standard Deviation (nM)	0.27	0.26	0.17	-	-	0.21	0.19	0.18
Minimum IC50 (nM)	0.06	0.07	0.01	-	-	0.06	0.08	0.06
Maximum IC50 (nM)	1.4	1.13	1.08	-	-	1.5	1.22	0.88
Seasonal influenza A(H1N1)								
Number of isolates tested	18	136	4	25	-	-	-	-
Mean IC50 (nM)	1.26	0.81	768	1385	-	-	-	-
Standard Deviation (nM)	0.89	0.64	287	1996	-	-	-	-
Minimum IC50 (nM)	0.2	0.05	573	305	-	-	-	-
Maximum IC50 (nM)	3	2.7	1184	7912	-	-	-	-
Influenza A(H1N1)pdm09								
Number of isolates tested	-	-	-	483	334	29	95	37
Mean IC50 (nM)	-	-	-	0.4	0.68	0.53	0.33	0.38
Standard Deviation (nM)	-	-	-	0.24	0.41	0.26	0.19	0.20
Minimum IC50 (nM)	-	-	-	0.09	0.01	0.18	0.09	0.09
Maximum IC50 (nM)	-	-	-	1.4	2.05	1.31	316	0.85

* IC50; inhibitory concentration of the drug at which a 50% reduction in enzymatic activity is observed.

** Mean and standard deviation calculated for 2011 and 2012 includes 3 outliers deemed to be resistant to oseltamivir (having IC50 values >10-fold higher than the overall mean for a given subtype recorded for all years). Three outliers were: exone one pandemic influenza A(H1N1)pdm09 virus in 2012 and two influenza B viruses in 2011.

Table 9. Antiviral susceptibility to zanamivir for influenza viruses, 2013

Zanamivir	Influenza B	A(H1N1)pdm09	A(H3N2)
Number of isolates tested	196	37	121
Mean IC50 (nM)	1.21	0.158	0.29
Standard Deviation (nM)	0.86	0.17	0.109
Minimum IC50 (nM)	0.02	0.01	0.12
Maximum IC50 (nM)	5.6	1.07	0.78

4. RECENT STRAIN CHARACTERISATION FOR SOUTHERN HEMISPHERE VIRUSES AND LIKELY VACCINE CANDIDATES

4.1. Influenza A(H1N1)pdm09

The influenza A(H1N1)pdm09 virus was first detected in April 2009 in the United States and was responsible for outbreaks in Mexico in March and April 2009. Outbreaks subsequently occurred in all regions of the world and, by July 2009, influenza A(H1N1)pdm09 was the predominant influenza virus circulating in many countries in the Americas, Asia, Europe and Oceania.

During the 2013 influenza season, 616 A(H1N1)pdm09 viruses were received at the Melbourne WHOCC from 11 countries with most coming from Australia and New Zealand. The virology laboratories in New Zealand use the kit supplied by the Melbourne WHOCC to analyse influenza A(H1N1)pdm09 strains. The antiserum used for antigenic typing was the rabbit/sheep antisera raised against A/California/7/2009-like strain. A total of 44 influenza A(H1N1)pdm09 viruses from New Zealand were forwarded to WHOCC in 2013.

Among all of the influenza A(H1N1)pdm09 viruses analysed at the Melbourne WHOCC, most of the viruses reacted well with ferret sera to A/California/7/2009, with 8.4% of A(H1N1)pdm09 viruses being classified as low reactors (≥8-fold reduction compared with the homologous titre) (Figure 3.1, Tables 3.2 and 3.3 in Appendix 3). Many of these low reactors had changes in the HA gene in the 153-158 amino acid region which has been shown to reduce reactivity in HI assays but as these changes were mostly not in the original clinical samples, these mutations appear to be artefacts caused by isolation in MDCK cells or in eggs. Viruses belonging to HA genetic subgroups (6A, B, C, or 7) could not be distinguished antigenically. In addition, a total of 85 influenza A(H1N1)pdm09 viruses were sequenced in the HA gene. The sequence analysis indicated that there was genetic diversity evident in most of the viruses isolated during 2013 with two major sub-clades designated group 7 and group 6 (CDC designations, Figure 3.2 in Appendix 3). The majority of recent viruses (85.9%) fell into group 6. A further 14.1% of the viruses fell into subgroup 7. The NA (N1) genes of the A(H1N1)pdm09 viruses were also sequenced, resulting in groups similar to their HA grouping (Figure 3.3 in Appendix 3). Furthermore, vaccines containing influenza A/California/7/2009-like antigen stimulated anti-HA antibodies of similar geometric mean HI titres to the vaccine virus and recent influenza A(H1N1)pdm09 isolates. (WER 86(42), and Tables 3.7 & 3.8 in Appendix 3).

In summary, influenza A(H1N1)pdm09 viruses have replaced seasonal A(H1N1) viruses since 2009. HI tests showed that most isolates were antigenically similar to A/California/7/2009-like strain. Current vaccines containing the A/California/7/2009 antigen stimulated anti-HA antibodies of similar geometric mean HI titres to the vaccine virus and recent A(H1N1) influenza isolates. Based on all of the epidemiological, antigenic, genetic and serological data, the WHO consultation recommended vaccines containing a A/California/7/2009 (H1N1)-like strain. The AIVC accepted this recommendation.

4.2. Seasonal influenza A(H3N2)

Influenza A(H3N2) has frequently been 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 AIVC (Table 1).

The Melbourne WHOCC analysed 358 A(H3N2) isolates from 11 countries during February to September 2013. These viruses made up 24.1% of all viruses analysed at the Melbourne WHOCC. Virtually all of the influenza A(H3N2) viruses were recognised by ferret sera raised against cell

propagated A/Victoria/361/2011-like or A/Texas/50/2012-like viruses, with few low reactors (Figure 4.1, Tables 4.2 and 4.3 in Appendix 4). This was not the case for ferret sera raised to egg grown A/Victoria/361/2011 or A/Texas/50/2012 viruses which generally showed marked reductions compared to the homologous titre for recent cell propagated viruses. In addition, HA gene phylogenetic analysis of the influenza A(H3N2) viruses (55) sequenced showed that most viruses were A/Victoria/208/2009-like. Most of the recent viruses fell into group 3 with only a few viruses in groups 5 & 6 (CDC designations, Figure 4.2 in Appendix 4). Within group 3, viruses were further divided into 3 subgroups (3A, 3B, 3C) with the majority falling into group 3C. Group 3 had an A198S, V223I and N312S changes with additional S45N and T48I changes in 3C. Sequence analysis of the N2 NA gene analysed showed that the most recent viruses grouped in a similar manner as their HA genes (Figure 4.3 in Appendix 4). Furthermore, vaccines containing A/Texas/50/2012 (a virus antigenically like cell-propagated A/Victoria/361/2011) antigens elicited antibodies of similar geometric mean HI titres to the cell-propagated vaccine virus and the majority of representative recent A(H3N2) viruses. When compared with the titre to egg-propagated A/Texas/50/2012, titres against cell-propagated representative recent viruses were reduced (average reductions for cell-propagated A(H3N2) viruses compared to egg-propagated A/Texas/50/2012: adults, 81%; older adults, 79%; average reductions for egg-propagated A(H3N2) viruses compared to egg-propagated A/Texas/50/2012: adults, 31%; older adults, 27%; average reductions for cell grown H3N2 viruses compared to cell grown A/Texas/50/2012: adults, 31%; older adults, 28%) (WER 86(42), and Tables 4.10 and 4.11 in Appendix 4).

In summary, influenza A(H3N2) viruses were associated with outbreaks in several countries. The majority of recent viruses were antigenically and genetically similar to the cell-propagated A/Texas/50/2012 and A/Victoria/361/2011 viruses. Many H3N2 viruses isolated since February 2013 were inhibited by ferret antisera raised against egg-propagated A/Texas/50/2012. Vaccines containing A/Texas/50/2012 antigens elicited antibodies of similar geometric mean HI titres to the cell-propagated vaccine virus and the majority of representative recent A(H3N2) viruses. Based on all of the epidemiological, antigenic, genetic and serological data, the WHO Consultative Group recommended the H3 component of the vaccines containing an A/Texas/50/2012 (H3N2)-like strain. AIVC accepted this recommendation.

4.3. Influenza B

Two distinct lines of influenza B have co-circulated in many countries during recent years. This dates from the late 1980s when the B/Panama/45/90 variant of influenza B was first observed. This strain and its further variants of the Yamagata/16/88 lineage (most recently representative strain-B/Florida/4/2006) spread worldwide, whereas strains of the previous B/Victoria/2/87-like viruses continued to circulate in Asia and subsequently underwent independent evolution as an antigenically distinct lineage (most recent representative strain-B/Brisbane/60/2008). For reasons not wholly understood, these remained geographically restricted to Asia until 2001. In 2002 the B/Victoria/2/87 lineage viruses were the predominant viruses worldwide.

Both recent B/Victoria-like strains (B/Brisbane/60/2008 is the current reference strain) and B/Yamagata-like strains (B/Wisconsin/1/2010 is the current reference strain) continued to be isolated worldwide in 2013. The proportion of B/Yamagata/16/88 lineage viruses increased in many parts of the world but B/Victoria/2/87 lineage viruses predominated in some countries. A total of 419 influenza B viruses were detected in New Zealand in 2013. Among all antigenically typed B viruses, 98 were as the B/Yamagata lineage and 3 as the B/Victoria lineage.

511 influenza B isolates were received in 2013 by the Melbourne WHOCC from nine countries (34.4% of total isolates). The majority of isolates (92.1%) were typed as B/Yamagata lineage. When B/Victoria-lineage viruses were reacted with ferret sera raised against egg grown

B/Brisbane/60/2008-like virus, about 66% of viruses showed reduced reactivity (≥8-fold reduction compared with the homologous titre). However, when ferret serum raised to cell propagated virus was used only a small percentage of viruses were low reactors in HI assays. The B/Yamagata-lineage viruses could be distinguished antigenically between B/Massachusetts/2/2012-like and B/Wisconsin/1/2010-like viruses (Figure 5.2 in Appendix 5). Again differences in reactivity were seen between ferret sera raised to egg or cell propagated reference viruses with sera to egg derived viruses giving much lower titres against recent viruses than sera to cell propagated viruses. By far the majority of viruses appeared to be B/Massachusetts/2/2012-like viruses with some 96% showing good reactivity with ferret sera to cell derived ferret viruses and the low reactors (>8 fold reduction) mostly resembling A/Wisconsin/1/2013-like viruses. HI assays in Tables 5.2, 5.3, 5.4 and 5.5 (Appendix 5) were performed at the Melbourne WHOCC. In addition, sequence analysis of the HA1 gene of recent isolates showed that recent isolates fell into one of the two major lineages of B viruses (B/Victoria/2/87 or B/Yamagata/16/88) consistent with their antigenic typing. The B/Victoria lineage viruses mostly grouped in the B/Brisbane/60/2008 group (all group 1A) with signature amino acid changes at S172P, N75K, N165K with no viruses grouping with the older B/Malaysia/2506/2004-like viruses or B/Sydney/508/2010-like viruses. B/Yamagata lineage fell into two clades represented by B/Wisconsin/1/2010-like virus (group 3) and B/Brisbane/3/2007-like or B/Massachusetts/2/2012 virus group (Group 2), with increasing number of viruses falling in group 2. Group 2 viruses have several amino acid changes including P48K, P108A, and T182A compared to group 3 viruses (Figures 5.5, and 5.7, in Appendix 5). The NA sequence analysis from viruses with a B/Brisbane/60/2008-like HA showed the same groupings as their HA genes with no detection of the inter-clade reassortants (HA/NA reassortants) seen during the previous period. (Figure 5.6 in Appendix 5). B/Yamagata lineage virus NA genes matched the HA genes falling into the same group 2 or groups 3 pattern as their HA did (Figure 5.8 in Appendix 5). Furthermore, vaccines containing influenza B/Massachusetts/2/2012-like antigens elicited anti-HA antibodies of similar geometric mean HI titres to the vaccine virus and the majority of representative recent B/Yamagata/16/88 lineage viruses. Geometric mean HI titres to recent B/Victoria/2/87 lineage viruses were reduced (average reductions for B/Victoria/2/87 lineage viruses: adults, 86%; older adults, 74%). (WER 86(42), Tables 5.9, 5.10, 5.11 and 5.12 in Appendix 5).

In summary, influenza B activity was reported in many countries. The proportion of B/Yamagata/16/88 lineage viruses increased in many parts of the world. The majority of recent B/Victoria/2/87 lineage viruses were antigenically and genetically closely related to B/Brisbane/60/2008. The majority of recently reported B/Yamagata/16/88 viruses belonged to the HA phylogenetic clade 2. Most recently isolated B/Yamagata/16/88 lineage viruses were antigenically similar to B/Massachusetts/2/2012-like (clade 2) viruses. Current vaccines containing B/Massachusetts/2/2012 antigens elicited anti-HA antibodies in humans that had similar titres against the vaccine viruses and recent viruses of the B/Yamagata/16/88 lineage. Therefore, the WHO Consultative Group recommended the B component of the vaccines containing a B/Yamagata/16/88 lineage virus (B/Massachusetts/2/2012-like virus) is recommended for the 2013 southern hemisphere season trivalent vaccine. The AIVC accepted this recommendation.

5. SUMMARY OF VACCINE COMPOSITION RECOMMENDATION

It is recommended that the influenza vaccine formulation for New Zealand for 2014 is:

- A(H1N1) an A/California/7/2009 (H1N1)pdm09 - like virus
- A(H3N2) an A/Texas/50/2012 (H3N2) - like virus
- B a B/Massachusetts/2/2012 - like virus

5.1. Explanation of "like" strains suitable for inclusion in vaccine

In the past, some strains of influenza recommended for inclusion in the vaccine formulation have been unsuitable vaccine candidates due to their poor growth potential with resulting low yields or poor serological responses in vaccinees. Under the "like" strain concession in the vaccine recommendation, an antigenically similar strain can be substituted which has the qualities that are lacking in the prototype strain.

The AIVC considered the information about international surveillance by WHO, recent data from Australia, New Zealand, South Africa and Argentina on influenza epidemiology and virus strain characterisation, and the recommendations of the WHO annual consultation on the composition of influenza vaccine for the southern hemisphere. The AIVC agreed to adopt the WHO recommendations. The influenza vaccine components for year 2014 season should contain the following:

A (H1N1):	an A/California/7/2009 (H1N1)-like strain,	15 µg HA per dose
A (H3N2):	an A/Texas/50/2012 (H3N2)-like strain,	15 µg HA per dose
B:	a B/Massachusetts/2/2012-like strain,	15 µg HA per dose

WHO is now listing all recommended vaccine viruses/reassortants for either the Northern or Southern Hemisphere recommendations at the following website:
http://www.who.int/influenza/vaccines/virus/en/

Influenza A(H1N1)pdm09
Conventional egg based reassortants derived from A/California/7/2009 have been produced by a number of laboratories. The best yielding strain has been NYMC X-181. Reassortants produced by reverse genetics such as NIBRG-121xp are also available. A reassortant of A/Christchurch/16/2010. NIB-74 has also been produced by NIBSC and is being used by a European manufacturer.

Influenza A(H3N2)
Wild type or reassortants of A/Texas/50/2012 viruses have been made available and distributed by NYMC/CDC. Available reassortants are NYMC X-223 or X-223A.

Influenza B
B/Brisbane/60/2008 and B/Brisbane/33/2008-like wild type viruses have been recommended by WHO as suitable B/Victoria-lineage vaccine strains for a number of years. A reassortant virus (based on B/Brisbane/60/2008) NYMC BX-35 has also been produced. Most manufacturers have used B/Brisbane/60/2008 wild type virus. B/Massachusetts/2/2012 wild type virus (B/Yamagata-lineage) and its reassortants NYMC BX-51B and BX-51C are available from WHO CCs and ERLs.

APPENDIX 1 - Composition of the Australian Influenza Vaccine Committee 2013

AIVC Members and Observers 2013

Committee Members (Voting and Non-voting NV):

1. Dr Gary Grohmann, OLSS, TGA NV
2. Dr Ian Barr, WHOCC NV
3. Professor Robert Booy, NCIRS
4. Dr Mike Catton, VIDRL
5. Dr Alan Hampson, Interflu Pty Ltd

*6. Dr David Smith, UWA

*7. Emeritus Prof Greg Tannock, Macfarlane Burnet Institute

8. Assoc Prof Helen Marshall
9. Dr Tania Dalla Pozza, OLSS, TGA (Secretary) NV

*10. Dr Sue Huang, NIC NZ

Observers:

1. Mr Tony Wilson-Williams, Abbott
2. Ms Milka Smoljko, bioCSL
3. Ms Christine Wadey, bioCSL
4. Ms Leonora Pancho, bioCSL
5. Mr Bill Cracknell, bioCSL
6. Mr Vincent Chung, BioCSL
7. Prof Ian Ramshaw BioDiem
8. Ms Cathy Cropp BioDiem
9. Ms Kate Pennington DoH
10. Dr Andrea McCracken, GlaxoSmithKline Australia Pty Ltd
12. Dr Monique Baldwin, GlaxoSmithKline Australia Pty Ltd
13. Ms Alicia Ham, Sanofi Pasteur
14. Dr Andrea Forde, Sanofi Pasteur
15. Mr Mathieu Miele, Novartis
16. Dr Anthony Hobbs, TGA
17. Dr Mark McDonald, TGA
18. Dr John McEwen, TGA
19. Dr Peter Christian, TGA

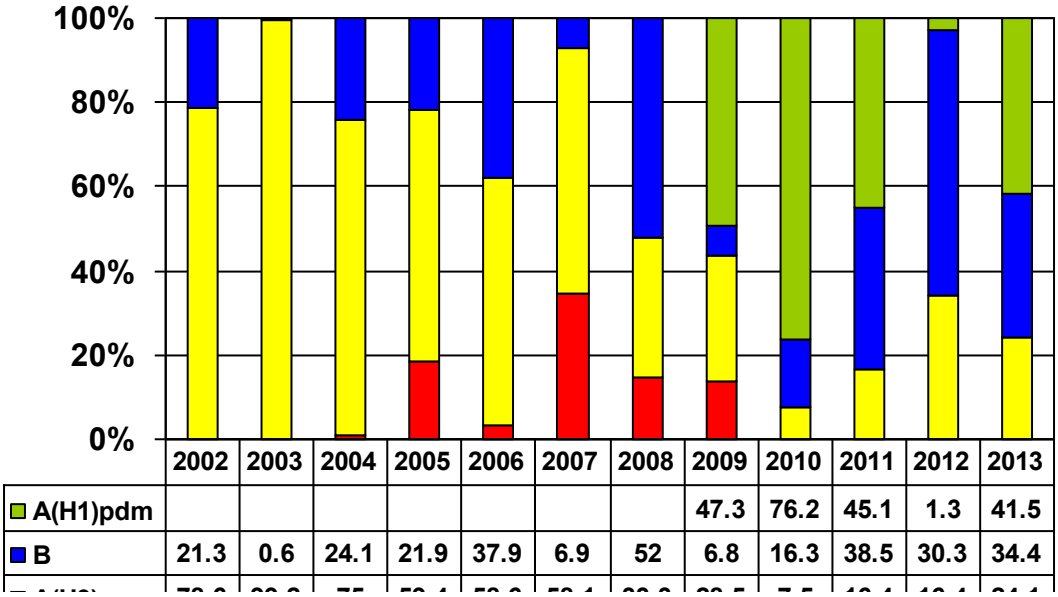
*Participating by teleconference

APPENDIX 2 - Isolates Received For Analysis at the Australian WHO Collaborating Centre

Table 3.7 Influenza Viruses Analysed at the Melbourne WHO CC
1 February – 18 September 2013

Country	A(H1N1) pdm09	A(H3N2)	B	TOTAL
Australia	436	231	304	957
Cambodia	28	2	5	35
Fiji	3	6	1	10
Macau	9	1	0	10
Malaysia	0	1	18	19
New Caledonia	22	7	0	29
New Zealand	44	62	144	250
Papua New Guinea	12	0	0	12
Philippines	6	1	7	14
Singapore	25	33	25	83
Sri Lanka	14	12	5	31
South Africa	17	2	2	21
Total	**616**	**358**	**511**	**1485**
%	41.5	24.1	34.4	

Figure 2.1
Influenza isolates by type/subtype received and analysed at the Melbourne WHO CC
2002-13



APPENDIX 3 – Influenza A(H1N1)pdm09

TABLE 3.3 – (H1N1)pdm09 viruses

Haemagglutination Inhibition Assay - WHO Influenza Centre (VIDRL)															
Compilation: 5/6, 16/7, 31/7		Reference Antisera													
	Sequenced		A	B	C	D	E	F	G	H	I	J	K		
		HA	F1656	FS5	F2255	F1620	F1704	F1860	F2525	F1903	F2522	F2523	F2505	Passage	Sample
	Reference Antigens	GP	CAL/7	AUCK/1	ILLINOIS/9	BAY/69	CHCH/16	PERTH/198	VIC/918	BRIS/70	VIC/637	SING/51	BRIS/96	History	Date
A	A/CALIFORNIA/7/2009		**2560**	320	1280	640	640	1280	1280	1280	2560	2560	640	E5	
B	A/AUCKLAND/1/2009		5120	**640**	2560	1280	1280	2560	2560	2560	>5120	>5120	1280	E4	
C	A/ILLINOIS/9/2007		2560	320	**>5120**	320	640	1280	1280	1280	2560	2560	320	C2,MDCK4	
D	A/BAYERN/69/2009		80	<40	40	**640**	80	160	<40	160	160	80	320	MDCK8	
E	A/CHRISTCHURCH/16/2010		2560	320	1280	1280	**2560**	1280	640	1280	2560	2560	1280	E3	
F	A/PERTH/198/2010		1280	320	1280	320	640	**1280**	640	640	2560	2560	1280	E4	
G	A/VICTORIA/918/2010		2560	640	2560	640	640	1280	**1280**	1280	2560	2560	320	MDCK3	
H	A/BRISBANE/70/2011		2560	320	2560	1280	640	2560	1280	**1280**	2560	2560	1280	E3	
I	A/VICTORIA/637/2012		<80	<40	<40	160	40	80	<40	<40	**640**	80	160	E5	
J	A/SINGAPORE/51/2012		1280	160	640	320	320	1280	320	640	1280	**1280**	320	MDCK0,MDCK3	
K	A/BRISBANE/96/2012		80	<40	40	320	80	160	<40	160	320	160	**640**	MDCK4	
	Test Antigens														
1	A/STH AUSTRALIA/24/2013		5120	640	2560	1280	1280	2560	1280	1280	2560	2560	1280	MDCK1	01/07/2013
2	A/STH AUSTRALIA/25/2013		5120	640	2560	1280	1280	2560	1280	1280	2560	2560	1280	MDCK1	01/07/2013
3	A/SYDNEY/16/2013		5120	1280	>5120	2560	>5120	2560	2560	2560	2560	2560	1280	mdckx,mdck1	17/06/2013
4	B/SYDNEY/16/2013		5120	1280	2560	1280	2560	2560	2560	2560	>5120	>5120	1280	mdckx,mdck1	27/05/2013
5	A/SRI LANKA/30/2013	6B	5120	>5120	>5120	1280	2560	2560	>5120	>5120	>5120	>5120	2560	mdck1	04/05/2013
6	A/PERTH/38/2013	6B	2560	320	2560	640	640	1280	1280	1280	2560	2560	640	MDCKX, MDCK1	05/06/2013
7	A/STH AUSTRALIA/30/2013	6B	2560	640	2560	640	1280	1280	1280	1280	2560	2560	640	MDCK1	01/07/2013
8	A/STH AUCKLAND/8/2013	7	2560	320	2560	640	640	1280	1280	1280	2560	2560	640	MDCKX, MDCK1	05/05/2013
9	A/STH AUSTRALIA/26/2013	6B	2560	640	2560	1280	1280	2560	2560	1280	2560	2560	640	E3	02/07/2013
10	A/SYDNEY/15/2013		2560	320	2560	640	2560	1280	1280	640	2560	2560	1280	mdckx,mdck1	14/06/2013
11	A/STH AUCKLAND/7/2013	6C	2560	640	2560	640	640	1280	640	640	640	1280	320	MDCKX, MDCK2	19/04/2013
12	A/SYDNEY/22/2013		2560	1280	2560	640	1280	2560	1280	2560	2560	2560	1280	MDCK1	06/06/2013
13	A/SYDNEY/25/2013		2560	640	2560	640	1280	2560	1280	1280	2560	>5120	1280	MDCKX, MDCK1	20/06/2013
14	A/SYDNEY/7/2013	6C	2560	640	2560	640	640	1280	640	1280	2560	2560	640	MDCK1	13/02/2013
15	A/GOROKA/2/2013		2560	640	2560	640	1280	1280	1280	1280	2560	2560	320	MDCK1	01/07/2013
16	A/VICTORIA/518/2013	6B	2560	640	2560	1280	1280	2560	2560	2560	>5120	>5120	640	MDCK1	11/07/2013
17	A/BRISBANE/39/2013		2560	640	2560	640	640	1280	1280	1280	2560	2560	320	MDCK4	28/04/2013
18	A/BRISBANE/43/2013		2560	1280	2560	1280	2560	2560	2560	2560	>5120	>5120	640	mdck2	02/07/2013
19	A/CANBERRA/9/2013	6B	2560	640	>5120	1280	2560	1280	2560	2560	>5120	>5120	1280	mdck1	13/07/2013
20	A/VICTORIA/519/2013		2560	640	1280	640	1280	1280	1280	1280	2560	>5120	640	MDCK1	12/07/2013
21	A/BRISBANE/44/2013		2560	640	1280	320	1280	1280	1280	1280	2560	320	320	mdck3	26/06/2013
22	A/GOROKA/21/2013		1280	320	2560	640	640	1280	1280	1280	2560	2560	320	MDCK1	04/04/2013
23	A/VICTORIA/515/2013		1280	160	640	320	320	640	640	640	1280	1280	640	MDCK1	09/07/2013
24	A/GOROKA/4/2013	6C	1280	320	1280	320	640	1280	640	640	1280	1280	320	MDCK3	01/07/2013
25	A/GOROKA/23/2013	6C	1280	320	640	320	640	1280	640	640	1280	1280	320	MDCK3	02/06/2013
26	A/VICTORIA/514/2013		1280	320	640	320	640	1280	640	640	1280	1280	320	MDCK2	09/07/2013
27	A/STH AUSTRALIA/17/2013	6B	1280	640	2560	640	1280	1280	1280	640	2560	2560	1280	E3	23/05/2013
28	A/STH AUSTRALIA/19/2013	6C	1280	320	1280	320	640	1280	640	320	2560	2560	320	mdck1	24/05/2013
29	A/CHRISTCHURCH/513/2013	7	1280	320	1280	320	640	1280	640	640	1280	2560	320	mdck1	27/05/2013
30	A/VICTORIA/509/2013	7	640	160	1280	320	640	1280	640	320	2560	2560	640	MDCK1	30/05/2013
31	A/TOWNSVILLE/37/2013	6C	160	40	40	1280	160	320	<40	320	320	320	1280	MDCK4	01/05/2013
32	A/BRISBANE/38/2013		80	<40	<40	640	80	<40	<40	80	<40	40	320	MDCK5	22/04/2013
33	A/BRISBANE/40/2013	6C	80	40	<40	160	160	160	<40	160	160	80	320	mdck2	29/06/2013

TABLE 3.4 – (H1N1)pdm09 viruses

	Date: June 21, 2012	Haemagglutination Inhibition Assay - WHO Influenza Centre, Melbourne													
	Turkey no. 85	Reference Antisera													
	Sequenced	A	C	D	E	F	F	G	H	I	J	K	L		
		F1656-14D	FS5	F2260-13D	F1614-14D	F2255-13D	F1620-13D	F1686-13D	F1704-14D	F1860-13D	F1857-13D	F1903-13D	Passage	Sample	
		E4			C2,MDCK1	C2,MDCK5	MDCK4	E2	E2	E3	MDCK1	E4	Details	Date	
	Reference Antigens	CAL/7	AUCK/1	AUCK/1	ILLINOIS/9	ILLINOIS/9	BAY/69	BRIS/10	CHCH/16	PERTH/198	VIC/918	BRIS/70			
A	A/CALIFORNIA/7/2009	**2560**	320	2560	320	2560	640	1280	640	1280	2560	2560	E5		
B	A/AUCKLAND/1/2009	2560	640	>5120	640	2560	1280	2560	1280	2560	>5120	2560	E4		
C	A/ILLINOIS/9/2007	2560	**640**	2560	640	>5120	640	1280	640	1280	2560	1280	C2/MDCK2		
D	A/BAYERN/69/2009	<80	40	**80**	<40	<40	320	160	80	80	<40	160	MDCK7		
E	A/BRISBANE/10/2010	640	160	640	**160**	640	640	1280	2560	640	640	640	E2		
F	A/CHRISTCHURCH/16/2010	2560	320	2560	320	**1280**	1280	5120	2560	1280	2560	2560	E3		
G	A/PERTH/198/2010	1280	160	2560	320	1280	**640**	640	640	1280	1280	1280	E4		
H	A/VICTORIA/918/2010	2560	320	>5120	640	2560	640	**1280**	640	1280	2560	2560	MDCK2		
I	A/BRISBANE/70/2011	2560	320	>5120	640	2560	640	**1280**	1280	1280	2560	2560	E4		
	Test Antigens														
1	A/VICTORIA/514/2012	2560	320	2560	640	2560	640	1280	1280	1280	2560	2560	MDCK2	28/05/2012	
2	ASONG KHLA/40/2012	1280	320	2560	640	2560	640	1280	1280	1280	2560	2560	mdckx,mdck1	06/03/2012	
3	A/PERTH/42/2012	1280	320	2560	320	1280	320	640	640	640	1280	1280	MDCKX, MDCK2	10/04/2012	
4	A/PERTH/47/2012	1280	320	2560	320	1280	320	640	640	640	1280	1280	MDCKX, MDCK2	13/04/2012	
5	A/VICTORIA/4/2012	1280	320	2560	320	1280	320	640	640	640	1280	1280	MDCK2	07/05/2012	
6	A/VICTORIA/6/2012	1280	320	2560	320	2560	320	640	1280	1280	2560	1280	MDCK4	15/05/2012	
7	A/GOROKA/7/2011	1280	320	2560	320	1280	320	640	640	1280	1280	1280	MDCK2	08/01/2011	
8	A/GOROKA/9/2011	1280	160	2560	320	1280	320	640	640	640	1280	1280	MDCK2	08/02/2011	
9	A/GOROKA/14/2011	1280	320	2560	320	1280	320	640	1280	640	1280	1280	MDCK2	08/04/2011	
10	A/GOROKA/16/2011	1280	320	2560	320	1280	320	640	1280	1280	1280	1280	MDCK2	08/09/2011	
11	A/GOROKA/20/2011	1280	320	2560	320	1280	320	640	640	640	1280	1280	MDCK2		
12	A/SOUTH AUSTRALIA/42/2012	1280	320	2560	320	2560	320	640	640	1280	1280	1280	MDCK2	31/05/2012	
13	A/PERTH/501/2012	640	160	2560	160	640	320	640	640	640	1280	1280	MDCK2	02/03/2012	
14	A/PERTH/46/2012	320	80	320	<40	40	640	160	320	320	160	320	MDCKX, MDCK2	13/04/2012	
15	A/GOROKA/15/2011	320	160	1280	80	320	320	320	640	640	640	640	MDCK2	08/05/2011	

FIGURE 3.2
Phylogenetic relationships among influenza A(H1N1)pdm09 HA genes

FIGURE 3.3

Phylogenetic relationships among influenza A(H1N1)pdm09 N1 neuraminidase genes

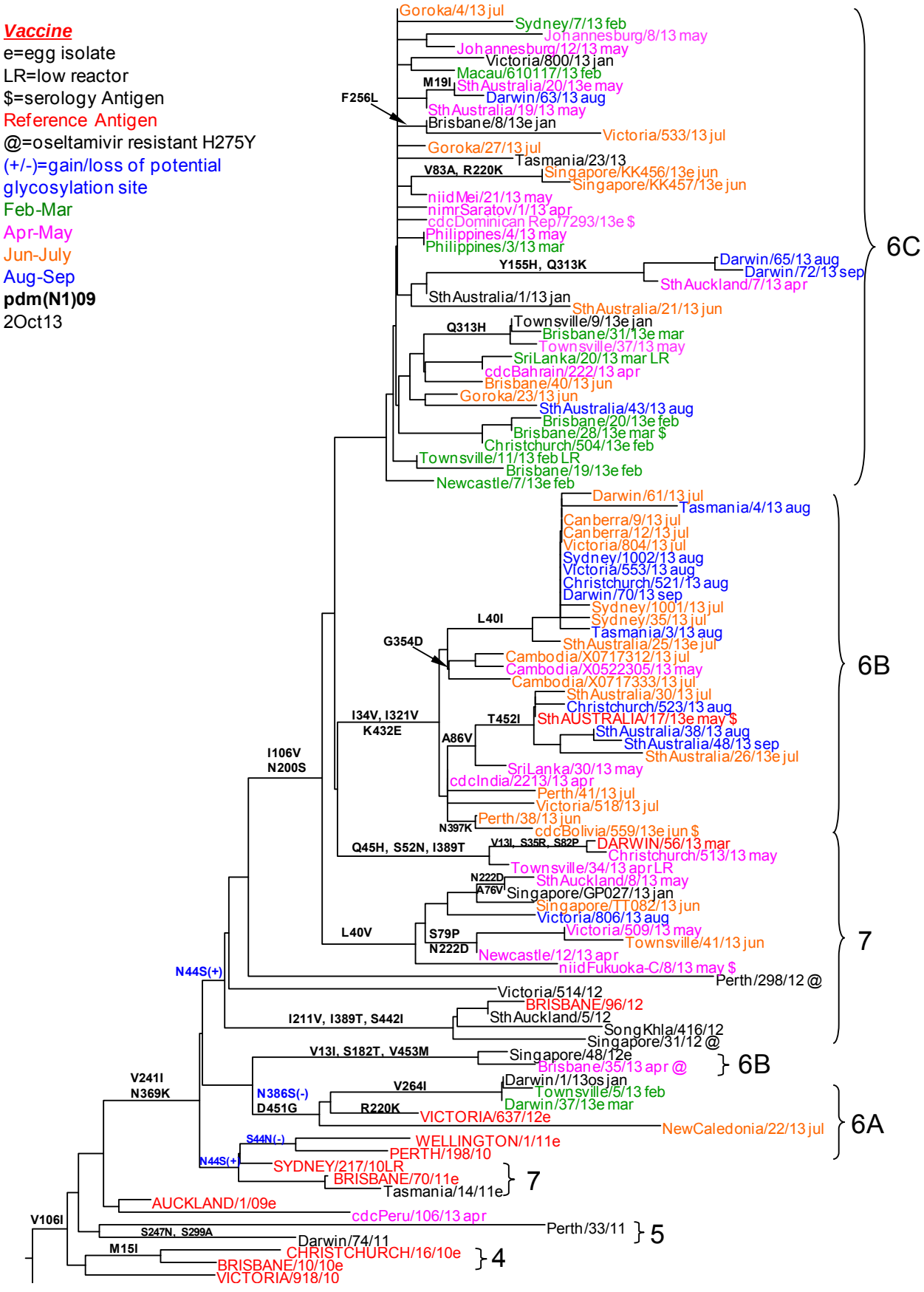


TABLE 3.7
Haemagglutination inhibition antibody titres
Influenza type A(H1N1)pdm09 viruses – Young Adults

Antigen	Pop	N	Passage History	% Rise	GMT		% Reduction in GMT: vaccine	%>/=40		%>/=160	
					Pre	Post		Pre	Post	Pre	Post
A/California/07/2009*	AUS	22	E5	59.1	10.9	46.5	100	22.7	72.7	4.6	22.7
	EURO	24	E5	83.3	9.2	134.5	100	16.7	95.8	4.2	62.5
A/Fukuoka-C/8/2013	AUS	22	MDCK2+1/MDCK1	40.9	10.9	33.4	71.8	22.7	59.1	9.1	18.2
A/Dominican Republic/7293/2013	AUS	22	C2, MDCK1	31.8	11.3	26.2	56.3	18.2	59.1	9.1	18.2
A/Bolivia/559/2013	AUS	22	C2, MDCK1	40.9	10.0	32.4	69.7	22.7	59.1	13.6	40.9
A/Brisbane/28/2013	AUS	22	E5	40.9	10.9	34.4	73.9	27.3	63.6	9.1	22.7
	EURO	24	E5	87.5	8.4	138.5	102.9	16.7	95.8	4.2	58.3
A/Bolivia/559/2013	AUS	22	E5	40.9	12.0	43.8	94.2	27.3	68.2	9.1	40.9
	EURO	24	E5	75.0	8.9	103.7	77.1	20.8	91.7	8.3	50.0
A/South Australia/17/2013	AUS	22	E3	45.5	13.9	46.5	100	36.4	63.6	13.6	40.9
	EURO	24	E3	75.0	10.3	134.5	100	25.0	91.7	8.3	70.8

*Australian & European Vaccine strain

TABLE 3.8
Haemagglutination inhibition antibody titres
Influenza type A(H1N1)pdm09 viruses – Older Adults

Antigen	Pop	N	Passage History	% Rise	GMT		% Reduction in GMT: vaccine	%>/=40		%>/=160	
					Pre	Post		Pre	Post	Pre	Post
A/California/07/2009*	AUS	23	E5	43.5	12.6	37.8	100	30.4	78.3	8.7	17.4
	EURO	24	E5	29.2	9.2	25.2	100	20.8	45.8	4.2	16.7
A/Fukuoka-C/8/2013	AUS	23	MDCK2+1/MDCK1	56.5	8.2	24.5	64.8	17.4	52.2	4.3	8.7
A/Dominican Republic/7293/2013	AUS	23	C2, MDCK1	30.4	10.6	21.8	57.7	21.7	47.8	0.0	8.7
A/Bolivia/559/2013	AUS	23	C2, MDCK1	47.8	10.3	34.6	91.5	26.1	65.2	4.3	17.4
A/Brisbane/28/2013	AUS	23	E5	47.8	8.9	26.7	70.6	17.4	65.2	4.3	8.7
	EURO	24	E5	33.3	7.5	21.2	84.1	16.7	50.0	0.0	8.3
A/Bolivia/559/2013	AUS	23	E5	47.83	9.2	33.6	88.9	21.74	69.57	0.00	17.39
	EURO	24	E5	25.0	8.4	21.2	84.1	16.7	41.7	4.2	16.7
A/South Australia/17/2013	AUS	23	E3	60.9	10.3	44.9	118.8	26.1	82.6	4.4	17.4
	EURO	24	E3	37.5	7.7	23.1	91.7	16.7	41.7	0.0	20.8

*Australian & European Vaccine strain

APPENDIX 4 - Influenza A (H3N2)

TABLE 4.2: A(H3) viruses (1)

Haemagglutination Inhibition Assay - WHO Influenza Centre																
	Sequenced		A	B	C	D	E	F	G	H	I	J	K	L		
	Compilation: 7/8, 20/8		**F2565-14D**	**F2243-13D**	**F1757-13D**	**F2429-13D**	**F2363-13D**	**F2361-13D**	**F2426-13D**	**F2240-14D**	**F 2567-14D**	**F2568-14D**	**F2572-15D**	**F2573-15D**	**Passage**	**Sample**
			E4	**MDCK4**	**MDCK2**	**MDCK3**	**MDCK4**	**MDCK2**	**E3**	**MDCK2**	**E4**	**MDCK1**	**E6**	**MDCK3**	**History**	**Date**
	Reference Antigens	**HA GP**	**SING/37**	**PERTH/16**	**PERTH/10**	**STH AUS/3**	**STH AUCK/7**	**CCH/516**	**VIC/361**	**VIC/361**	**SING/22**	**SING/22**	**Tex/50**	**Tex/50**		
A	A/SINGAPORE/37/2004		**1280**	<20	<20	40	<20	<20	<20	<20	<20	<20	20	<20	E4	
B	A/PERTH/16/2009		20	**640**	320	640	160	320	160	320	160	640	320	320	MDCK3	
C	A/PERTH/10/2010		<20	80	**160**	160	160	160	80	160	160	160	160	160	MDCKX,MDCK2	
D	A/STH AUSTRALIA/3/2011		20	80	160	**160**	160	160	80	160	160	320	160	160	MDCK4	
E	A/STH AUCKLAND/7/2012		20	40	80	80	**80**	80	80	80	80	160	160	80	MDCKX,MDCK3	
F	A/CHRISTCHURCH/516/2012		20	80	160	160	160	**160**	80	160	160	320	160	160	MDCK2	
G	A/VICTORIA/361/2011		20	80	320	320	160	320	**1280**	160	320	160	640	640	E4	
H	A/VICTORIA/361/2011		20	40	160	80	80	80	80	**160**	80	160	160	160	MDCK3	
I	A/SINGAPORE/22/2012		<20	160	320	1280	320	1280	640	160	**640**	320	1280	1280	E4	
J	A/SINGAPORE/22/2012		20	80	160	320	160	160	160	320	160	**640**	160	160	MDCK0,MDCK2	
K	A/TEXAS/50/2012		<20	320	1280	1280	640	1280	640	640	640	640	**>2560**	>2560	E5E1	
L	A/TEXAS/50/2012		20	80	160	160	160	160	160	160	80	160	160	**160**	M1/C2,MDCK3	
	Test Antigens															
1	A/VICTORIA/505/2013		<20	320	640	1280	640	>2560	640	320	640	640	1280	1280	E4	17/06/2013
2	A/PERTH/43/2013		40	640	640	640	640	640	320	640	640	1280	640	640	mdckx,mdck1	11/07/2013
3	A/VICTORIA/506/2013		<20	320	320	640	320	640	80	160	160	320	640	320	E4	16/06/2013
4	A/VICTORIA/535/2013		40	160	320	320	320	320	80	160	160	640	320	320	MDCK1	26/07/2013
5	A/PERTH/510/2013		20	640	320	640	160	640	160	320	160	1280	320	320	MDCK1	27/07/2013
6	A/PERTH/49/2013		40	320	320	640	320	320	160	320	160	640	320	320	mdckx,mdck1	15/07/2013
7	A/PERTH/54/2013		40	320	320	640	320	320	160	320	160	1280	320	320	mdckx,mdck1	16/07/2013
8	A/PERTH/60/2013	**3C.2**	40	320	640	640	320	640	160	320	160	640	320	320	mdckx,mdck1	25/07/2013
9	A/PERTH/45/2013		20	320	320	640	320	640	160	160	160	320	160	320	mdckx,mdck1	09/07/2013
10	A/PERTH/50/2013		<20	320	320	640	320	640	160	160	320	640	160	320	mdckx,mdck1	16/07/2013
11	A/SYDNEY/28/2013	**3C.2**	<20	80	160	160	160	160	80	160	80	320	320	160	MDCKX,MDCK1	19/06/2013
12	A/SYDNEY/21/2013		20	80	160	160	160	160	80	160	80	160	160	160	mdckx,mdck2	02/06/2013
13	A/VICTORIA/522/2013	**3C.2**	<20	80	160	160	80	80	80	160	80	160	160	160	MDCK1	12/07/2013
14	A/TUVALU/2/2013	**3C.3**	<20	80	160	160	160	320	80	160	160	320	160	160	MDCK1	02/05/2013
15	A/VICTORIA/530/2013		<20	160	160	320	160	160	80	160	160	320	160	160	MDCK2	23/07/2013
16	A/PERTH/508/2013	**3C.2**	<20	160	320	320	320	320	80	160	160	320	320	160	MDCK1	20/07/2013
17	A/JOHANNESBURG/16/2013		<20	80	160	160	160	160	80	160	80	160	160	160	mdck3	18/06/2013
18	A/JOHANNESBURG/17/2013	**3C.3**	40	80	160	160	160	320	80	80	160	320	160	160	mdck3	20/06/2013
19	A/SINGAPORE/27/2013		20	80	160	160	160	160	80	160	80	160	160	160	mdck0,mdck1	15/05/2013
20	A/SINGAPORE/29/2013		20	80	160	160	160	160	80	160	80	160	160	160	mdck0,mdck1	20/05/2013
21	A/SINGAPORE/31/2013		20	80	160	160	160	160	80	160	80	160	160	160	mdck2	30/05/2013
22	A/SINGAPORE/33/2013		20	80	160	160	160	80	80	80	80	160	160	160	mdck0,mdck1	23/05/2013
23	A/SINGAPORE/36/2013		20	40	160	160	160	160	80	160	80	160	160	160	mdck0,mdck1	01/06/2013
24	A/SINGAPORE/37/2013		20	80	160	160	160	160	80	160	80	160	160	160	mdck0,mdck1	18/06/2013
25	A/PERTH/47/2013		20	160	320	320	160	320	80	160	160	320	160	160	mdckx,mdck1	12/07/2013
26	A/PERTH/58/2013		20	160	320	320	160	320	80	160	160	320	320	160	mdckx,mdck1	20/07/2013
27	A/PERTH/61/2013		20	160	320	320	320	320	80	160	160	320	160	160	mdckx,mdck1	25/07/2013
28	A/PERTH/40/2013		20	80	160	160	160	160	80	160	80	160	80	160	mdckx,mdck1	27/06/2013
29	A/PERTH/42/2013		<20	80	160	160	160	160	80	160	80	320	80	160	mdckx,mdck1	08/07/2013
30	A/VICTORIA/528/2013	**3C.2**	<20	80	160	160	80	80	80	80	80	160	80	80	MDCK2	19/07/2013
31	A/BRISBANE/57/2013	**3C.2**	20	80	160	80	80	80	40	80	80	80	40	80	X, mdck1	22/07/2013

TABLE 4.3: A(H3) viruses (2)

	Haemagglutination Inhibition Assay - WHO Influenza Centre												
		Reference Antisera											
	Sequenced	A	B	C	D	E	F	G	H	I	J		
	September 17, 2013	**F2243-13D**	**F2426-13D**	**F2240-14D**	**F2572-15D**	**F2573-15D**	**F2852-14D**	**F2857-13D**	**F2856-13D**	**F2858-13D**	**F2859-13D**	**Passage**	**Sample**
		MDCKX, MDCK4	**E3**	**MDCK2**	**E6**	**M1/C2,MDCK3**	**E6**	**E4**	**E4**	**E4**	**E8**	**History**	**Date**
	Reference Antigens	**PERTH/16**	**VIC/361**	**VIC/361**	**Tex/50**	**Tex/50**	**Bris/1**	**Vic/504**	**Vic/505**	**Vic/700**	**Newcastle/1**		
A	A/PERTH/16/2009	**640**	160	320	320	320	80	320	320	80	320	MDCKX, MDCK6	
B	A/VICTORIA/361/2011	160	**>2560**	640	1280	1280	320	1280	640	>2560	640	E4	
C	A/VICTORIA/361/2011	80	80	**160**	160	320	80	80	160	80	160	MDCK6	
D	A/TEXAS/50/2012	320	1280	1280	**>2560**	>2560	640	>2560	>2560	320	1280	E5E1	
E	A/TEXAS/50/2012	160	160	160	320	**320**	160	320	320	160	160	M1/C2,MDCK3	
F	A/BRISBANE/1/13	320	320	640	>2560	>2560	**640**	1280	1280	640	>2560	E5	
G	A/VICTORIA/504/2013	320	320	640	1280	1280	320	**1280**	640	320	640	E4	
H	A/VICTORIA/505/2013	320	640	640	>2560	>2560	640	>2560	**>2560**	640	>2560	E4	
I	A/VICTORIA/700/2013	160	>2560	320	640	640	160	640	320	**1280**	640	E8	
J	A/NEWCASTLE/1/2013	320	640	640	>2560	>2560	640	1280	>2560	640	**1280**	E3	
	Test Antigens												
1	A/PERTH/132/2013	320	160	160	320	640	160	320	320	160	320	MDCKX,MDCK1	13/08/2013
2	A/SINGAPORE/CGH05/2013	320	80	320	1280	320	80	320	320	40	320	E5	28/05/2013
3	A/WELLINGTON/4/2013	160	160	320	320	320	160	320	320	160	320	SIATX, MDCK1	19/07/2013
4	A/SOUTH AUCKLAND/16/2013	80	80	160	320	320	80	320	320	160	160	SIATX, MDCK1	02/07/2013
5	A/CHRISTCHURCH/516/2013	80	80	160	160	320	80	160	160	160	160	MDCK2	20/06/2013
6	A/SOUTH AUCKLAND/20/2013	320	160	320	320	320	160	640	640	160	320	SIATX, MDCK1	10/07/2013
7	A/VICTORIA/564/2013	160	80	160	320	320	160	320	320	160	160	MDCK1	25/08/2013
8	A/MIDCENTRAL/3/2013	80	80	160	160	320	80	160	160	160	160	SIATX, MDCK2	23/07/2013
9	A/WELLINGTON/6/2013	80	80	160	160	320	80	160	160	160	160	SIATX, MDCK2	26/07/2013
10	A/AUCKLAND/512/2013	80	80	160	320	320	80	160	160	80	160	SIATX, MDCK1	12/07/2013
11	A/AUCKLAND/518/2013	160	160	320	320	320	80	320	320	80	160	SIATX, MDCK1	20/07/2013
12	A/PERTH/117/2013	80	80	160	160	320	80	320	160	160	160	MDCKX,MDCK1	12/08/2013
13	A/VICTORIA/573/2013	80	80	80	160	320	80	320	160	80	80	mdck1	03/09/2013
14	A/PERTH/119/2013	160	160	320	320	320	160	320	320	160	160	MDCKX,MDCK1	13/08/2013
15	A/PERTH/121/2013	160	160	160	320	320	80	320	320	160	160	MDCKX,MDCK1	13/08/2013
16	A/PERTH/127/2013	80	80	160	160	320	80	320	160	80	160	MDCKX,MDCK1	17/08/2013
17	A/PERTH/129/2013	320	160	320	320	320	160	320	320	160	320	MDCKX,MDCK1	18/08/2013
18	A/PERTH/134/2013	80	80	160	160	320	80	320	160	160	160	MDCKX,MDCK1	20/08/2013
19	A/PERTH/140/2013	160	160	320	640	320	80	320	640	160	320	MDCKX,MDCK1	21/08/2013
20	A/VICTORIA/571/2013	80	80	160	320	320	80	320	320	160	160	mdck1	04/09/2013
21	A/SINGAPORE/GP637/2013	160	40	160	640	160	40	80	80	20	160	E5	22/04/2013
22	A/VICTORIA/559/2013	80	80	160	160	160	80	160	320	160	160	MDCK2	20/08/2013
23	A/AUCKLAND/519/2013	80	80	160	160	160	80	160	320	160	160	MDCKX, MDCK1	23/07/2013
24	A/NORTHLAND/1/2013	80	80	160	160	160	80	320	160	80	80	SIATX, MDCK1	25/07/2013
25	A/TAURANGA/7/2013	80	80	160	160	160	80	160	320	80	160	SIATX, MDCK1	26/07/2013
26	A/MIDCENTRAL/4/2013	80	80	80	160	160	80	160	160	80	80	SIATX, MDCK1	31/07/2013
27	A/SOUTH AUCKLAND/29/2013	80	80	160	160	160	80	160	320	80	160	MDCKX, MDCK1	20/07/2013
28	A/AUCKLAND/520/2013	40	80	80	160	160	80	160	160	80	80	SIATX, MDCK1	24/07/2013
29	A/SOUTH AUCKLAND/10/2013	80	80	160	160	160	80	320	160	160	160	SIATX, MDCK1	07/06/2013
30	A/SOUTH AUCKLAND/22/2013	80	80	80	80	160	80	80	160	80	80	SIATX, MDCK1	13/07/2013
31	A/SOUTH AUCKLAND/25/2013	80	80	80	80	160	80	160	160	160	160	MDCKX, MDCK1	16/07/2013
32	A/VICTORIA/563/2013	80	80	80	80	160	80	160	160	80	80	MDCK1	23/08/2013
33	A/NTH WEST AUCKLAND/1/2013	80	80	160	160	160	80	80	160	80	80	SIATX, MDCK1	10/07/2013
34	A/SOUTH AUCKLAND/13/2013	80	80	160	160	160	80	160	160	80	160	SIATX, MDCK1	17/06/2013
35	A/SOUTH AUCKLAND/21/2013	160	160	160	160	160	80	160	320	160	160	SIATX, MDCK1	12/07/2013

36	A/SOUTH AUCKLAND/28/2013	40	80	80	80	160	40	80	80	80	80	MDCKX, MDCK1	20/07/2013
37	A/AUCKLAND/515/2013	80	80	80	160	160	80	160	320	80	80	SIATX, MDCK1	15/07/2013
38	A/AUCKLAND/521/2013	40	80	80	80	160	40	80	80	80	80	SIATX, MDCK1	25/07/2013
39	A/WELLINGTON/3/2013	80	80	80	160	160	80	160	160	160	160	SIATX, MDCK2	10/07/2013
40	A/WELLINGTON/5/2013	80	80	160	160	160	80	160	160	160	160	SIATX, MDCK2	23/07/2013
41	A/CHIBA-C/39/2013	40	80	80	80	160	40	80	80	80	80	MDCK2+1, MDCK1	12/04/2013
42	A/KANAGAWA/141/2013	80	80	80	160	160	80	160	80	80	80	MDCK2+1, MDCK1	09/05/2013
43	A/OSAKA/32/2013	80	80	80	80	160	80	80	160	80	80	MDCK2+1, MDCK1	01/05/2013
44	A/AUCKLAND/506/2013	160	80	160	160	160	80	160	320	80	160	SIATX, MDCK2	19/06/2013
45	A/AUCKLAND/510/2013	80	80	160	160	160	80	160	320	80	160	SIATX, MDCK2	08/07/2013
46	A/AUCKLAND/511/2013	80	80	160	160	160	80	160	320	80	80	SIATX, MDCK1	10/07/2013
47	A/SOUTH AUCKLAND/24/2013	80	80	80	160	160	80	80	160	80	80	SIATX, MDCK1	15/07/2013
48	A/SOUTH AUCKLAND/27/2013	160	80	160	160	160	80	320	320	160	160	SIATX, MDCK1	18/07/2013
49	A/TAURANGA/1/2013	80	80	80	160	160	80	160	160	80	80	SIATX, MDCK1	24/06/2013
50	A/VICTORIA/13/2013	80	80	160	160	160	80	160	160	160	160	MDCK1	19/08/2013
51	A/BRISBANE/66/2013	80	80	80	160	160	80	160	160	80	80	MDCK4	19/07/2013
52	A/BRISBANE/80/2013	80	80	80	80	160	80	80	80	80	80	MDCK2	07/08/2013
53	A/NEW YORK/39/2012	40	80	80	160	160	40	80	80	80	80	C2,MDCK1	20/10/2012
54	A/BRISBANE/67/2013	80	80	80	160	160	80	80	160	80	80	MDCK3	29/07/2013
55	A/AUCKLAND/507/2013	80	80	80	80	160	80	160	160	80	80	SIATX, MDCK2	19/06/2013
56	A/SOUTH AUCKLAND/15/2013	40	40	80	80	80	80	80	80	80	80	MDCKX, MDCK1	18/06/2013
57	A/SOUTH AUCKLAND/17/2013	40	40	40	40	80	40	40	80	40	40	SIATX, MDCK1	02/07/2013
58	A/TAURANGA/6/2013	80	40	80	80	80	80	80	160	80	80	SIATX, MDCK2	25/07/2013
59	A/YOKOHAMA/153/2013	40	40	80	80	80	40	40	80	80	80	MDCK3+1, MDCK1	12/04/2013
60	A/BRISBANE/73/2013	40	40	80	80	80	40	80	80	80	80	MDCK2	06/08/2013

TABLE 4.4 – A(H3) viruses
Virus Neutralization of Influenza A(H3N2) Viruses in MDCK cells

Virus Neutralization Assay							
September 5, 2013							
Assay tested by: Iwona/Rob							
Data entered by:Iwona							
Guinea Pig RBC's							
	1	**2**	**3**	**4**	**5**		
	F2238-13D	**F2244-13D**	**F2426-13D**	**F2573-13D**	**F2572-15D**	**Passage**	**Sample**
	MDCKX,MDCK3	**MDCK2**	**E3**	**M1/C2,MDCK3**	**E6**	**History**	**Date**
Reference Antigens	**PERTH/16**	**VIC/361**	**VIC/361**	**TEXAS/50**	**TEXAS/50**		
A/PERTH/16/2009	**320**	80	80	320	160	MDCKX,MDCK6	
A/VICTORIA/361/2011	160	**320**	160	320	640	MDCK5	
A/VICTORIA/361/2011	80	160	**320**	160	320	E5	
A/TEXAS/50/2012	40	80	40	**160**	320	M1/C2,MDCK5	
A/TEXAS/20/2013	640	1280	1280	2560	**>5120**	E6	
Test Antigens							
A/VICTORIA/528/2013	40	<40	<40	<40	<40	MDCK2	19/07/2013
A/JOHANNESBURG/17/2013	40	80	40	160	80	MDCK3	20/06/2013
A/SINGAPORE/GP1046/2013	80	80	40	160	160	MDCK0,MDCK1	18/06/2013
A/PERTH/65/2013	160	80	80	160	320	MDCKX,MDCK2	29/07/2013
A/PERTH/59/2013	80	80	40	160	160	MDCKX,MDCK2	19/07/2013
A/VICTORIA/546/2013	80	160	80	160	320	MDCK2	04/08/2013
A/JOHANNESBURG/16/2013	40	<40	<40	80	80	MDCK3	18/06/2013
A/PERTH/70/2013	80	80	40	80	80	MDCKX,MDCK2	31/07/2013
A/CAMBODIA/X0717305/2013	80	80	40	80	80	MDCK3	02/07/2013
A/CAMBODIA/X0717310/2013	40	40	40	40	80	MDCK3	09/07/2013

FIGURE 4.2
Phylogenetic relationships among influenza A(H3) HA genes

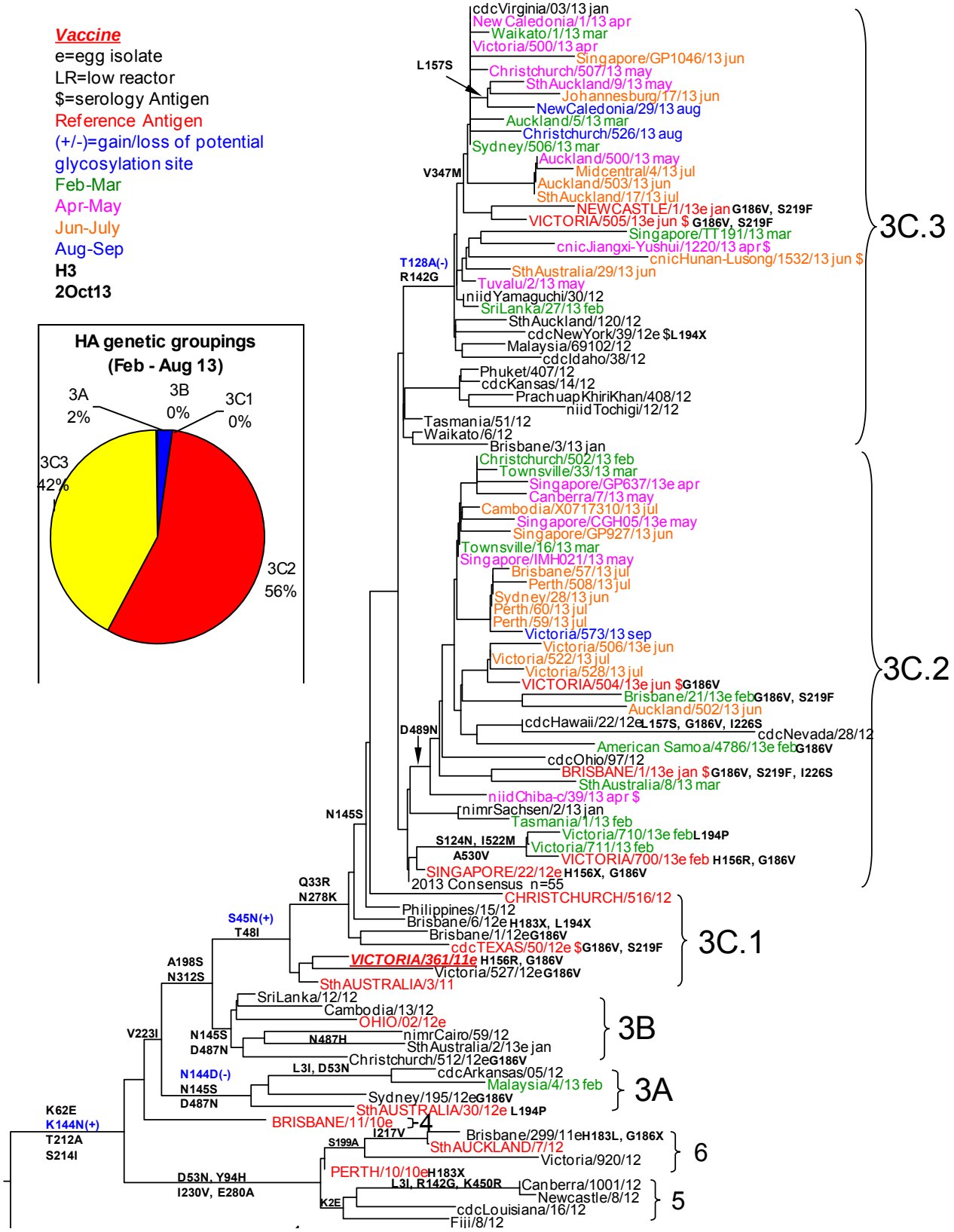


FIGURE 4.3
Phylogenetic relationships among influenza N2 Neuraminidase genes

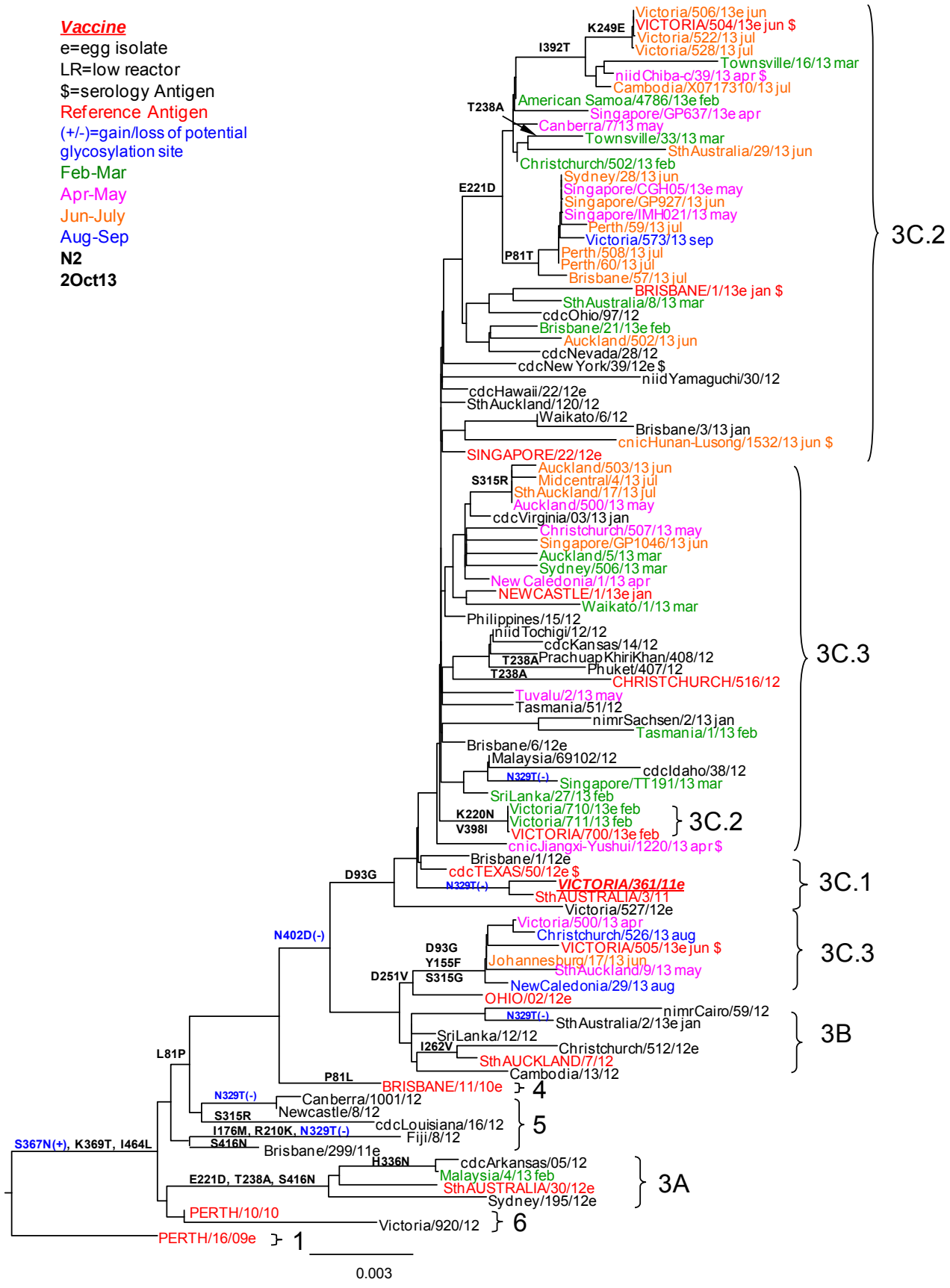


TABLE 4.10
Haemagglutination inhibition antibody titres
Influenza type A(H3N2) viruses – Young Adults

	Pop	N	Passage History	% Rise	GMT		% Reduction in GMT: vaccine	%>/=40		%>/=160	
					Pre	Post		Pre	Post	Pre	Post
A/Texas/50/2012*	AUS	22	E7	59.1	64.8	292.3		81.8	100.0	31.8	86.4
	EURO	24	E7	95.8	58.2	553.9	100	87.5	100.0	12.5	100.0
A/Texas/50/2012	AUS	22	M1/C2, MDCK5	54.5	27.9	68.8		59.1	90.9	9.1	31.8
	EURO	24	M1/C2, MDCK5	66.7	24.5	106.8	18.2	41.7	100.0	0.0	41.7
A/Victoria/505/2013	AUS	22	E4	68.2	62.2	330.2		68.2	100.0	31.8	81.8
	EURO	24	E4	91.7	49.0	522.9	94.4	75.0	100.0	12.5	100.0
A/Victoria/504/2013	AUS	22	E4	63.6	68.8	244.0		81.8	100.0	36.4	86.4
	EURO	24	E4	87.5	69.2	465.8	84.1	95.8	100.0	16.7	100.0
A/Jianxi-Yushi/1220/2013	AUS	22	C1+1, MDCK1	45.5	27.0	64.8		59.1	90.9	4.6	27.3
A/New York/39/2012	AUS	22	E5	59.1	27.9	101.8		59.1	86.4	9.1	50.0
	EURO	24	E5	83.3	258.3	201.6	36.3	62.5	100.0	4.2	70.8
A/Brisbane/1/2013	AUS	22	E5	63.6	43.8	180.5		63.6	100.0	27.3	77.3
	EURO	24	E5	91.7	49.0	359.2	64.9	83.3	100.0	8.3	95.8
A/New York/39/2012	AUS	22	C2, MDCK1	36.4	18.8	42.5		36.4	81.8	0.0	13.6
	EURO	24	C2, MDCK1	50.0	20.6	56.6	10.1	33.3	91.7	0.0	4.2

* European Vaccine strain (Australian Vaccine strain not shown)

TABLE 4.11
Haemagglutination inhibition antibody titres
Influenza type A(H3N2) viruses – Older Adults

Antigen	Pop	N	Passage History	% Rise	GMT		% Reduction in GMT: vaccine	%>/=40		%>/=160	
					Pre	Post		Pre	Post	Pre	Post
A/Texas/50/2012*	AUS	23	E7	39.1	100.8	246.8		91.3	100.0	47.8	87.0
	EURO	24	E7	54.2	30.0	80.0	100	87.5	100.0	25.0	87.5
A/Texas/50/2012	AUS	23	M1/C2, MDCK5	26.1	33.6	59.9		73.9	100.0	0.0	13.0
	EURO	24	M1/C2, MDCK5	33.3	30.0	80.0	100	54.2	100.0	12.5	20.8
A/Victoria/505/2013	AUS	23	E4	39.1	101.8	292.3		82.6	100.0	43.5	82.6
	EURO	24	E4	58.3	63.5	320.0	400	70.8	100.0	25.0	75.0
A/Victoria/504/2013	AUS	23	E4	39.1	92.4	246.8		91.3	100.0	39.1	87.0
	EURO	24	E4	41.7	89.8	302.0	377.5	91.7	100.0	29.2	87.5
A/Jianxi-Yushi/1220/2013	AUS	23	C1+1, MDCK1	30.4	29.1	55.0		65.2	87.0	4.4	17.4
A/New York/39/2012	AUS	23	E5	39.1	34.6	103.7		65.2	91.3	8.7	47.8
	EURO	24	E5	25.0	40.0	109.9	137.4	70.8	95.8	8.3	33.3
A/Brisbane/1/2013	AUS	23	E5	43.5	69.2	174.5		78.3	100.0	30.4	60.9
	EURO	24	E5	41.7	56.6	226.3	282.9	75.0	100.0	20.8	66.7
A/New York/39/2012	AUS	23	C2, MDCK1	26.1	21.2	34.6		39.1	73.9	0.0	4.4
	EURO	24	C2, MDCK1	25.0	22.4	42.4	53	37.5	70.8	0.0	8.3

*European Vaccine Strain (Australian Vaccine strain not shown)

APPENDIX 5 - Influenza B

TABLE 5.2: B viruses (B/Victoria lineage) (1)

	Haemagglutination Inhibition Assay - WHO Influenza Centre													
		Reference Antisera												
	Sequenced	A	B	C	D	E	F	G	H	I	J	K		
	July 30, 2013	**F1175-21D**	**F2428-21D**	**F2259-21D**	**F2256-22D**	**F2425-21D**	**F1364-21D**	**F2253-21D**	**F2314-21D**	**F2315-21D**	**F2574-21D**	**F1687-21D**		
		E4	**MDCK3**	**E3**	**MDCKX,MDCK1**	**E4**	**E3**	**E2**	**MDCK1**	**MDCK1**	**E4**	**E4**	**Passage**	**Date**
	Reference Antigens	**MAL/2506**	**PHIL/6363**	**CAMB/30**	**BRIS/60**	**BRIS/60**	**HK/90**	**SYD/508**	**S.Aus/11**	**DAR/40**	**S.Aus/81**	**WISC/1**	**History**	
A	B/MALAYSIA/2506/2004	**1280**	640	>2560	20	1280	640	320	40	20	1280	<20	E5	
B	B/PHILIPPINES/6363/2009	640	**640**	1280	20	640	320	160	20	<20	320	<20	MDCK3	
C	B/CAMBODIA/30/2011	1280	640	**1280**	40	640	640	320	40	40	640	<20	E3	
D	B/BRISBANE/60/2008	20	<20	<20	**640**	160	320	160	320	640	640	<20	MDCKX,MDCK5	
E	B/BRISBANE/60/2008	160	160	1280	160	**1280**	1280	640	160	320	1280	<20	E6	
F	B/BRISBANE/33/2008	320	320	1280	320	1280	**1280**	1280	160	320	1280	<20	E4	
G	B/HONG KONG/90/2008	320	320	1280	320	1280	1280	**1280**	160	320	>2560	<20	E5	
H	B/SYDNEY/508/2010	320	320	1280	320	1280	1280	1280	**160**	320	1280	<20	E2	
I	B/STH AUSTRALIA/11/2012	20	40	80	640	160	320	320	320	**1280**	1280	<20	MDCK2	
J	B/DARWIN/40/2012	20	40	80	640	160	320	160	320	640	**1280**	<20	MDCK2	
K	B/STH AUSTRALIA/81/2012	160	160	1280	160	640	640	640	160	320	1280	**<20**	E4	
L	B/WISCONSIN/1/2010	40	<20	40	<20	<20	<20	<20	<20	<20	<20	**640**	E5	
	Test Antigens													
1	B/SYDNEY/1/2013	<20	40	80	320	320	640	160	320	640	1280	<20	MDCK1	31/01/2013
2	B/BRISBANE/13/2013	20	40	80	320	320	320	160	320	640	640	<20	MDCK2	22/05/2013
3	B/BRISBANE/17/2013	20	20	80	640	320	640	160	320	1280	1280	<20	mdck2	18/06/2013
4	B/BRISBANE/18/2013	20	40	80	640	320	640	320	640	1280	1280	<20	mdck2	27/06/2013
5	B/FIJI/1/2013	20	40	80	640	320	640	320	320	1280	1280	<20	MDCK1	17/01/2013
6	B/TOWNSVILLE/4/2013	20	40	80	320	160	640	160	320	640	1280	<20	MDCK2	12/05/2013
7	B/TOWNSVILLE/5/2013	20	<20	80	320	160	320	160	320	640	1280	<20	MDCK2	20/05/2013
8	B/BRISBANE/10/2013	40	20	80	320	160	320	160	320	640	640	<20	MDCK2	14/05/2013
9	B/BRISBANE/14/2013	20	20	40	640	160	640	160	320	1280	1280	<20	mdck3	02/06/2013
10	B/BRISBANE/16/2013	20	20	80	640	160	640	160	320	1280	1280	<20	mdck4	03/06/2013

TABLE 5.3: B viruses (B/Victoria lineage) (2)

Haemagglutination Inhibition Assay - WHO Influenza Centre

Reference Antisera

	Sequenced	A	B	C	D	E	F	G	H	I	J	K	L		
	September 6, 2013	**F1175-21D**	**F2428-21D**	**F2259-21D**	**F2256-22D**	**F2425-21D**	**F2424-21D**	**F1364-21D**	**F2253-22D**	**F2314-21D**	**F2315-21D**	**F2574-21D**	**F2851-21D**		
		E4	**MDCK3**	**E3**	**MDCKX, MDCK1**	**E4**	**E3**	**E3**	**E2**	**MDCK1**	**MDCK1**	**E4**	**E3**	**Passage**	**Date**
	Reference Antigens	**MAL/2506**	**PHIL/6363**	**CAMB/30**	**BRIS/60**	**BRIS/60**	**BRIS/33**	**HK/90**	**SYD/508**	**S AUS/11**	**DAR/40**	**Sth Aust/81**	**Sth Aust/36**	**History**	
A	B/MALAYSIA/2506/2004	**640**	320	>2560	<20	640	320	320	160	20	<20	640	80	E5	
B	B/PHILIPPINES/6363/2009	160	**320**	640	<20	160	160	160	160	20	<20	320	<20	MDCK3	
C	B/CAMBODIA/30/2011	640	320	**>2560**	<20	320	320	160	160	20	<20	640	40	E3	
D	B/BRISBANE/60/2008	<20	<20	<20	**160**	80	80	160	80	160	320	640	80	MDCKX,MDCK5	
E	B/BRISBANE/60/2008	160	160	640	80	**640**	1280	640	640	80	160	640	160	E6	
F	B/BRISBANE/33/2008	160	160	1280	160	1280	**>2560**	1280	1280	160	320	1280	320	E4	
G	B/HONG KONG/90/2008	160	320	1280	160	640	1280	**640**	640	80	160	1280	160	E5	
H	B/SYDNEY/508/2010	160	160	640	160	640	1280	640	**640**	80	320	1280	160	E2	
I	B/STH AUSTRALIA/11/2012	<20	<20	<20	320	160	160	160	160	**320**	640	640	160	MDCK2	
J	B/DARWIN/40/2012	<20	<20	<20	320	160	160	160	160	160	**640**	640	160	MDCK2	
K	B/STH AUSTRALIA/81/2012	160	160	640	160	640	1280	1280	640	160	320	**1280**	160	E4	
L	B/STH AUSTRALIA/36/2012	80	160	640	160	640	1280	1280	640	160	320	1280	**320**	E3	
	Test Antigens														
1	B/BRISBANE/18/2013	320	320	1280	160	1280	1280	640	640	160	640	1280	320	E4	27/06/2013
2	B/CAMBODIA/X0117311/2013	40	40	160	160	320	640	320	320	160	640	1280	160	mdck3	02/01/2013
3	B/CAMBODIA/X0314305/2013	80	80	160	320	320	640	640	320	160	320	1280	160	mdck2	12/03/2013
4	B/SINGAPORE/GP006/2013	<20	<20	<20	320	160	320	320	160	320	640	1280	160	mdck0,mdck1	02/01/2013
5	B/SINGAPORE/GP079/2013	<20	<20	<20	320	160	320	320	160	320	640	1280	160	mdck0,mdck1	09/01/2013
6	B/SINGAPORE/KK037/2013	<20	<20	<20	320	160	320	320	160	320	640	1280	160	mdck0,mdck1	14/01/2013
7	B/SINGAPORE/GP068/2013	<20	<20	<20	320	160	160	320	80	160	640	640	160	mdck0,mdck1	09/01/2013
8	B/SINGAPORE/TT145/2013	<20	<20	40	320	160	320	320	160	320	640	1280	160	mdck0,mdck1	19/02/2013
9	B/SINGAPORE/GP390/2013	<20	<20	20	320	160	160	160	80	320	640	640	80	mdck0,mdck1	19/02/2013
10	B/SINGAPORE/GP344/2013	<20	<20	20	320	160	160	320	160	160	640	640	160	mdck0,mdck1	14/02/2013
11	B/SINGAPORE/GP479/2013	<20	<20	20	320	160	160	320	80	160	640	640	80	mdck0,mdck1	19/03/2013
12	B/SINGAPORE/GP545/2013	<20	<20	20	320	160	320	320	160	320	640	640	80	mdck0,mdck1	09/04/2013
13	B/SINGAPORE/TT231/2013	<20	<20	20	320	160	320	320	160	320	640	1280	160	mdck0,mdck1	04/04/2013
14	B/SINGAPORE/KK351/2013	<20	<20	20	320	160	320	160	160	160	640	640	80	mdck0,mdck1	20/05/2013
15	B/SINGAPORE/GP864/2013	<20	<20	40	320	160	320	320	160	320	640	1280	160	mdck0,mdck1	22/05/2013
16	B/SINGAPORE/GP1016/2013	<20	<20	20	320	160	160	320	80	320	640	1280	160	mdck0,mdck1	12/06/2013
17	B/SINGAPORE/KK492/2013	<20	<20	20	320	160	320	160	160	160	640	640	160	mdck0,mdck1	17/06/2013
18	B/BRISBANE/24/2013	<20	<20	20	320	160	160	160	160	160	640	640	80	mdck2	06/07/2013
19	B/CAMBODIA/X0206301/2013	<20	<20	40	320	160	320	320	160	160	640	640	160	mdck3	16/01/2013
20	B/SOUTH AUSTRALIA/26/2013	<20	<20	<20	320	160	160	320	160	160	640	640	80	mdck1	08/08/2013
21	B/CAMBODIA/X0117308/2013	<20	<20	20	320	160	320	320	160	160	640	640	160	mdck4	04/01/2013
22	B/PHILIPPINES/10/2013	<20	<20	20	320	160	160	320	160	320	640	640	160	MDCK3	10/06/2013
23	B/SINGAPORE/KK204/2013	<20	<20	<20	160	80	160	160	80	160	640	640	80	mdck0,mdck1	04/03/2013
24	B/VICTORIA/813/2013	<20	<20	20	320	80	160	160	80	160	640	640	80	MDCK1	21/08/2013

TABLE 5.4: B viruses (B/Yamagata lineage) (1)

			Haemagglutination Inhibition Assay - WHO Influenza Centre (VIDRL)											
			Reference Antisera											
	Sequenced		A	B	C	D	E	F	G	H	I	J		
	Compilation: 16/7, 31/7, 6/8		**F2254-21D**	**F1883-21D**	**F1881-21D**	**F1654-21D**	**F2312-21D**	**F2504-21d**	**F2506-21D**	**F2507-21D**	**F2569-21D**	**F2570-21D**		
		HA GP	**E2**	**E4**	**E4**	**E4**	**Mdckx,mdck2**	**mdck**	**E2**	**E2**	**E4**	**M1/C2,MDCK1**	**Passage**	**Sample**
	Reference Antigens		**BRIS/3**	**FLORID/4**	**WISC/1**	**HBEI/158**	**MAL/412**	**WELL/3**	**WELL/3**	**BRIS/36**	**MASSACH/2**	**MASSACH/2**	**History**	**Date**
A	B/BRISBANE/3/2007	**2**	**1280**	1280	640	640	160	320	160	1280	>2560	640	E5	
B	B/FLORIDA/4/2006	**1**	1280	**>2560**	640	640	320	640	320	1280	1280	1280	E4	
C	B/WISCONSIN/1/2010	**3**	320	320	**640**	320	40	160	40	320	640	80	E5	
D	B/HUBEI WUJIAGANG/158/2009	**3**	320	320	320	**320**	20	80	<20	640	640	40	E7	
E	B/MALAYSIA/412/2012	**2**	640	1280	320	160	**640**	640	640	1280	640	1280	MDCKX,MDCK3	
F	B/WELLINGTON/3/2012	**2**	320	320	80	80	320	**1280**	1280	1280	320	1280	MDCKX,MDCK2	
G	B/WELLINGTON/3/2012	**2**	320	320	40	80	160	1280	**1280**	640	320	640	E2	
H	B/BRISBANE/36/2012	**2**	640	640	160	320	160	320	320	**1280**	640	1280	E2	
I	B/MASSACHUSETTS/02/2012	**2**	320	640	320	160	80	160	80	640	**1280**	320	E3.E1	
J	B/MASSACHUSETTS/02/2012	**2**	640	640	160	320	640	640	640	1280	640	**1280**	M1/C2,MDCK2	
	Test Antigens													
1	B/VICTORIA/502/2013	**2**	320	320	80	160	80	160	80	320	640	320	E3	12/05/2013
2	B/SYDNEY/19/2013		640	640	80	80	320	640	640	640	320	1280	MDCK1	06/06/2013
3	B/CANBERRA/10/2013		640	640	80	160	320	640	640	1280	320	1280	mdck1	03/07/2013
4	B/VICTORIA/504/2013	**2**	160	320	40	80	40	80	40	320	320	320	E5	
5	B/STH AUCKLAND/13/2013	**2**	640	320	40	40	160	640	320	640	160	640	MDCKX, MDCK1	01/06/2013
6	B/WELLINGTON/1/2013	**2**	640	320	40	80	160	320	320	640	160	1280	MDCKX, MDCK1	01/05/2013
7	B/VICTORIA/532/2013	**2**	320	320	20	20	160	640	320	640	160	640	MDCK1	30/06/2013
8	B/VICTORIA/522/2013	**2**	320	320	20	40	160	320	160	320	160	640	MDCK1	07/07/2013
9	B/STH AUCKLAND/16/2013		320	320	40	80	320	640	320	640	160	1280	MDCKX, MDCK1	03/06/2013
10	B/STH AUCKLAND/19/2013		320	320	20	40	160	320	160	640	160	640	SIATX, MDCK1	08/06/2013
11	B/STH AUCKLAND/22/2013		320	320	20	40	160	320	320	640	160	640	MDCKX, MDCK1	11/06/2013
12	B/STH AUCKLAND/23/2013		640	640	40	40	320	640	320	640	160	1280	SIATX, MDCK1	12/06/2013
13	B/TAURANGA/2/2013	**2**	640	640	40	80	320	640	320	640	160	1280	MDCKX, MDCK1	12/06/2013
14	B/BRISBANE/19/2013		320	320	40	160	160	320	320	640	160	1280	mdck2	01/07/2013
15	B/BRISBANE/20/2013	**2**	320	320	40	80	160	320	320	640	160	640	mdck2	28/06/2013
16	B/BRISBANE/21/2013		320	640	40	160	320	640	320	640	160	1280	mdck2	01/07/2013
17	B/VICTORIA/546/2013	**2**	320	320	40	80	160	320	320	640	160	640	MDCK1	12/07/2013
18	B/CANBERRA/8/2013	**2**	320	320	40	80	160	320	320	640	160	640	mdck1	03/07/2013
19	B/CANBERRA/9/2013		320	320	40	80	160	320	320	640	160	640	mdck1	03/07/2013
20	B/VICTORIA/4/2013		320	320	40	80	160	320	320	640	160	640	MDCK1	12/07/2013
21	B/VICTORIA/10/2013		320	320	40	80	160	320	320	640	160	640	MDCK1	05/07/2013
22	B/VICTORIA/12/2013		320	640	40	160	160	640	320	640	160	640	MDCK1	18/07/2013
23	B/VICTORIA/13/2013	**2**	320	320	40	80	160	640	320	640	160	1280	MDCK1	16/07/2013
24	B/VICTORIA/552/2013		320	320	40	80	160	320	320	640	160	640	MDCK1	20/07/2013
25	B/VICTORIA/555/2013	**2**	640	640	40	80	160	640	320	640	160	640	MDCK1	24/07/2013
26	B/VICTORIA/559/2013		320	320	40	80	160	640	320	640	160	640	MDCK1	23/07/2013
27	B/VICTORIA/548/2013		320	320	20	80	160	320	320	640	160	640	MDCK1	16/07/2013
28	B/VICTORIA/513/2013	**2**	320	320	40	80	160	320	160	640	160	640	MDCK1	15/06/2013
29	B/VICTORIA/526/2013	**2**	320	320	20	20	160	160	160	320	160	640	MDCK1	06/07/2013
30	B/VICTORIA/501/2013	**3**	80	160	80	160	40	160	80	160	160	80	mdck1	14/05/2013
31	B/CHRISTCHURCH/503/2013	**2**	640	640	40	80	320	640	320	640	80	1280	mdck1	14/05/2013
32	B/PERTH/37/2013	**2**	160	160	20	20	160	320	160	320	80	640	MDCKX, MDCK1	03/06/2013
33	B/AUCKLAND/503/2013	**2**	160	160	20	20	80	320	160	320	80	320	MDCKX, MDCK1	12/06/2013
34	B/CHRISTCHURCH/2/2013	**2**	320	320	20	40	80	320	160	320	80	640	MDCKX, MDCK1	16/06/2013

TABLE 5.5: B viruses (B/Yamagata lineage) (2)

			Haemagglutination Inhibition Assay - WHO Influenza Centre												
			Reference Antisera												
	Sequenced		A	B	C	D	E	F	G	H	I	J	K		
	August 27,2013: Part A&B	**HA GP**	**F2254-22D**	**F1883-21D**	**F1881-21D**	**F2258-22D**	**F2312-21D**	**F2504-21d**	**F2506-21D**	**F2507-21D**	**F2569-21D**	**F2570-21D**	**F2424-21D**		
			E2	**E4**	**E4**	**E4**	**mdck2**	**mdck**	**E2**	**E2**	**E4**	**M1/C2,MDCK1**	**E3**	**Passage**	**Date**
	Reference Antigens		**BRIS/3**	**FLORID/4**	**WISC/1**	**HBEI/158**	**MAL/412**	**WELL/3**	**WELL/3**	**BRIS/36**	**MASSACH/2**	**MASSACH/2**	**BRIS/33**	**History**	
A	B/BRISBANE/3/2007		**640**	1280	320	320	160	320	160	640	>2560	320	<20	E4	
B	B/FLORIDA/4/2006		1280	**1280**	640	1280	320	640	320	1280	>2560	1280	<20	E4	
C	B/WISCONSIN/1/2010		640	320	**640**	640	40	160	40	320	640	80	<20	E5	
D	B/HUBEI WUJIAGANG/158/2009		320	320	320	**640**	40	80	40	640	320	80	<20	E7	
E	B/MALAYSIA/412/2012		640	640	160	320	**640**	640	640	1280	640	1280	<20	MDCKX,MDCK3	
F	B/WELLINGTON/3/2012		640	640	80	160	640	**1280**	1280	1280	320	1280	<20	MDCKX,MDCK2	
G	B/WELLINGTON/3/2012		640	640	80	160	320	1280	**1280**	640	320	640	<20	E2	
H	B/BRISBANE/36/2012		640	640	160	320	160	320	160	**1280**	640	640	<20	E2	
I	B/MASSACHUSETTS/02/2012		640	640	320	320	160	320	160	640	**1280**	640	<20	E3.E1	
J	B/MASSACHUSETTS/02/2012		640	640	40	160	320	640	640	640	160	**640**	<20	M1/C2,MDCK2	
K	B/BRISBANE/33/2008 (Victoria)		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	**1280**	E4	
	Test Antigens														
1	B/STH AUSTRALIA/28/2013		640	640	80	320	640	640	640	1280	320	>2560	<20	mdck1	08/08/2013
2	B/CANBERRA/20/2013		640	320	80	160	320	320	320	640	320	1280	<20	MDCK1	31/07/2013
3	B/VICTORIA/567/2013		320	320	40	80	320	640	640	640	160	1280	<20	MDCK1	30/07/2013
4	B/VICTORIA/570/2013	**2**	640	320	40	80	320	320	320	640	160	1280	<20	MDCK1	01/08/2013
5	B/VICTORIA/572/2013		640	640	40	80	320	640	640	640	160	1280	<20	MDCK1	01/08/2013
6	B/VICTORIA/805/2013		320	320	40	80	160	640	320	640	160	1280	<20	MDCK1	05/08/2013
7	B/PERTH/52/2013		320	320	40	80	320	640	320	640	160	1280	<20	mdckx,mdck1	15/07/2013
8	B/TASMANIA/3/2013		640	320	40	80	320	640	640	640	160	1280	<20	mdck1	22/07/2013
9	B/NEWCASTLE/15/2013		640	640	40	160	320	640	320	640	160	1280	<20	mdck1	08/07/2013
10	B/VICTORIA/573/2013		640	640	40	160	320	640	640	640	160	1280	<20	mdck1	03/08/2013
11	B/VICTORIA/575/2013		320	320	40	80	160	640	320	640	160	1280	<20	mdck1	04/08/2013
12	B/VICTORIA/576/2013		640	320	40	80	160	640	320	640	160	1280	<20	mdck1	05/08/2013
13	B/STH AUSTRALIA/25/2013		320	320	40	80	160	640	320	640	160	1280	<20	mdck1	08/08/2013
14	B/STH AUSTRALIA/27/2013	**2**	640	1280	40	160	320	640	640	640	160	1280	<20	mdck1	08/08/2013
15	B/BRISBANE/22/2013		640	640	40	80	320	640	320	640	160	1280	<20	mdck3	04/07/2013
16	B/BRISBANE/33/2013		320	320	80	160	320	640	320	640	320	1280	<20	mdck2	25/07/2013
17	B/BRISBANE/34/2013		640	640	40	80	320	640	320	640	160	1280	<20	mdck2	29/07/2013
18	B/SINGAPORE/GP997/2013		640	320	40	80	160	320	320	640	160	640	<20	mdck0,mdck1	11/06/2013
19	B/PERTH/46/2013		320	320	40	80	160	320	160	320	160	640	<20	mdckx,mdck1	12/07/2013
20	B/PERTH/74/2013		320	320	40	80	160	640	320	640	160	640	<20	mdckx,mdck1	31/07/2013
21	B/PERTH/75/2013	**2**	320	320	40	80	320	320	320	640	160	640	<20	mdckx,mdck1	02/08/2013
22	B/NEWCASTLE/14/2013		320	320	40	80	160	320	320	640	160	640	<20	mdck1	30/06/2013
23	B/VICTORIA/11/2013		320	320	40	80	160	160	160	320	160	640	<20	mdck1	19/07/2013
24	B/VICTORIA/19/2013		320	320	40	80	160	320	320	640	160	640	<20	mdck1	06/08/2013
25	B/STH AUSTRALIA/23/2013		640	640	40	80	320	320	320	640	160	640	<20	mdck1	09/08/2013
26	B/BRISBANE/23/2013		640	640	40	160	320	640	320	640	160	640	<20	mdck2	01/07/2013
27	B/BRISBANE/30/2013		320	320	40	80	160	320	320	640	160	640	<20	MDCK(MCB)1	20/07/2013
28	B/BRISBANE/31/2013		320	320	40	80	160	320	320	640	160	640	<20	mdck2	22/07/2013
29	B/CAMBODIA/X0611302/2013	**2**	320	320	40	80	160	320	320	640	160	640	<20	mdck2	29/05/2013
30	B/VICTORIA/18/2013		320	320	40	80	160	320	320	320	160	640	<20	mdck1	31/07/2013
31	B/STH AUSTRALIA/31/2013	**2**	320	320	20	40	160	320	320	320	80	640	<20	mdck1	09/08/2013
32	B/SINGAPORE/KK446/2013		160	80	160	160	40	320	40	160	160	80	<20	mdck0,mdck1	05/06/2013
33	B/SINGAPORE/TT457/2013		320	80	160	160	40	160	40	160	80	80	<20	mdck0,mdck1	14/06/2013

FIGURE 5.5
Phylogenetic relationships among influenza B HA genes
B/Victoria Lineage

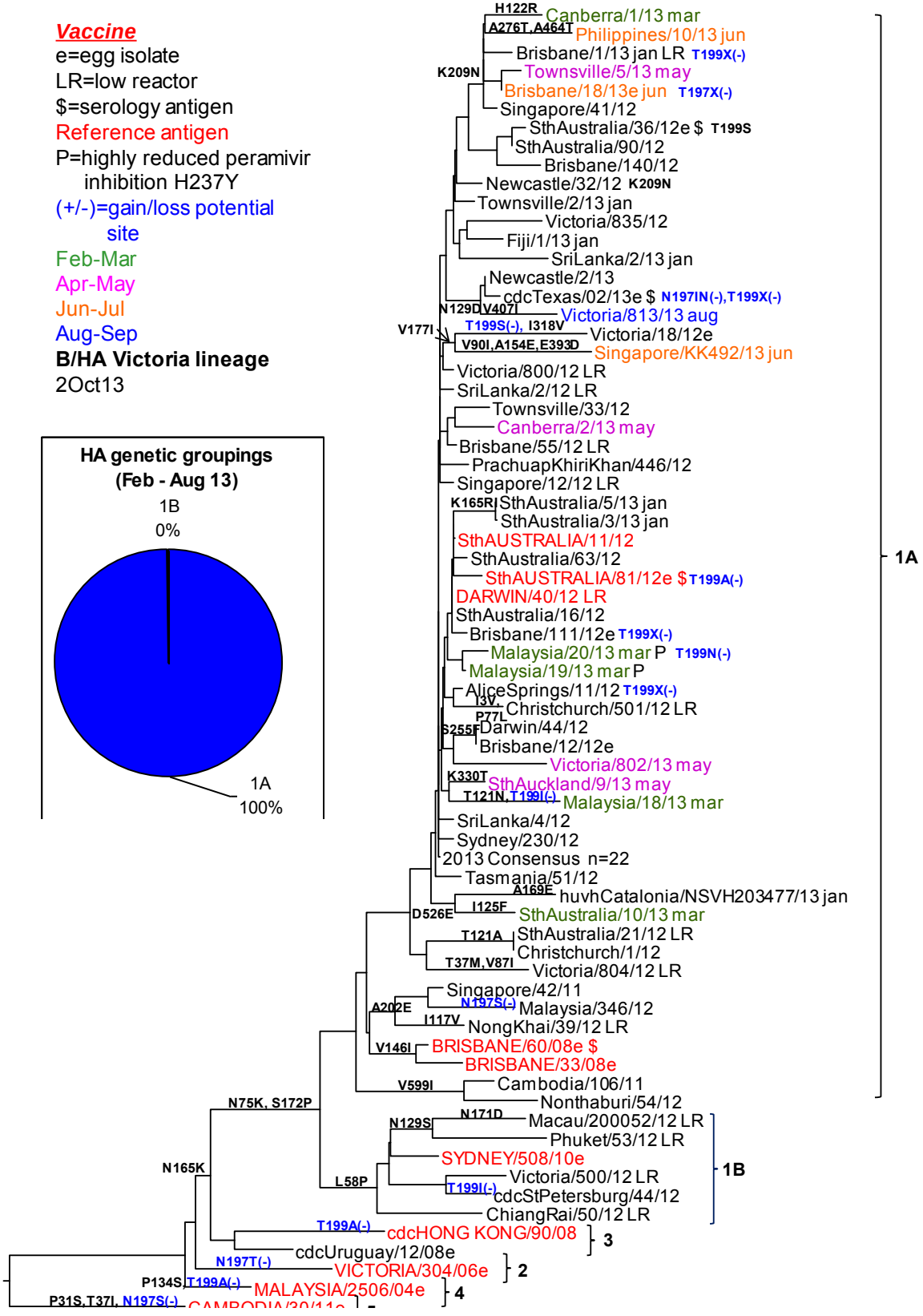


FIGURE 5.6
Phylogenetic relationships among influenza B neuraminidase genes
B/Victoria Lineage

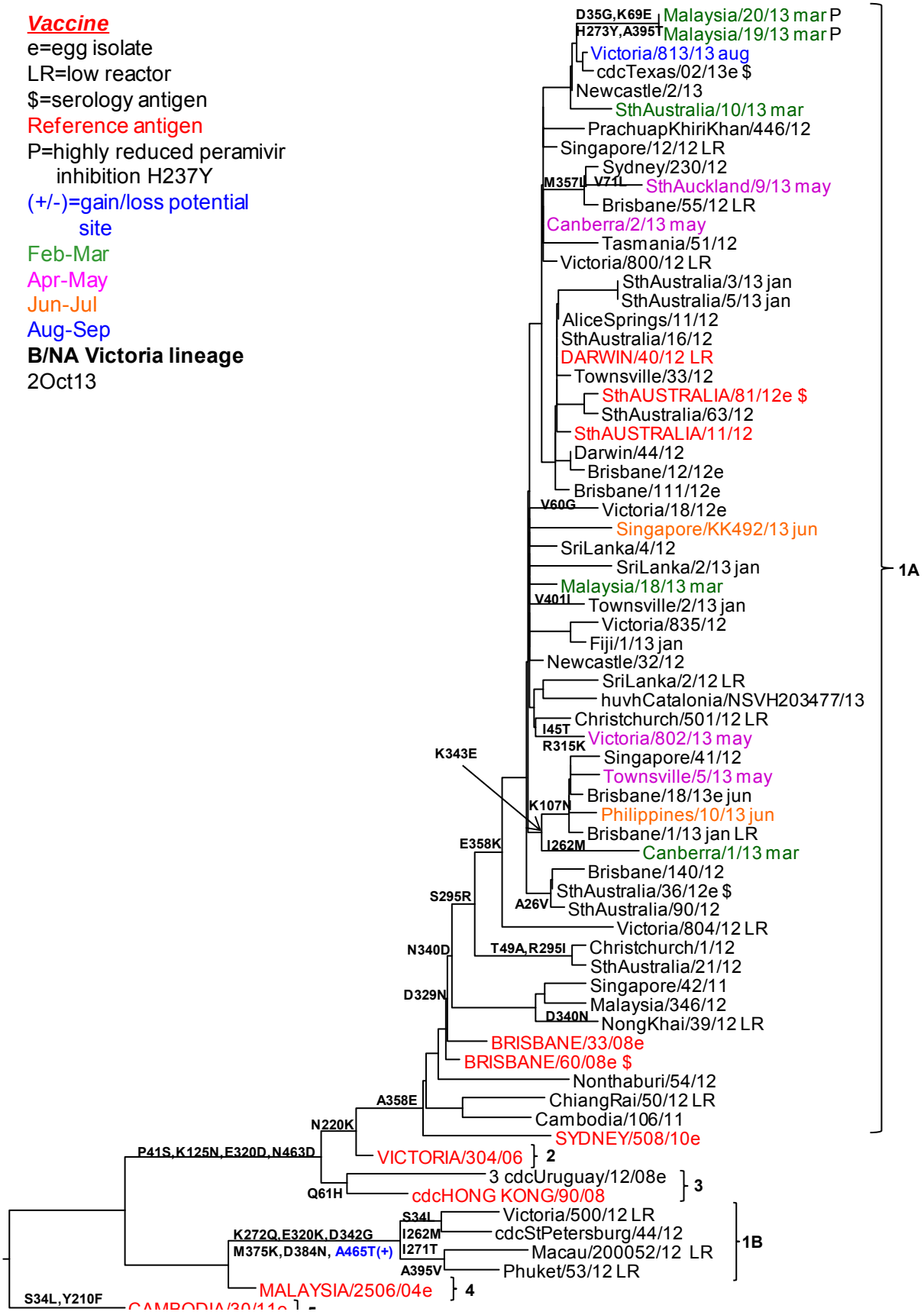


FIGURE 5.7
Phylogenetic relationships among influenza B HA genes
B/Yamagata Lineage

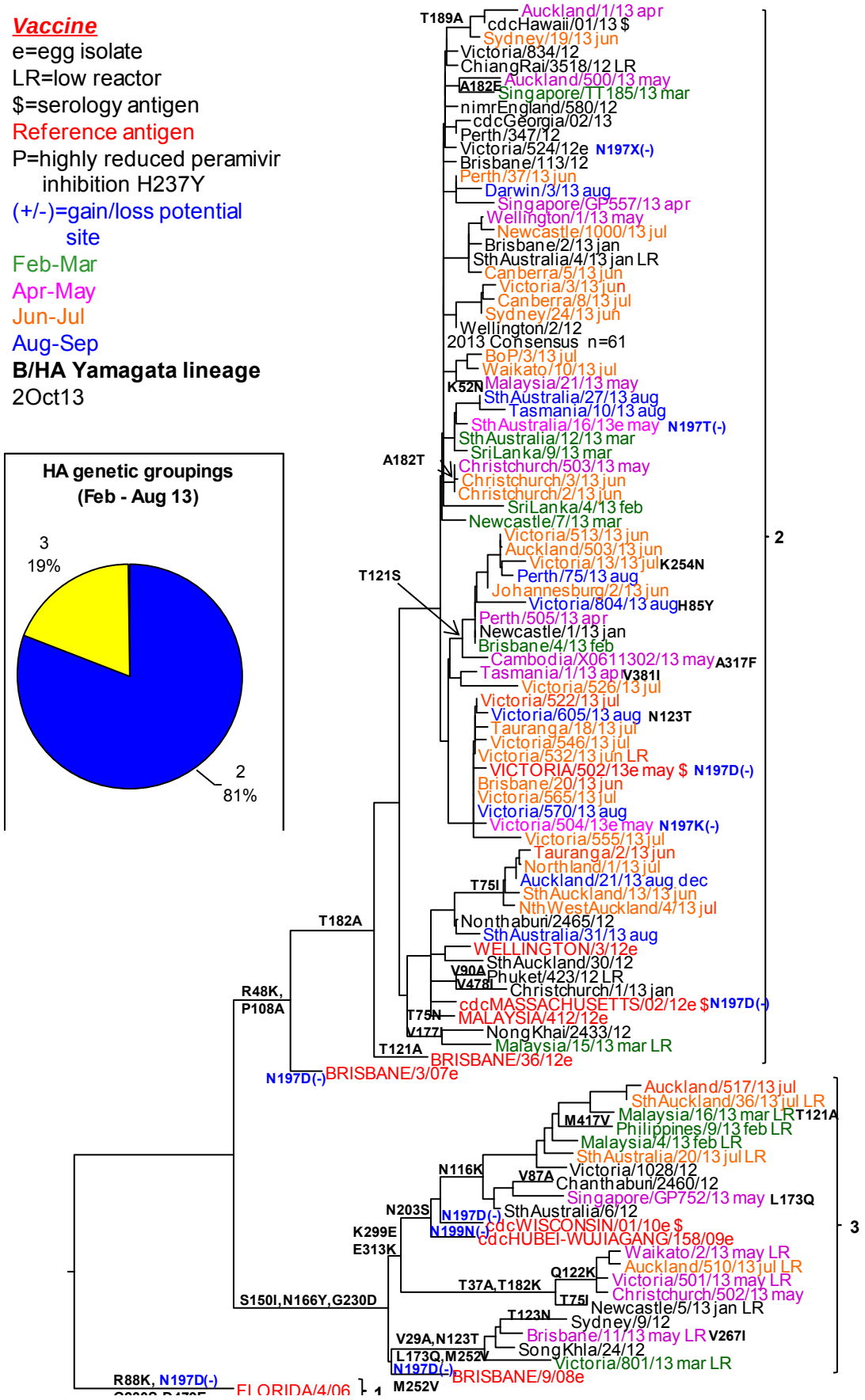


FIGURE 5.8
Phylogenetic relationships among influenza B neuraminidase genes
B/Yamagata Lineage

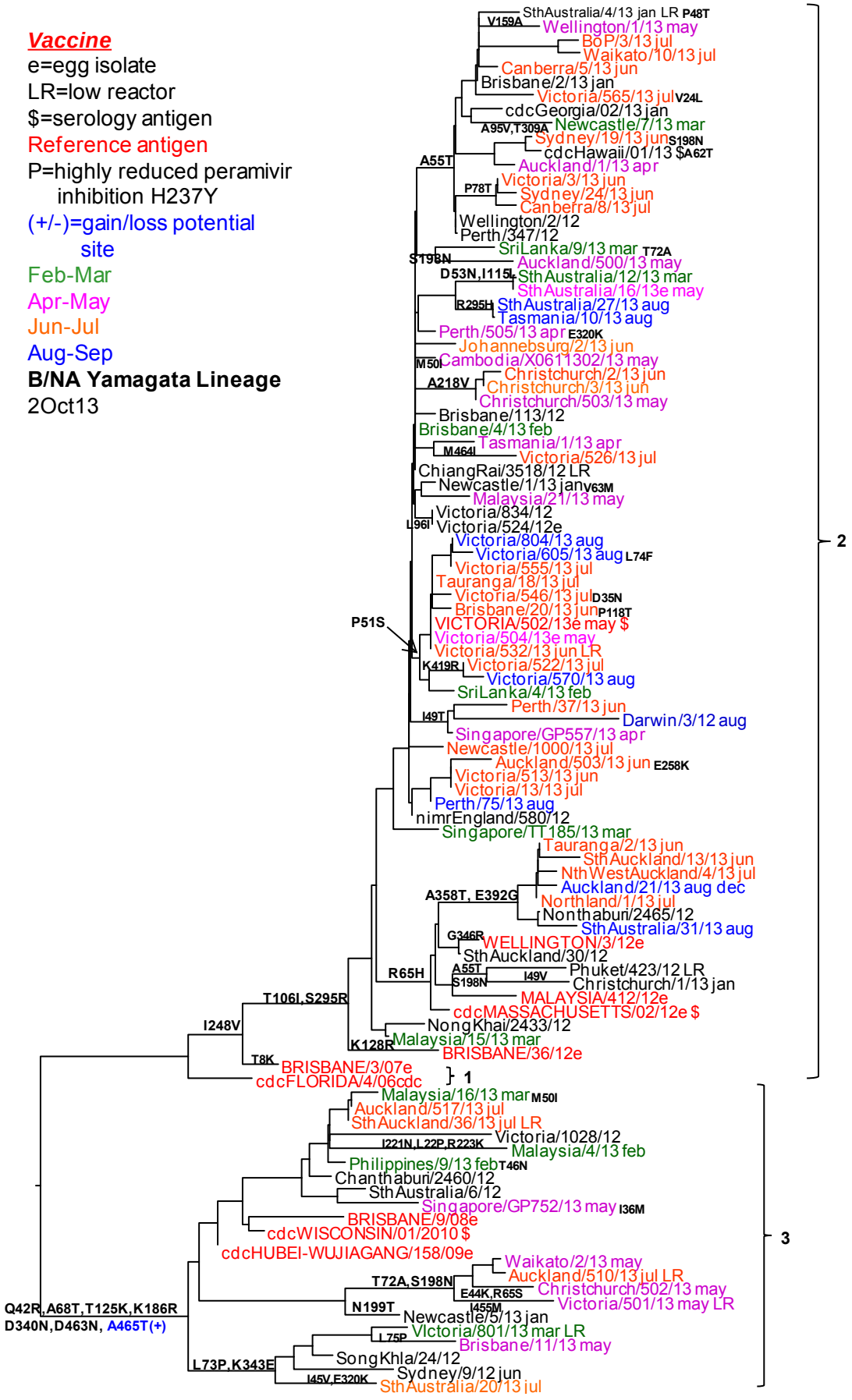


TABLE 5.7
Number of Amino Acid Differences (B/Victoria lineage) from Consensus B HA Sequence
(n=41, 2013 sequences)

Virus	Number of Amino Acid Differences from 2013 Consensus HA sequence
B/Brisbane/60/2008e	1
B/South Australia/36/2012e	1
B/South Australia/81/2012e	1
B/South Australia/10/2013	1
B/South Auckland/9/2013	1
B/Canberra/2/2013	0
B/Singapore/KK492/2013	3
B/Philippines/10/2013	2
B/Brisbane/18/2013e	2
B/Texas/02/2013e - cdc	3

TABLE 5.8
Number of Amino Acid Differences (B/Yamagata lineage) from Consensus B HA Sequence
(n=43, 2013 sequences)

Virus	Number of Amino Acid Differences from 2013 Consensus HA sequence
B/Wisconsin/01/2010e	8
B/Brisbane/36/2012e	2
B/Massachusetts/02/2012e	1
B/South Australia/16/2013e	1
B/Victoria/504/2013e	1
B/Victoria/502/2013e	1
B/Auckland/500/2013	0
B/Victoria/526/2013	0
B/Canberra/8/2013	0
B/South Australia/20/2013	10
B/Johannesburg/2/2013	1
B/Hawaii/01/2013 – cdc	1
B/Christchurch/502/2013	9

APPENDIX 6 - WHO Recommendation for Influenza Vaccines

World Health Organization

Organisation mondiale de la Santé

Weekly epidemiological record
Relevé épidémiologique hebdomadaire

11 OCTOBER 2013, 88th YEAR / 11 OCTOBRE 2013, 88e ANNÉE
No. 41, **2013**, **88**, 437–448
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Recommended composition of influenza virus vaccines for use in the 2014 southern hemisphere influenza season

September 2013

WHO convenes technical consultations[1] in February and September each year to recommend viruses for inclusion in influenza vaccines[2] for the northern and southern hemispheres, respectively. This recommendation relates to the influenza vaccines for the forthcoming influenza season in the southern hemisphere (2014). A recommendation will be made in February 2014 relating to vaccines that will be used for the influenza season in the northern hemisphere (2014–2015). For countries in equatorial regions, epidemiological considerations influence which recommendation (February or September) individual national and regional authorities consider appropriate.

Seasonal influenza activity, February – September 2013

Between February and September 2013, influenza activity was reported in Africa, the Americas, Asia, Europe and Oceania. Activity varied from low or moderate to high due to the circulation of influenza A(H1N1)pdm09, A(H3N2) and B viruses.

In the northern hemisphere, influenza activity was moderate to high from February to April and started to decline from April onwards. For the southern hemisphere in general, activity increased in May and was declining in September. In tropical areas, activity was variable throughout the period.

Influenza A(H1N1)pdm09 activity was variable in Africa, the Americas, Asia, Europe and Oceania. Regional and widespread outbreaks occurred in Europe between February and March and activity decreased after April. In Africa, widespread outbreaks occurred in Algeria and Tunisia

[1] See http://www.who.int/influenza/vaccines/virus/en/, accessed September 2013.

[2] A description of the process of influenza vaccine virus selection and development is available at: http://www.who.int/gb/pip/pdf_files/Fluvaccvirusselection.pdf, accessed September 2013.

Composition recommandée des vaccins antigrippaux pour la saison grippale 2014 dans l'hémisphère Sud

Septembre 2013

L'OMS convoque chaque année des consultations techniques[1] en février et en septembre afin de recommander les virus devant entrer dans la composition des vaccins[2] contre la grippe saisonnière dans l'hémisphère Nord et l'hémisphère Sud, respectivement. La présente recommandation s'applique aux vaccins destinés à la prochaine saison grippale dans l'hémisphère Sud (2014). Une recommandation relative aux vaccins à utiliser pendant la saison grippale dans l'hémisphère Nord (2014-2015) sera émise en février 2014. Dans les pays des régions équatoriales, les autorités nationales et régionales s'appuieront sur des considérations d'ordre épidémiologique pour déterminer individuellement la recommandation qu'il convient d'appliquer (février ou septembre).

Activité grippale saisonnière, février-septembre 2013

Entre février et septembre 2013, une activité grippale a été signalée en Afrique, dans les Amériques, en Asie, en Europe et en Océanie. Cette activité a été de faible ou modérée à forte et résultait de la circulation des virus grippaux A(H1N1)pdm09, A(H3N2) et B.

Dans l'hémisphère Nord, l'activité grippale a été modérée à forte de février à avril et a commencé à régresser à partir du mois d'avril. Pour l'hémisphère Sud en général, l'activité a augmenté en mai et diminué en septembre. Dans les zones tropicales, elle a été variable sur l'ensemble de la période.

L'activité de la grippe A(H1N1)pdm09 a été variable en Afrique, dans les Amériques, en Asie, en Europe et en Océanie. Des épidémies régionales et étendues se sont produites en Europe, entre février et mars, puis l'activité a régressé après le mois d'avril. En Afrique, des épidémies de grande ampleur ont eu lieu en Algérie et en

[1] Se référer à l'adresse: http://www.who.int/influenza/vaccines/virus/en/, consultée en septembre 2013.

[2] Une description du processus de sélection et de préparation des virus grippaux vaccinaux est disponible à l'adresse: http://www.who.int/gb/pip/pdf_files/Fluvaccvirusselection.pdf, consultée en septembre 2013.

in February and March. Regional and widespread outbreaks occurred from June until August in Madagascar and South Africa. A(H1N1)pdm09 predominated in Argentina, Brazil, and Chile from May through August. Regional to widespread outbreaks were reported in Australia in July and August. Sporadic to local activity was reported in New Zealand from May through August. In general, sporadic to local A(H1N1)pdm09 activity was reported in Asia and North America.

Influenza A(H3N2) activity was variable in Africa, the Americas, Asia, Europe and Oceania. In Africa, sporadic activity was reported between February and August. In the Americas, sporadic to local activity was reported in Canada and Mexico in February and March, and local to regional activity was reported in the United States of America (USA) during the same period. Local to regional activity was reported in El Salvador from February through August and in Argentina and Panama from May through August. In Asia, regional to widespread outbreaks were reported in Japan in February and March. Activity was local in China and remained low in the rest of the region during this period. In Europe, from February to April many countries reported sporadic activity, although regional and widespread outbreaks reported in some countries including Croatia, Czech Republic, Germany, Hungary, Ireland, Netherlands, Russian Federation and Ukraine. In Oceania, sporadic activity occurred from February until June and increased in July with regional outbreaks reported in Australia.

Widespread and regional outbreaks associated with influenza B viruses were reported in Europe and parts of Africa, the Americas, Asia and Oceania. In northern Africa, regional and widespread outbreaks were reported in Algeria and Tunisia in February and March. In southern Africa, local activity was reported in Madagascar from April until July. In the Americas, regional outbreaks were reported in the USA during February through April, and sporadic to local activity was reported in Canada and Mexico during the same time period. Activity was generally low in South America except Brazil where regional outbreaks were reported in May through August. In Asia, regional outbreaks were reported in Japan in March through June. Local to regional activity was reported in Hong Kong Special Administrative Region of China, in March and April. Regional to widespread outbreaks were reported in the majority of countries in Europe in February, and activity remained high through April. In Oceania, influenza B activity was sporadic in February through June and increased to regional activity in July and August.

The extent and type of seasonal influenza activity worldwide are summarized in *Table 1*.

Zoonotic influenza infections

From 19 February to 23 September 2013, 16 confirmed human cases of A(H5N1) infection, 6 of which were fatal, were detected in Cambodia, Egypt, Indonesia and Viet Nam where highly pathogenic avian influenza A(H5N1) is present in poultry. Since December 2003, a total of 637 cases with 378 deaths have been confirmed in 15 countries.[3] To date there has been no evidence of sustained human-to-human transmission.

Tunisie en février et en mars. Des épidémies d'ampleur régionale ou étendues se sont produites de juin à août à Madagascar et en Afrique du Sud. La grippe A(H1N1)pdm09 prédominait de mai à août en Argentine, au Brésil et au Chili. Des épidémies régionales à étendues ont été signalées en Australie en juillet et en août. Une activité sporadique à locale été rapportée en Nouvelle-Zélande de mai à août. D'une manière générale, une activité sporadique à locale de la grippe A(H1N1)pdm09 a été notifiée en Asie et en Amérique du Nord.

L'activité de la grippe A(H3N2) a été variable en Afrique, dans les Amériques, en Asie, en Europe et en Océanie. En Afrique, une activité sporadique a été signalée entre février et août. Dans les Amériques, une activité sporadique à locale a été signalée au Canada et au Mexique pendant les mois de février et mars, et une activité locale à régionale aux États-Unis sur la même période. Une activité locale à régionale a été notifiée au Salvador de février à août, et en Argentine et au Panama de mai à août. En Asie, des épidémies régionales à étendues ont été rapportées au Japon en février et en mars. L'activité a été locale en Chine, puis est demeurée à un niveau faible dans le reste de la région pendant cette période. En Europe, entre février et avril, de nombreux pays ont rapporté une activité sporadique, alors que d'autres, dont l'Allemagne, la Croatie, la Fédération de Russie, la Hongrie, l'Irlande, les Pays-Bas, la République tchèque et l'Ukraine, notifiaient des épidémies régionales ou étendues. En Océanie, l'activité a été sporadique de février à juin, puis a pris de l'ampleur en juillet, avec des épidémies régionales en Australie.

Des épidémies étendues ou régionales, associées à des virus grippaux du groupe B, ont été signalées en Europe et dans certaines parties de l'Afrique, dans les Amériques, en Asie et en Océanie. En ce qui concerne l'Afrique du Nord, des épidémies régionales ou étendues ont été rapportées en Algérie et en Tunisie en février et mars. Dans le sud de l'Afrique, une activité locale a été enregistrée à Madagascar d'avril à juillet. Dans la région des Amériques, les États-Unis ont signalé des épidémies régionales de février à avril et le Canada et le Mexique une activité sporadique à locale sur la même période. L'activité a été généralement faible en Amérique du Sud, sauf au Brésil où des épidémies régionales ont été signalées de mai à août. En Asie, des épidémies régionales ont été notifiées au Japon de mars à juin. Une activité locale à régionale a été rapportée à Hong Kong, Région administrative spéciale de la République populaire de Chine, pendant les mois de mars et avril. Des épidémies régionales à étendues ont été notifiées dans la majorité des pays d'Europe en février, et l'activité est restée forte jusqu'en avril. En Océanie, l'activité de la grippe B a été sporadique de février à juin, puis a pris une ampleur régionale en juillet et en août.

Le *Tableau 1* récapitule l'ampleur et le type de l'activité grippale saisonnière pour l'ensemble du monde.

Infections grippales zoonotiques

Du 19 février au 23 septembre 2013, 16 cas humains confirmés d'infection par un virus A(H5N1), dont 6 mortels, ont été détectés au Cambodge, en Égypte, en Indonésie et au Viet Nam, où la grippe aviaire A(H5N1) hautement pathogène est présente chez les volailles. Depuis décembre 2003, 637 cas au total, parmi lesquels 378 décès, ont été confirmés dans 15 pays.[3] À ce jour, il n'existe aucune preuve de transmission interhumaine soutenue.

[3] See http://www.who.int/entity/influenza/human_animal_interface/EN_GIP_20130829CumulativeNumberH5N1cases.pdf, accessed September 2013.

[3] Se référer à l'adresse: http://www.who.int/entity/influenza/human_animal_interface/EN_GIP_20130829CumulativeNumberH5N1cases.pdf, consultée en septembre 2013.

Between February and 23 September 2013, 135 cases of A(H7N9) infection, including 44 deaths, were reported in China[4] with no evidence of sustained human-to-human transmission.

Eighteen cases of A(H3N2) variant (v) infection were detected in the USA from 21 June to 9 September 2013[5] with a total of 339 confirmed cases and one death since August 2011.

The following zoonotic infections were also reported during this period: 2 human non-fatal cases of influenza A(H1N1)v in the USA; 3 cases of A(H7N7) conjunctivitis in Italy; 1 non-fatal case of A(H6N1) in Taiwan, China. No cases of A(H1N2)v, A(H7N3) or A(H9N2) infection were reported.

Antigenic and genetic characteristics of recent seasonal influenza viruses

Influenza A(H1N1)pdm09 viruses

Between February and September 2013, all seasonal influenza A(H1N1) viruses detected worldwide were A(H1N1)pdm09. Haemagglutination inhibition (HI) tests using post-infection ferret antisera indicated that the majority of A(H1N1)pdm09 viruses remained antigenically homogeneous and closely related to the vaccine virus A/California/7/2009. Sequence analysis of the HA genes of A(H1N1)pdm09 viruses indicated that the viruses fell into several genetic clades which were antigenically indistinguishable. Recently circulating viruses belonged to clade 6 or 7, defined by S185T and S451N substitutions in the HA, with the great majority falling into clade 6, distinguished by the additional substitution D97N. A small proportion of viruses showed reductions in reactivity in HI assays with ferret antisera raised against A/California/7/2009-like reference viruses; most of these carried amino acid substitutions in the region corresponding to positions 153–157 of HA, often associated with propagation in cells, consistent with results obtained since May 2009.

Influenza A(H3N2) viruses

Antigenic characteristics of A(H3N2) viruses collected from February to August 2013 were assessed with panels of post-infection ferret antisera in HI and virus neutralization assays. The majority of recent A(H3N2) viruses were well inhibited by ferret antisera raised against cell-propagated reference viruses such as A/Victoria/361/2011 and A/Texas/50/2012. Post-infection ferret antisera raised against egg-propagated A/Texas/50/2012 inhibited many recent viruses, while ferret antisera raised against egg-propagated A/Victoria/361/2011 poorly inhibited most of the recent viruses. The HA genes of most recent A(H3N2) viruses fell into phylogenetic clade 3C, with small numbers in phylogenetic clades 3A, 3B, 5 and 6. Viruses in these genetic clades, including those clade 3C viruses with amino acid

Entre le mois de février et le 23 septembre 2013, 135 cas d'infection par la grippe A(H7N9), y compris 44 décès, ont été notifiés en Chine,[4] sans qu'on ait la preuve d'une transmission interhumaine soutenue.

Dix-huit cas d'infection par un variant (v) du virus A(H3N2) ont été détectés aux États-Unis du 21 juin au 9 septembre 2013,[5] soit au total 339 cas confirmés et un décès depuis août 2011.

Les infections zoonotiques suivantes ont aussi été notifiées pendant la même période: 2 cas humains non mortels de grippe A(H1N1)v aux États-Unis; 3 cas de conjonctivite à A(H7N7) en Italie; 1 cas non mortel de grippe A(H6N1) à Taïwan, en Chine. Aucun cas d'infection par un virus A(H1N2)v, A(H7N3) ou A(H9N2) n'a été notifié.

Caractéristiques antigéniques et génétiques des virus de la grippe saisonnière récents

Virus grippaux A(H1N1)pdm09

Entre février et septembre 2013, tous les virus grippaux saisonniers A(H1N1) détectés de par le monde étaient des virus A(H1N1)pdm09. Les épreuves d'inhibition de l'hémagglutination (IH), réalisées au moyen d'immunsérums de furet postinfection, ont indiqué que la majorité des virus A(H1N1) pdm09 restaient homogènes sur le plan antigénique et étroitement apparentés au virus vaccinal A/California/7/2009. L'analyse des séquences de gènes de l'hémagglutinine (HA) de ces virus A(H1N1)pdm09 a fait apparaître qu'ils se répartissaient en plusieurs clades génétiques impossibles à distinguer sur le plan antigénique. Les virus récemment en circulation appartenaient aux clades 6 et 7, définies par des substitutions S185T et S451N de l'hémagglutinine, la majorité d'entre eux étant des membres du clade 6, qui se distinguent par la présence de la substitution supplémentaire D97N. Un faible pourcentage de ces virus a présenté une réactivité diminuée dans les épreuves IH avec des immunsérums de furet obtenus après inoculation de virus de référence analogues de A/California/7/2009, dont la plupart étaient porteurs de substitutions par des acides aminés dans la région correspondant aux positions 153-157 de HA, souvent associées à la propagation dans les cellules, ce qui est cohérent avec les résultats relevés depuis mai 2009.

Virus grippaux A(H3N2)

Les caractéristiques antigéniques des virus A(H3N2) collectés entre février et août 2013 ont été évaluées au moyen de collections d'immunsérums de furet postinfection dans des épreuves IH et de neutralisation virale. La majorité des virus A(H3N2) récents étaient bien inhibés par les immunsérums de furet obtenus après inoculation de virus de référence propagés en culture cellulaire tels que A/Victoria/361/2011 et A/Texas/50/2012. Les immunsérums de furet postinfection obtenus après inoculation du virus A/Texas/50/2012 propagé sur des œufs inhibaient de nombreux virus récents, tandis que les immunsérums de furet dirigés contre le virus A/Victoria/361/2011, également propagé sur des œufs, inhibaient de façon médiocre la plupart de ces virus récents. Les gènes de l'hémagglutinine HA des virus A(H3N2) les plus récents les rattachaient généralement au clade phylogénétique 3C, un petit nombre d'entre eux appartenant

[4] See http://www.who.int/influenza/human_animal_interface/influenza_h7n9/Data_Reports/en/index.html, accessed September 2013.

[5] See http://www.cdc.gov/flu/swineflu/h3n2v-situation.htm, accessed September 2013.

[4] Se référer à l'adresse: http://www.who.int/influenza/human_animal_interface/influenza_h7n9/Data_Reports/en/index.html, consultée en septembre 2013.

[5] Se référer à l'adresse: http://www.cdc.gov/flu/swineflu/h3n2v-situation.htm, consultée en septembre 2013.

Table 1 **Extent and type of influenza activity worldwide, from end of January to early September 2013**
Tableau 1 **Etendue et type d'activité grippale saisonnière dans le monde, fin janvier à début septembre 2013**

Geographical region / Country, area or territory	Weeks – Semaines 5–8	Weeks – Semaines 9–12	Weeks – Semaines 13–16	Weeks – Semaines 17–20	Weeks – Semaines 21–24	Weeks – Semaines 25–28	Weeks – Semaines 29–32	Weeks – Semaines 33–36
Africa – Afrique								
Algeria – Algérie	●●●●H1(pdm09), ●H3, ●●●●B	●●●H1(pdm09), ●H3, ●●●B	●H1(pdm09), ●B	0	0	0	0	●B
Burkina Faso	●H1(pdm09), ●B	●H1(pdm09), ●H3, ●B	●H3	●B	●B		●B	
Cameroon – Cameroun	●H1(pdm09), ●B	●H1(pdm09), ●B	●H1(pdm09), ●B	●●H1(pdm09), ●B	●●H1(pdm09), ●B	●H1(pdm09), ●B	●H1(pdm09), ●B	
Central African Republic – République centrafricaine	●H1(pdm09)	●H1(pdm09)	●H1(pdm09)	●H1(pdm09)	●H1(pdm09), ●B	●B	●H1(pdm09), ●B	●H1(pdm09), ●●B
Côte d'Ivoire	●H1(pdm09)	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3	●H1(pdm09), ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B
Democratic Republic of the Congo – République démocratique du Congo	0	0	0	●B	●B	●B	●B	
Egypt – Egypte	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●●B	●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B
Ethiopia – Ethiopie	●H1(pdm09), ●H3							
Ghana	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●H3	●H1(pdm09), ●H3	●H3	●●H1(pdm09), ●H3, ●B	●H3	●H3
Kenya	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3	●H1(pdm09), ●H3, ●B	●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B		
Madagascar	●H3, ●B	●H1(pdm09), ●H3, ●B	●●H1(pdm09), ●●B	●●●H1(pdm09), ●●B	●●●H1(pdm09), ●●B	●H1(pdm09), ●●B	●H1(pdm09), ●B	●H1(pdm09)
Mali	●B							
Mauritius – Maurice	0	●H1(pdm09), ●H3	●H1(pdm09)			●H3	●H3, ●B	●H3
Morocco – Maroc	●●●H1(pdm09), ●B	●H1(pdm09), ●B	●H1(pdm09)	0	0	0	0	0
Niger	●H1(pdm09)	●H1(pdm09)	●H1(pdm09)					
Nigeria – Nigéria	●H1(pdm09), ●B	●H1(pdm09), ●B	●B	●B	●B	●B		
Rwanda	●H3	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●B	●B		
Senegal – Sénégal	●B	●●B	●B	●B	●B	●B	●B	
South Africa – Afrique du Sud	●H1(pdm09), ●B	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●●H1(pdm09), ●H3, ●B	●●H1(pdm09), ●H3, ●B	●●●●H1(pdm09), ●H3, ●B	●●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3, ●●B
Togo	●B	●H3, ●B	0	●H1(pdm09)	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●H3, ●B	
Tunisia – Tunisie	●●●●H1(pdm09), ●H3, ●●●●B	●●●H1(pdm09), ●H3, ●●B	●H1(pdm09)	●H1(pdm09), ●B				
Uganda – Ouganda	●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●B	●H1(pdm09), ●●B	●H1(pdm09), ●●B	
United Republic of Tanzania – République-Unie de Tanzanie	●●H1(pdm09), ●H3, ●B	●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●B	●H3	●A
Zambia – Zambie	●H1(pdm09), ●B	●H1(pdm09), ●B	●B	0	0	0	0	0
America – Amériques								
Argentina – Argentine	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H3, ●B	●●H1(pdm09), ●●H3, ●B	●●●H1(pdm09), ●●H3, ●B	●●H1(pdm09), ●●●H3, ●B	●●●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3, ●B
Barbados – Barbade	●H3							
Bermuda – Bermudes	●H3							
Bolivia (Plurinational State of) – Bolivie (Etat plurinational de)	●H1(pdm09), ●H3, ●B	●B	●H3, ●B	●H3, ●B	●H1(pdm09), ●●●H3, ●●●B	●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B
Brazil – Brésil	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●●H3, ●●B	●H1(pdm09), ●●H3, ●●B	●●●H1(pdm09), ●●●H3, ●●●B	●●●H1(pdm09), ●●●H3, ●●●B	●●●H1(pdm09), ●●●H3, ●●●B	●●●H1(pdm09), ●●H3, ●●●B	●●H1(pdm09), ●H3, ●●B

Table 1 *(continued)* – Tableau 1 *(suite)*

Geographical region / Country, area or territory	Weeks – Semaines 5–8	Weeks – Semaines 9–12	Weeks – Semaines 13–16	Weeks – Semaines 17–20	Weeks – Semaines 21–24	Weeks – Semaines 25–28	Weeks – Semaines 29–32	Weeks – Semaines 33–36
Canada	•H1(pdm09), ••H3, ••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Chile – Chili	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	•••H1(pdm09), ••H3, ••B	•H1(pdm09), ••H3, •B
Colombia – Colombie	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	•H1(pdm09), •H3	••H1(pdm09), •H3	•H1(pdm09), •H3, •B
Costa Rica	••H1(pdm09), ••H3, ••B	•••H1(pdm09), •••H3	••••H1(pdm09), ••••H3	••H1(pdm09), •H3, ••B	••••H1(pdm09), •H3, •B	••H1(pdm09), ••H3, ••B	••••H1(pdm09), ••••H3, ••••B	0
Cuba	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	••H1(pdm09), •H3	••H1(pdm09), •H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Dominica – Dominique	•H3	•B						
Dominican Republic – République dominicaine	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09)	•H1(pdm09), •H3	•H1(pdm09)	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3
Ecuador – Equateur	•H3, •••B	•H1(pdm09), •H3, •B	•H1(pdm09), •••H3, •B	•••H1(pdm09), •••H3, •B	•••H1(pdm09), •H3, •B	•••H1(pdm09), •H3, •B	•••H1(pdm09), •H3, •••B	•••H1(pdm09), •B
El Salvador	••H3	••H3	••H3	•••H3, •B	•••H3	•H1(pdm09), •••H3	•H1(pdm09), •••H3	•H1(pdm09), ••H3, •B
France, French Guiana – Guyane française, France	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	0	0
France, Martinique	•B		•H3					
Guatemala	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B	•H1(pdm09), •B	0
Haiti – Haïti					•H1(pdm09)	•H1(pdm09)		
Honduras	•H3, •B	•H3, •B	0	•B	0	•H3, •B	0	•B
Jamaica – Jamaïque	•H1(pdm09), •H3, •B	•H1(pdm09)	•H1(pdm09)	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09)	•H1(pdm09)	0
Mexico – Mexique	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3
Nicaragua	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09), ••H3, •B	••H1(pdm09), •••H3	••H1(pdm09), ••H3
Panama	•••H1(pdm09), •••H3	0	•H3	•H3	•••H3	•••H1(pdm09), •••H3	•H1(pdm09), •••H3	•H1
Paraguay	•H3, •B	•H3, •B	•H1(pdm09), •H3, •B	•H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, •B	•H1
Peru – Pérou	•H1(pdm09), •H3, •B	•H3	•H1(pdm09), •H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H1(pdm09), ••H3, ••B	•••H1(pdm09), ••H3, ••B	•••H1(pdm09), •H3, •B
Trinidad and Tobago – Trinité-et-Tobago	•H3	•H1(pdm09), •H3						
United Kingdom of Great Britain and Northern Ireland, Cayman Islands – Royaume-Uni et Irlande du Nord, Iles Caïman	•B							
United States of America – Etats-Unis d'Amérique	••H1(pdm09), •••H3, •••B	••H1(pdm09), •••H3, •••B	••H1(pdm09), ••H3, •••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Uruguay	0	0	0	0	•••H1(pdm09), •••H3, •••B	•••H1(pdm09), •••H3	•••H1(pdm09)	•H1(pdm09), •H3
Venezuela (Bolivarian Republic of) – Venezuela (République bolivarienne du)	•••H1(pdm09)				••••H1(pdm09), •••H3	••H1(pdm09), ••H3		
Asia – Asie								
Armenia– Arménie	•H1(pdm09), •B	••H1(pdm09), ••B	•H1(pdm09), •B	•B	0	0	0	0
Afghanistan	0							
Azerbaijan – Azerbaïdjan	•B	•H3, •B	•H3, •B	•H3, •B	0	0	0	0
Bahrain – Bahreïn	•H1(pdm09), •B	•H1(pdm09), •B	••H1(pdm09)					

Table 1 *(continued)* – Tableau 1 *(suite)*

Geographical region / Country, area or territory	Weeks – Semaines 5–8	Weeks – Semaines 9–12	Weeks – Semaines 13–16	Weeks – Semaines 17–20	Weeks – Semaines 21–24	Weeks – Semaines 25–28	Weeks – Semaines 29–32	Weeks – Semaines 33–36
Bangladesh	•H1(pdm09), •H3, •B	•H1(pdm09)	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09), ••H3	•H1(pdm09), ••H3		
Bhutan – Bhoutan	•H3	•H3	•H3	0	•H1(pdm09), •H3	•H3	•H3	•H3
Cambodia – Cambodge	•B	•B	•B	•H1(pdm09), •B	•H1(pdm09), •B	••H1(pdm09), •H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
China – Chine	••H1(pdm09), ••H3, •B	••H1(pdm09), ••H3, •B	••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
China, Hong Kong SAR – Chine, Hong Kong, RAS	•H1(pdm09), ••H3, •B	••H1(pdm09), ••H3, ••B	•••H1(pdm09), ••H3, •••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
India – Inde	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, •B
Indonesia – Indonésie	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Iran (Islamic Republic of) – Iran (République islamique d')	•H1(pdm09), •H3, ••B	•H1(pdm09), ••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3	•H1(pdm09), •H3, •B	•H1(pdm09), •B	
Iraq	•H1(pdm09)	••H1(pdm09)	0	0	0	0	0	0
Israel – Israël	••••H1(pdm09), •H3, •B	•••H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B					
Japan – Japon	•H1(pdm09), ••••H3, ••B	•H1(pdm09), •••H3, •••B	•H1(pdm09), ••H3, •••B	•H1(pdm09), •H3, •••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B	•H1, •H3	•H3
Jordan – Jordanie	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•B	•H3, •B	•H1(pdm09), •B	0	
Kazakhstan	•H1(pdm09), ••H3, ••B	•H1(pdm09), ••H3, ••B	•H1(pdm09), •H3, •B	•H1(pdm09)	0	0	0	
Kyrgyzstan – Kirghizistan	•H1(pdm09), •B	•B	0	0	0	0	0	
Lao People's Democratic Republic – République démocratique populaire lao	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B	•H1(pdm09), •H3, ••B	•H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09)	•H1(pdm09)
Malaysia – Malaisie	0							
Mongolia – Mongolie	•H1(pdm09), ••H3	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09), •B	0	0	0	
Nepal – Népal	•H1(pdm09), •H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09), ••H3	•H1(pdm09), ••H3	•H1(pdm09), •H3, •B	•H3, •B
Oman	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •B					
Pakistan	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•B				
Philippines	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Qatar	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B				
Republic of Korea – République de Corée	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	0	•H3	0
Singapore – Singapour	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), ••H3, ••B	•H1(pdm09), ••H3, •B	••H3, •B	•H1(pdm09), •H3, •B
Sri Lanka	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	••H1(pdm09), •H3, ••B	••H1(pdm09), •H3, ••B	•H1(pdm09), •B	•H1(pdm09), •B	•H3, •B
Suriname	•H1(pdm09)		•H1(pdm09)	•H1(pdm09)				
Thailand – Thaïlande	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B	•H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Uzbekistan – Ouzbékistan	•H1(pdm09), •H3, •B	•H3, •B	•H3, •B	0				
Viet Nam	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Europe								
Albania – Albanie	•H1(pdm09), •B	•H1(pdm09), ••B						

Table 1 *(continued)* – Tableau 1 *(suite)*

Geographical region / Country, area or territory	Weeks – Semaines 5–8	Weeks – Semaines 9–12	Weeks – Semaines 13–16	Weeks – Semaines 17–20	Weeks – Semaines 21–24	Weeks – Semaines 25–28	Weeks – Semaines 29–32	Weeks – Semaines 33–36
Austria – Autriche	●●●●H1(pdm09), ●H3, ●●●●B	●●●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●●B	●B	●H1(pdm09)	0	0	0
Belarus – Bélarus	●●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H3, ●B				
Belgium – Belgique	●●●●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●B	0	0	0	0	0
Bosnia and Herzegovina – Bosnie-Herzégovine	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	0	0	0	0	0
Bulgaria – Bulgarie	●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●B	●B	●B	0	0	0
Croatia – Croatie	●●●●H1(pdm09), ●●●●H3, ●B	0	●H1(pdm09), ●H3, ●B	●B				
Czech Republic – République tchèque	●●●●H1(pdm09), ●●●●H3, ●●B	●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●●B			●H1(pdm09)		
Denmark – Danemark	●●H1(pdm09), ●●H3, ●●●●B	●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●●B	●B	0	●H3, ●B	0	0
Estonia – Estonie	●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●●●●B	●B	0	0	0	0
Finland – Finlande	●●●●H1(pdm09), ●H3, ●B	●●●●H1(pdm09), ●●H3, ●B	●●●H1(pdm09), ●●●H3, ●●●B	●H1(pdm09)	0			
France	●●●●H1(pdm09), ●●H3, ●●●●B	●●●H1(pdm09), ●●H3, ●●●●B	●H1(pdm09), ●H3, ●●B	●H3, ●B	●B	0	0	0
Georgia – Géorgie	●●●●H1(pdm09), ●●B	●●●●H1(pdm09), ●●B	●H1(pdm09), ●●B	●H1(pdm09), ●●B	●B	0	0	0
Germany – Allemagne	●●●●H1(pdm09), ●●●H3, ●●●●B	●●H1(pdm09), ●●●H3, ●●●●B	●H1(pdm09), ●●●H3, ● ●●●●B	●H3, ●B	●H1(pdm09), ●H3	●H1(pdm09), ●H3, ●B	0	0
Greece – Grèce	●●H1(pdm09), ●●H3, ●B	●●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●B	●H1(pdm09), ●H3	0		
Hungary – Hongrie	●●●H1(pdm09), ●●●H3, ●B	●●●H1(pdm09), ●●H3, ●●●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B				
Iceland – Islande	●●●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●B			
Ireland – Irlande	●●●H1(pdm09), ●●●H3, ●●●●B	●●H1(pdm09), ●●●H3, ●●●B	●●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H3	0	0
Italy – Italie	●●●H1(pdm09), ●H3, ●●●●B	●●●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●B					
Latvia – Lettonie	●●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●●●●B	●●●B	●B			
Lithuania – Lituanie	●●●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●●●B	●A, ●●B	●B	0	0	0	0
Luxembourg	●●●●H1(pdm09), ●H3, ●●●●B	●●H1(pdm09), ●H3, ●●●●B	●H3, ●B	●B				
Netherlands – Pays-Bas	●●●●H1(pdm09), ●●●●H3, ●●●●B	●H1(pdm09), ●●H3, ●●●●B	●H1(pdm09), ●H3, ●●●●B	●B	●B	0	0	0
Norway – Norvège	●●●H1(pdm09), ●H3, ●●●●B	●●●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●●●B	●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●B	●B	●H1(pdm09)	●H1(pdm09), ●B
Poland – Pologne	●●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●B	●B	0	0	0	●H3, ●B
Portugal	●●●●H1(pdm09), ●H3, ●●●●B	●●●●H1(pdm09), ●H3, ●●●●B	●H1(pdm09), ●H3, ●B	●B	●B	0	0	0
Republic of Moldova – République de Moldavie	●●●●H1(pdm09), ●H3, ●●●●B	●●●H1(pdm09), ●H3, ●●●B	●H1(pdm09), ●H3, ●B	●H3, ●B	0	0	0	0
Romania – Roumanie	●●●H1(pdm09), ●H3, ●●●B	●●●●H1(pdm09), ●H3, ●●●●B	●●H1(pdm09), ●H3, ●●B	●H1(pdm09), ●H3, ●B	0	0	0	0

Table 1 *(continued)* – Tableau 1 *(suite)*

Geographical region / Country, area or territory	Weeks – Semaines 5–8	Weeks – Semaines 9–12	Weeks – Semaines 13–16	Weeks – Semaines 17–20	Weeks – Semaines 21–24	Weeks – Semaines 25–28	Weeks – Semaines 29–32	Weeks – Semaines 33–36
Russian Federation – Fédération de Russie	•••H1(pdm09), •••H3, ••B	••••H1(pdm09), ••••H3, ••••B	••••H1(pdm09), ••••H3, ••••B	•H1(pdm09), •H3, •B	•H3, •B	0	0	0
Serbia – Serbie	•••H1(pdm09), •H3, •••B	•H1(pdm09), •H3, •••B	•H3, •B	0				
Slovakia – Slovaquie	••H1(pdm09), •H3, ••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •B	•H3, •B	0	0	0	0
Slovenia – Slovénie	••••H1(pdm09), •H3, ••••B	•H1(pdm09), •H3, ••••B	•H1(pdm09), •H3, ••B	•B	0	0	0	0
Spain – Espagne	••H1(pdm09), •H3, ••••B	••H1(pdm09), •H3, •••B	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09)	•H1(pdm09), •H3	0
Sweden – Suède	••••H1(pdm09), •H3, ••••B	••H1(pdm09), •H3, ••••B	•H1(pdm09), •H3, •••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •B	•H1(pdm09)	•H1(pdm09)	0
Switzerland – Suisse	•H1(pdm09), •H3, ••••B	•H1(pdm09), •H3, ••••B	•H1(pdm09), •H3, ••B					
The former Yugoslav Republic of Macedonia – Ex-République Yougoslave de Macédoine	••H1(pdm09), ••B							
Turkey – Turquie	••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	0	0	0	0
Ukraine	•••H1(pdm09), •H3, •B	•••H1(pdm09), •H3, •B	••H1(pdm09), ••H3, •••B	•H1(pdm09), •B	•H3, •B	0		
United Kingdom of Great Britain and Northern Ireland – Royaume-Uni et Irlande du Nord	•H1(pdm09), ••H3, •••B	•H1(pdm09), ••H3, •••B	•H1(pdm09), ••H3, ••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Oceania – Océanie								
Australia – Australie	•H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), ••H3, •B	•••H1(pdm09), •••H3, ••B	•••H1(pdm09), •••H3, •••B
Fiji – Fidji	0	•H3, •B	0					
France, New Caledonia – Nouvelle Calédonie	•H1(pdm09), •H3	•H1(pdm09), •B	•H3	0	•H1(pdm09)	0	••H1(pdm09), •H3	••H1(pdm09), •H3
Micronesia (Federated States of)– Micronésie (Etats fédérés de)						•H1(pdm09)		
New Zealand – Nouvelle Zélande				•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), ••H3, ••B	•H1(pdm09), ••H3, ••B
United States of America, American Samoa	•H3	•H3		•H3				
United States of America, Guam – Etats-Unis d'Amérique, Guam			•H3					
United States of America, Northern Mariana Islands – États-Unis d'Amérique, Îles Mariannes du Nord	•H1(pdm09)			•H1(pdm09)				

Data in *Table 1* were provided by the Global Influenza Surveillance and Response System and other partners. – Les données du *Tableau 1* ont été fournies par le Système mondial OMS de surveillance de la grippe et de riposte et d'autres partenaires.

• = Sporadic activity – Activité sporadique
•• = Local activity – Activité locale
••• = Regional outbreaks – Flambées régionales
•••• = Widespread outbreaks – Flambées étendues

A = Influenza A (not subtyped) – Grippe A (sous-type non déterminé)
B = Influenza B – Grippe B
H1(pdm09) = Influenza A(H1N1)pdm09 – H1(pdm09) = Grippe A (H1N1)pdm09
H1 = Former seasonal influenza A(H1N1) – Virus antérieur de la grippe A(H1N1)
H3 = Influenza A(H3N2) – H3 = Grippe A(H3N2)
0 = All negative

substitutions T128A, R142G and N145S, were antigenically indistinguishable in HI and neutralization assays.

Influenza B viruses

Influenza B viruses of the B/Victoria/2/87 and the B/Yamagata/16/88 lineages co-circulated. Viruses of the B/Yamagata/16/88 lineage were prevalent in all countries reporting influenza B infections.

The HA genes of B/Yamagata/16/88 lineage viruses fell within genetic clades 2 or 3, with the majority in clade 2. Viruses with HA genes in these clades could be distinguished antigenically in HI tests by some post-infection ferret antisera. Post-infection antisera raised against the egg-propagated vaccine virus B/Massachusetts/2/2012 (a clade 2 virus) recognised the majority of recent viruses. Similarly, antisera raised against cell-propagated viruses from clade 2 also recognised the vast majority of test viruses.

The HA gene sequences of most B/Victoria/2/87 lineage viruses belonged to the B/Brisbane/60/2008 genetic clade subgroup 1A and, in HI tests with post-infection ferret antisera, the majority of viruses were antigenically closely related to the vaccine virus, B/Brisbane/60/2008, and viruses closely related to B/Brisbane/60/2008 that were propagated in cells.

Resistance to influenza antiviral drugs

Neuraminidase inhibitors

The majority of A(H1N1)pdm09 viruses tested were sensitive to oseltamivir and all were sensitive to zanamivir. Of the small number of A(H1N1)pdm09 viruses detected with highly reduced inhibition (HRI)[6] by oseltamivir, some were linked to the use of this drug for treatment; where tested these viruses also showed HRI by peramivir. In all instances, HRI was due to a histidine to tyrosine substitution at amino acid 275 (H275Y) in the neuraminidase. The great majority of A(H3N2) and B viruses tested were sensitive to oseltamivir, peramivir and zanamivir. The exceptions were: 3 A(H3N2) viruses which showed HRI by oseltamivir and carried the E119V substitution in the neuraminidase; 2 B/Victoria lineage viruses which showed HRI by peramivir and carried the H273Y substitution in the neuraminidase; and a small number of B/Victoria lineage viruses which showed reduced inhibition either by oseltamivir or by both oseltamivir and peramivir. A smaller number of viruses were also tested for susceptibility to laninamivir and all were sensitive.

M2 inhibitors

M gene sequencing of A(H1N1)pdm09 and A(H3N2) viruses revealed that all those analysed had the serine to asparagine substitution at amino acid 31 (S31N) of the

[6] See No. 39, 2012, pp. 369–374.

aux clades phylogénétiques 3A, 3B, 5 et 6. Les virus de ces clades génétiques, y compris ceux de la clade 3C porteurs des substitutions par des acides aminés T128A, R142G et N145S, étaient impossibles à différencier sur le plan antigénique dans les épreuves IH et de neutralisation.

Virus grippaux B

Des virus grippaux B des lignées B/Victoria/2/87 et B/Yamagata/16/88 ont circulé conjointement. Des virus de la lignée B/Yamagata/16/88 étaient présents dans tous les pays signalant des infections grippales de type B.

Les gènes de l'hémagglutinine HA des virus de la lignée B/Yamagata/16/88 les rattachaient aux clades génétiques 2 et 3, la majorité d'entre eux appartenant au clade 2. Les virus dotés de gènes de l'hémagglutinine les classant dans ces clades étaient différentiables sur le plan antigénique dans des épreuves IH par certains immunsérums de furet postinfection. Les immunsérums postinfection obtenus après inoculation du virus vaccinal B/Massachusetts/2/2012 (un virus du clade 2) propagé sur des œufs reconnaissaient la majorité des virus récents. De même, les antisérums obtenus après inoculation de virus du clade 2 propagés en culture cellulaire ont aussi reconnu en grande majorité les virus testés.

Les séquences de gènes de l'hémagglutinine HA de la plupart des virus de la lignée B/Victoria/2/87 les rattachaient au sous-groupe 1A du clade génétique B/Brisbane/60/2008 et, dans les épreuves IH effectuées avec des antisérums de furet postinfection, la majorité des virus de cette lignée étaient étroitement apparentés sur le plan antigénique au virus vaccinal B/Brisbane/60/2008, et à des virus étroitement apparentés à ce virus, propagés sur culture cellulaire.

Résistance aux médicaments antiviraux utilisés contre la grippe

Inhibiteurs de la neuraminidase

La majorité des virus A(H1N1)pdm09 testés étaient sensibles à l'oseltamivir et la totalité étaient sensibles au zanamivir. Parmi le petit nombre de virus A(H1N1)pdm09 détectés comme présentant une forte réduction de l'inhibition par l'oseltamivir,[6] cette résistance était parfois liée à l'utilisation de l'oseltamivir pendant le traitement et lorsqu'on les soumettait à des tests de résistance au peramivir, ces virus se révélaient aussi beaucoup moins inhibés par ce médicament. Dans tous les cas, la forte réduction de l'inhibition était due à la substitution d'une histidine par une tyrosine au niveau de l'acide aminé 275 (H275Y) de la neuraminidase. La grande majorité des virus A(H3N2) et B testés étaient sensibles à l'oseltamivir, au peramivir et au zanamivir. Faisaient exception: 3 virus A(H3N2) présentant une forte réduction de l'inhibition par oseltamivir et porteurs de la substitution E119V de la neuraminidase; 2 virus de la lignée 2 B/Victoria manifestant une forte réduction de l'inhibition par le peramivir et porteurs de la substitution H273Y de la neuraminidase; et un petit nombre de virus de la lignée B/Victoria présentant une réduction de l'inhibition soit par l'oseltamivir, soit par l'oseltamivir et le peramivir. Un nombre encore plus réduit de virus ont subi des tests de sensibilité au laninamivir et se sont tous révélés sensibles.

Inhibiteurs de la protéine M2

Le séquençage du gène M des virus A(H1N1)pdm09 et A(H3N2) a révélé que tous ceux qui avaient été analysés présentaient une substitution de la sérine par l'asparagine au niveau de l'acide

[6] Se référer au N° 39, 2012, pp. 369-374.

M2 protein which is known to confer resistance to the M2 inhibitors, amantadine and rimantadine.

Human serology studies with inactivated influenza virus vaccines

HI assays were used to measure the presence of antibodies to recent virus isolates in panels of sera from children, adults and older adults who had received seasonal trivalent inactivated vaccines. For A(H3N2) viruses, virus neutralization assays were used for a subset of sera. One panel of sera from adults and older adults was obtained from recipients of the vaccine for the northern hemisphere 2013–2014 season (A/California/7/2009 (H1N1)pdm09-like, cell-propagated A/Victoria/361/2011 (H3N2)-like and B/Massachusetts/2/2010-like viruses); 3 panels of sera from adults and older adults as well as one panel from children were from trials of vaccine with the composition recommended for the southern hemisphere 2013 season (A/California/7/2009 (H1N1)pdm09-like, A/Victoria/361/2011 (H3N2)-like and B/Wisconsin/1/2010-like viruses).

Vaccines containing A/California/7/2009-like antigens elicited anti-HA antibodies of similar geometric mean HI titres to the vaccine virus and the majority of representative recent A(H1N1)pdm09 viruses.

Vaccines containing A/Texas/50/2012 (a virus antigenically like cell-propagated A/Victoria/361/2011) antigens elicited antibodies of similar geometric mean HI titres to the cell-propagated vaccine virus and the majority of representative recent A(H3N2) viruses. When compared with the titre to egg-propagated A/Texas/50/2012, titres against cell-propagated representative recent viruses were reduced (average reductions for cell-propagated A(H3N2) viruses compared to egg-propagated A/Texas/50/2012: adults, 81%; older adults, 79%; average reductions for egg-propagated A(H3N2) viruses compared to egg-propagated A/Texas/50/2012: adults, 31%; older adults, 27%; average reductions for cell-propagated A(H3N2) viruses compared to cell-propagated A/Texas/50/2012: adults, 31%; older adults, 28%).

Vaccines containing influenza B/Massachusetts/2/2012-like antigens elicited anti-HA antibodies of similar geometric mean HI titres to the vaccine virus and the majority of representative recent B/Yamagata/16/88 lineage viruses. Geometric mean HI titres to recent B/Victoria/2/87 lineage viruses were reduced (average reductions for B/Victoria/2/87 lineage viruses: adults, 86%; older adults, 74%).

Recommended composition of influenza virus vaccines for use in the 2014 southern hemisphere influenza season

A(H1N1)pdm09 viruses co-circulated in varying proportions with A(H3N2) and B viruses during the period of February–September 2013, with outbreaks in several

aminé 31 (S31N) de la protéine M2, dont on sait qu'elle confère une résistance aux inhibiteurs de cette protéine que sont l'amantadine et la rimantadine.

Études sérologiques chez l'homme avec des vaccins antigrippaux à virus inactivé

Au moyen d'épreuves IH, on a mesuré la présence d'anticorps dirigés contre des isolements viraux récents dans des batteries de sérums provenant d'enfants, d'adultes et d'adultes plus âgés ayant reçu des vaccins inactivés trivalents contre la grippe saisonnière. Dans le cas des virus A(H3N2), on a réalisé des épreuves de neutralisation virale sur un sous-ensemble de sérums. Une batterie de sérums provenant d'adultes et d'adultes plus âgés a été constituée à partir d'échantillons prélevés chez des personnes ayant reçu le vaccin antigrippal pour la saison 2013-2014 dans l'hémisphère Nord (souches A/California/7/2009 (H1N1)pdm09, A/Victoria/361/2011 (H3N2) propagée en culture cellulaire et B/Massachusetts/2/2010); 3 autres batteries de sérums provenant d'adultes et d'adultes plus âgés et une dernière batterie provenant d'enfants ont été rassemblées à partir d'essais portant sur un vaccin ayant la composition recommandée pour la saison 2013 dans l'hémisphère Sud (souches A/California/7/2009 (H1N1)pdm09, A/Victoria/361/2011 (H3N2) et B/Wisconsin/1/2010).

Les vaccins renfermant des antigènes de la souche A/California/7/2009 ont suscité la formation d'anticorps anti-HA à des titres d'IH analogues en moyenne géométrique à ceux obtenus contre le virus vaccinal et la majorité des virus A(H1N1)pdm09 représentatifs récents.

Les vaccins contenant des antigènes du virus A/Texas/50/2012 (un virus analogue sur le plan antigénique au virus A/Victoria/361/2011 propagé en culture cellulaire) ont suscité la formation d'anticorps à des titres d'IH analogues en moyenne géométrique à ceux obtenus contre le virus vaccinal propagé en culture cellulaire et contre la majorité des virus A(H3N2) représentatifs récents. Par comparaison avec le titre obtenu après inoculation du virus A/Texas/50/2012 propagé sur des œufs, les titres générés contre des virus représentatifs récents propagés en culture cellulaire étaient plus faibles (diminutions moyennes pour les virus A(H3N2) propagés en culture cellulaire par rapport au virus A/Texas/50/2012 propagé sur des œufs: adultes, 81%; adultes plus âgés, 79%; diminutions moyennes pour les virus A(H3N2) propagés sur des œufs par rapport au virus A/Texas/50/2012 propagé sur des œufs: adultes, 31%; adultes plus âgés, 27%; diminutions moyennes pour les virus A(H3N2 propagés en culture cellulaire par rapport au virus A/Texas/50/2012 propagé en culture cellulaire cellulaire: adultes, 31%; adultes plus âgés, 28%).

Les vaccins renfermant des antigènes de la souche B/Massachusetts/2/2012 ont suscité la formation d'anticorps anti-HA à des titres d'IH analogues en moyenne géométrique à ceux obtenus contre le virus vaccinal et contre la majorité des virus représentatifs récents de la lignée B/Yamagata/16/88. En moyenne géométrique, les titres d'IH obtenus contre les virus récents de la lignée B/Victoria/2/87 étaient plus faibles (diminutions moyennes pour les virus de la lignée B/Victoria/2/87: adultes, 86%; adultes plus âgés, 74%).

Composition recommandée pour les vaccins antigrippaux destinés à être utilisés pendant la saison grippale 2014 dans l'hémisphère Sud

Des virus A(H1N1)pdm09 ont circulé conjointement avec des virus A(H3N2) et B en proportions variables de février à septembre 2013, en donnant lieu à des épidémies dans plusieurs

countries. The majority of A(H1N1)pdm09 viruses were antigenically similar to A/California/7/2009. Vaccines containing A/California/7/2009 antigens elicited anti-HA antibodies in humans of similar titres against the vaccine virus and recent A(H1N1)pdm09 viruses.

Influenza A(H3N2) viruses were associated with outbreaks in several countries. The majority of recent viruses were antigenically and genetically similar to the cell-propagated A/Texas/50/2012 and A/Victoria/361/2011 viruses. Many A(H3N2) viruses isolated since February 2013 were inhibited by ferret antisera raised against egg-propagated A/Texas/50/2012. Vaccines containing A/Texas/50/2012 antigens elicited antibodies of similar geometric mean HI titres to the cell-propagated vaccine virus and the majority of representative recent A(H3N2) viruses.

Influenza B activity was reported in many countries. The proportion of B/Yamagata/16/88 lineage viruses increased in many parts of the world. The majority of recent B/Victoria/2/87 lineage viruses were antigenically and genetically closely related to B/Brisbane/60/2008. The majority of recently reported B/Yamagata/16/88 viruses belonged to the HA phylogenetic clade 2. Most recently isolated B/Yamagata/16/88 lineage viruses were antigenically similar to B/Massachusetts/2/2012-like (clade 2) viruses. Current vaccines containing B/Massachusetts/2/2012 antigens elicited anti-HA antibodies in humans that had similar titres against the vaccine viruses and recent viruses of the B/Yamagata/16/88 lineage.

It is recommended that vaccines for use in the 2014 influenza season (southern hemisphere winter) contain the following:

– an A/California/7/2009 (H1N1)pdm09-like virus;[a]

– an A/Texas/50/2012 (H3N2)-like virus;[b]

– a B/Massachusetts/2/2012-like virus.

It is recommended that quadrivalent vaccines containing 2 influenza B viruses contain the above 3 viruses and a B/Brisbane/60/2008-like virus.

[a] A/Christchurch/16/2010 is an A/California/7/2009-like virus.

[b] A/Texas/50/2012 is an A(H3N2) virus that following adaptation to growth in eggs has maintained antigenic properties similar to the majority of recently circulating cell-propagated A(H3N2) viruses including A/Victoria/361/2011.

Lists of candidate influenza vaccine viruses that are available or under development and reagents for vaccine standardization, including those for this recommendation, can be found on the WHO website.[7] Candidate vaccine viruses for A(H5N1), A(H9N2), A(H7) and A(H3N2)v viruses are updated on the same website.

As in previous years, national or regional authorities approve the composition and formulation of vaccines

[7] See in http://www.who.int/influenza/vaccines/virus/candidates_reagents/home, accessed September 2013.

pays. La majorité de ces virus étaient similaires sur le plan antigénique au virus A/California/7/2009. Les vaccins renfermant des antigènes de ce virus ont suscité chez des êtres humains la formation d'anticorps anti-HA à des titres analogues à ceux obtenus contre le virus vaccinal et des virus A(H1N1)pdm09 récents.

Des virus grippaux A(H3N2) étaient associés aux épidémies survenues dans plusieurs pays. La majorité des virus récents étaient similaires sur le plan antigénique et génétique aux virus A/Texas/50/2012 et A/Victoria/361/2011 propagés en culture cellulaire. De nombreux virus H3N2 isolés depuis février 2013 étaient inhibés par les immunsérums de furet obtenus par inoculation du virus A/Texas/50/2012 propagé sur des œufs. Les vaccins contenant des antigènes de ce virus ont suscité la formation d'anticorps à des titres d'IH analogues en moyenne géométrique à ceux obtenus contre le virus vaccinal propagé en culture cellulaire et la majorité des virus A(H3N2) représentatifs récents.

Une activité de la grippe B a été signalée dans de nombreux pays. Le pourcentage de virus appartenant à la lignée B/Yamagata/16/88 a augmenté dans nombre de parties du monde. La majorité des virus récents de la lignée B/Victoria/2/87 étaient étroitement apparentés sur le plan antigénique et génétique au virus B/Brisbane/60/2008. La majorité des virus de la lignée B/Yamagata/16/88 récemment notifiés appartenaient au clade phylogénétique 2. Les virus de la lignée B/Yamagata/16/88 isolés le plus récemment étaient analogues sur le plan antigénique à la souche B/Massachusetts/2/2012 (clade 2). Les vaccins actuels renfermant des antigènes de cette souche ont suscité la formation d'anticorps anti-HA chez des êtres humains à des titres analogues à ceux obtenus contre des virus vaccinaux et des virus récents de la lignée B/Yamagata/16/88.

Pendant la saison grippale 2014 (hiver dans l'hémisphère Sud), il est recommandé d'utiliser des vaccins contenant les souches suivantes:

– A/California/7/2009 (H1N1)pdm09;[a]

– A/Texas/50/2012 (H3N2);[b]

– B/Massachusetts/2/2012.

Il est recommandé que les vaccins quadrivalents contenant 2 virus grippaux B renferment les 3 virus ci-dessus et une souche B/Brisbane/60/2008.

[a] A/Christchurch/16/2010 est un virus analogue à A/California/7/2009.

[b] A/Texas/50/2012 est un virus A(H3N2) qui, après adaptation à la culture sur des œufs, a conservé des propriétés antigéniques similaires à celles de la majorité des virus A(H3N2) en circulation récemment, propagés sur culture cellulaire, y compris le virus A/Victoria/361/2011.

Les listes des virus vaccinaux candidats disponibles ou en cours de mise au point et des réactifs servant à la standardisation des vaccins, y compris ceux prévus par cette recommandation, peuvent être consultées sur le site Web de l'OMS.[7] Les virus vaccinaux candidats pour les virus A(H5N1), A(H9N2), A(H7) et A(H3N2)v sont aussi tenus à jour sur ce même site.

Comme les années précédentes, les autorités nationales ou régionales de contrôle devront approuver la composition et la

[7] Se référer à l'adresse: http://www.who.int/influenza/vaccines/virus/candidates_reagents/home, consultée en septembre 2013.

used in each country. National public health authorities are responsible for making recommendations regarding the use of the vaccine. WHO has published recommendations on the prevention of influenza.[8]

Candidate vaccine viruses (including reassortants) and reagents for use in the laboratory standardization of inactivated vaccine may be obtained from:

(i) Immunobiology, Office of Laboratory and Scientific Services, Monitoring and Compliance Group, Therapeutic Goods Administration, P.O. Box 100, Woden, ACT, 2606, Australia (fax: +61262328564, email: influenza.standards@tga.gov.au; website: http://www.tga.gov.au);

(ii) Division of Virology, National Institute for Biological Standards and Control, a centre of the Medicines and Healthcare products Regulatory Agency (MHRA), Blanche Lane, South Mimms, Potters Bar, Hertfordshire, EN6 3QG, UK (fax: +441707641050, e-mail: enquiries@nibsc.org, website: http://www.nibsc.ac.uk/spotlight/influenza_resource_centre/reagents.aspx);

(iii) Division of Biological Standards and Quality Control, Center for Biologics Evaluation and Research, Food and Drug Administration, 1401 Rockville Pike, Rockville, MD 20892, USA (fax: +1 301 480 9748);

(iv) Center for Influenza Virus Research, National Institute of Infectious Diseases, Gakuen 4-7-1, Musashi-Murayama, Tokyo 208-0011, Japan (fax: +81425616156, email: flu-vaccine@nih.go.jp).

Requests for reference viruses should be addressed to:

(i) WHO Collaborating Centre for Reference and Research on Influenza, VIDRL, 10 Wreckyn Street, North Melbourne, Victoria 3051, Australia (fax: +61393423939, website: http://www.influenzacentre.org, email: whoflu@influenzacentre.org);

(ii) WHO Collaborating Centre for Reference and Research on Influenza, National Institute of Infectious Diseases, Gakuen 4-7-1, Musashi-Murayama, Tokyo 208-0011, Japan (fax: +81425616149 or +81425652498, email: todagiri@nih.go.jp;

(iii) WHO Collaborating Centre for Surveillance, Epidemiology and Control of Influenza, Centers for Disease Control and Prevention, 1600 Clifton Road, Mail Stop G16, Atlanta, GA 30333, USA (fax: +14046390080, website: http://www.cdc.gov/flu/, email: influenzavirussurveillance@cdc.gov);

(iv) WHO Collaborating Centre for Reference and Research on Influenza, MRC National Institute for Medical Research, The Ridgeway, Mill Hill, London NW7 1AA, UK (fax: +442089064477, website: http://www.nimr.mrc.ac.uk/wic/, email: whocc@nimr.mrc.ac.uk);

(v) WHO Collaborating Centre for Reference and Research on Influenza, National Institute for Viral Disease Control and Prevention, China CDC, 155 Changbai Road, Changping District, 102206, Beijing, P.R. China. (tel: +86 10 5890 0851, fax: +86 10 5890 0851, email: whocc-china@cnic.org.cn, website: http://www.cnic.org.cn/eng/).

Influenza surveillance information is updated on the WHO website.[9] ■

[8] See No. 47, 2012, pp. 461–476.

[9] See http://www.who.int/influenza

formulation des vaccins utilisés dans chaque pays. Les autorités nationales de santé publique sont chargées de faire des recommandations concernant l'utilisation du vaccin. L'OMS a publié des recommandations relatives à la prévention de la grippe.[8]

Les virus vaccins candidats (y compris réassortis) et les réactifs nécessaires à la standardisation en laboratoire du vaccin inactivé peuvent être obtenus auprès des organismes suivants:

i) Immunobiology, Office of Laboratory and Scientific Services, Monitoring and Compliance Group, Therapeutic Goods Administration, P.O. Box 100, Woden ACT, 2606 Australie (télécopie: +61262328564, courriel: influenza.standards@tga.gov.au; site Web: http://www.tga.gov.au);

ii) Division of Virology, National Institute for Biological Standards and Control, un centre sur les produits médicamenteux et de soins de l'agence de réglementation (MHRA), Blanche Lane, South Mimms, Potters Bar, Hertfordshire, EN6 3QG, Royaume-Uni (télécopie: +441707641050; courriel: enquiries@nibsc.org; site Web: http://www.nibsc.ac.uk/spotlight/influenza_resource_centre/reagents.aspx);

iii) Division of Biological Standards and Quality Control, Center for Biologics Evaluation and Research, Food and Drug Administration, 1401 Rockville Pike, Rockville, MD 20892, États-Unis (télécopie: +1 301 480 9748);

iv) Centre de Recherche sur le Virus grippal, Institut national des Maladies infectieuses, Gakuen 4-7-1, Musashi-Murayama, Tokyo 208-0011, Japon (télécopie: +81425616156; courriel:flu-vaccine@nih.go.jp).

Les souches de référence peuvent être obtenues en s'adressant aux établissements suivants:

i) Centre collaborateur OMS de référence et de recherche pour la grippe, VIDRL, 10 Wreckyn Street, North Melbourne, Victoria 3051, Australie (télécopie: +61393423939; courriel: whoflu@influenzacentre.org; site Web: http://www.influenzacentre.org);

ii) Centre collaborateur OMS de référence et de recherche pour la grippe, Institut national des Maladies infectieuses, Gakuen 4-7-1, Musashi-Murayama, Tokyo 208-0011, Japon (télécopie: +81425616149 ou +81425652498; courriel: todagiri@nih.go.jp);

iii) WHO Collaborating Center for Surveillance, Epidemiology and Control of Influenza, Centers for Disease Control and Prevention, 1600 Clifton Road, Mail Stop G16, Atlanta, GA 30333, États-Unis (télécopie: +14046390080; courriel: influenzavirussurveillance@cdc.gov; site Web: http://www.cdc.gov/flu/);

iv) Centre collaborateur OMS de référence et de recherche pour la grippe, MRC National Institute for Medical Research, The Ridgeway, Mill Hill, London NW7 1AA, Royaume-Uni (télécopie: +442089064477; courriel: whocc@nimr.mrc.ac.uk; site Web: http://www.nimr.mrc.ac.uk/wic/);

v) Centre collaborateur OMS de référence et de recherche pour la grippe, Institut national de Lutte contre les Maladies virales, Chine CDC, 155 route de Changbai, district de Changping, 102206, Beijing, République populaire de Chine (téléphone: +86 10 5890 0851; télécopie: +86 10 589 00851; courriel: whocc-china@cnic.org; site Web: http://www.cnic.org.cn/eng/).

Les informations relatives à la surveillance de la grippe sont mises à jour sur le site web de l'OMS.[9] ■

[8] Se référer au Nº 47, 2012, pp. 461-476.

[9] Se référer à l'adresse: http://www.who.int/influenza/fr/index.html