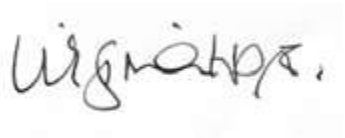
RECOMMENDATION FOR SEASONAL INFLUENZA VACCINE COMPOSITION FOR NEW ZEALAND FOR 2015



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RECOMMENDATION FOR SEASONAL INFLUENZA VACCINE COMPOSITION FOR NEW ZEALAND FOR 2015

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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.
- Research nurses, clinicians and participants in the National Influenza Surveillance Programme and SHIVERS project.

Recommendations

The Australian Influenza Vaccine Committee (AIVC) met with a New Zealand representative (Appendix 1) in Melbourne on 9 October 2014 to consult on the influenza vaccine composition for 2015 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/Switzerland/9715293/2013 (H3N2)-like virus
B	a B/Phuket/3073/2013-like virus (belonging to B/Yamagata lineage)

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Formulation Recommendations		Vaccine used for	A H3N2	A H1N1	B
NZ & WHO*	2014	2015	A/Switzerland/9715293/2013	A/California/7/2009	B/Phuket/3073/2013
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 2014

Between February and September 2014, 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 influenza B viruses.

In the northern hemisphere, influenza activity was high from February to April and started to decline from April onwards with the exception of a few countries. In the southern hemisphere, activity remained low from February until May when moderate to high activity was reported from a number of countries.

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 Asia, Europe and North America between February and April. Activity was low from May until September in the northern hemisphere. Regional outbreaks occurred in Brazil from May to August and in Paraguay during May and June. There were widespread outbreaks in the Plurinational State of Bolivia in June. Activity in Australia increased from May and caused widespread outbreaks in August and September. New Zealand had regional outbreaks in September. In general, low A(H1N1)pdm09 activity was recorded in Africa with the exception of Egypt where regional and widespread outbreaks were reported in February and March.

Influenza A(H3N2)

Influenza A(H3N2) activity was generally moderate to high in parts of Africa, the Americas, Asia, Europe and Oceania. In Africa, local and regional outbreaks were reported in February and March in Egypt, Madagascar and Tunisia and during July and August in South Africa. In the Americas, local and regional outbreaks were reported by Canada, Mexico and the United States of America between February and March, while regional outbreaks occurred in a number of South American countries (Bolivia (Plurinational State of), Brazil, Colombia, Paraguay and Peru) from May onwards. Widespread outbreaks occurred in Chile from June to August. In Asia regional outbreaks were reported by China, Japan and the Republic of Korea in February and March, in Singapore during June, and in Nepal in August. There were widespread outbreaks in Japan in February, Georgia and Israel in February and March, and Cambodia from May to July. In Europe, many countries reported regional or widespread outbreaks of A(H3N2) between February and April with co-circulation of A(H1N1)pdm09 virus. In Oceania, sporadic activity occurred from February until April. Regional outbreaks were reported in Australia from May until August with co-circulation of both A(H1N1)pdm09 and influenza B viruses. In September widespread A(H3N2) outbreaks occurred in Australia and regional outbreaks occurred in New Caledonia and New Zealand.

Influenza B

In general influenza B activity was low in most of Africa and Europe with the exception of the Democratic Republic of the Congo and Egypt where regional outbreaks occurred in February and May respectively. In Asia, widespread and regional outbreaks occurred in Japan from February until May. Regional outbreaks were reported by China in February and March and by

the Republic of Korea from February to April. Regional and widespread activity occurred in Canada from February to May. In Central and South America regional activity was reported in Paraguay from May to July, El Salvador in June, Brazil in July and August, and Nicaragua in September. In Oceania, regional outbreaks occurred in Australia from July onwards.

(Abridged from the Weekly Epidemiological Record, 2014 89(41):441-456).

Zoonotic influenza infections

From 18 February 2014 to 23 September 2014, 15 confirmed human cases of A(H5N1), 7 of which were fatal, were reported from Cambodia, China, Egypt and Indonesia. Highly pathogenic avian influenza A(H5N1) is present in poultry in these countries. Since December 2003, a total of 667 human cases with 393 deaths have been confirmed in 16 countries3. To date there has been no evidence of sustained human-to-human transmission. In addition a single fatal case of A(H5N6) was reported in China. This was the first reported human infection with this virus.

During this period 99 additional cases of avian influenza A(H7N9) virus infection were reported in China. Since February 2013, a total of 454 cases with at least 171 deaths have been confirmed.

Two cases of non-fatal A(H3N2)v were reported in the United States of America. No cases of A(H9N2) or A(H10N8) were reported in this period. *(Abridged from the Weekly Epidemiological Record, 2014 89(41):441-456).*

The WHO Collaborating Centre for Reference and Research on Influenza in Melbourne, Australia (Melbourne WHOCC) analysed influenza isolates received from 1 February to 16 September 2014. Influenza A(H1N1)pdm09 virus was the predominant strain which accounted for 61.3% (1240/2024) of isolates, while 26.0% (527/2024) were A(H3N2) and 12.7% (257/2024) were influenza B (Table 3.7 and Figure 2.1 in Appendix 2).

1.2. Influenza activity in Australia, February to September 2014

Influenza activity in Australia in 2014 was moderate 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 2014 may be different from that of previous years. The national case definition for ILI is presentation with fever, cough and fatigue. Overall, the rate of ILI consultations had a sustained peak during August, which was similar to the peak levels observed in 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 regional variations: the Western Australian emergency department presentation rates were within the range reported in recent seasons; the New South Wales data showed the highest activity since 2010; the Northern Territory data showed the similar trend observed in 2011.

- **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, the rates of fever and cough among participants in 2014 peaked in the middle of August (week ending 24 August), close to the peak rate observed 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 26 September 2014, there have been 59,867 laboratory-confirmed notifications of influenza diagnosed and reported to NNDSS. Of these, 90% cases were reported as influenza A (71% influenza A (unsubtyped), 9% A(H3N2) and 11% A(H1N1)pdm09) and 10% were influenza B. In addition, most notifications have been highest among those aged less than 5 years with a secondary peak in those aged between 30 and 44 years. Overall, the 2014 notification data have been the highest since 2010.

- **WHOCC Laboratory Surveillance.** This is conducted by the Melbourne WHOCC. A total of 1329 influenza viruses from Australia were received for analysis at the Melbourne WHOCC from 1 January to 2 October 2014. 71% were A(H1N1)pdm09 viruses, 19% influenza A(H3N2), 10% influenza B. The majority of influenza B viruses were from B/Yamagata lineage. Regarding oseltamivir-resistant viruses, one influenza A(H1N1)pdm09 virus (out of 1187 tested) has 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 43% of all ILI patients presenting to ASPREN-based sentinel GPs were swabbed for laboratory testing. From the report during a period of 13 to 26 September 2014, 16% 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 (76%) have been with influenza A. Around 43% of the cases were aged 16 to less than 65 years and over (median age 51 years) and 73% of all cases have known medical co-morbidities. 10% of influenza patients have been admitted directly to ICU.

- **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 28 September 2014, there were 2028 admissions, including 251 to intensive care units. The age distribution of confirmed influenza admissions in 2014 showed a bimodal distribution peaking in the 0– 9 and the 60– 69 years. Of those influenza infections that have been subtyped, these have mostly been A(H1N1)pdm09.

- **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 30 September 2014, there have been 71 hospitalisations associated with severe influenza complications in children, with 19 of these cases in the most recent fortnight. The median age of these cases was 3 years. Almost all (97%) of cases were associated with influenza A infections, including one influenza A&B co-infection; 32% admitted to ICU; and 31% were reported as having underlying chronic conditions.

- **Death associated with influenza and pneumonia.** Nationally reported influenza deaths are notified by jurisdictions to the NNDSS. So far in 2014, 57 influenza associated deaths have been notified to the NNDSS, with a median age of 69 years (range 5 to 96 years). Influenza type A infection was reported in all of the influenza associated deaths. 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 does not represent the true mortality impact associated with this disease.

(Abridged from the Australian Influenza Surveillance Report 2014, 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 2014

Influenza surveillance in South Africa in 2014 consisted of 5 main surveillance programmes:

- **Viral watch programme.** This program was established in 1984. It focuses on patients with ILI consultations seen mainly by general practitioners as well as a few paediatricians and primary health care clinics across the country. In 2014, a total of 168 doctors and primary health care nurses have been recruited across the country to participate in the ILI sentinel surveillance programme from all nine provinces.

- **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 6 hospitals covering all nine provinces and focuses on hospitalised patients with severe acute respiratory-tract infection (SARI) across the country.
- **ILI surveillance in public health clinics.** This programme was established in 2012. It systematically enrols patients meeting a clinical case definition of ILI. Patients are enrolled at 6 primary health care clinics in two provinces of South Africa. Detailed epidemiologic data are collected on all patients.

- **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. The 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 2014, a total of 4038 suspected influenza specimens were processed up to week 34. Of which, 765 influenza viruses were detected. This gave an overall detection rate of 19% compared with 20% in 2013. Among all detected influenza viruses, influenza A was detected in 667 and influenza B in 98. Influenza A(H3N2)pdm09 was the predominant strain (77%, 586/765) followed the A(H1N1)pdm09 (11%, 82/765) and influenza B (12%, 98/765).

A total of 35 seasonal influenza A(H3N2) viruses were sequenced and they were clustered genetically in group 3 of the seven lineages, particularly in subgroup 3C.3. A total of 32 A(H3N2) virus isolates were characterised antigenically by hemagglutination inhibition assay (HI) and 5 (16%, 5/32) had reduced to the A/Texas/50/2012 reference antiserum.

A total of 5 influenza A(H1N1)pdm09 viruses were sequenced and most of them were clustered genetically in subgroup 6B and 6C. A total of 6 A(H1N1)pdm09 virus isolates were characterised antigenically by HI assay and all showed normal reactivity to the A/California/7/2009 reference antiserum.

A total of 76 influenza B viruses (78%, 76/98) were lineage typed as B/Yamagata lineage by real-time PCR. Two (2%, 2/98) were B/Victoria lineage. Influenza B sequencing is still in progress.

No neuraminidase inhibitor resistant influenza viruses have been detected for 15 tested viruses by using phenotypic assay against oseltamivir and zanamivir.

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

2. INFLUENZA ACTIVITY IN NEW ZEALAND IN 2014

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, isolation of the virus, or direct detection of viral antigen. Influenza viruses are typed and subtyped as influenza A, B, seasonal A(H3N2), or A(H1N1)pdm09. 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 2014, 60 sentinel practices were recruited from 17 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 56, with an average patient population roll of 315 247 approximately 7.1% of the New Zealand population. From week 18 (the week ending 4 May 2014) through week 35 (the week ending 31 August 2014), a total of 1637 consultations for ILI were reported from the 17 DHBs. It is estimated that ILI resulting in a visit to a general practitioner affected over 23 217 New Zealanders (0.52% of total population). The cumulative incidence of ILI consultation during this period was 519.3 per 100 000 population. The average weekly ILI consultation rate during this period was 31.3 per 100 000 population.

Weekly national ILI consultation rates for the study period were compared with the average epidemic curve in 2000-2013 (excluding 2009) and also compared with the same period in 2010 and 2013 (Figures 1 & 2). From week 18 (ending 4 May 2014) through week 35 (ending 31 August 2014), influenza consultation activity remained below the seasonal threshold level from weeks 18 to 26 in 2014, and then increased to a peak in week 32 (4–10 August 2014), with a consultation rate of 52.7 per 100 000 patient population. The peak occurred a five weeks earlier than the first peak in 2013 (week 37, 47.3 per 100 000 patient population) and a week later than the peak in 2012 (week 31, 154.1 per 100 000 patient population).

Figure 1. Weekly consultation rates for influenza-like illness in New Zealand in 2014 in comparison to the average epidemic curve in 2000–2013 (excluding 2009)

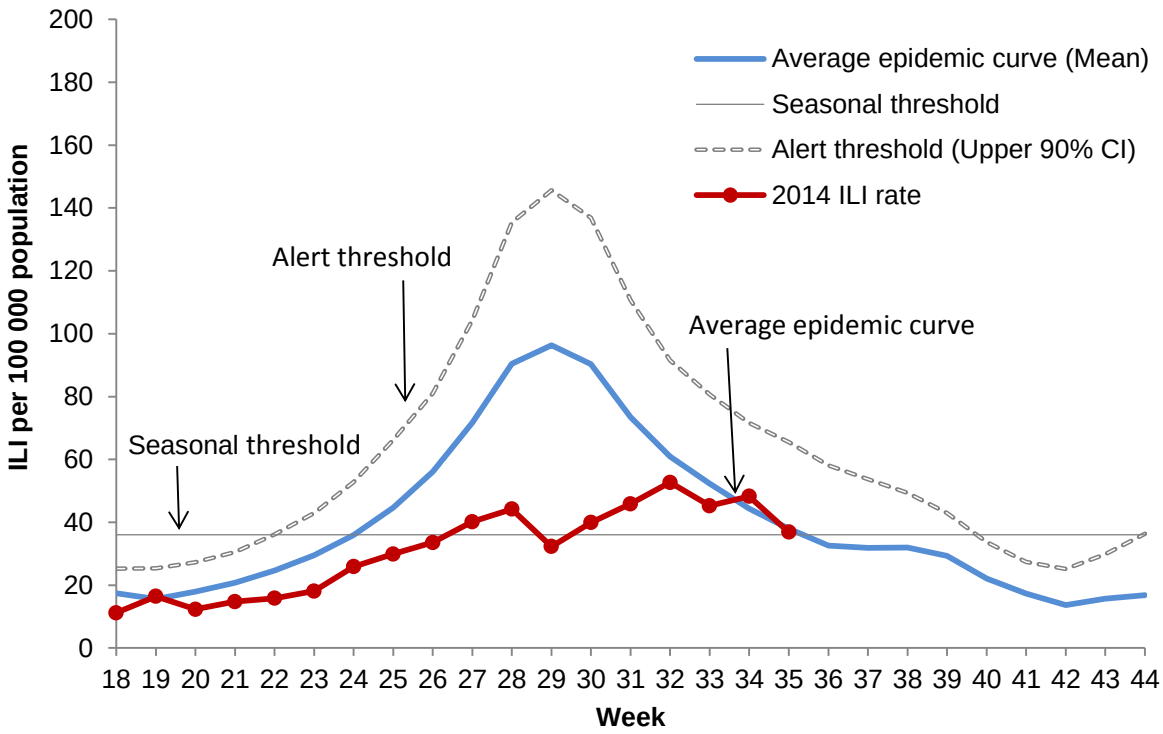
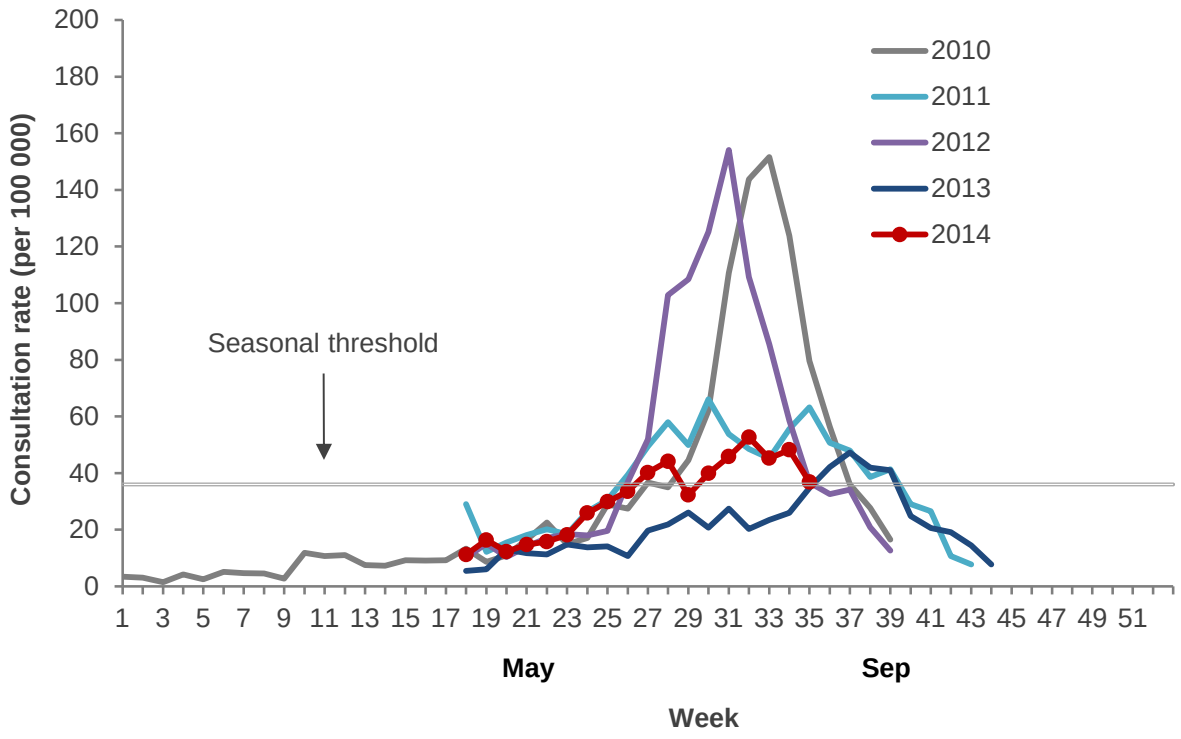
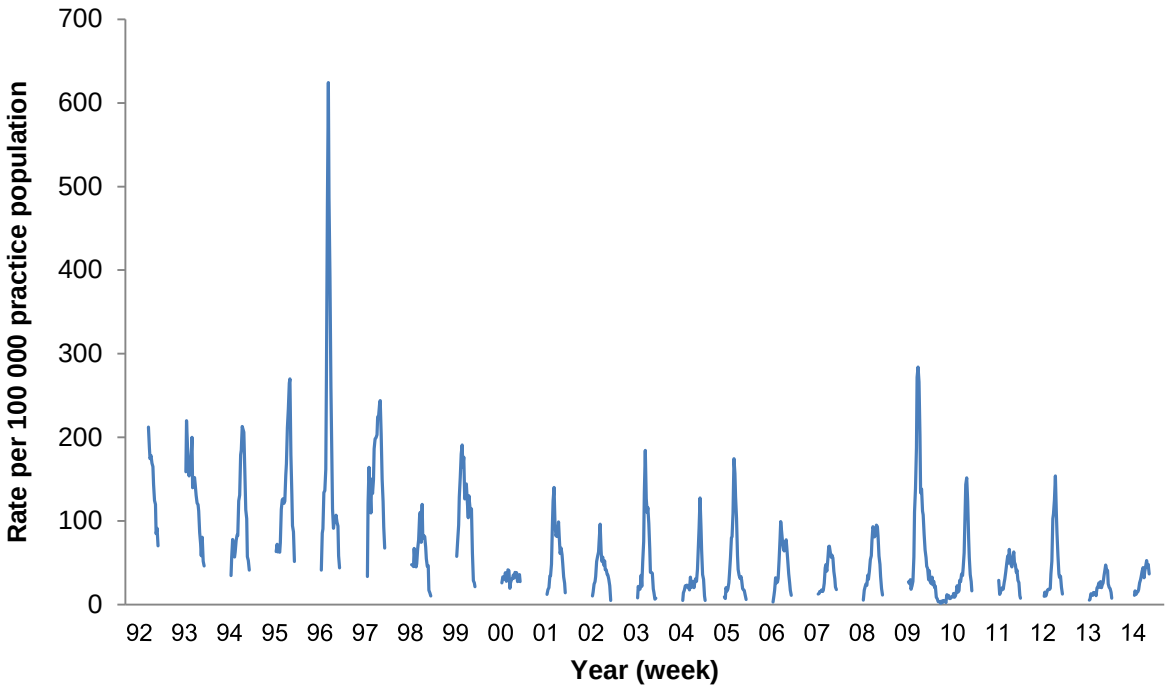


Figure 2. Weekly Consultation Rates for Influenza-like Illness in New Zealand, 2010–2014



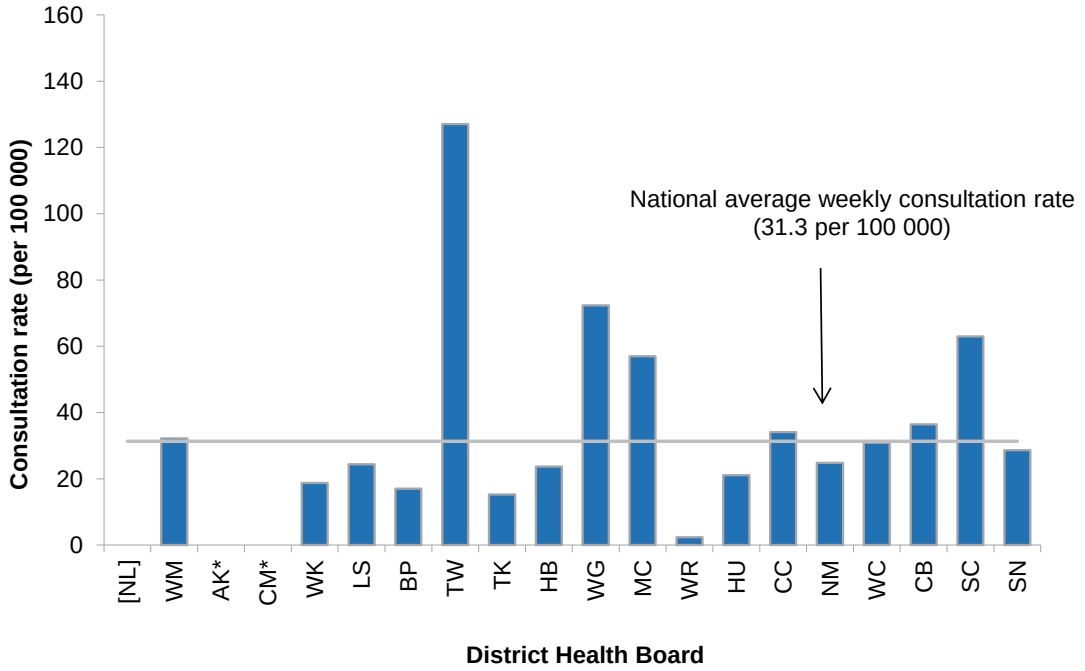
Weekly national ILI consultation rates for the study period were compared with the weekly consultation rates for ILI in 1992–2013 (Figure 3). The peak ILI rate in 2014 was the third lowest during 1992–2014.

Figure 3. Weekly Consultation Rates for Influenza-like Illness in New Zealand, 1992–2014



As in previous years, 2014 consultation rates for ILI varied greatly among DHBs (Figure 4). From week 18 (the week ending 4 May 2014) through week 35 (the week ending 31 August 2014), Tairawhiti DHB had the highest consultation rate (127.0 per 100 000), followed by Whanganui (72.3 per 100 000), and South Canterbury (63.0 per 100 000).

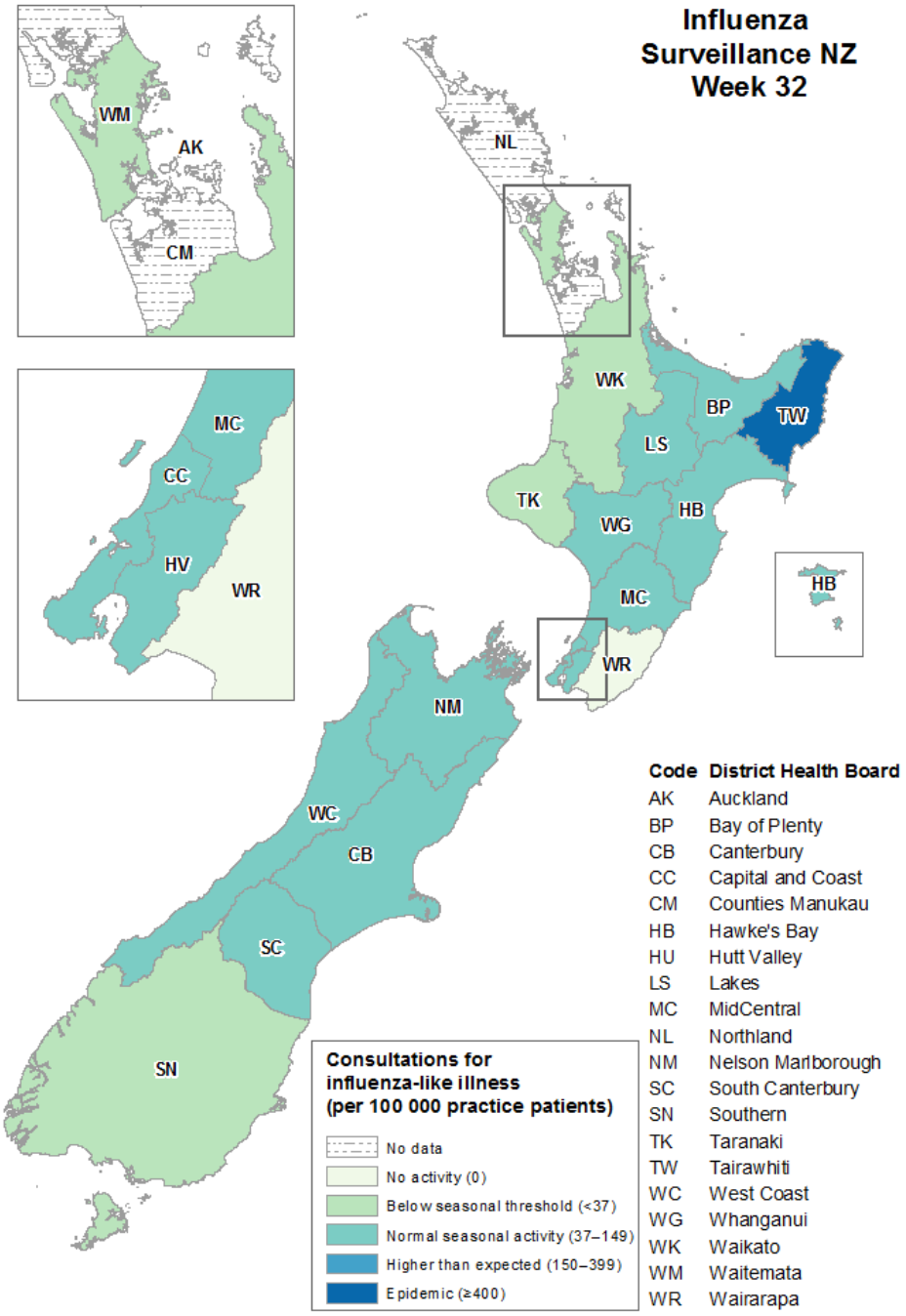
Figure 4. Average weekly consultation rate for influenza-like illness by District Health Board, 2014



[ ] DHB not participating in the sentinel surveillance. * Participating in SHIVERS.

Figure 5 shows ILI consultations among DHBs during the peak week 32 (4–10 August 2014). Tairawhiti DHB had the highest consultation rate (550.5 per 100 000, 9 cases) followed by Whanganui (105.8 per 100 000, 5 cases), and MidCentral (103.4 per 100 000, 9 cases).

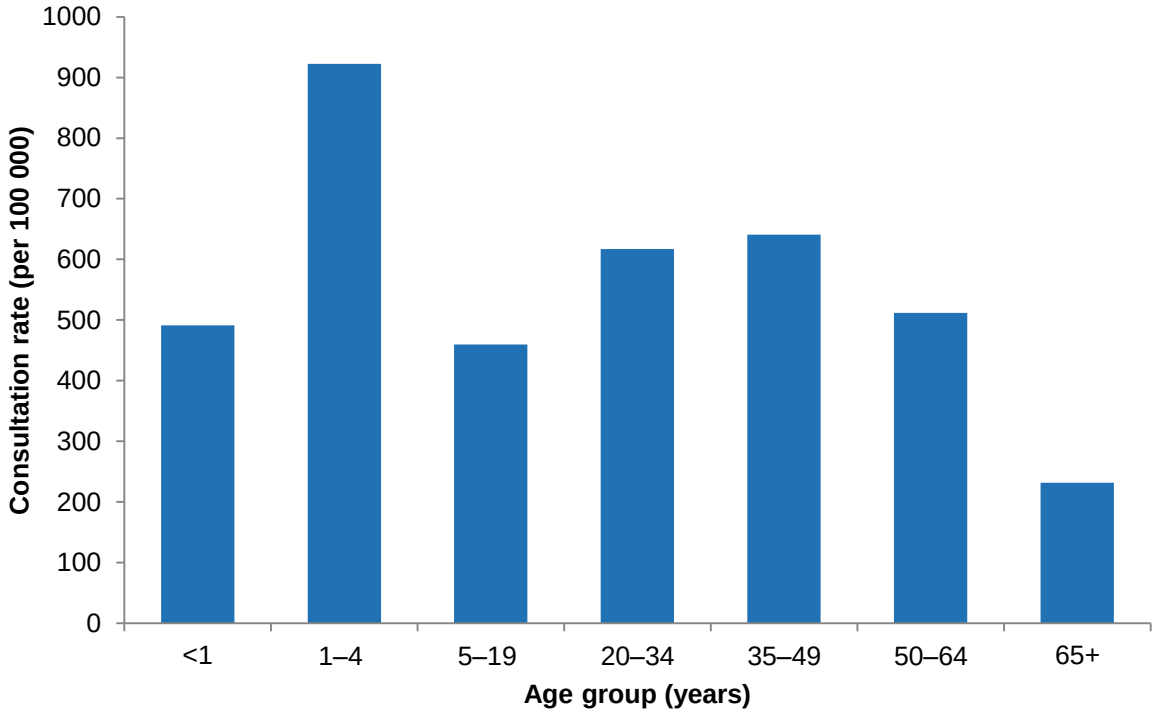
Figure 5. ILI consultation rates by District Health Board for the peak week 32 (4–10 August 2014)



A rate of 37–149 per 100 000 is used to describe normal seasonal influenza activity based on the 25th and 75th percentiles of the ILI data (2000–2013 excluding 2009). A rate of 150–399 is used to describe higher than expected influenza activity (i.e. 2009 pandemic). A rate of ≥400 is used to describe an epidemic level of influenza activity (i.e. 1996 experience).

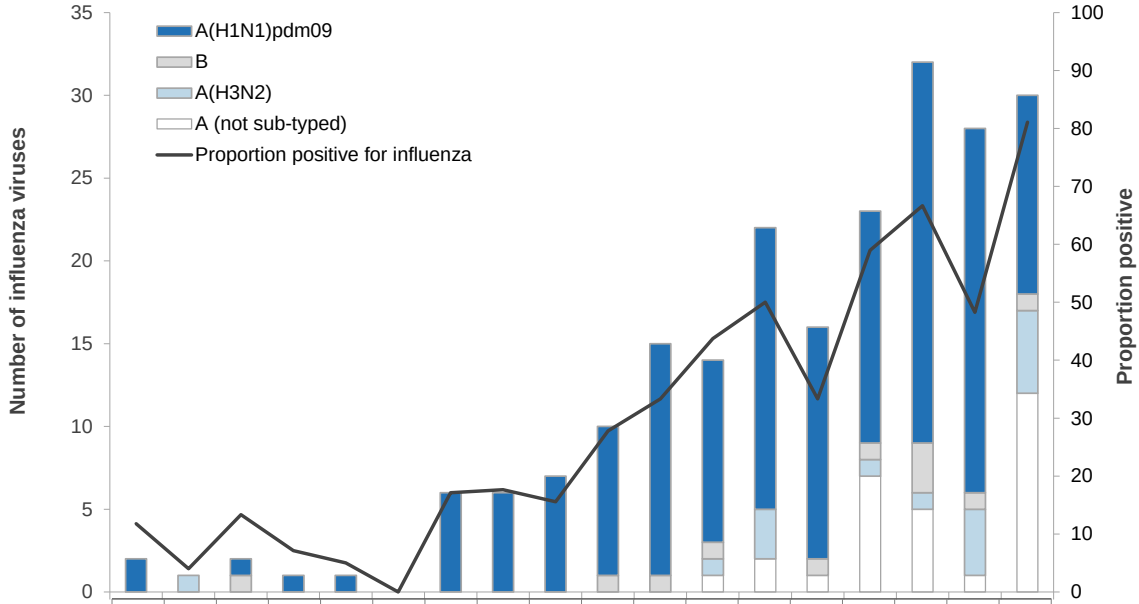
From week 18 (the week ending 4 May 2014) through week 35 (the week ending 31 August 2014), the highest cumulative ILI consultation rates were recorded among children and aged 1–4 years (922.2 per 100 000 age group population) and those aged 35–49 years (640.6 per 100 000) and 20–34 years (617.1 per 100 000) (Figure 6). The lowest rates were in the ≥65 years (231.8 per 100 000).

Figure 6. Sentinel Average Cumulative Consultation Rates for ILI by Age Group, 2014



A total of 616 swabs were sent to virology laboratories from sentinel GPs during week 18 (ending 4 May 2014) through week 35 (ending 31 August 2014). From these swabs, 216 influenza viruses were identified. This gave an overall detection rate of 35.1%. The predominant strain was influenza A(H1N1)pdm09 (160) including 29 A/California/7/2009, followed by B (11) including one B/Massachusetts/02/2012 (belonging to the B/Yamagata lineage), A(H3N2) (16) including one A/Texas/50/2012. There were 29 A (not sub-typed) (Figure 7). Influenza A(H1N1)pdm09 viruses have been the predominant strain for the most of the winter season in 2014.

Figure 7. Number of influenza viruses reported by type and week from sentinel surveillance for weeks 18–35 in 2014



	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
A (not sub-typed)	0	0	0	0	0		0	0	0	0	0	1	2	1	7	5	1	12
A(H3N2)	0	1	0	0	0	0	0	0	0	0	0	1	3	0	1	1	4	5
B	0	0	1	0	0	0	0	0	0	1	1	1	0	1	1	3	1	1
A(H1N1)pdm09	2	0	1	1	1	0	6	6	7	9	14	11	17	14	14	23	22	12

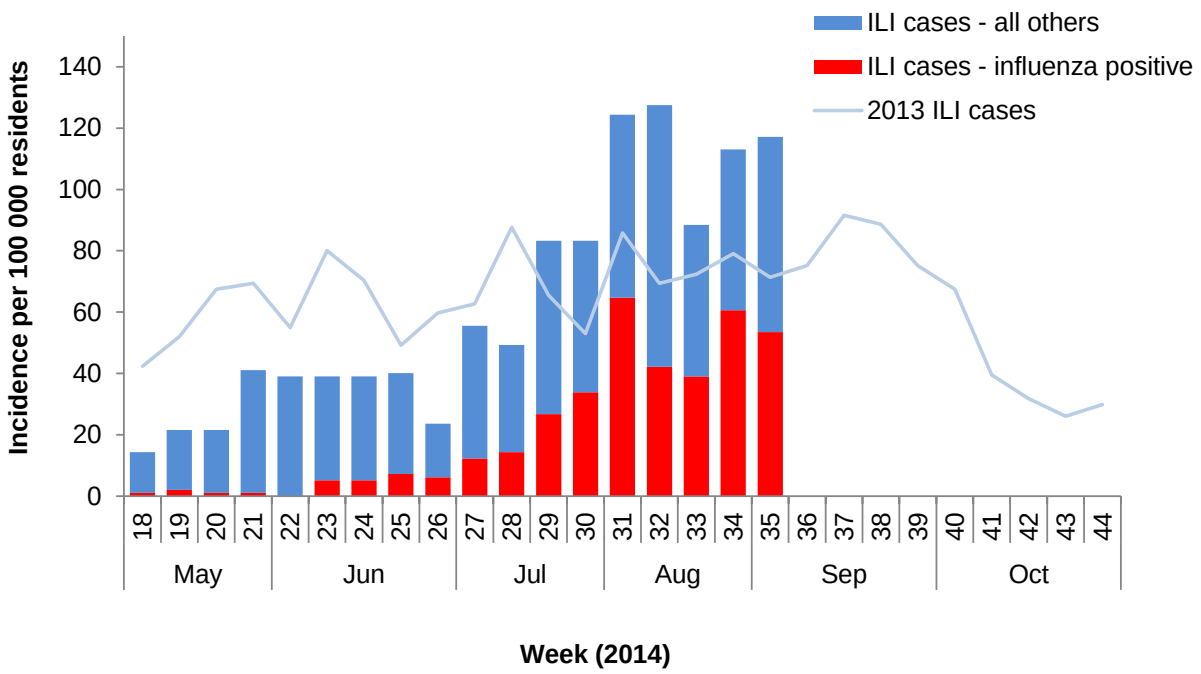
2.1.2 SHIVERS sentinel practice based influenza-like illness (ILI) surveillance

In SHIVERS sentinel practices, GPs and/or practice nurses screened every patient who was seeking medical attention for an ILI. The case definition was "*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 a GP consultation*". If a consultation-seeking patient met this definition, a respiratory specimen (nasopharyngeal or throat swab) was collected, to test for influenza and other respiratory pathogens. Information on the patient's demography, clinical history, co-morbidities, vaccination history, regular medication and pregnancy status was also collected. Obesity was determined by visual assessment.

Totals of patients meeting the ILI definition, numbers tested, number positive for influenza viruses, number of the enrolled patients, and total consultations, were collected. This allowed calculation of population-based incidence for ILI and associated influenza, overall and stratified by age, sex, ethnicity and socio-economic status, among the ADHB and CMDHB resident population (from 2006 census data). For example, the overall ILI incidence was calculated using the ILI patients who were enrolled in sentinel practices, residing in ADHB and CMDHB, divided by the total enrolled patient population. Incidence rates were calculated, along with 95% confidence intervals (95%CI). In addition, this allowed the calculation of the proportion of ILI and associated influenza among total consultations, by overall and stratified patients, regardless of residence or enrolment status. For example, the overall proportion of ILI consultations was calculated using total ILI patients, divided by total consultations, regardless of their enrolment and residence status.

SHIVERS community-based ILI surveillance is in its second year, which started on 28 April 2014. Figure 8 shows weekly resident ILI and influenza positive cases from week 18 to week 35.

Figure 8. Weekly resident ILI and influenza positive cases, 28 April to 31 August 2014



From 28 April 2013 to 31 August 2014, a total of 1230 ILI cases were identified. 18% were children aged less than 5 years and 5.9% were adults 65 years and older. 1091 were enrolled patients residing in ADHB and CMDHB. This gives a cumulative ILI incidence of 1121.4 per 100 000 patient population (Table 1). Among the 1039 tested ILI cases who were enrolled ADHB and CMDHB residents, 366 (35.2%) were positive for influenza viruses. This gives ILI related influenza incidence of 376.2 per 100 000 patient population.

Table 2. Demographic characteristics of ILI and influenza cases, 28 April–31 August 2014

Characteristics	ILI & influenza cases among sentinel practices			ILI & influenza cases among ADHB & CMDHB residents			
	ILI cases	Influenza cases	Prop Influenza positive[1] (%)	ILI cases	ILI incidence (per 100 000)	Influenza cases	Influenza incidence (per 100 000)
Overall	**1230**	**401**	**34.3**	**1091**	**1121.4**	**366**	**376.2**
Age group (years)							
<1	36	4	11.1	31	2691.0	4	347.2
1 to 4	185	61	33.0	174	2574.3	57	843.3
5 to 19	286	87	30.4	266	1200.7	84	379.2
20 to 34	246	88	35.8	203	993.3	76	371.9
35 to 49	232	81	34.9	204	940.4	75	345.7
50 to 64	172	65	37.8	149	969.8	57	371.0
65 to 79	63	12	19.0	54	729.0	10	135.0
80 and over	10	3	30.0	10	429.9	3	129.0
Unknown	0	0	-	0	-	0	-
Ethnicity							
Maori	68	22	32.4	58	847.2	20	292.1
Pacific Peoples	190	72	37.9	154	670.4	65	283.0
Asians	208	72	34.6	184	1199.9	65	423.9
European and others	762	234	30.7	693	1329.7	215	412.5
Unknown	0	0	-	0	0.0	0	0.0
DHB							
Auckland	862	280	32.5	844	1374.1	277	451.0
Counties Manukau	248	89	35.9	238	663.5	85	237.0
Sex							
Female	716	215	30.0	630	1224.4	198	384.8
Male	514	186	36.2	461	1005.8	168	366.5
Unknown	0	0	-	0	-	0	-

Between 28 April to 31 August 2014, a total of 1172 ILI specimens were tested for influenza viruses (Table 2) and 402 (34.3%) were positive with the following viruses: influenza A(H1N1)pdm09 (228) including A/California/7/2009 (120), A(H3N2) (20) including A/Texas/50/2012 (7), influenza A (not sub-typed) (93), and influenza B (61) including B/Yamagata lineage (48) and B/Victoria lineage (2). There were 21 co-detections of influenza and non-influenza viruses among ILI specimens. Influenza A(H1N1)pdm09 was the predominant strain.

Between 28 April to 31 August 2014, a total of 1011 ILI specimens were tested for non-influenza viruses and 362 (35.8%) were positive with the following viruses: respiratory syncytial virus (76), rhinovirus (150), parainfluenza virus type 1 (44), parainfluenza virus type 2 (1), parainfluenza virus type 3 (6), adenovirus (33), and human metapneumovirus (82). 336 ILI specimens (92.8%) had single virus detection and 26 (7.2%) had multiple virus detection.

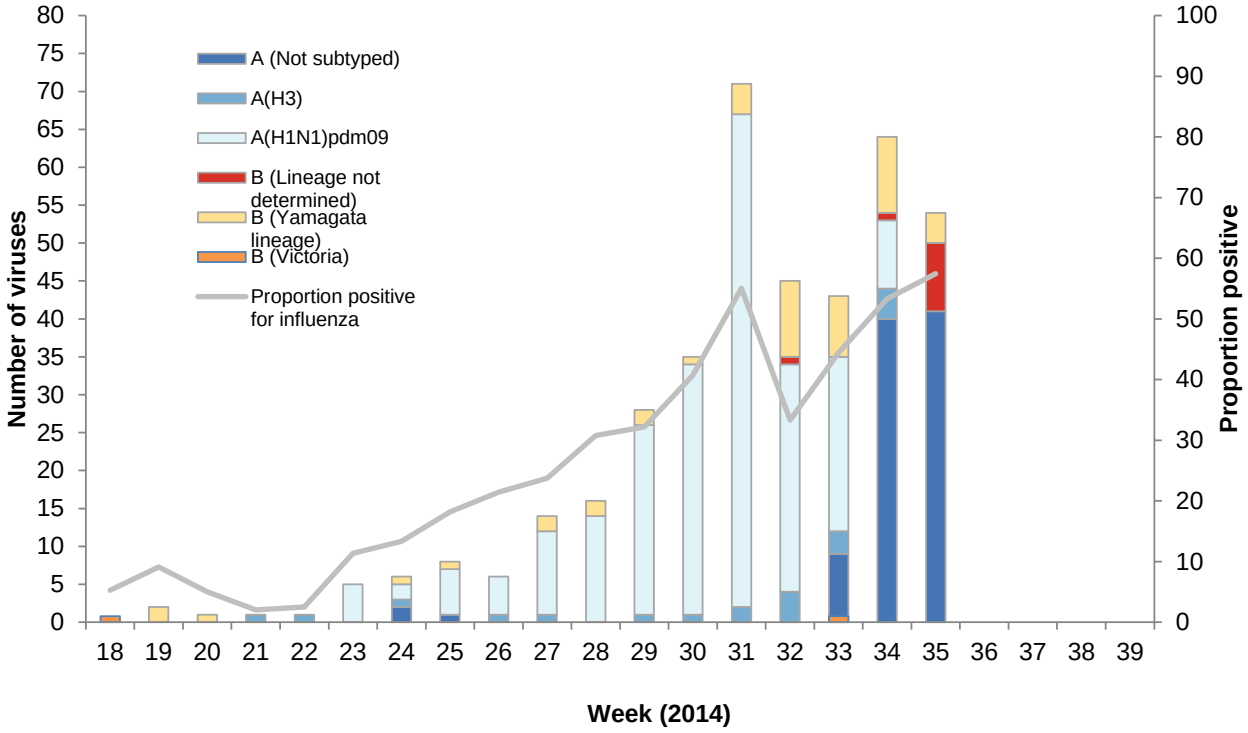
Table 3. Influenza and non-influenza respiratory viruses among ILI cases, 28 April 2014 to 31 August 2014

Influenza viruses	**ILI**
	Cases
No. of specimens tested	1172
No. of positive specimens (%)[1]	402 (34.3)
Influenza A	341
A (not subtyped)	93
A (H1N1)pdm09	228
A(H1N1)pdm09 by PCR	108
A/California/7/2009 (H1N1) - like	120
A(H3N2)	20
A(H3N2) by PCR	13
A/Texas/50/2012 (H3N2) - like	7
Influenza B	61
B (lineage not determined)	11
B/Yamagata lineage	48
B/Yamagata lineage by PCR	26
B/Massachusetts/2/2012 - like	22
B/Victoria lineage	2
B/Victoria lineage by PCR	0
B/Brisbane/60/2008 - like	2
Influenza and non-influenza co-detection (% +ve)	21 (5.2)
Non-influenza respiratory viruses	**ILI**
	Cases
No. of specimens tested	1011
No. of positive specimens (%)[1]	362 (35.8)
Respiratory syncytial virus (RSV)	76
Parainfluenza 1 (PIV1)	44
Parainfluenza 2 (PIV2)	1
Parainfluenza 3 (PIV3)	6
Rhinovirus (RV)	150
Adenovirus (AdV)	33
Human metapneumovirus (hMPV)	82
Single virus detection (% of positives)	336 (92.8)
Multiple virus detection (% of positives)	26 (7.2)

[1]Number of specimens positive for at least one of the listed viruses; note a specimen may be positive for more than one virus

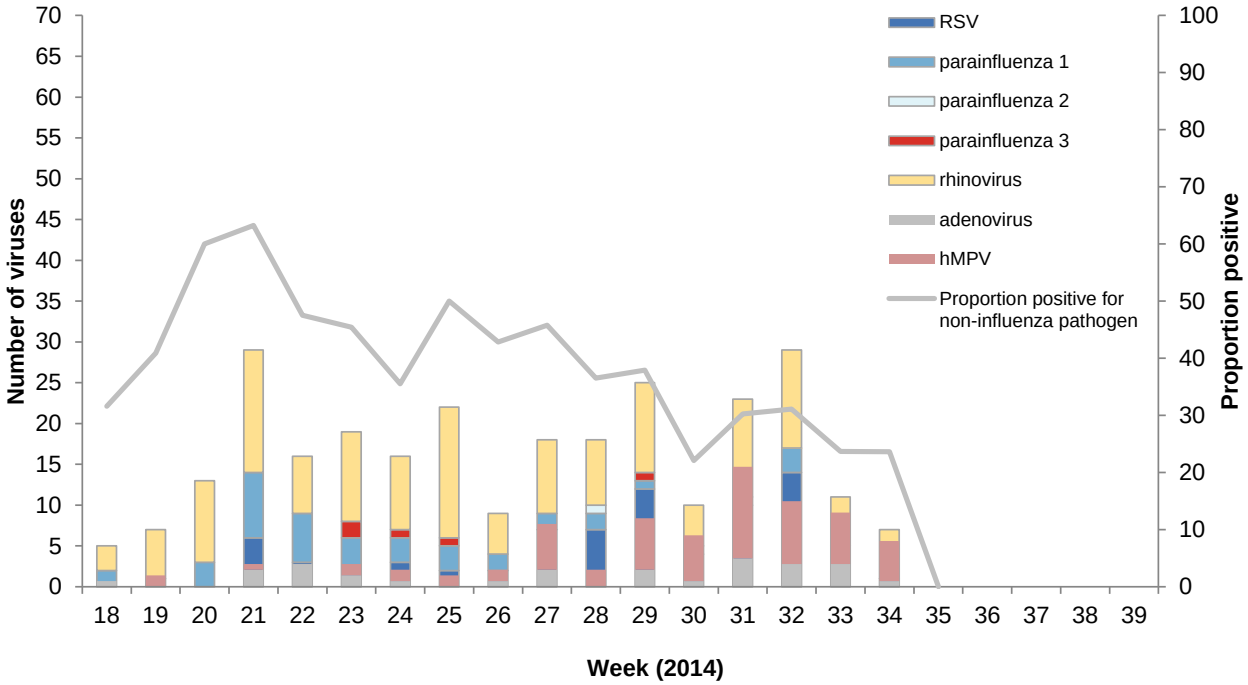
During 28 April to 31 August 2014, the temporal distribution of the number and proportion of the influenza viruses and non-influenza respiratory viruses is shown in Figures 9 & 10. Influenza A(H1N1)pdm09 was the predominant strain during this period.

Figure 9. Temporal distribution of the number and proportion of influenza viruses from ILI specimens, 28 April to 31 August 2014, by type and week



* Figures for recent weeks will be underestimates due to time lag in receiving laboratory test results.

Figure 10. Temporal distribution of the number and proportion of non-influenza viruses from ILI specimens, 28 April to 31 August 2014, by type and week



* Figures for recent weeks will be underestimates due to time lag in receiving laboratory test results.

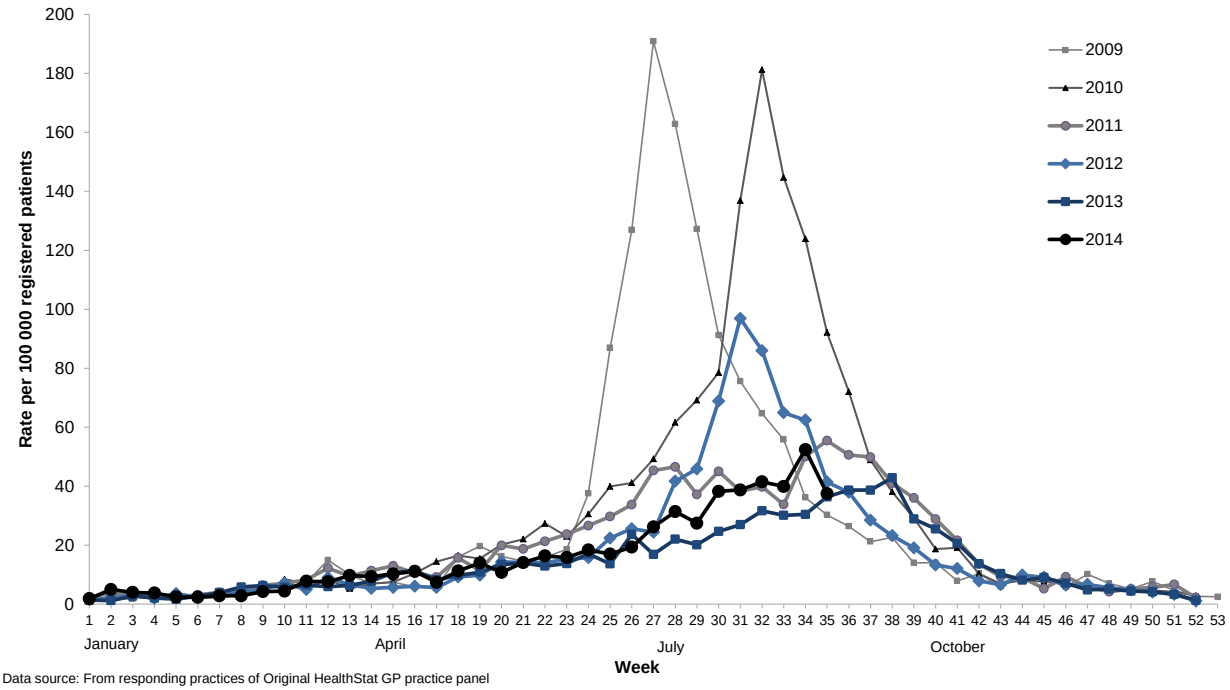
2.1.3 HealthStat GP-based surveillance

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). If the daily call count exceeds a threshold a flag is signalled.

Figure 11 below shows the weekly rate of ILI per 100 000 registered population, 2009–2014. The 2009 and 2010 data shows major difference 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.

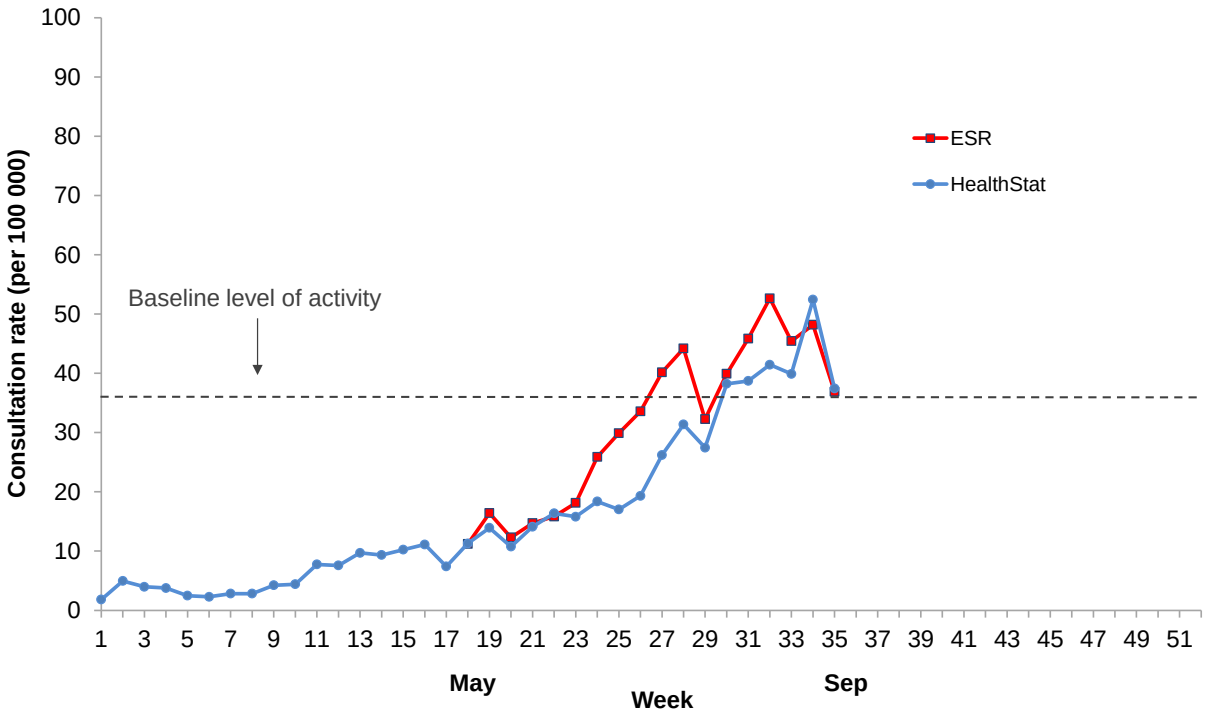
Figure 11. HealthStat ILI consultation rates by week, 2009–2014



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

Overall, the trend of the 2014 data is similar to ESR's sentinel GP surveillance (Figure 12 below).

Figure 12. ESR and HealthStat sentinel GP-based ILI rates comparison, 2014



2.1.4 Healthline

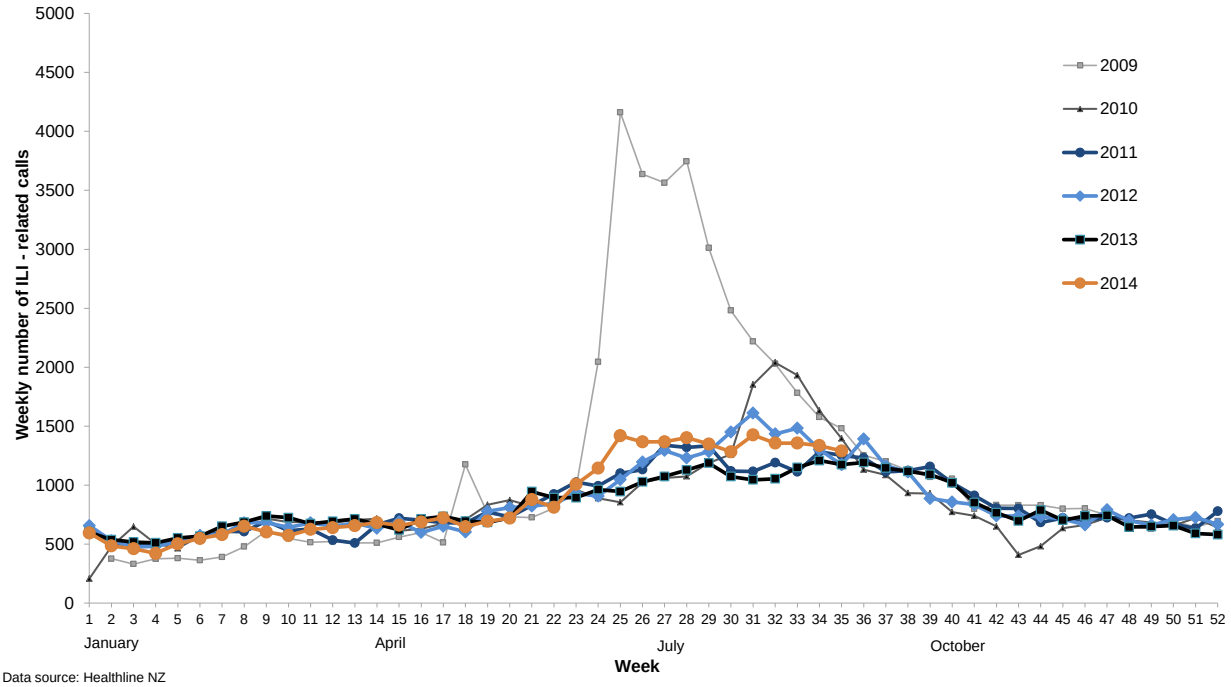
Healthline is the free national 0800 24 hour telephone health advice service funded by the Ministry of Health. Calls made to Healthline are triaged using electronic clinical decision support software. Data collected are daily counts of all symptomatic calls made to Healthline and those triaged for Influenza-Like-Illness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

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 13 shows the weekly number of calls to Healthline for ILI during 2009–2013. Healthline calls in 2014 were slightly higher than 2013 and lower than 2012.

Figure 13. Weekly number of ILI-related calls to Healthline, 2009–2014



Data source: Healthline NZ

2.2 Hospital-based surveillance

2.2.1 SHIVERS hospital-based Severe Acute Respiratory Illness (SARI) surveillance

Inpatients with suspected respiratory infections admitted overnight to any of the four District Health Board hospitals (Auckland City Hospital and the associated Starship Children's Hospital, Middlemore Hospital and the associated Kidz First Children's Hospital) in the two DHBs, were screened by research nurses each day. Overnight admission is defined as: "*A patient who is admitted under a medical team, and to a hospital ward or assessment unit*". Case ascertainment followed a surveillance algorithm. The presence of the components of the case definition was determined through a combination of reviewing the clinician's admission diagnoses and by interviewing patients about their presenting symptoms. Records of all patients admitted overnight to medical wards were reviewed daily to identify anyone with a suspected respiratory infection. These patients were categorised into one of ten admission diagnostic syndrome groups. Research nurses then interviewed the patients and documented the components of the case definition that were present and differentiated patients into SARI and non-SARI cases.

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 met the SARI case definition, a respiratory sample was collected

to test for influenza and other respiratory pathogens. In addition, patient information was captured via a case report form which included patient demographics, presenting symptoms and illness, pre-hospital healthcare, medication usage, influenza vaccination history, co-morbidities, disease course and outcome, including major treatments, ICU admission and mortality, epidemiologic risk factors and laboratory results.

The total numbers of all new hospital inpatient acute admissions and newly assessed and tested patients, including ICU admissions and deaths were collected. This allowed calculation of population-based incidence for SARI and associated influenza cases overall and stratified by age, sex, ethnicity and socio-economic status among the ADHB and CMDHB resident population (from 2006 census data). Incidence rates were calculated along with 95% confidence intervals (95%CI). In addition, this allowed the calculation of the proportion of SARI and associated influenza cases, including ICU admissions and deaths, by overall and stratified patients, among all acute admissions regardless of residence status. An acute admission is defined as an unplanned admission on the day of presentation at the admitting health care facility. Admission may have been from the emergency or outpatient departments of the health care facility, a transfer from another facility or a referral from primary care.

A case may have more than one specimen taken for influenza and non-influenza virus testing. The number of specimens can therefore differ from the number of cases and specimens and cases may be reported separately.

From 28 April 2014 to 31 August 2014, there were 49581 acute admissions to ADHB and CMDHB hospitals. A total of 3473 patients with suspected respiratory infections were assessed in these hospitals. Of these, 1676 (48.3%) patients met the SARI case definition. Among these SARI patients, 213 (21.8%) had influenza viruses detected. Table 3 shows the admission diagnoses/syndromes of the suspected respiratory infections and SARI cases and influenza positive cases since start of the SARI surveillance.

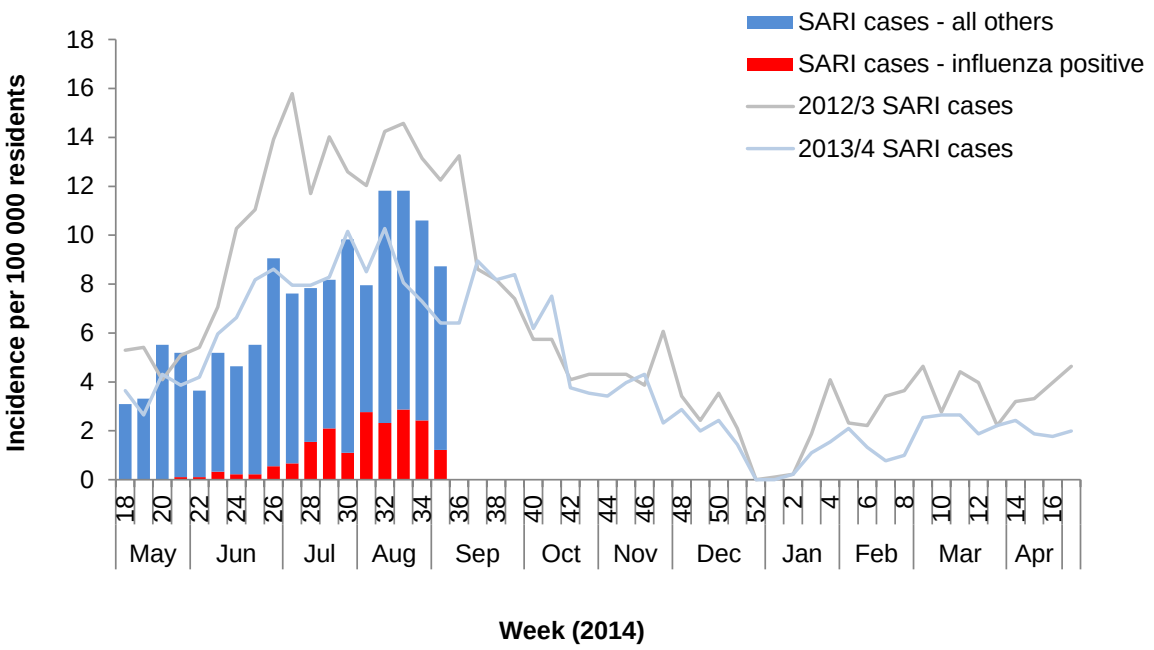
Table 4. Admission diagnoses/syndromes of suspected respiratory infections and SARI cases, 28 April to 17 August 2014

Conditions	Acute respiratory infection cases				SARI cases			Non-SARI cases		
	SHIVERS assessed cases (%)	SARI cases	Non-SARI cases	Proportion SARI (%)	Tested SARI	Flu +ve	Proportion flu +ve (%)	Tested non-SARI	Flu +ve	Proportion flu +ve (%)
Admission Diagnosis/Syndrome										
Suspected acute upper respiratory tract infection[1]	188 (5.4)	98	90	52.1	59	14	23.7	38	3	7.9
Suspected croup	28 (0.8)	17	11	60.7	7	2	28.6	4	0	0.0
Suspected bronchiolitis (in children)	544 (15.7)	300	244	55.1	193	22	11.4	116	5	4.3
Suspected pneumonia	1127 (32.5)	710	417	63.0	409	87	21.3	158	27	17.1
Exacerbation of asthma	288 (8.3)	90	198	31.3	63	17	27.0	74	6	8.1
Exacerbation of childhood chronic lung disease[2]	66 (1.9)	23	43	34.8	13	3	23.1	8	0	0.0
Exacerbation of adult chronic lung disease[3]	348 (10.0)	106	242	30.5	56	13	23.2	80	12	15.0
Respiratory failure	28 (0.8)	11	17	39.3	1	0	0.0	2	0	0.0
Febrile illness with respiratory symptoms[4]	355 (10.2)	233	122	65.6	125	33	26.4	37	5	13.5
Other suspected acute respiratory infection	228 (6.6)	85	143	37.3	51	22	43.1	36	2	5.6
Not provided	272 (7.8)	2	270	0.7	1	0	0.0	75	3	4.0
TOTAL	3472 (100.0)	1675	1797	48.2	978	213	21.8	628	63	10.0

[1]Including coryza, pharyngitis; [2]Including bronchiectasis, cystic fibrosis; [3]Including COPD, emphysema, bronchitis; [4]Including shortness of breath

Of the 1676 SARI cases identified from 28 April 2014 to 31 August 2014, 1173 were residents of ADHB and CMDHB. 168 of the 823 tested resident SARI cases had influenza viruses (Figure 14).

Figure 14. Weekly resident SARI and influenza positive cases during 28 April to 31 August 2014 and previous seasons (2012/3 and 2013/4) SARI cases



During 28 April to 31 August 2014, the 1676 SARI cases give a SARI proportion of 33.8 per 1000 acute hospitalisations (Table 4). Of these SARI cases, 36% were children aged less than 5 years and 12.6% were adults 65 years and older. 107 SARI cases have been admitted to ICU and five deaths were reported during this period.

Of the 1676 SARI cases, 1173 were ADHB and CMDHB residents, giving the SARI incidence rate of 129.5 per 100 000 population (Table 4). Among the 823 tested SARI cases who were ADHB and CMDHB residents, 168 (20.4%) had positive influenza virus results. This gives a SARI related influenza incidence of 18.6 per 100 000 population.

Table 5. Demographic characteristics of SARI cases and related influenza cases, 28 April to 31 August 2014

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[1] (%)	SARI cases	SARI incidence (per 100 000)	Influenza Cases	Influenza incidence (per 100 000)
Overall	**49581**	**3473**	**1676 (48.3)**	**33.8**	**213 (21.8)**	**1173**	**129.5**	**168**	**18.6**
Age group (years)									
<1	2101		353	168	30 (12.3)	326	2413.7	29	214.7
1 to 4	4110		250	60.8	19 (11.0)	220	416.1	16	30.3
5 to 19	5772		98	17	9 (15.8)	74	38.4	7	3.6
20 to 34	9057		104	11.5	35 (46.7)	100	48.0	35	16.8
35 to 49	7573		106	14	28 (40.0)	99	51.8	27	14.1
50 to 64	8237		161	19.5	35 (31.0)	150	99.6	31	20.6
65 to 79	7573		143	18.9	21 (21.0)	138	188.8	21	28.7
80 and over	5158		68	13.2	3 (6.3)	66	281.7	2	8.5
Unknown	0		393		33 (33.0)	0	-	0	-
Ethnicity									
Maori	6720		270	40.2	39 (20.5)	242	243.3	36	36.2
Pacific Peoples	10502		515	49	79 (20.8)	482	349.3	73	52.9
Asians	7438		101	13.6	12 (18.5)	97	46.1	12	5.7
European and others	24545		397	16.2	50 (20.4)	352	87.7	47	11.7
Unknown	363		393	0	33 (33.0)	0	0.0	0	0.0
Hospitals									
ADHB	27497	1668	724	26.3	44 (15.8)	450	103.1	38	8.7
CMDHB	22084	1805	952	43.1	169 (24.1)	723	154.1	130	27.7
Sex									
Female	26118		637	24.4	106 (23.9)	588	126.4	102	21.9
Male	23463		646	27.5	74 (17.0)	585	132.8	66	15.0
Unknown	0		393		33 (33.0)	0	-	0	-

From 28 April to 31 August 2014, 1040 SARI specimens have been tested and 222 (21.3%) were positive for influenza viruses (Table 5): influenza A(H1N1)pdm09 (175) including A/California/7/2009 (17), A(H3N2) (24) including A/Texas/50/2012 (3), influenza A (not sub-typed) (7) and influenza B (16) including B/Yamagata lineage (2). There were 9 co-detections of influenza and non-influenza viruses among SARI specimens.

From 28 April to 31 August 2014, 570 SARI specimens were tested for non-influenza respiratory viruses (Table 5). Of these, 321 (56.3%) were positive with the following viruses: respiratory syncytial virus (140), rhinovirus (98), parainfluenza virus type 1 (34), parainfluenza virus type 2 (1), parainfluenza virus type 3 (3), adenovirus (32), and human metapneumovirus (56). 280 SARI specimens (87.2%) had single virus detection and 41 (12.8%) had multiple virus detection.

Table 6. Influenza and non-influenza respiratory viruses among SARI cases, 28 April 2014 to 31 August 2014

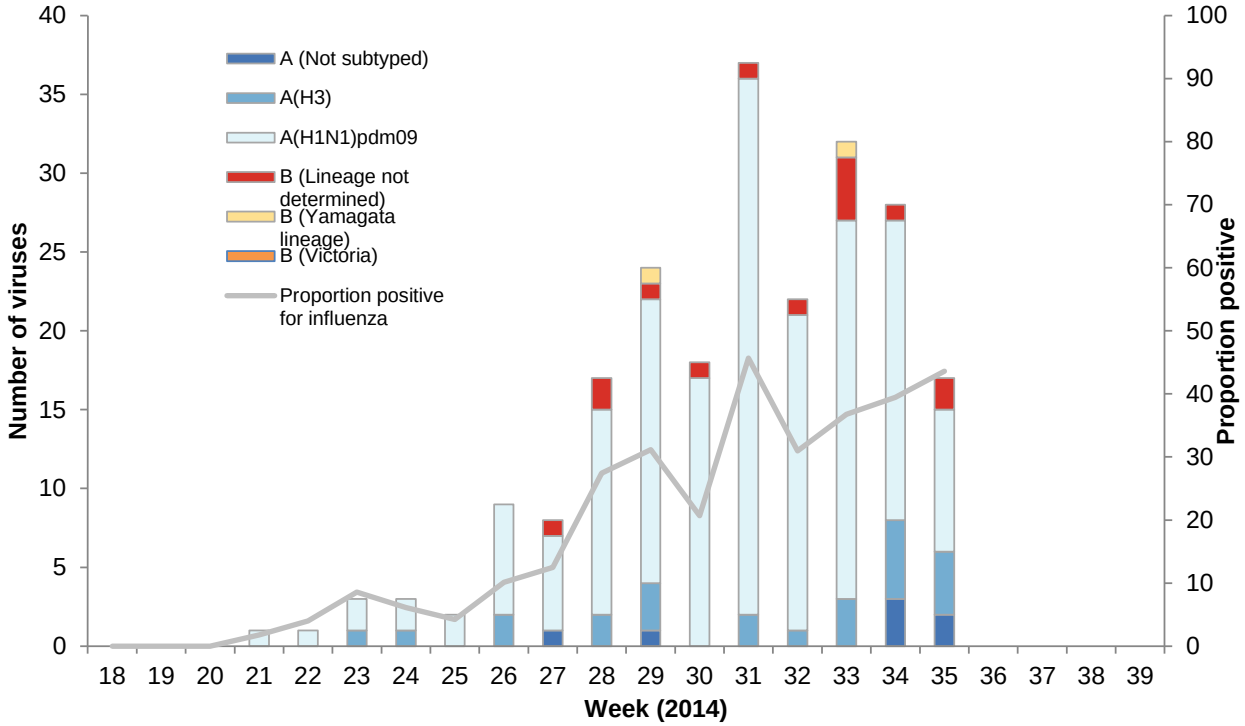
Influenza viruses	**SARI**		
	Cases	**ICU**	**Deaths**
No. of specimens tested	1040	65	4
No. of positive specimens (%)[1]	222 (21.3)	14 (21.5)	3 (75.0)
Influenza A	206	14	3
A (not subtyped)	7	2	0
A (H1N1)pdm09	175	12	3
A(H1N1)pdm09 by PCR	158	11	3
A/California/7/2009 (H1N1) - like	17	1	0
A(H3N2)	24	0	0
A(H3N2) by PCR	21	0	0
A/Texas/50/2012 (H3N2) - like	3	0	0
Influenza B	16	0	0
B (lineage not determined)	14	0	0
B/Yamagata lineage	2	0	0
B/Yamagata lineage by PCR	0	0	0
B/Massachusetts/2/2012 - like	2	0	0
B/Victoria lineage	0	0	0
B/Victoria lineage by PCR	0	0	0
B/Brisbane/60/2008 - like	0	0	0
Influenza and non-influenza co-detection (% +ve)	9 (4.1)	0 (0.0)	0 (0.0)

Non-influenza respiratory viruses	**SARI**		
	Cases	**ICU**	**Deaths**
No. of specimens tested	570	24	2
No. of positive specimens (%)[1]	321 (56.3)	14 (58.3)	0 (0.0)
Respiratory syncytial virus (RSV)	140	6	0
Parainfluenza 1 (PIV1)	34	3	0
Parainfluenza 2 (PIV2)	1	0	0
Parainfluenza 3 (PIV3)	3	0	0
Rhinovirus (RV)	98	3	0
Adenovirus (AdV)	32	5	0
Human metapneumovirus (hMPV)	56	2	0
Single virus detection (% of positives)	280 (87.2)	9 (64.3)	0 (0.0)
Multiple virus detection (% of positives)	41 (12.8)	5 (35.7)	0 (0.0)

[1]Number of specimens positive for at least one of the listed viruses; note a specimen may be positive for more than one virus

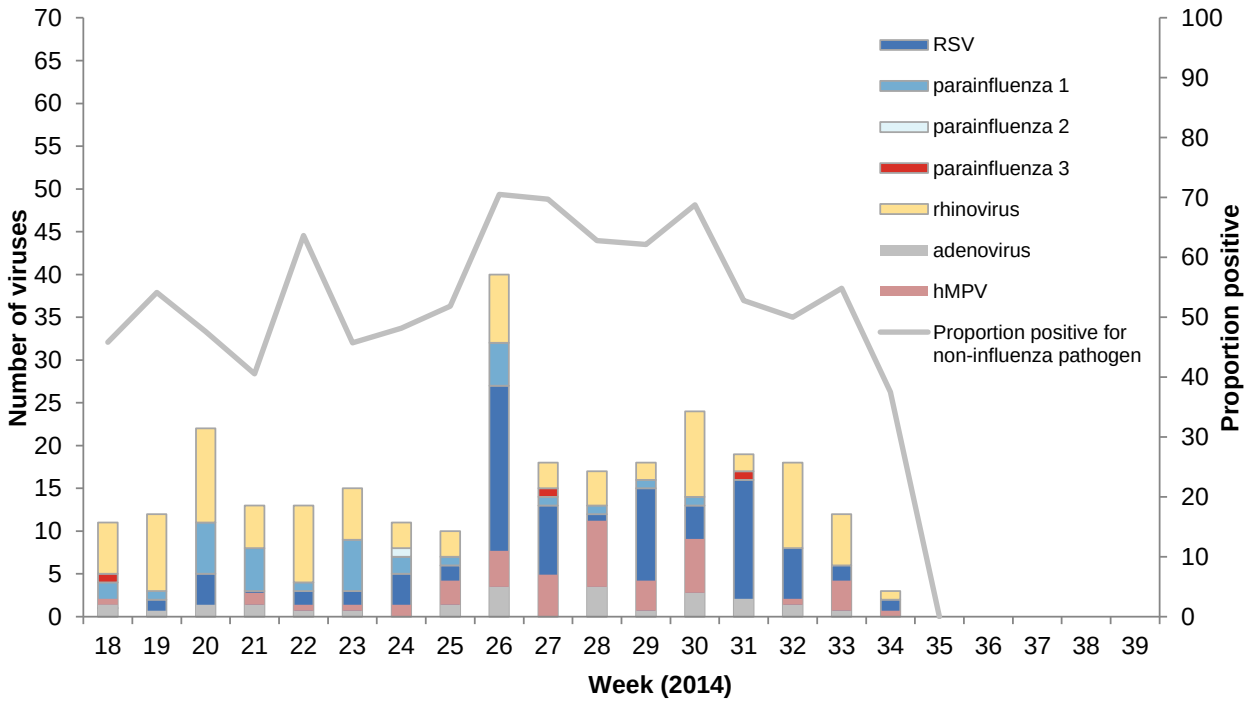
The temporal distribution of the number and proportion of the influenza viruses and non-influenza respiratory viruses is shown in Figures 15 & 16. Influenza A(H1N1)pdm09 was the predominant strain during 28 April to 31 August 2014.

Figure 15. Temporal distribution of the number and proportion of influenza viruses from SARI specimens, 28 April to 31 August 2014, by type and week



* Figures for recent weeks will be underestimates due to time lag in receiving laboratory test results.

Figure 16. Temporal distribution of the number and proportion of non-influenza viruses from SARI specimens, 28 April to 31 August 2014, by type and week



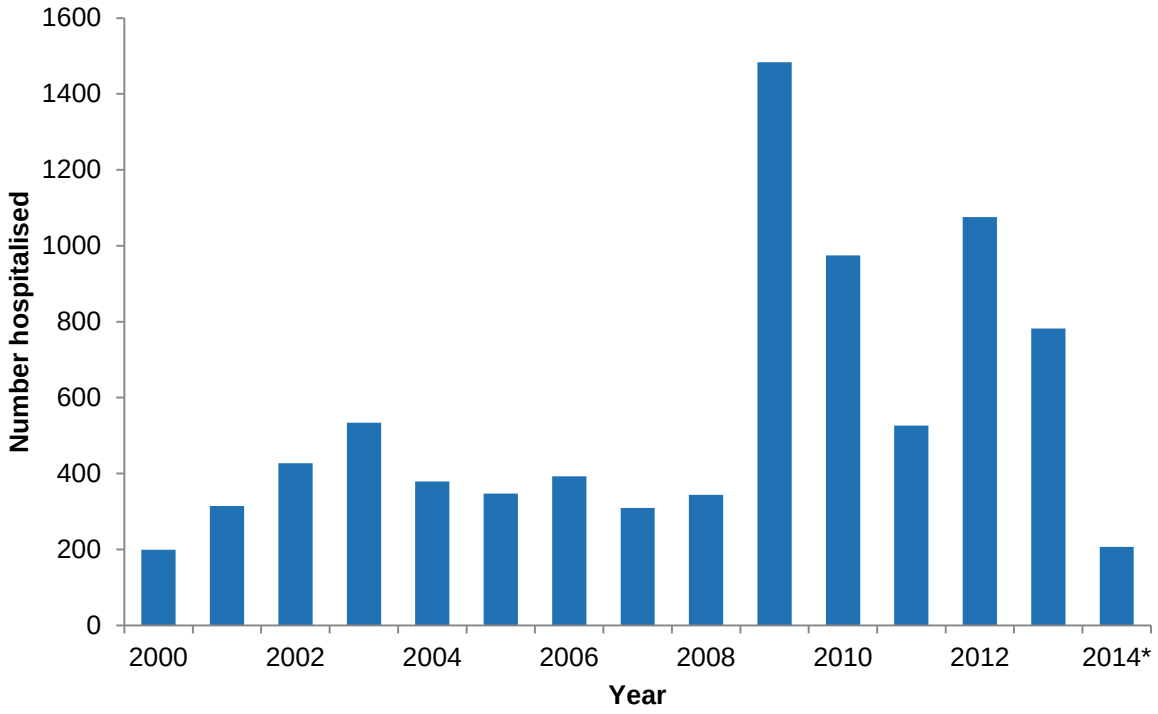
*Figures for recent weeks will be underestimates due to time lag in receiving laboratory test results.

2.2.2 Ministry of Health data on publicly funded hospital discharges

Hospitalisation data for influenza (ICD-10AM-VI code I (J09–J11) for 2014 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 2000–2014. Influenza-related hospitalisations were conservatively taken to include only those cases where influenza was the principal diagnosis. Repeat admissions were included, as infections with another influenza A subtype or B virus are possible.

From 1 January to 30 June 2014, there were a total of 207 hospitalisations for influenza (Figure 17). Influenza hospitalisation coding has not been completed for the year. This data only captured a proportion of influenza cases for the winter season of 2014.

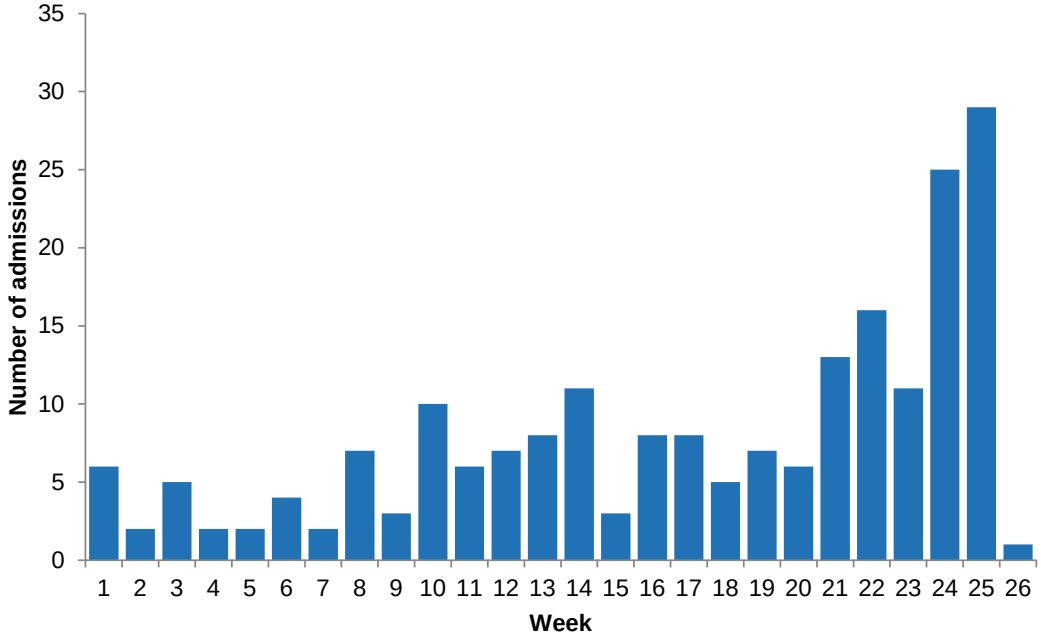
Figure 17. Influenza hospital discharges, 2000–2014



*Data from 1 Jan to 30 June 2014 only.
Source: Ministry of Health, NMDS (Hospital Events)

Figure 18 shows influenza hospitalisations by week discharged. The high number of hospitalisations (85) occurred in June.

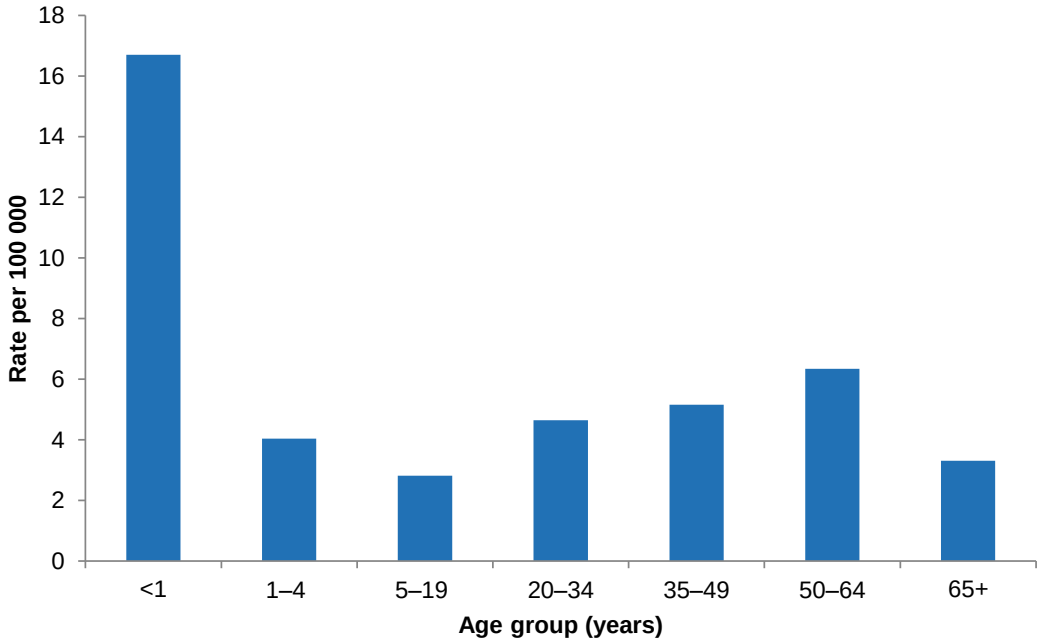
Figure 18. Influenza hospital discharges by week, 2014



*Data from 1 Jan to 30 June 2014 only.
Source: Ministry of Health, NMDS (Hospital Events)

From 1 January to 30 June 2014, the highest influenza hospitalisation rates were recorded among young infants aged less than one year old (Figure 19), with rates of 16.7 per 100 000 age group population. This was followed by the 50–64 years old (6.3 per 100 000) and 35–49 years old (5.2 per 100 000).

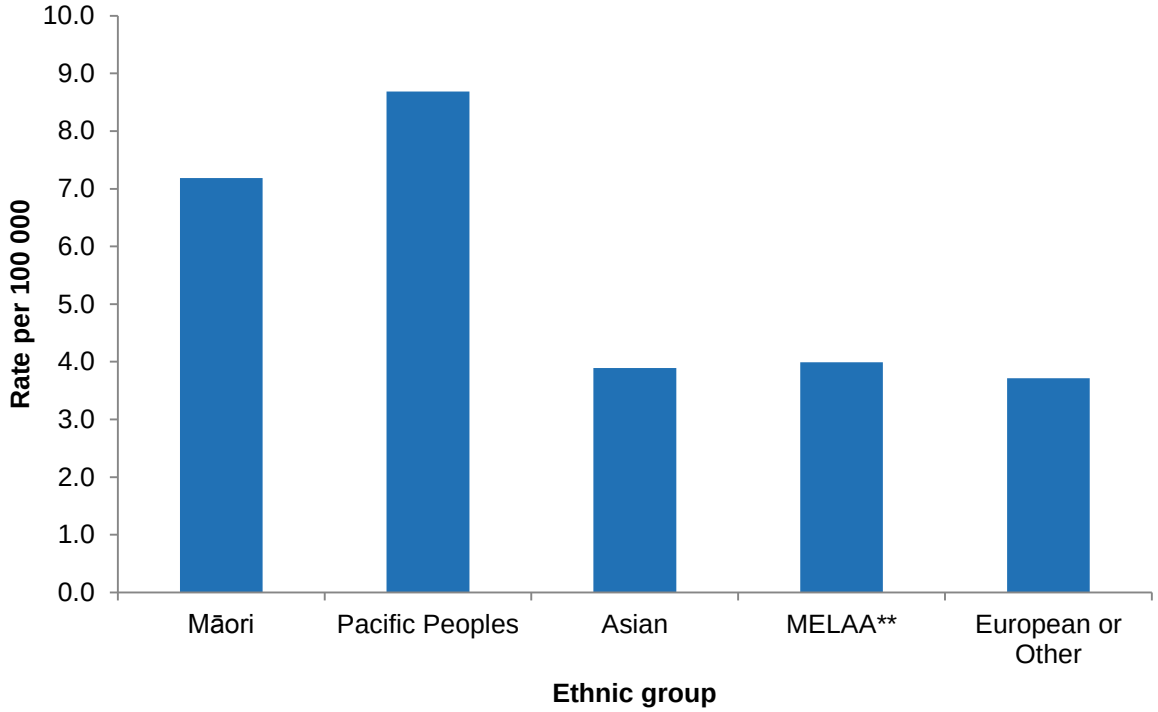
Figure 19. Influenza hospital discharge rates by age group, 2014



*Data from 1 Jan to 30 June 2014 only.
Source: Ministry of Health, NMDS (Hospital Events)

The ethnic distribution of influenza hospitalisations in 2014 is shown in Figure 20. Pacific Peoples had the highest hospitalisation rate (8.7 per 100 000, 24 hospitalisations) followed by Maori (7.2 per 100 000, 48 hospitalisations). European or Other ethnic group had the lowest rate of hospitalisations (3.7 per per 100 000, 110 hospitalisations).

Figure 20. Hospital discharge rates by prioritised ethnic group, 2014



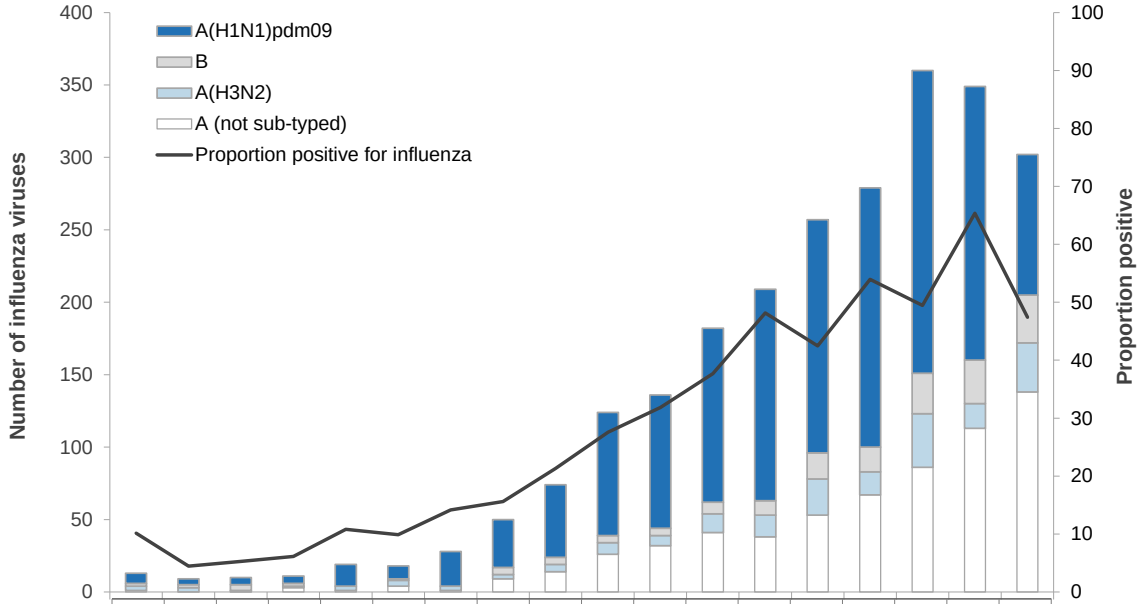
*Data from 1 Jan to 30 June 2014 only.
**MELAA – interpret rate with caution as there were only two hospitalisations. Source: Ministry of Health, NMDS (Hospital Events)

2.2.3 Laboratory-based non-sentinel surveillance–for outpatients and inpatients

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

A total of 7861 non-sentinel swabs were received during 1 January to 31 August 2014. Among them, 2596 influenza viruses were identified. This gave an overall detection rate of 33.0%. The predominant strain was influenza A(H1N1)pdm09 (1532) including 272 A/California/7/2009 (H1N1)-like viruses followed by A(H3N2) (221) including 43 A/Texas/50/2012 and B/Yamagata lineage (50) including 34 of B/Massachusetts/02/2012 and one of B/Wisconsin/1/2010-like and B/Victoria lineage (3) including three of B/Brisbane/60/2008-like and B (not lineage typed) (141). There were 649 A (not sub-typed) (Figure 21). Note: one laboratory did not provide the number of swabs tested and another laboratory joined in July 2014.

Figure 21. Number of influenza viruses reported by type and week from non-sentinel surveillance for weeks 18–35 in 2014



	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
A (not sub-typed)	1	0	0	3	1	4	1	9	14	26	32	41	38	53	67	86	113	138
A(H3N2)	3	3	1	1	3	4	3	3	5	8	7	13	15	25	16	37	17	34
B	2	2	4	2	0	1	0	5	5	5	5	8	10	18	17	28	30	33
A(H1N1)pdm09	7	4	5	5	15	9	24	33	50	85	92	120	146	161	179	209	189	97

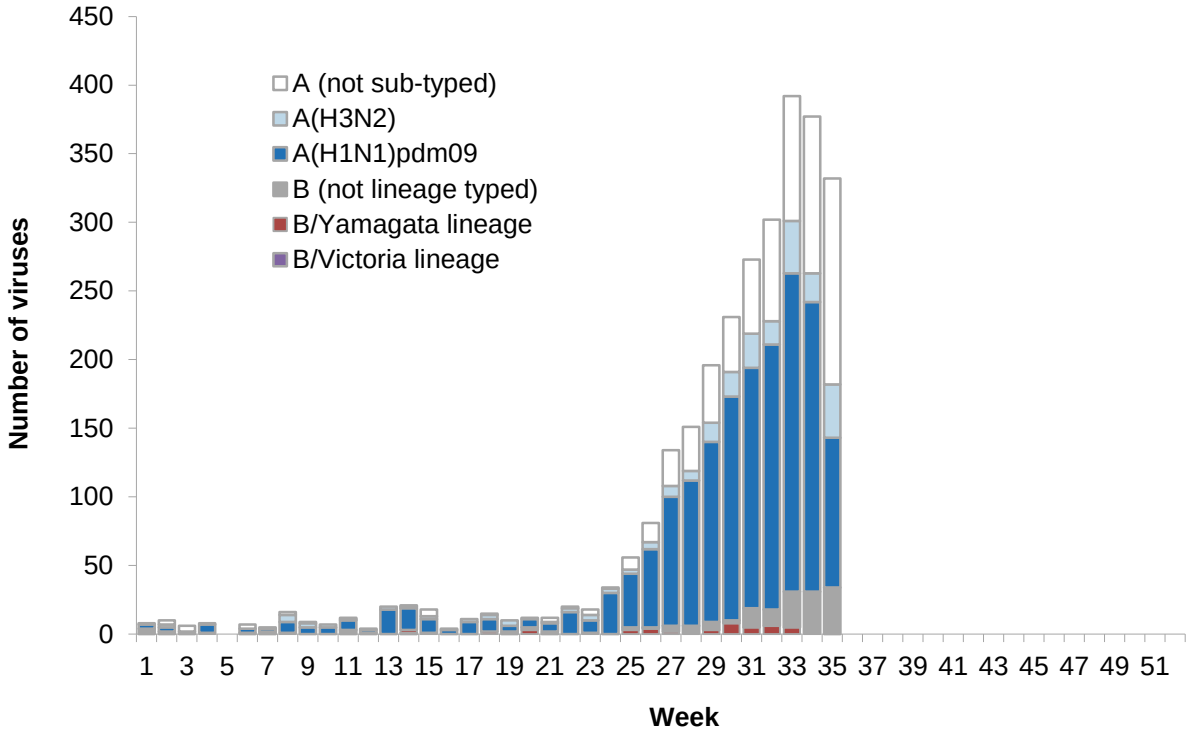
*data shown is from week 18 only.

3. NEW ZEALAND STRAIN CHARACTERISATIONS

3.1 Circulating strains in 2014

A total of 2812 influenza viruses were detected from sentinel and non-sentinel surveillance in 2014, from 1 January to 31 August 2014 (Figure 22). The predominant strain was A(H1N1)pdm09 (1692) including 301 A/California/7/2009 (H1N1)-like followed by A(H3N2) (237) including 44 A/Texas/50/2012, and B/Yamagata lineage (51) including 35 B/Massachusetts/02/2012-like and one B/Wisconsin/1/2010-like, B/Victoria lineage (3) including three of B/Brisbane/60/2008-like viruses, and B (not lineage typed) (151). There were 678 A (not sub-typed).

Figure 22. Total influenza viruses by type and week reported for weeks 1–35, 2014



The influenza virus detections by type and subtype for weeks 1 to 35, 2014 is shown in Table 6.

Table 7. Influenza viruses by type and subtype for weeks 1–35, 2014

Viruses	All viruses (%)	sub-typed/lineage-typed (%)
Influenza A	**2607 (92.7)**	
A (not sub-typed)	678 (24.1)	
Influenza A(H1N1)pdm09	**1692 (60.2)**	**1692 (85.3)**
A(H1N1)pdm09 by PCR	1391 (49.5)	1391 (70.1)
A/California/7/2009 (H1N1)-like	301 (10.7)	301 (15.2)
Influenza A(H3N2)	**237 (8.4)**	**237 (12.0)**
A(H3N2) by PCR	193 (6.9)	193 (9.7)
A/Texas/50/2012	44 (1.6)	44 (2.2)
Influenza B	**205 (7.3)**	
B (not lineage typed)	151 (5.4)	
Influenza B/Yamagata lineage	**51 (1.8)**	**51 (2.6)**
B/Yamagata lineage by PCR	15 (0.5)	15 (0.8)
B/Massachusetts/02/2012	35 (1.2)	35 (1.8)
B/Wisconsin/1/2010-like	1 (0.0)	1 (0.1)
Influenza B/Victoria lineage	**3 (0.1)**	**3 (0.2)**
B/Brisbane/60/2008-like	3 (0.1)	3 (0.2)
Total	**2812 (100.0)**	**1983 (100.0)**

Influenza A viruses (2607/2812 or 92.7% of all viruses) co-circulated with influenza B viruses (205/2812 or 7.3% of all viruses). The influenza A(H1N1)pdm09 virus represented 60.2% (1692/2812) of all viruses and 85.3% (1692/1983) of all sub-typed and lineage-typed viruses. The seasonal influenza A(H3N2) strain represented 8.4% (237/2812) of all viruses and 12.0% (237/2812) of all sub-typed and lineage-typed viruses. Influenza B/Yamagata lineage virus represented 1.8% (51/2103) of all viruses and 2.6% (51/1983) of all sub-typed and lineage-typed viruses. Influenza B/Victoria lineage virus represented 0.1% (3/2812) of all viruses and 0.2% (3/1983) of all sub-typed and lineage-typed viruses.

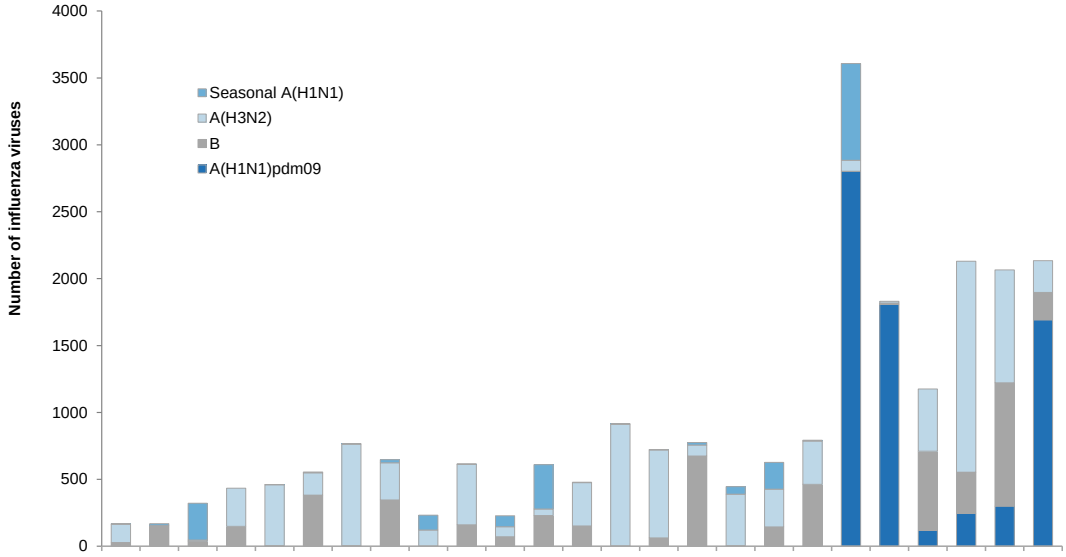
3.2 Predominant strains during 1990–2014

Overall, the patterns of the predominant strains during 1990–2014 are described below:

- Influenza A(H1N1)pdm09 strain has become the predominant strain in 2009, 2010 and 2014.
- 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, 2011 and 2013). 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). However, there were only 3 B/Victoria lineage viruses detected in 2014.

Figure 23 shows the number and percentage of typed and subtyped (not including A not subtyped) influenza viruses from 1990 to 2014.

Figure 23. Influenza viruses by type and subtypes, 1990–2014

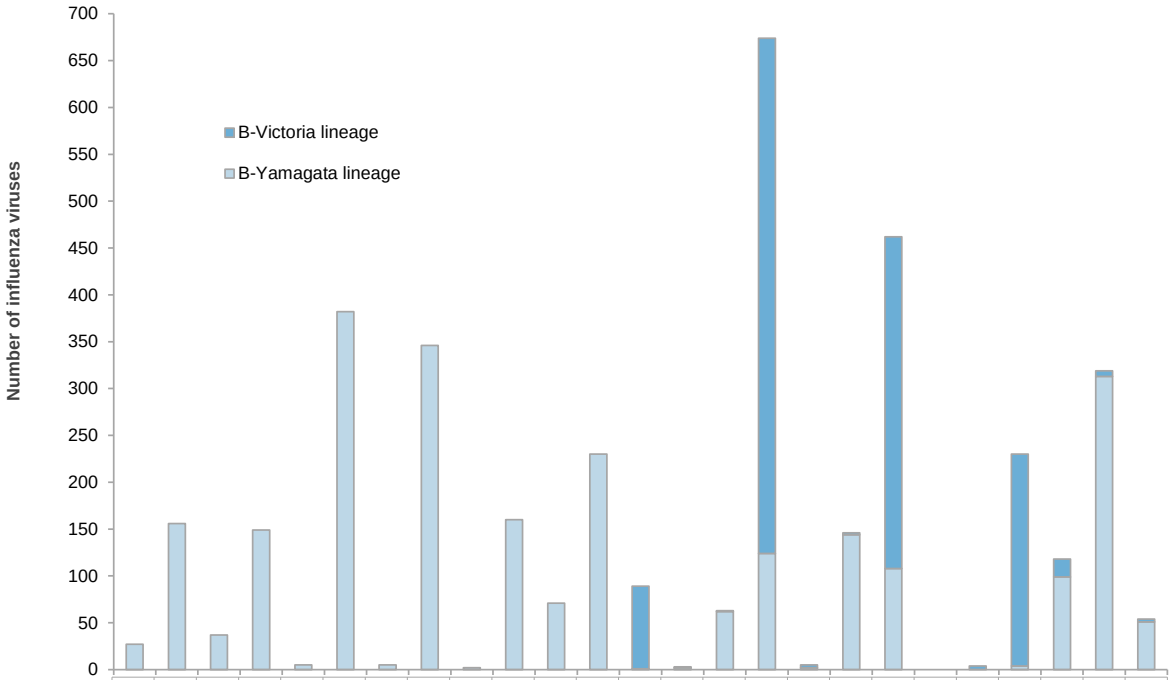


	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Seasonal A(H1N1)(%)	1	8	86	0	0	1	0	4	47	0	36	54	0	0	0	2	13	32	1	20	0	0	0	0	0
A(H3N2)(%)	83	0	3	66	99	30	99	43	52	74	33	8	68	100	91	11	86	45	41	2	1	40	74	41	11
B(%)	16	92	11	34	1	69	1	53	1	26	31	38	32	0	9	87	1	23	58	0	1	50	14	45	10
A(H1N1)pdm09(%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	99	10	12	15	79

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

Figure 24 shows the number and percentage of all antigenically typed B viruses from 1990 to 2014. 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. However, in 2014, it did not predominate over the B/Yamagata lineage.

Figure 24. Influenza B antigenic types, 1990–2014



	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
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	2	6
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	98	94

3.3 Influenza A(H1N1)pdm09

Representative of influenza A(H1N1)pdm09 isolates 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 and CDC-Atlanta. Between 1 January to 3 September 2014, a total of 383 influenza A(H1N1)pdm09 isolates were antigenically typed by hemagglutination inhibition assay at NIC. Of them, 279 (73%, 279/383) were antigenically closely related to the reference strain A/California/7/2009 (H1N1)pdm09 and 104 (27%, 104/383) had reduced reactivity against the same reference strain.

3.4 Seasonal influenza A(H3N2)

Representative seasonal influenza A(H3N2) isolates 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 and CDC-Atlanta. Between 1 January to 3 September 2014, a total of 38 influenza A(H3N2) isolates were antigenically typed by hemagglutination inhibition assay at NIC. Of them, 33 (87%, 33/38) had reduced reactivity against the reference strain A/Texas/50/2012 (H3N2) and 5 (13%, 5/38) remained antigenically closely related to the reference strain.

3.5 Influenza B

Representative influenza B/Yamagata lineage isolates and B/Victoria lineage 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 and CDC-Atlanta. Between 1 January to 3 September 2014, a total of 36 B/Yamagata lineages isolates were antigenically typed by hemagglutination inhibition assay at NIC. Of them, 19 (53%, 19/36) were antigenically closely related to the reference strain B/Massachusetts/02/2012 and 17 (47%, 17/36) had reduced reactivity against the same reference strain. In addition, results of the five B/Victoria lineage viruses indicated that they were antigenically closely related to the reference strain B/Brisbane/60/2008.

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 2014, fluorometric neuraminidase inhibition assay was used to test a total of 197 influenza viruses against oseltamivir and 203 against zanamivir. All viruses were sensitive to both oseltamivir and zanamivir (Tables 7 & 8).

A brief summary of antiviral susceptibility: 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) viruses 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, two oseltamivir resistant A(H1N1)pdm09 virus were detected by both phenotypic and genetic methods.

Table 8. Antiviral susceptibility to oseltamivir for influenza viruses, 2006–2014

Influenza type/sub-type	2006	2007	2008	2009	2010	2011**	2012**	2013	2014
Influenza B									
Number of isolates tested	1	132	306	-	1	244	64	316	26
Mean IC50 (nM)	-	37.5	26.5	-	-	32.1	11.2	14.3	19.7
Standard Deviation (nM)	-	22.5	16.9	-	-	20.2	5.8	8.1	6.7
Minimum IC50* (nM)	-	0.9	0.22	-	-	4.1	4.8	0.1	4.5
Maximum IC50 (nM)	-	97.4	87.8	-	-	182.7	31.8	51.1	34.2
Influenza A(H3N2)									
Number of isolates tested	189	45	120	-	1	224	271	321	27
Mean IC50 (nM)	0.7	0.4	0.3	-	-	0.4	0.4	0.3	0.4
Standard Deviation (nM)	0.3	0.3	0.2	-	-	0.2	0.2	0.2	0.1
Minimum IC50 (nM)	0.1	0.1	0.0	-	-	0.1	0.1	0.1	0.2
Maximum IC50 (nM)	1.4	1.1	1.1	-	-	1.5	1.2	0.9	0.7
Seasonal influenza A(H1N1)									
Number of isolates tested	18	136	4	25	-	-	-	-	-
Mean IC50 (nM)	1.3	0.8	768.0	1385.0	-	-	-	-	-
Standard Deviation (nM)	0.9	0.6	287.0	1996.0	-	-	-	-	-
Minimum IC50 (nM)	0.2	0.1	573.0	305.0	-	-	-	-	-
Maximum IC50 (nM)	3.0	2.7	1184.0	7912.0	-	-	-	-	-
Influenza A(H1N1)pdm09									
Number of isolates tested	-	-	-	483	334	29	95	75	144
Mean IC50 (nM)	-	-	-	0.4	0.7	0.5	0.3	0.4	0.4
Standard Deviation (nM)	-	-	-	0.2	0.4	0.3	0.2	0.2	0.2
Minimum IC50 (nM)	-	-	-	0.1	0.0	0.2	0.1	0.1	0.1
Maximum IC50 (nM)	-	-	-	1.4	2.1	1.3	316.0	1.4	1.6

*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 4 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). Four outliers were: exone two influenza B viruses in 2011and two pandemic influenza A(H1N1)pdm09 viruses in 2012.

Table 9. Antiviral susceptibility to zanamivir for influenza viruses, 2013–2014

Influenza type/sub-type	2013	2014
Influenza B		
Number of isolates tested	314	31
Mean IC50 (nM)	1.3	0.9
Standard Deviation (nM)	0.8	0.3
Minimum IC50* (nM)	0.0	0.5
Maximum IC50 (nM)	5.6	1.7
Influenza A(H3N2)		
Number of isolates tested	324	26
Mean IC50 (nM)	0.3	0.3
Standard Deviation (nM)	0.2	0.2
Minimum IC50 (nM)	0.1	0.2
Maximum IC50 (nM)	1.4	0.8
Influenza A(H1N1)pdm09		
Number of isolates tested	72	146
Mean IC50 (nM)	0.19	0.23
Standard Deviation (nM)	0.15	0.09
Minimum IC50 (nM)	0.01	0.09
Maximum IC50 (nM)	1.07	0.62

4. INFLUENZA VACCINE EFFECTIVENESS

The SHIVERS study allowed the estimation of vaccine effectiveness (VE) against influenza illness requiring hospitalisation since 2012 and against influenza illness requiring primary care (general practice) since 2013 and VE estimates have been reported [1,2].

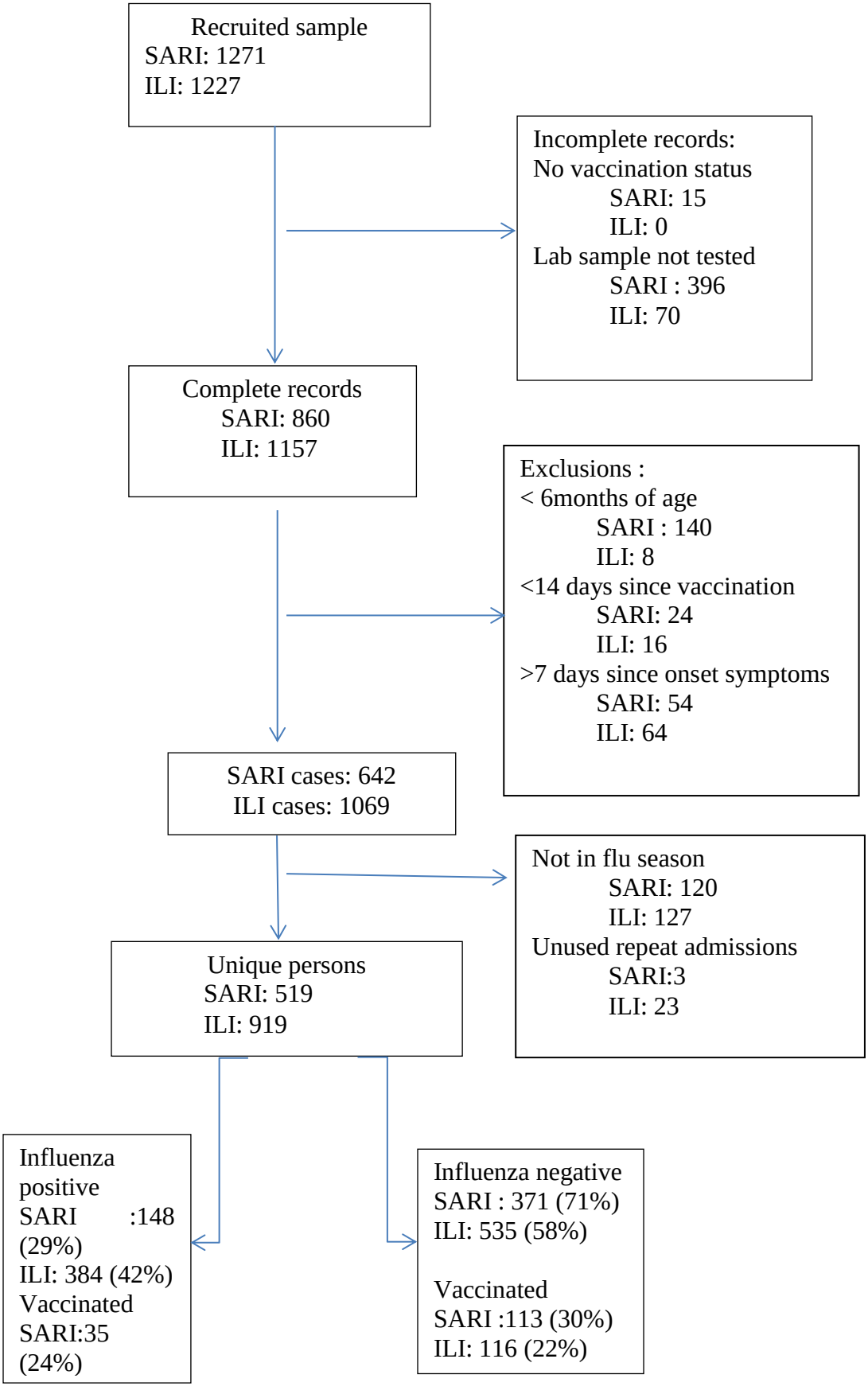
In New Zealand seasonal trivalent influenza vaccine is offered annually free of charge to all adults aged 65 years and over, pregnant women and all those over six months of age with chronic medical conditions that are likely to increase the severity of the infection. Since 2013, free influenza vaccines have been offered to children (6-months to 4-years) who have been hospitalised or have a history of significant respiratory illness. Influenza vaccines are also available on the private market for all others over six months of age. The influenza season usually occurs between March and September.

Using the case test-negative design to estimate propensity-adjusted VE as previously described [2], we estimated the effectiveness of seasonal trivalent inactivated influenza vaccine in preventing laboratory-confirmed influenza in patients hospitalised with severe acute respiratory infections (SARI) and in patients presenting to general practice with an influenza-like illness (ILI) during the 2014 influenza season. The influenza season was defined as starting when there were two consecutive weeks with two or more cases; this was from 28 April 2014. The final data collection was 31 August 2014, based on the requirements to complete the analysis in time for the WHO strain selection meeting in September.

Most ILI and SARI patients with laboratory-confirmed influenza are included except those with incomplete data for vaccination status, infants under 6 months of age, children under 9 years who were only given one dose of vaccine, those vaccinated less than 14 days before admission or presentation. For patients with multiple episodes, the first influenza virus-positive episode was used for the analysis or the first illness episode if there was no influenza virus-positive episode.

A total of 519 SARI and 919 ILI patients were included in the analysis, of whom 148 (29%) and 384 (42%) were influenza virus positive, respectively. Of the 148 SARI admissions who tested influenza virus positive, 35 (24%) were vaccinated, compared with 118 of the 371 (32%) who tested negative. Of the 384 ILI patients who tested influenza virus positive, 37 (10%) were vaccinated compared with 116/534 (22%) who tested negative (Figure 25).

Figure 25. Flowchart of all selected, recruited and tested patients with influenza-like illness and severe acute respiratory infection for influenza vaccine effectiveness analysis, New Zealand, 2014 influenza season



Vaccine effectiveness

The proportion vaccinated did not change throughout the season. For influenza-confirmed SARI the crude VE against all circulating influenza virus strains was 34% (95% confidence interval (CI): -3 to 57). After adjustment for age and week of admission, the estimated VE was 54% (95% CI: 19 to 74). Adjusted VE to the prevailing circulating strain A(H1N1)pdm09 was 65% (95% CI: 33 to 81). VE was not calculated for children and adolescents 6 months to 17 years of age because of limited data. Adjusted VE against all influenza in the 18–49 age group was 46% (95% CI: -42 to 80); in the 50–64 year olds 74% (95% CI: 23 to 91) and in the 65 and over age group 58% (95% CI -36 to 87). In our SARI sensitivity analysis where we adjusted for the propensity to be vaccinated the VE for all ages was 50% (19 to 69).

For influenza-confirmed ILI the crude VE was 61% (95% CI: 43 to 74). After adjustment for age and week of presentation, the estimated VE was 67% (95% CI: 48 to 79). Adjusted VE to the prevailing circulating strain A(H1N1) was 73% (95% CI:50 to 85). VE was not calculated for younger people or those aged 65 years an over because of limited data; for the 18-49 age group VE was 66% (95% CI: 30 to 84); and in the 50 – 64 year olds 57% (95% CI:-1 to 82).

Table 10. Estimated influenza vaccine effectiveness, by participant age group and by influenza virus type and subtype: crude and propensity adjusted models, New Zealand, 2013 influenza season

	Influenza-positive			Influenza-negative			Vaccine Effectiveness			
							Unadjusted		Adjusted[1]	
Influenza type/ age group	Number Vaccinated	Total	%	Number Vaccinated	Total	%	VE %	95% CI	VE %	95% CI
SARI										
Overall (years)	35	148	24	118	371	32	34	-3-57	54	19 - 74
6mo -17	4	42	10	15	193	8	N/A[2]		N/A	
18-49	9	58	16	13	52	25	45	-42-79	46	-42-80
50-64	10	29	34	29	51	57	60	-3 -84	74	23 - 91
65+	12	19	63	61	75	81	61	-18 -87	58	-36 -87
A(H1N1)	22	119	18	118	371	32	51	19 - 71	65	33 - 81
ILI										
Overall	37	384	10	116	535	22	61	43 - 74	67	48 - 79
6mo-17	2	143	1	26	226	12	N/A	N/A	N/A	N/A
18-49	12	168	7	32	195	16	61	21 - 81	66	30 - 84
50-64	12	60	20	26	75	35	53	-4 -79	57	-1 -82
65+	11	13	85	32	39	82	N/A	N/A	N/A	N/A
A(H1N1)	14	220	6	116	535	22	75	56 - 86	73	50 - 85

1. Adjusted for age and week time in the season
2. Data not applicable and numbers to too low to reach any significance

CI = confidence intervals

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

5.1. 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 2014 influenza season, 616 A(H1N1)pdm09 viruses were received at the Melbourne WHOCC from 12 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. Of the 383 A(H1N1)pdm09 isolates tested at ESR by hemagglutination inhibition assay during the period of 1 January to 3 September 2014, 279 (73%, 279/383) were antigenically closely related to the reference strain A/California/7/2009 (H1N1)pdm09. A total of 104 influenza A(H1N1)pdm09 viruses from New Zealand were forwarded to WHOCC in 2014.

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 0.6% of A(H1N1)pdm09 viruses being classified as low reactors (≥8-fold reduction compared with the homologous titre) (Figure 3.1, Tables 3.3 and 3.4 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. In addition, a total of 123 influenza A(H1N1)pdm09 viruses were sequenced in the HA gene. The sequence analysis indicated that there was little genetic diversity among the viruses isolated during 2014 with all viruses falling into genetic clade 6B. No viruses sequenced by the WHO CC Melbourne during this period fell into other genetic clades (CDC designations, Figure 3.2 in Appendix 3). 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, 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 received seasonal trivalent inactivated vaccines. Five panels of sera from adults and older adults as well as two panels from children were from trials of egg-grown trivalent vaccine of the composition recommended for the northern hemisphere 2013–14 and southern hemisphere 2014 seasons (A/California/7/2009 (H1N1)pdm09-like, A/Texas/50/2012 (H3N2)-like and B/Massachusetts/2/2012-like viruses); one panel of sera from adults and older adults was from a trial of cell-grown trivalent vaccine of the same composition. For the majority of panels tested, geometric mean HI titres of antibodies against representative recent A(H1N1)pdm09 viruses were not reduced significantly as compared to HI titres to the vaccine virus (WER 89(41), and Tables 3.7 & 3.8 in Appendix 3). (*Abridged from the Weekly Epidemiological Record, 2014 89(41):441–456 and a report to AIVC by Dr Ian Barr, WHO Collaborating Centre for Influenza, Melbourne)*

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.

5.2. 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 A).

During the 2014 influenza season, 527 A(H3N2) viruses were received at the Melbourne WHOCC from 13 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/Texas/50/2012-like strain. Of the 38 A(H3N2) isolates tested at ESR by hemagglutination inhibition assay during the period of 1 January to 3 September 2014, 33 (87%, 33/38) had reduced reactivity against the reference strain A/Texas/50/2012. A total of 20 A(H3N2) viruses from New Zealand were forwarded to WHOCC in 2014.

A(H3N2) viruses have become increasingly difficult to test in the haemagglutination inhibition assay. Particular mutations or polymorphisms in the NA of recent H3N2 viruses appear to allow some level of binding to Red Blood Cells, thus interfering with the inhibition of viruses using post-infection ferret sera. To overcome this problem a number of WHOCCs have been performing their HI assays in the presence of 20nM oseltamivir carboxylate in order to prevent this NA binding. This appears to improve the discrimination between antigenically drifted vs not-drifted viruses. Alternatively virus neutralization assays such as the microneutralization or plaque reduction assays can be used where the NA binding is not relevant.

Among all A(H3N2) isolates analysed without oseltamivir at the Melbourne WHOCC, most of the A(H3N2) viruses tested in this period reacted well with ferret sera raised to cell propagated A/Victoria/361/2011 or A/Texas/50/2012 viruses, with only 8.6% of viruses tested at the Melbourne CC showing ≧8 fold reduction in HI titre compared to homologous titres. This figure rose substantially (to 35%) when a ≥4 fold reduction was used. In contrast when ferret sera raised to egg grown A/Victoria/361/2011 or A/Texas/50/2012 viruses were used marked reductions in titres to recent cell propagated viruses compared to the homologous titres were observed with 75.8% of recent viruses showing ≥8 fold reduction in HI titre compared to homologous titres with the egg derived A/Texas/50/2012 antiserum (Figure 4.1, Tables 4.2 and 4.5 in Appendix 4). In addition, a total of 101 influenza A(H3N2) viruses were sequenced in the HA gene. The phylogenetic analysis of the influenza A(H3N2) viruses showed that all viruses fell into clade 3C. Viruses could be further distinguished into sub-clades 3C3, 3C3a, 3C3b, 3C2 and 3C2a (CDC designations, Figure 4.2 in Appendix 4). The majority of viruses sequenced in this period fell into subclade 3C3a followed by 3C3b. 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, geometric mean HI titres against clade 3C.3a (A(H3N2) viruses were significantly reduced compared to HI tires against both cell-propagated A/Texas/50/2012 viruses (average reductions for 3C.3a viruses compared to egg propagated A/Texas/50/2012: adults, 79%; older adults, 77%; children, 70%; average reductions compared to cell propagated A/Texas/50/2012: adults, 67%;

older adults, 72%; children, 52%). (WER 89(41), and Tables 4.10 and 4.11 in Appendix 4). (*Abridged from the Weekly Epidemiological Record, 2014 89(41):441–456 and a report to AIVC by Dr Ian Barr, WHO Collaborating Centre for Influenza, Melbourne)*

In summary, influenza A(H3N2) viruses were associated with outbreaks in several countries. The majority of recent viruses were antigenically distinguishable from the previous vaccine virus A/Texas/50/2012and more closely related to A/Switzerland/9715293/2013. Current vaccines containing A/Texas/50/2012 antigens elicited antibodies in human that reacted less well to A(H3N2) clade 3C3a 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/Switzerland/9715293/2013-like strain. AIVC accepted this recommendation.

5.3. 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/Massachusetts/2/2012) 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/Massachusetts/2/2012 is the current reference strain) continued to be isolated worldwide in 2014. B/Yamagata/16/88 lineage viruses predominated in all countries reporting influenza B infections.

257 influenza B isolates were received in 2014 by the Melbourne WHOCC from 12 countries. The majority of isolates (89%) were typed as B/Yamagata lineage with the remaining being B/Victoria-lineage viruses (11%). 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 4% of viruses were low reactors in HI assays (Figure 5.1 in Appendix 5). The B/Yamagata-lineage viruses could be distinguished antigenically between B/Massachusetts/2/2012-like and B/Wisconsin/1/2010-like viruses, although these differences were not as clear cut as previously (Figure 5.2 in Appendix 5). The majority (70.2%) of recent viruses were low reacting (≥8 fold reduction in HI titre compared to homologous titre) with the B/Massachusetts/02/2012 ferret sera whether cell or egg propagated viruses were used. These viruses were also had low reactivity against B/Wisconsin/1/2010 ferret sera. Better reactivity was obtained with ferret sera raised to more recent viruses such as B/Phuket/3073/2013 and B/Brisbane/9/2014. Separation between these viruses was clearest when visualised by antigenic cartography (Figure 5.2 in Appendix 5). HI assays in Tables 5.2, 5.4 (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. B/Yamagata lineage fell into two clades represented by B/Wisconsin/1/2010-like virus (group 3) and

B/Massachusetts/2/2012 virus group (Group 2), with the majority (88%) of viruses falling in group 3 but these viruses had several amino acid changes in their HA compared to B/Wisconsin/1/2010-like virus. Many recent group 3 viruses had an L173Q change in their HA (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 (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, Serum panels were tested against representative recent B/Yamagata/16/88 lineage viruses of genetic groups 2 and 3 viruses. Geometric mean HI titres of antibodies against representative recent group 2 B/Yamagata/16/88 lineage viruses were not reduced significantly compared to HI titres to the vaccine virus. However, for a majority of panels tested, geometric mean HI titres against group 3 viruses were significantly reduced compared to HI titres against the group 2 vaccine virus. Geometric mean HI titres to recent B/Victoria/2/87 lineage viruses were reduced (WER 89(41), Tables 5.9, 5.10, 5.11, 5.12, 5.13 in Appendix 5). (*Abridged from the Weekly Epidemiological Record, 2014 89(41):441–456 and a report to AIVC by Dr Ian Barr, WHO Collaborating Centre for Influenza, Melbourne)*

In summary, influenza B activity was reported in many countries. B/Yamagata/16/88 remained dominant over B/Victoria/2/87 lineage viruses. Most recently isolated B/Yamagata/16/88 lineage viruses were antigenically distinguishable from the current vaccine virus B/Massachusetts/2/2012 (clade 2) and were more closely related to B/Phuket/3073/2013-like (clade 3) viruses. Current vaccines containing B/Massachusetts/2/2012 antigens induced anti-HA antibodies that reacted well to B/Yamagata/16/88 lineage clade 2 viruses; however, significant reductions in GMT were observed more frequently when testing clade 3 viruses. Therefore, the WHO Consultative Group recommended the B component of the vaccines containing a B/Yamagata/16/88 lineage virus (B/Phuket/3073/2013-like virus). The AIVC accepted this recommendation.

6. SUMMARY OF VACCINE COMPOSITION RECOMMENDATION

It is recommended that the influenza vaccine formulation for New Zealand for 2015 is:

- A(H1N1) an A/California/7/2009 (H1N1)pdm09-like virus
- A(H3N2) an A/Switzerland/9715293/2013 (H3N2)-like virus
- B a B/Phuket/3073/2013-like virus (belonging to B/Yamagata lineage)

6.1. 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 2015 season should contain the following:

A (H1N1):	an A/California/7/2009 (H1N1)-like strain,	15 µg HA per dose
A (H3N2):	an A/Switzerland/9715293/2013 (H3N2)-like strain,	15 µg HA per dose
B:	a B/Phuket/3073/2013-like strain,	15 µg HA per dose

It is recommended that quadrivalent vaccines containing two influenza B viruses contain the above three viruses and a B/Brisbane/60/2008-like virus with 15 µg HA per dose

WHO is now listing all recommended candidate viruses and potency testing reagents for development and production of vaccines for use in specific influenza seasons at the following website: http://www.who.int/influenza/vaccines/virus/candidates_reagents/home/en/

APPENDIX 1 - Composition of the Australian Influenza Vaccine Committee 2014

AIVC Members and Observers 2014

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

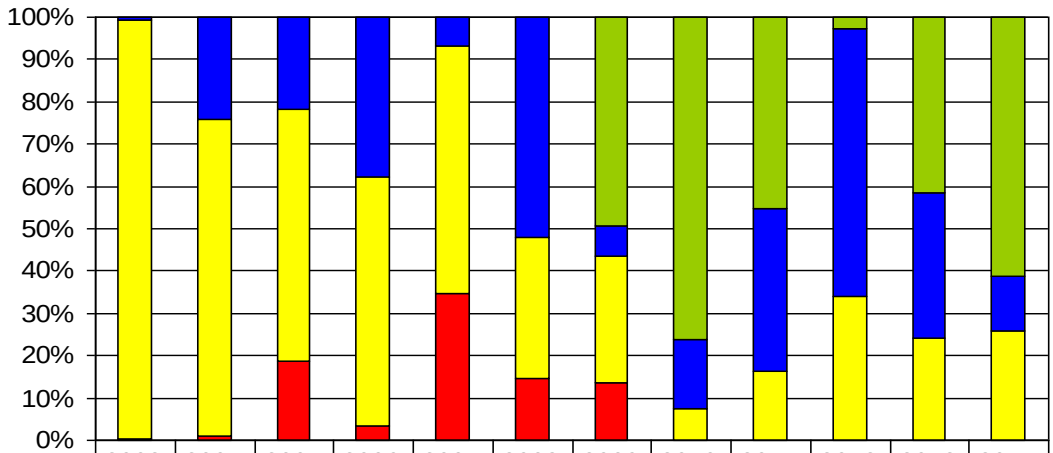
*Participated by teleconference

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 – 16 September 2014

Country	A(H1N1) pdm09	A(H3N2)	B	Mixed	TOTAL
Australia	960	343	119	0	1422
Cambodia	27	44	3	0	74
Fiji	0	2	1	0	3
Macau	1	1	2	0	4
Malaysia	16	7	16	0	39
Mongolia	2	1	12	0	15
New Caledonia	66	10	1	0	77
New Zealand	104	20	22	0	146
Philippines	2	13	4	0	19
Singapore	42	43	66	0	151
Sri Lanka	4	29	0	0	33
South Africa	4	9	1	0	14
Thailand	12	5	10	0	27
Total	**1240**	**527**	**257**	**0**	**2024**
%	61.3	26.0	12.7	0	100%

Figure 2.1
Influenza isolates by type/subtype received and analysed at the Melbourne WHO CC 2003–14



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
A(H1)pdm							47.3	76.2	45.1	1.3	41.5	61.3
B	0.6	24.1	21.9	37.9	6.9	52	6.8	16.3	38.5	30.3	34.4	12.7
A(H3)	99.2	75	59.4	58.6	58.1	33.3	28.5	7.5	16.4	16.4	24.1	26
A(H1)	0.2	0.9	18.7	3.5	34.4	14.7	13	0	0	0	0	0

APPENDIX 3 – Influenza A(H1N1)pdm09

FIGURE 3.1
Antigenic cartographic representation of A(H1N1)pdm09 HI analysis
(blue dots represent viruses from last 12 months and grey dots earlier viruses

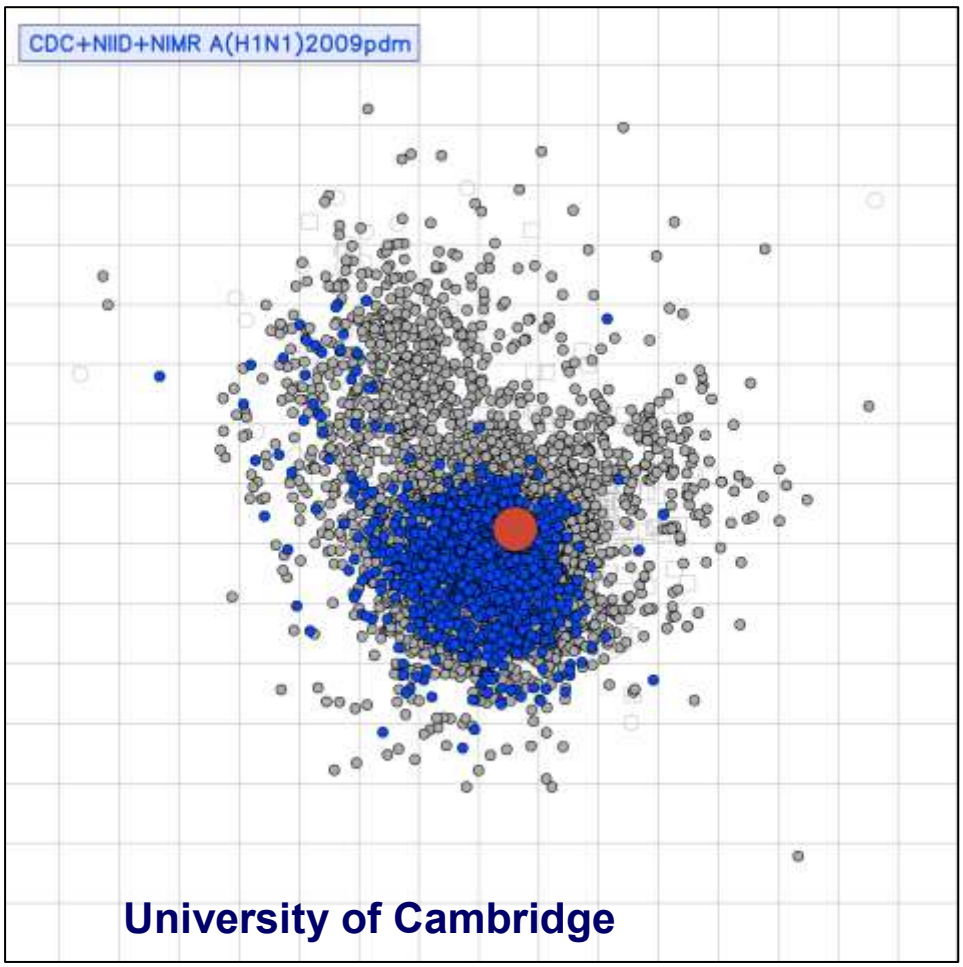


TABLE 3.3 – (H1N1)pdm09 viruses (2)

Haemagglutination Inhibition Assay - WHO Influenza Centre																
Reference Antisera																
	September 9, 2014, Part A&B		A	B	C	D	E	F	G	H	I	J	K	L		
	Sequenced		F2257-13D	F2260-13D	F2255-13D	F2771-13D	F2525-09D	F2524-7D	F2522-10D	F2523-12D	F2505-14D	F2855-14D	F2854-14D	F2894-13D	Passage	Sample
			E4	E3	C2,MDCK5	E2	MDCK2	E4	E5	X,MDCK1	MDCK4	MDCK1	E3	E5	Details	Date
	Reference Antigens	**GP**	**CAL/7**	**AUCK/1**	**ILLINOIS/9**	**CHCH/16**	**VIC/918**	**BRIS/70**	**VIC/637**	**SING/51**	**BRIS/96**	**DAR/56**	**S.AUS/17**	**BRIS/28**		
A	A/CALIFORNIA/7/2009		**2560**	5120	2560	2560	1280	2560	2560	2560	640	2560	640	2560	E7	
B	A/AUCKLAND/1/2009		>10240	**>10240**	5120	5120	2560	5120	5120	5120	2560	5120	1280	5120	E4	
C	A/ILLINOIS/9/2007		2560	2560	**2560**	1280	1280	2560	2560	2560	320	1280	640	1280	C2,MDCK7	
D	A/CHRISTCHURCH/16/2010	**4**	2560	2560	2560	**5120**	1280	5120	2560	2560	1280	5120	640	2560	E3	
E	A/VICTORIA/918/2010		5120	5120	2560	2560	**2560**	5120	2560	2560	320	2560	640	2560	MDCK3	
F	A/BRISBANE/70/2011	**7**	2560	2560	2560	2560	1280	**2560**	2560	2560	640	2560	640	2560	E5	
G	A/VICTORIA/637/2012	**6A**	160	160	<80	<80	<80	<80	**1280**	<80	320	160	<80	160	E5	
H	A/SINGAPORE/51/2012	**7**	1280	2560	1280	1280	640	1280	1280	**1280**	640	2560	320	1280	X,MDCK3	
I	A/BRISBANE/96/2012	**7**	160	320	80	160	<80	160	320	160	**1280**	1280	160	160	MDCK4	
J	A/DARWIN/56/2013	**7**	320	640	160	320	<80	160	640	320	640	**1280**	160	320	MDCK2	
K	A/STH AUSTRALIA/17/2013	**6B**	5120	5120	2560	2560	2560	5120	5120	5120	1280	5120	**1280**	2560	E3	
L	A/BRISBANE/28/2013	**6C**	1280	2560	1280	1280	640	1280	1280	1280	640	1280	640	**1280**	E5	
	Test Antigens															
1	A/NEW CALEDONIA/61/2014		>10240	>10240	5120	>10240	2560	>10240	5120	>10240	2560	5120	2560	5120	mdck1	16/06/2014
2	A/NEW CALEDONIA/66/2014		>10240	>10240	5120	5120	2560	5120	5120	5120	2560	>10240	2560	5120	mdck1	28/07/2014
3	A/NEW CALEDONIA/72/2014	**6B**	>10240	>10240	5120	>10240	2560	>10240	5120	>10240	2560	>10240	2560	5120	mdck1	14/08/2014
4	A/PERTH/601/2014		5120	>10240	5120	5120	2560	5120	5120	5120	2560	5120	1280	5120	X,MDCK1	12/07/2014
5	A/PERTH/602/2014		5120	>10240	5120	5120	2560	>10240	5120	>10240	2560	5120	1280	5120	X,MDCK1	11/07/2014
6	A/DARWIN/31/2014		5120	5120	2560	2560	2560	5120	5120	5120	1280	5120	1280	2560	mdck1	
7	A/WELLINGTON/022/2014	**6B**	5120	5120	5120	5120	2560	5120	5120	5120	1280	5120	1280	2560	X,MDCK1	29/06/2014
8	A/NEW CALEDONIA/60/2014		5120	5120	5120	2560	2560	5120	5120	5120	1280	5120	1280	2560	mdck1	4/06/2014
9	A/NEW CALEDONIA/62/2014		5120	5120	5120	5120	2560	5120	5120	5120	1280	5120	1280	2560	mdck1	26/06/2014
10	A/NEW CALEDONIA/63/2014		5120	5120	5120	5120	2560	5120	2560	5120	1280	5120	1280	2560	mdck1	1/07/2014
11	A/NEW CALEDONIA/65/2014		5120	5120	5120	5120	2560	5120	5120	5120	1280	5120	1280	2560	mdck1	24/07/2014
12	A/NEW CALEDONIA/67/2014		5120	5120	5120	5120	2560	5120	5120	5120	1280	5120	1280	2560	mdck1	4/08/2014
13	A/PERTH/575/2014		5120	5120	2560	2560	2560	5120	2560	2560	1280	5120	1280	2560	X,MDCK1	8/07/2014
14	A/PERTH/581/2014		5120	5120	2560	2560	2560	2560	2560	5120	640	5120	1280	2560	X,MDCK1	10/07/2014
15	A/PERTH/589/2014		5120	5120	2560	2560	1280	5120	2560	5120	1280	5120	1280	2560	X,MDCK1	11/07/2014
16	A/PERTH/606/2014		5120	5120	5120	5120	2560	5120	5120	5120	2560	5120	1280	2560	X,MDCK1	15/07/2014
17	A/PERTH/608/2014		5120	5120	5120	5120	2560	5120	5120	5120	1280	5120	1280	2560	X,MDCK1	14/07/2014
18	A/SYDNEY/155/2014		5120	5120	5120	5120	2560	5120	5120	5120	1280	5120	1280	2560	mdck1	13/07/2014
19	A/NEWCASTLE/56/2014	**6B**	2560	2560	2560	1280	1280	2560	2560	2560	320	2560	640	1280	MDCK1	4/08/2014
20	A/SYDNEY/514/2014		2560	5120	2560	2560	1280	2560	2560	2560	320	1280	640	1280	X,MDCK1	27/06/2014
22	A/PERTH/580/2014		2560	2560	2560	2560	1280	2560	2560	2560	640	2560	640	2560	X,MDCK1	8/07/2014
22	A/PERTH/592/2014		2560	2560	2560	2560	1280	2560	2560	2560	640	2560	640	2560	X,MDCK1	11/07/2014
23	A/PERTH/604/2014		2560	5120	2560	2560	1280	2560	2560	2560	640	2560	1280	2560	X,MDCK1	13/07/2014
24	A/PERTH/639/2014		2560	5120	2560	2560	1280	2560	2560	2560	640	2560	640	2560	X,MDCK1	17/07/2014
25	A/SYDNEY/131/2014		2560	5120	2560	2560	1280	5120	2560	2560	640	2560	1280	2560	X,MDCK1	4/08/2014
26	A/SYDNEY/134/2014		2560	2560	2560	2560	1280	2560	2560	2560	640	2560	640	1280	X,MDCK1	5/08/2014
27	A/SYDNEY/154/2014		2560	5120	2560	2560	1280	2560	2560	2560	640	2560	1280	2560	X,MDCK1	6/08/2014
28	A/SYDNEY/160/2014		2560	2560	2560	2560	1280	2560	2560	2560	640	2560	640	1280	X,MDCK1	21/07/2014
29	A/PERTH/586/2014		1280	2560	1280	1280	640	1280	1280	1280	320	1280	320	1280	X,MDCK1	10/07/2014
30	A/VICTORIA/255/2014		1280	2560	1280	1280	640	1280	1280	1280	320	1280	640	1280	MDCK2	4/08/2014
31	A/PERTH/587/2014		1280	2560	1280	1280	1280	2560	2560	2560	320	1280	640	1280	X,MDCK1	10/07/2014
32	A/SYDNEY/118/2014		1280	1280	1280	1280	640	1280	1280	1280	320	1280	320	640	X,MDCK1	25/07/2014
33	A/SYDNEY/143/2014		1280	1280	1280	1280	640	1280	1280	1280	320	1280	320	640	X,MDCK1	7/07/2014

TABLE 3.4 – (H1N1)pdm09 viruses (3)

Haemagglutination Inhibition Assay - WHO Influenza Centre																
Reference Antisera																
	August 28, 2014, Part A&B		A	B	C	D	E	F	G	H	I	J	K	L		
	Sequenced		F2257-13D	F2260-13D	F2255-13D	F2771-13D	F2525-09D	F2524-7D	F2522-10D	F2523-12D	F2505-14D	F2855-14D	F2854-14D	F2894-13D	Passage	Sample
			E4	E3	C2,MDCK5	E2	MDCK2	E4	E5	X,MDCK1	MDCK4	MDCK1	E3	E5	Details	Date
	Reference Antigens	**GP**	**CAL/7**	**AUCK/1**	**ILLINOIS/9**	**CHCH/16**	**VIC/918**	**BRIS/70**	**VIC/637**	**SING/51**	**BRIS/96**	**DAR/56**	**S.AUS/17**	**BRIS/28**		
A	A/CALIFORNIA/7/2009		**2560**	2560	2560	1280	1280	2560	2560	2560	320	2560	640	1280	E7	
B	A/AUCKLAND/1/2009		5120	**5120**	2560	>10240	>10240	>10240	5120	>10240	>10240	>10240	>10240	2560	E4	
C	A/ILLINOIS/9/2007		1280	2560	**2560**	640	640	1280	1280	1280	320	1280	320	1280	C2,MDCK7	
D	A/CHRISTCHURCH/16/2010	**4**	2560	2560	1280	**5120**	1280	2560	2560	2560	1280	5120	640	1280	E3	
E	A/VICTORIA/918/2010		2560	2560	2560	1280	**1280**	2560	2560	>10240	320	>10240	640	2560	MDCK3	
F	A/BRISBANE/70/2011	**7**	2560	2560	2560	1280	1280	**2560**	2560	1280	640	2560	640	2560	E5	
G	A/VICTORIA/637/2012	**6A**	80	160	<80	<80	<80	<80	**1280**	<80	160	160	<80	80	E5	
H	A/SINGAPORE/51/2012	**7**	1280	2560	1280	1280	640	1280	1280	**1280**	640	2560	320	1280	X,MDCK3	
I	A/BRISBANE/96/2012	**7**	160	160	80	<80	<80	<80	160	<80	**1280**	1280	160	160	MDCK5	
J	A/DARWIN/56/2013	**7**	320	320	80	320	<80	160	640	320	1280	**1280**	160	320	MDCK2	
K	A/STH AUSTRALIA/17/2013	**6B**	2560	2560	1280	2560	1280	2560	2560	2560	1280	2560	**640**	2560	E3	
L	A/BRISBANE/28/2013	**6C**	2560	2560	1280	1280	1280	2560	2560	1280	640	2560	640	**2560**	E5	
	Test Antigens															
1	A/VICTORIA/919/2014		>10240	>10240	>10240	>10240	5120	>10240	5120	>10240	2560	>10240	2560	5120	mdck1	14/08/2014
2	A/DARWIN/32/2014		>10240	>10240	5120	5120	2560	5120	5120	5120	1280	5120	1280	5120	MDCK1	16/08/2014
3	A/VICTORIA/233/2014		>10240	>10240	5120	5120	2560	5120	5120	5120	2560	5120	1280	5120	MDCK1	2/08/2014
4	A/VICTORIA/244/2014		>10240	>10240	5120	>10240	2560	>10240	5120	5120	2560	5120	1280	5120	MDCK1	30/07/2014
5	A/VICTORIA/246/2014		>10240	>10240	5120	5120	2560	5120	5120	5120	2560	5120	1280	5120	MDCK1	4/08/2014
6	A/CHRISTCHURCH/527/2014		>10240	>10240	5120	2560	2560	5120	5120	5120	640	5120	640	5120	MDCK1	16/07/2014
7	A/CHRISTCHURCH/529/2014		>10240	>10240	5120	5120	2560	5120	5120	5120	2560	5120	1280	5120	MDCK1	8/07/2014
8	A/CHRISTCHURCH/533/2014		>10240	>10240	5120	5120	2560	5120	5120	5120	2560	5120	2560	5120	MDCK1	30/07/2014
9	A/WELLINGTON/013/2014		5120	5120	2560	2560	1280	5120	5120	5120	1280	5120	1280	2560	X,MDCK1	4/07/2014
10	A/WELLINGTON/047/2014		5120	5120	2560	2560	2560	5120	2560	5120	1280	5120	1280	2560	X,MDCK1	7/07/2014
11	A/WAIKATO/015/2014		5120	5120	2560	2560	2560	5120	2560	2560	640	5120	1280	2560	X,MDCK1	2/07/2014
12	A/WELLINGTON/051/2014		5120	5120	2560	2560	1280	5120	2560	5120	1280	5120	1280	2560	X,MDCK1	8/07/2014
13	A/WELLINGTON/053/2014		5120	5120	2560	2560	1280	5120	2560	2560	1280	5120	640	2560	X,MDCK1	7/07/2014
14	A/STH AUCKLAND/020/2014		5120	5120	5120	2560	1280	5120	5120	5120	640	5120	1280	2560	X,MDCK1	6/07/2014
15	A/STH AUCKLAND/022/2014	**6B**	5120	5120	5120	5120	2560	5120	5120	5120	1280	5120	1280	2560	X,MDCK1	11/07/2014
16	A/VICTORIA/247/2014		5120	5120	5120	2560	2560	5120	5120	5120	1280	5120	1280	2560	MDCK1	30/07/2014
17	A/VICTORIA/253/2014		5120	>10240	5120	5120	2560	5120	5120	5120	1280	5120	1280	2560	MDCK1	4/08/2014
18	A/CHRISTCHURCH/530/2014		5120	>10240	5120	5120	2560	5120	5120	5120	2560	5120	1280	5120	MDCK1	14/07/2014
19	A/CHRISTCHURCH/532/2014		5120	5120	2560	5120	1280	5120	2560	5120	1280	5120	1280	2560	MDCK1	23/07/2014
20	A/CANBERRA/71/2014		2560	2560	2560	1280	1280	2560	2560	2560	320	2560	640	1280	mdck1	30/07/2014
21	A/WELLINGTON/014/2014		2560	5120	2560	2560	1280	>10240	2560	2560	640	>10240	640	2560	X,MDCK1	12/07/2014
22	A/WELLINGTON/016/2014		2560	2560	1280	1280	640	1280	1280	2560	640	1280	640	1280	X,MDCK1	21/07/2014
23	A/WELLINGTON/028/2014		2560	5120	2560	2560	2560	2560	2560	2560	1280	5120	1280	2560	X,MDCK1	10/07/2014
24	A/WELLINGTON/044/2014		2560	2560	1280	1280	640	1280	1280	1280	320	1280	320	1280	X,MDCK1	1/07/2014
25	A/CHRISTCHURCH/004/2014		2560	2560	2560	1280	1280	2560	2560	2560	320	2560	640	1280	X,MDCK1	24/06/2014
26	A/WELLINGTON/049/2014		2560	5120	2560	2560	1280	2560	2560	2560	640	2560	640	1280	X,MDCK1	2/07/2014
27	A/WAIKATO/16/2014		2560	5120	2560	2560	1280	2560	2560	2560	640	2560	640	2560	X,MDCK1	4/07/2014
28	A/VICTORIA/234/2014		2560	5120	2560	2560	1280	2560	2560	2560	640	2560	640	2560	MDCK1	18/09/2014
29	A/WELLINGTON/010/2014		1280	2560	320	1280	640	1280	1280	1280	640	1280	320	1280	X,MDCK1	2/07/2014
30	A/STH AUCKLAND/013/2014		1280	2560	1280	1280	640	1280	1280	1280	320	2560	320	1280	X,MDCK1	2/07/2014
31	A/WELLINGTON/045/2014	**6B**	640	640	160	<80	160	320	320	640	160	640	320	640	X,MDCK1	1/07/2014
32	A/WELLINGTON/015/2014	**6B**	320	320	<80	160	<80	<80	320	<80	320	640	160	320	X,MDCK1	21/07/2014

TABLE 3.4: (H1N1)pdm09 viruses (3)

Haemagglutination Inhibition Assay - WHO Influenza Centre																
	August 14, 2014		A	B	C	D	E	F	G	H	I	J	K	L		
	Sequenced		F2257-13D	F2260-13D	F2255-13D	F2771-13D	F2525-09D	F2524-7D	F2522-10D	F2523-12D	F2505-14D	F2855-14D	F2854-14D	F2894-13D	Passage	Sample
			E4	E3	X,MDCK5	E2	MDCK2	E4	E5	X,MDCK1	MDCK4	MDCK1	E3	E5	Details	Date
	Reference Antigens	**GP**	**CAL/7**	**AUCK/1**	**ILLINOIS/9**	**CHCH/16**	**VIC/918**	**BRIS/70**	**VIC/637**	**SING/51**	**BRIS/96**	**DAR/56**	**S.AUS/17**	**BRIS/28**		
A	A/CALIFORNIA/7/2009	**-**	**2560**	2560	2560	1280	1280	2560	2560	2560	320	1280	640	1280	E7	
B	A/AUCKLAND/1/2009	**-**	2560	**5120**	2560	2560	2560	2560	2560	2560	1280	5120	640	2560	E4	
C	A/ILLINOIS/9/2007	**-**	1280	1280	**2560**	640	640	1280	1280	1280	320	1280	320	1280	X,MDCK7	
D	A/CHRISTCHURCH/16/2010	**4**	2560	2560	1280	**5120**	1280	2560	2560	2560	1280	5120	640	2560	E3	
E	A/VICTORIA/918/2010	**-**	2560	2560	1280	1280	**1280**	2560	2560	2560	320	2560	640	2560	MDCK3	
F	A/BRISBANE/70/2011	**7**	1280	2560	1280	1280	1280	**2560**	2560	2560	640	2560	640	2560	E5	
G	A/VICTORIA/637/2012	**6A**	<80	<80	<80	<80	<80	<80	**640**	<80	160	160	<80	80	E5	
H	A/SINGAPORE/51/2012	**7**	1280	1280	640	1280	640	1280	1280	**1280**	640	1280	320	1280	X,MDCK3	
I	A/BRISBANE/96/2012	**7**	<80	160	<80	<80	<80	<80	160	160	**640**	1280	80	160	MDCK4	
J	A/DARWIN/56/2013	**7**	160	320	80	160	<80	160	640	320	640	**1280**	160	320	MDCK2	
K	A/STH AUSTRALIA/17/2013	**6B**	2560	2560	1280	2560	1280	2560	2560	2560	1280	2560	**1280**	2560	E3	
L	A/BRISBANE/28/2013	**6C**	2560	2560	1280	1280	1280	2560	2560	1280	640	2560	640	**2560**	E5	
	Test Antigens															
1	A/STH AFRICA/522/2014		5120	5120	2560	5120	2560	5120	5120	5120	1280	5120	1280	5120	MDCK3	18/02/2014
2	A/SINGAPORE/GP779/2014		5120	5120	2560	2560	2560	5120	5120	5120	640	5120	1280	2560	X,MDCK1	8/05/2014
3	A/VICTORIA/71/2014		2560	2560	1280	1280	1280	2560	2560	2560	320	2560	640	1280	MDCK1	16/07/2014
4	A/CAMBODIA/FSS26716/2014		2560	5120	2560	2560	1280	2560	2560	2560	1280	2560	1280	2560	MDCK1	4/06/2014
5	A/CAMBODIA/FSS26724/2014		2560	5120	2560	2560	1280	2560	2560	2560	640	2560	640	2560	MDCK1	11/06/2014
6	A/SOUTH AFRICA/3599/2014		2560	5120	2560	2560	2560	5120	5120	5120	1280	5120	1280	2560	MDCK2	6/04/2014
7	A/SINGAPORE/GP744/2014		2560	2560	2560	2560	1280	5120	5120	2560	640	5120	1280	2560	X,MDCK1	30/04/2014
8	A/SINGAPORE/GP663/2014		2560	2560	2560	1280	1280	2560	2560	2560	640	2560	640	2560	X,MDCK1	11/04/2014
9	A/SINGAPORE/NUH003/2014		2560	2560	2560	2560	1280	2560	2560	2560	640	2560	640	2560	X,MDCK1	27/05/2014
10	A/SYDNEY/106/2014		1280	2560	1280	1280	1280	1280	2560	1280	320	1280	640	1280	X,MDCK1	30/06/2014
11	A/VICTORIA/70/2014		1280	2560	1280	1280	1280	2560	2560	2560	320	2560	640	1280	MDCK1	17/07/2014
12	A/VICTORIA/72/2014		1280	2560	1280	1280	640	1280	2560	2560	320	1280	640	1280	MDCK1	17/07/2014
13	A/VICTORIA/73/2014		1280	2560	1280	1280	640	1280	1280	1280	320	1280	640	1280	MDCK1	18/07/2014
14	A/VICTORIA/74/2014		1280	1280	1280	1280	640	1280	1280	1280	320	1280	640	1280	MDCK1	18/07/2014
15	A/CAMBODIA/Y0721417/2014		1280	2560	1280	1280	1280	1280	1280	1280	640	1280	640	1280	X,MDCK1	4/06/2014
16	A/CAMBODIA/Y0721419/2014		1280	2560	1280	1280	640	2560	2560	2560	320	2560	640	1280	X,MDCK1	9/06/2014
17	A/CAMBODIA/Y0721429/2014		1280	2560	1280	1280	1280	1280	1280	2560	640	2560	640	1280	X,MDCK1	11/06/2014
18	A/CAMBODIA/Y0721449/2014		1280	1280	1280	640	640	1280	1280	1280	320	1280	320	1280	X,MDCK1	27/06/2014
19	A/CAMBODIA/FSS28209/2014		1280	2560	1280	1280	640	2560	2560	2560	320	1280	640	1280	MDCK1	3/06/2014
20	A/SOUTH AFRICA/4044/2014		1280	1280	640	640	640	1280	1280	1280	160	1280	320	640	MDCK3	15/05/2014
21	A/SOUTH AFRICA/4987/2014		1280	2560	1280	1280	1280	2560	2560	2560	640	2560	640	1280	MDCK2	19/06/2014
22	A/SINGAPORE/GP614/2014		1280	1280	1280	1280	640	1280	1280	1280	320	1280	320	1280	X,MDCK1	3/04/2014
23	A/SINGAPORE/EN179/2014		1280	2560	1280	1280	1280	2560	2560	2560	320	2560	640	1280	X,MDCK1	7/04/2014
24	A/SINGAPORE/KK268/2014		1280	2560	1280	1280	1280	2560	2560	2560	320	2560	640	1280	X,MDCK1	23/04/2014
25	A/VICTORIA/75/2014	**6B**	640	640	640	640	320	640	640	640	160	640	320	640	MDCK1	21/07/2014
26	A/CAMBODIA/Y0721448/2014		640	1280	640	640	320	1280	640	1280	320	1280	320	640	X,MDCK1	26/06/2014
27	A/CAMBODIA/Y0721444/2014	**6B**	640	1280	640	640	320	640	640	640	160	640	320	640	X,MDCK1	26/06/2014
28	A/SINGAPORE/TT293/2014		<80	<80	<80	<80	<80	<80	160	<80	<80	160	<80	<80	X,MDCK1	24/04/2014

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

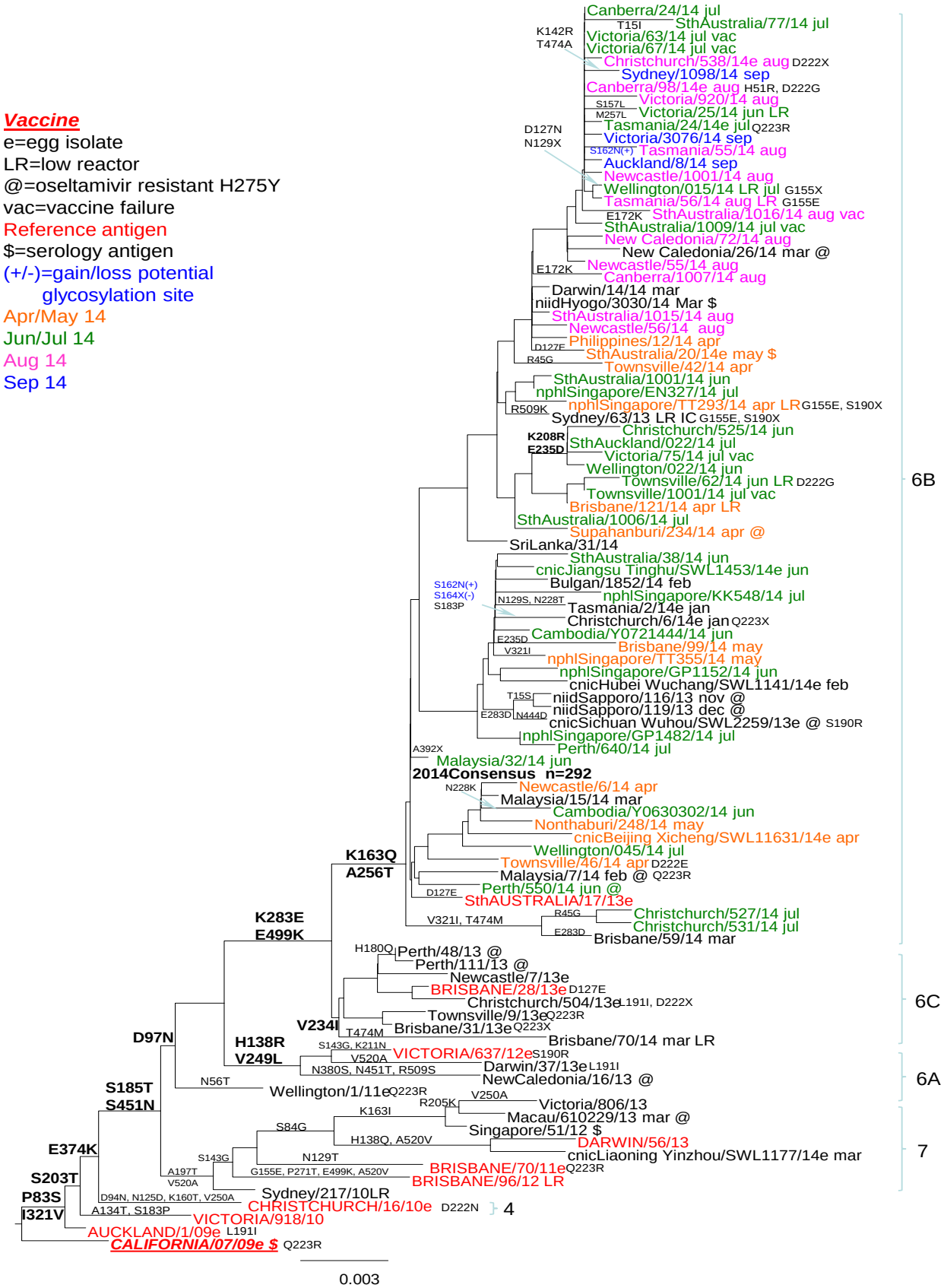


FIGURE 3.3
Phylogenetic relationships among influenza A(H1N1)pdm09 N1 neuraminidase genes

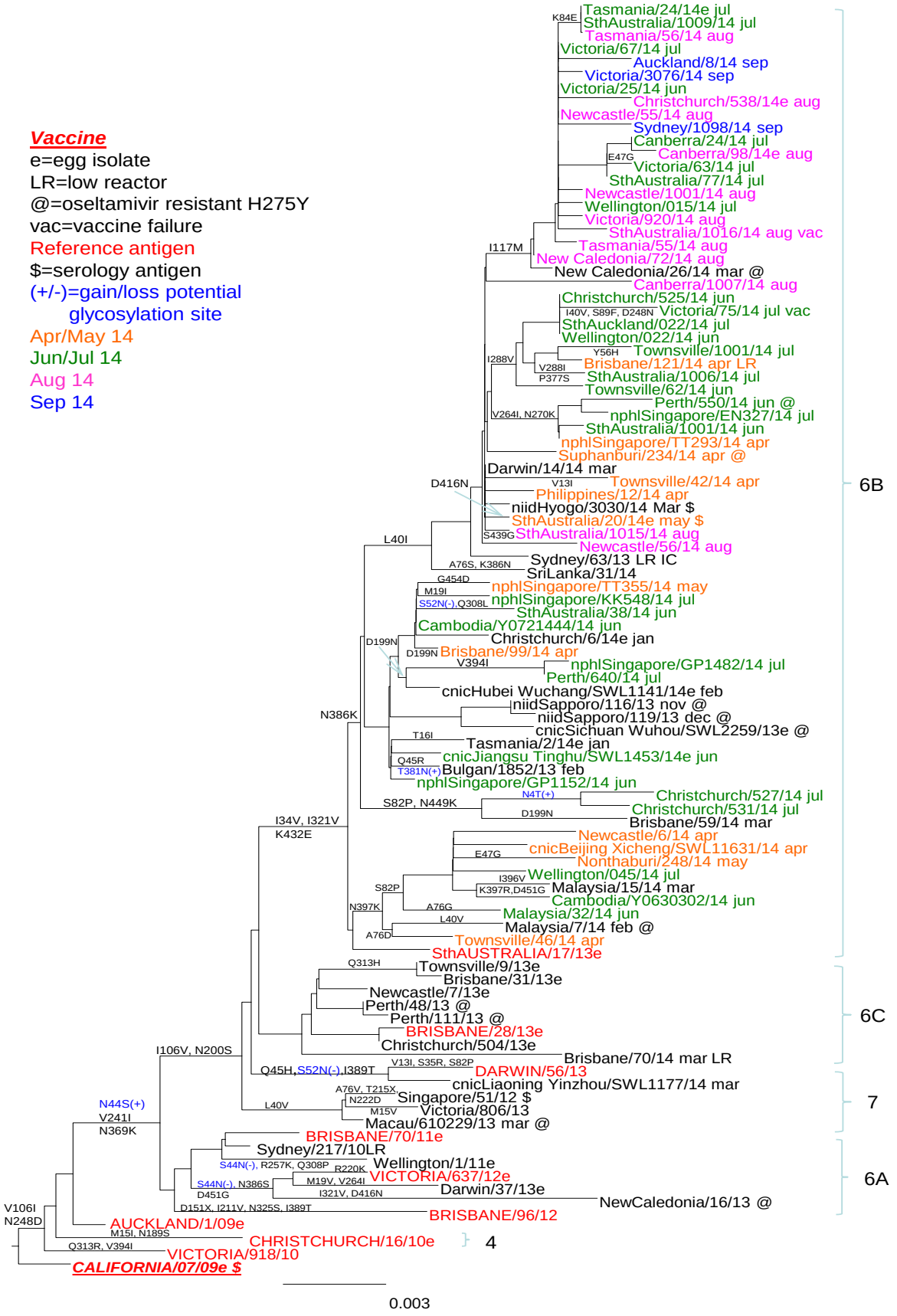


TABLE 3.7
Haemagglutination inhibition antibody titres
Influenza type A(H1N1)pdm09 viruses – Young Adults

Antigen			Passage History	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
A/Hyogo/3030/2014	AUS	24	MDCK2+MDCK1,MDCK1	62.5	25.7	132.4	37.5	83.3	16.7	50.0
	EU	24	MDCK2+MDCK1,MDCK1	79.2	19.4	277.0	37.5	91.7	12.5	79.2
A/South Australia/20/2014	AUS	24	E3	54.2	12.1	68.3	25.0	70.8	4.2	45.8
	EU	24	E3	75.0	17.8	285.1	41.7	91.7	12.5	75.0
A/California/07/2009*	AUS	24	E7	45.8	30.1	160.0	50.0	57.5	20.8	66.7
	EU	24	E7	75.0	21.8	380.5	37.5	100.0	8.3	83.3

*Australian Vaccine strain (European Vaccine Strain not shown)

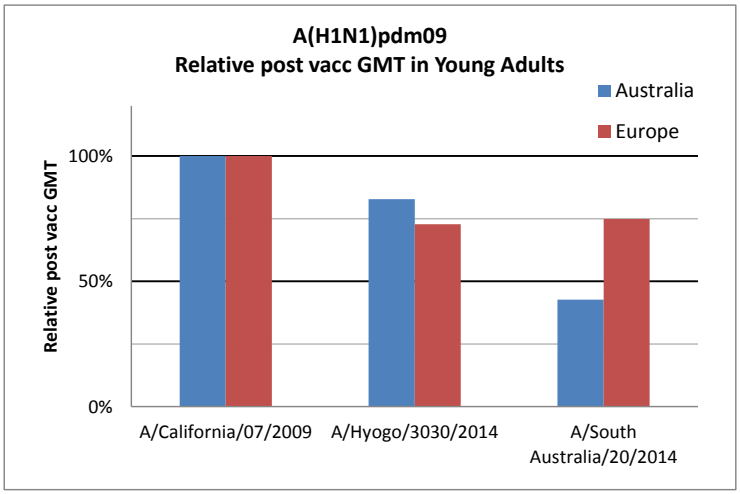
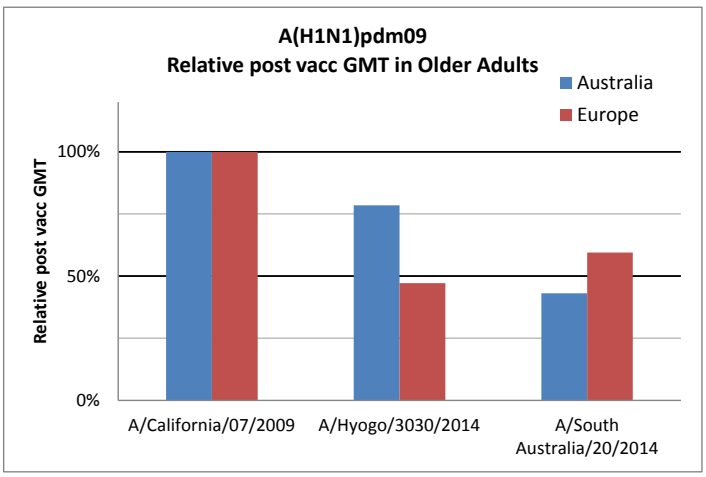


TABLE 3.8
Haemagglutination inhibition antibody titres
Influenza type A(H1N1)pdm09 viruses – Older Adults

Antigen			Passage History	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
A/Hyogo/3030/2014	AUS	24	MDCK2+MDCK1,MDCK1	29.2	13.1	26.2	20.8	54.2	4.2	4.2
	EU	24	MDCK2+MDCK1,MDCK1	62.5	13.0	80.0	29.2	79.2	8.3	41.7
A/South Australia/20/2014	AUS	24	E3	29.2	7.9	14.4	8.3	29.2	0.0	4.2
	EU	24	E3	54.2	15.0	100.8	29.2	75.0	16.7	54.2
A/California/07/2009*	AUS	24	E7	37.5	15.2	33.4	29.2	62.5	4.2	12.5
	EU	24	E7	62.5	19.4	169.5	37.5	87.5	20.8	66.7

*Australian Vaccine Strain (European Vaccine Strain not shown)



APPENDIX 4 - Influenza A (H3N2)

FIGURE 4.1
Antigenic cartographic representation of A(H3N2) HI analysis (coloured dots represent recent viruses)

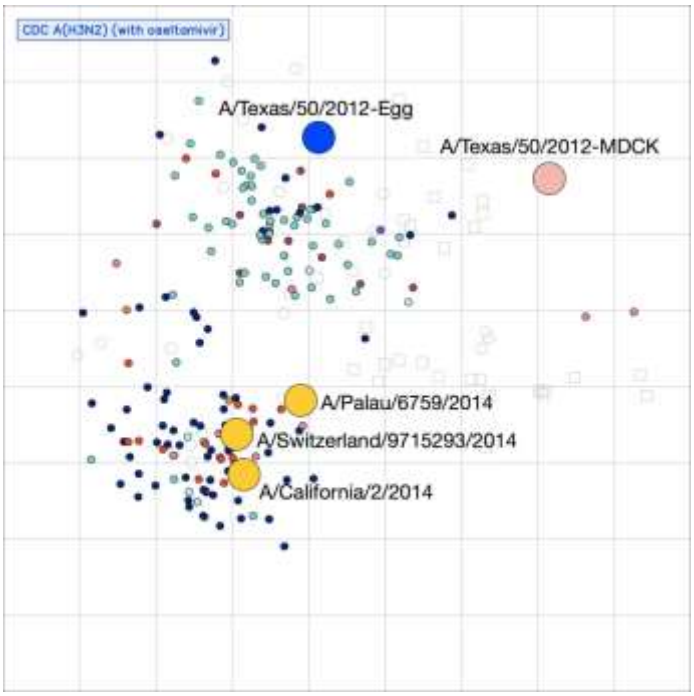


TABLE 4.2: A(H3) viruses (1)

Haemagglutination Inhibition Assay - WHO Influenza Centre

September 16, Part A&B — **Reference Antisera**

	Sequenced		A	B	C	D	E	F	G	H	I	J	K	L		
			F2238	F2770	F2573	F3063	F3065	F3066	F3127	F3130	F3126	F3129	F3055	F3059	Passage	Sample
	*Not on tree		X,MDCK4	E6	X,MDCK3	E6	MDCK3	MDCK3	E5	MDCK1	E4	X,SIAT1	MDCK3	X,MDCK4	History	Date
	Reference Antigens	**GP**	**PERTH/16**	**Tex/50**	**Tex/50**	**TAS/11**	**TAS/11**	**SYD/71**	**S.AUS/55**	**S.AUS/55**	**NEWC/22**	**NEWC/22**	**PERTH/1**	**SNG/GP1940**		
A	A/PERTH/16/2009		**320**	640	640	40	80	80	160	160	160	320	160	80	X,MDCK6	
B	A/TEXAS/50/2012	**3C.1**	320	**1280**	>2560	80	160	160	320	160	1280	>2560	640	80	E7	
C	A/TEXAS/50/2012	**3C.1**	160	320	**320**	80	80	160	160	160	160	160	80	80	X,MDCK7	
D	A/TASMANIA/11/2014	**3C.3a**	80	80	80	**320**	320	160	160	80	80	20	80	80	E6	
E	A/TASMANIA/11/2014	**3C.3a**	40	80	160	40	**80**	160	160	160	40	40	40	40	MDCK3	
F	A/SYDNEY/71/2014	**3C.2a**	40	80	160	40	40	**160**	80	160	40	40	40	40	MDCK3	
G	A/STH AUSTRALIA/55/2014	**3C.3a**	80	40	40	80	320	80	**160**	80	40	160	160	160	E5	
H	A/STH AUSTRALIA/55/2014	**3C.3a**	40	80	160	40	80	160	80	**160**	40	40	80	80	MDCK2	
I	A/NEWCASTLE/22/2014	**3C.3b**	160	320	320	80	80	80	160	160	320	**1280**	320	80	MDCK3	
J	A/PERTH/1/2014	**3C.3**	160	320	320	40	80	160	80	160	160	160	**320**	80	MDCK3	
K	A/SINGAPORE/GP1940/2013	**3C.3a**	40	160	160	40	80	160	80	160	40	40	40	**40**	X,MDCK4	
	Test Antigens															
1	A/NEWCASTLE/25/2014	**3C.3b**	320	1280	>2560	160	80	160	160	160	>2560	>2560	640	80	E3	4/05/2014
2	A/VICTORIA/361/2011		320	640	1280	160	160	160	320	160	320	1280	640	160	X,SIAT2	
3	A/VICTORIA/503/2014	**3C.3b**	640	640	640	160	160	320	320	320	1280	>2560	320	320	X,SIAT2	5/05/2014
4	A/SYDNEY/136/2014		640	1280	640	80	80	160	160	320	640	1280	320	160	X,MDCK2	1/08/2014
5	A/TASMANIA/11/2014		80	320	320	80	160	320	160	320	80	80	80	80	X,SIAT2	16/03/2014
6	A/SYDNEY/66/2014	**3C.2a***	80	160	320	80	80	320	160	320	40	40	40	80	X,SIAT2	29/04/2014
7	A/STH AUSTRALIA/16/2014	**3C.3***	80	160	320	40	80	80	80	160	80	160	80	40	X,SIAT2	22/05/2014
8	A/TASMANIA/15/2014	**3C.3**	80	160	320	80	40	160	160	160	160	80	80	40	X,SIAT2	4/06/2014
9	A/NEWCASTLE/22/2014	**3C.3b**	160	320	320	80	80	160	160	160	320	1280	320	160	X,SIAT2	16/06/2014
10	A/SYDNEY/81/2014	**3C.2a***	80	320	320	80	80	160	160	160	80	80	80	80	X,SIAT2	28/05/2014
11	A/SRI LANKA/16/2014	**3C.3***	160	320	320	80	80	160	160	160	320	640	320	80	X,SIAT2	19/06/2014
12	A/STH AUSTRALIA/1005/2014	**3C.3**	160	320	320	80	80	160	160	160	320	320	320	80	X,SIAT2	3/07/2014
13	A/SYDNEY/93/2014	**3C.3***	80	160	320	80	80	160	80	160	80	160	80	80	X,SIAT2	16/06/2014
14	A/NEWCASTLE/28/2014	**3C.3b***	160	320	320	80	80	80	160	160	320	640	160	80	X,SIAT2	28/06/2014
15	A/PERTH/630/2014		640	640	320	80	80	640	320	160	40	80	80	80	X,MDCK2	16/07/2014
16	A/SYDNEY/128/2014		160	320	320	80	80	160	160	160	160	320	160	80	X,MDCK2	26/07/2014
17	A/SYDNEY/147/2014		320	320	320	80	80	160	160	320	160	320	160	80	X,MDCK2	5/08/2014
18	A/BRISBANE/244/2014		160	320	320	80	80	80	160	160	320	1280	160	80	MDCK2	22/07/2014
19	A/BRISBANE/246/2014		160	160	320	80	160	320	160	160	40	80	80	80	MDCK3	14/07/2014
20	A/BRISBANE/255/2014		160	320	320	40	40	80	80	160	160	640	160	80	MDCK3	17/07/2014
21	A/VICTORIA/2027/2014		160	320	320	40	40	160	80	160	80	160	80	40	MDCK1	28/08/2014
22	A/WELLINGTON/018/2014		160	320	320	40	40	80	80	160	160	640	160	80	X,MDCK4	22/07/2014
23	A/NEW CALEDONIA/76/2014		80	320	320	40	40	80	80	160	320	640	160	80	MDCK3	20/08/2014
24	A/CHRISTCHURCH/510/2014	**3C.3a**	80	160	160	80	160	160	160	160	80	80	160	160	X,SIAT2	4/04/2014
25	A/STH AUSTRALIA/40/2014	**3C.3a**	80	80	160	80	160	160	160	160	80	80	160	160	X,SIAT2	20/06/2014
26	A/VICTORIA/27/2014	**3C.3a**	80	160	160	80	160	160	160	160	80	80	80	80	X,SIAT2	25/06/2014
27	A/SYDNEY/85/2014	**3C.3a**	40	80	160	80	160	160	160	160	80	80	80	80	X,SIAT2	3/06/2014
28	A/SYDNEY/95/2014	**3C.3a***	80	160	160	80	160	160	160	320	80	80	80	80	X,SIAT2	14/06/2014
29	A/BRISBANE/100/2014	**3C.2a***	40	160	160	80	80	320	80	160	80	80	80	80	X,SIAT2	7/04/2014
30	A/STH AUSTRALIA/55/2014	**3C.3a**	40	80	160	80	160	160	160	160	80	80	160	160	X,SIAT2	29/06/2014
31	A/SYDNEY/297/2014		80	80	160	40	80	80	80	160	40	40	40	40	X,MDCK2	19/07/2014
32	A/BRISBANE/254/2014		80	160	160	40	40	80	80	160	80	160	80	40	MDCK2	28/07/2014
33	A/BRISBANE/261/2014		80	160	160	40	40	80	80	160	80	80	80	40	MDCK2	31/07/2014
34	A/BRISBANE/262/2014		80	160	160	40	40	80	80	160	80	80	80	40	MDCK2	1/08/2014

TABLE 4.5 – A(H3) viruses
Virus Neutralization of Influenza A(H3N2) Viruses in MDCK cells
Performed by WHOCC, Melbourne, Australia

Virus Neutralization Assay										
	September 19, 2014		**1**	**2**	**3**	**4**	**5**	**6**		
	Guinea Pig RBC's #1		**F2573-15D**	**F2770-13D**	**F3065-13D**	**F3063-13D**	**F3130-13D**	**F3127-13D**	**Passage**	**Sample**
			M1/C2,MDCK3	**E6**	**MDCK2**	**E5**	**MDCK1**	**E5**	**History**	**Date**
	Reference Antigens	**GP**	**TEX/50**	**TEX/50**	**TAS/11**	**TAS/11**	**STH AUST/55**	**STH AUST/55**		
1	A/TEXAS/50/2012	**3C.1**	**320**	160	40	40	160	40	M1/C2,MDCK5	
2	A/TEXAS/50/2012	**3C.2**	2560	**1280**	320	640	160	640	E6	
3	A/TASMANIA/11/2014	**3C.3a**	320	320	**80**	40	320	80	MDCK4	
4	A/TASMANIA/11/2014	**3C.3a**	320	160	640	**1280**	640	320	E6	
5	A/STH AUSTRALIA/55/2014	**3C.3a**	40	40	40	<40	**80**	<40	MDCK2	
6	A/STH AUSTRALIA/55/2014	**3C.3a**	160	320	640	640	640	**1280**	E5	
	Test Ag									
1	A/SYDNEY/85/2014	**3C.3a**	<40	40	40	<40	<40	<40	MDCKX, MDCK1,SIAT2	3/06/2014
2	A/VICTORIA/361/2011	**3C.1**	320	160	40	80	160	160	mdck6,SIAT2	24/10/2011
3	A/TEXAS/50/2012	**3C.1**	160	80	<40	<40	80	80	M1/C2,MDCK7,SIAT2	15/04/2012
4	A/TASMANIA/11/2014	**3C.3a**	160	80	80	<40	80	40	MDCK4, SIAT2	16/03/2014
5	A/CHRISTCHURCH/510/2014	**3C.3a**	160	80	80	40	320	80	MDCK1,SIAT2	4/04/2014
6	A/SRI LANKA/16/2014	**3C.3**	160	80	<40	40	80	40	MDCK2,SIAT2	19/06/2014
7	A/SOUTH AUSTRALIA/1005/2014	**3C.3**	160	80	<40	<40	40	40	MDCK2,SIAT2	3/07/2014
8	A/NEWCASTLE/22/2014	**3C.3b**	80	80	<40	80	40	160	E4	16/06/2014
9	A/SOUTH AUSTRALIA/16/2014	**3C.3**	80	40	<40	40	40	40	MDCK1,SIAT2	22/05/2014
10	A/NEWCASTLE/22/2014	**3C.3b**	80	160	<40	40	80	80	MDCK1,SIAT2	16/06/2014
11	A/SOUTH AUSTRALIA/40/2014	**3C.3a**	80	160	80	40	80	160	MDCK1,SIAT2	20/06/2014
12	A/SYDNEY/93/2014	**3C.3**	80	<40	<40	<40	40	40	MDCKX, MDCK2,SIAT2	16/06/2014
13	A/NEWCASTLE/28/2014	**3C.3b**	80	160	80	80	80	80	MDCK1,SIAT2	28/06/2014
14	A/SYDNEY/66/2014	**3C.2a**	40	40	<40	40	160	<40	MDCKX,MDCK2, SIAT2	29/04/2014
15	A/TASMANIA/15/2014	**3C.3**	40	<40	<40	<40	40	<40	MDCK1,SIAT2	4/06/2014
16	A/SYDNEY/81/2014	**3C.2a**	40	<40	<40	<40	80	40	MDCKX, MDCK2,SIAT2	28/05/2014
17	A/VICTORIA/27/2014	**3C.3a**	40	80	40	40	<40	40	MDCK2,SIAT2	25/06/2014
18	A/SOUTH AUSTRALIA/55/2014	**3C.3a**	40	40	80	40	80	40	MDCK1,SIAT2	29/06/2014

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

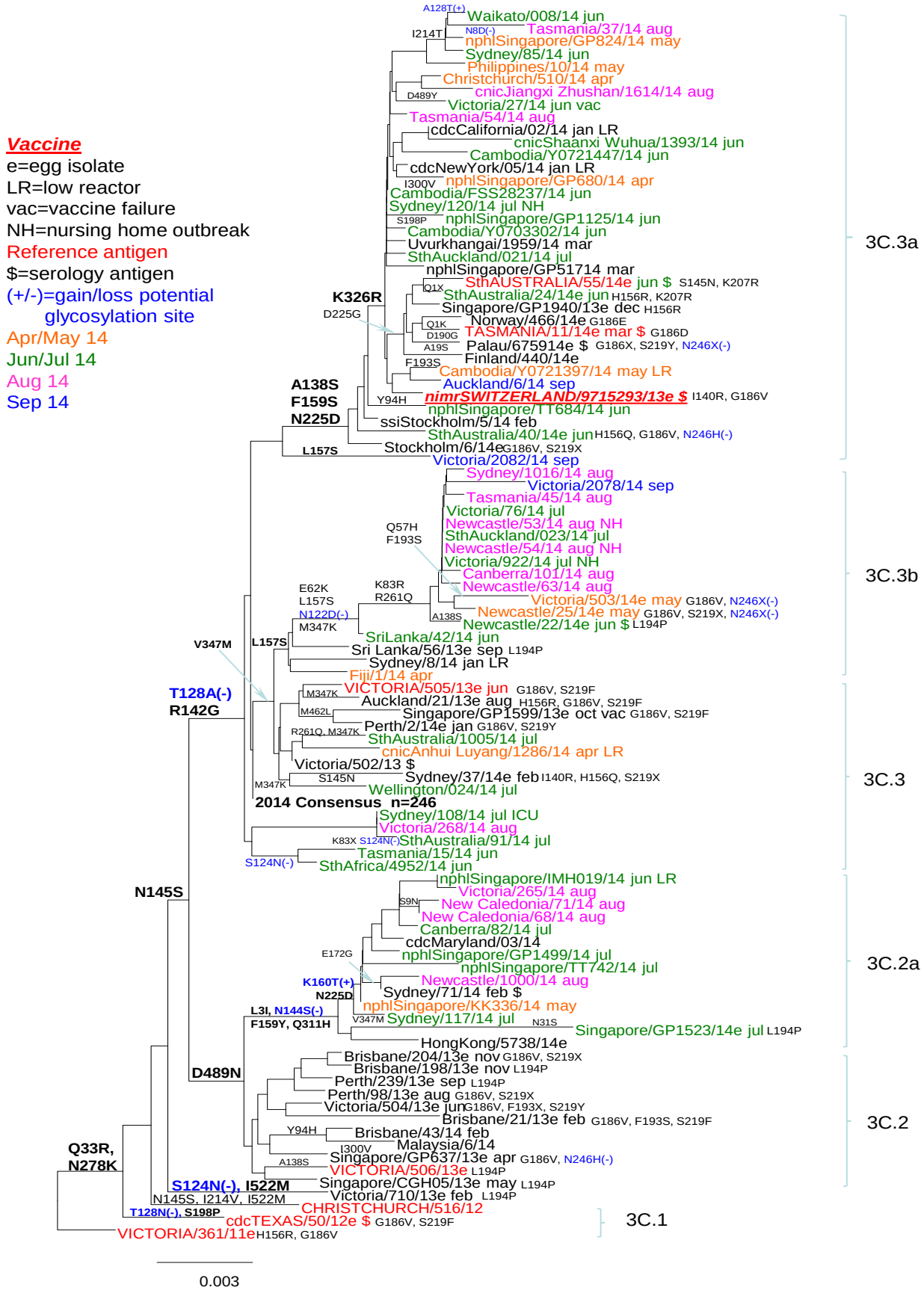


FIGURE 4.3
Phylogenetic relationships among influenza N2 Neuraminidase genes

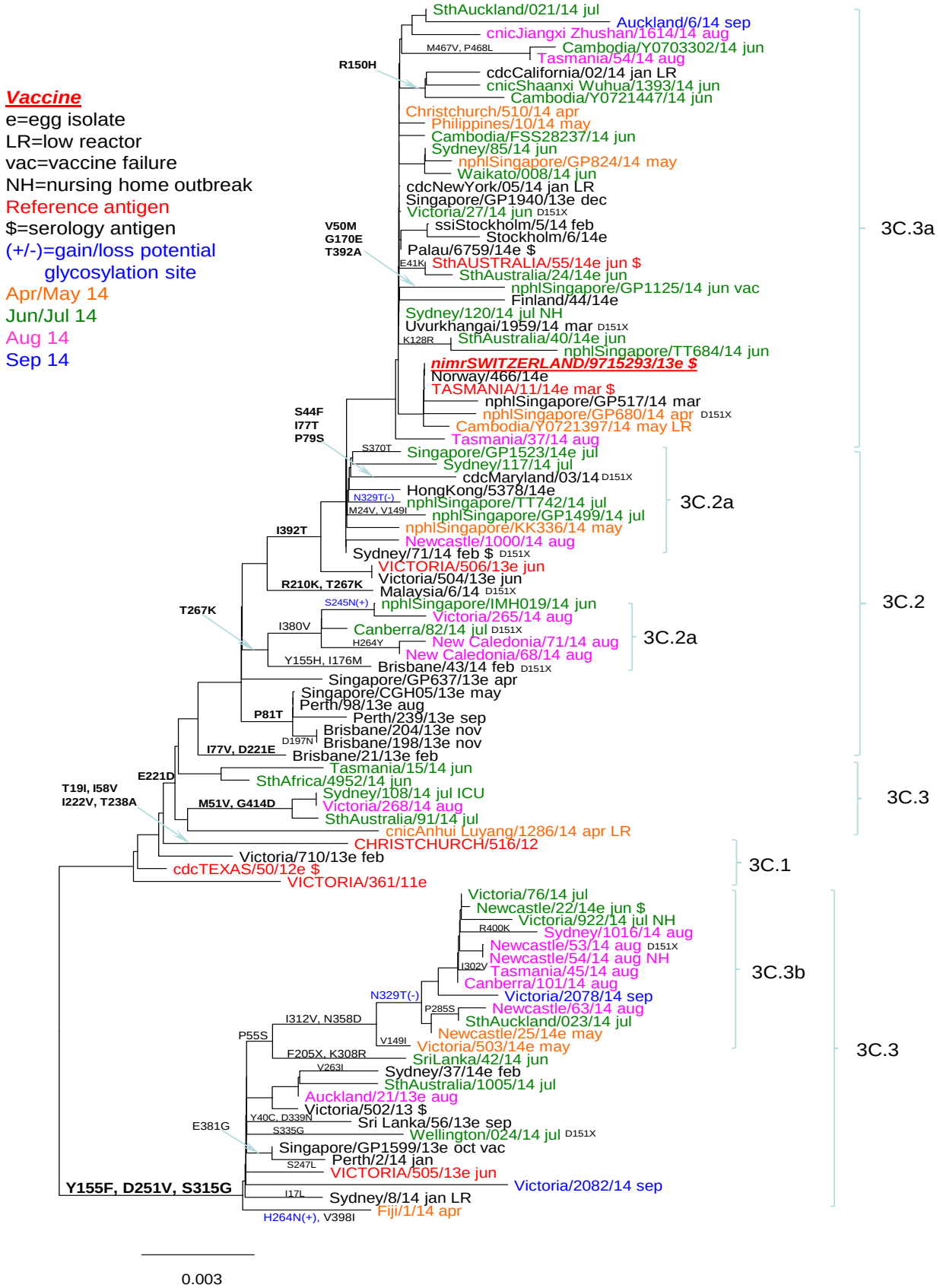


TABLE 4.10
Haemagglutination inhibition antibody titres
Influenza type A(H3N2) viruses – Young Adults

Antigen			Passage History	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
A/Texas/50/2012*	AUS	24	M1/C2,MDCK7	45.5	38.8	96.6	72.7	95.5	0.0	45.5
	EU	24	M1/C2,MDCK7	62.5	35.6	138.5	62.5	100.0	8.3	54.2
A/Texas/50/2012*	AUS	24	E5,E2	54.2	4.0	142.5	50.0	95.8	16.7	66.7
	EU	24	E5,E2	79.2	23.8	320.0	45.8	100.0	8.3	79.2
A/Tasmania/11/2014	AUS	24	MDCK3	16.7	18.2	37.6	16.7	75.0	0.0	0.0
	EU	24	MDCK3	50.0	20.0	50.4	41.7	79.2	4.2	16.7
A/Tasmania/11/2014	AUS	24	E6	41.7	8.8	24.2	8.3	45.8	0.0	0.0
	EU	24	E6	75.0	7.9	46.2	16.7	66.7	0.0	25.0
A/Palau/6759/2014	AUS	24	C2,MDCK1	16.7	16.0	33.1	12.5	58.3	0.0	0.0
	EU	24	C2,MDCK1	41.7	17.8	46.2	29.2	75.0	4.2	16.7
A/Palau/6759/2014	AUS	24	E6	54.2	10.3	41.3	16.7	58.3	0.0	12.5
	EU	24	E6	75.0	15.4	116.5	25.0	87.5	4.2	54.2
A/Newcastle/22/2014	AUS	24	MDCK3	29.2	35.3	87.9	66.7	83.3	0.0	29.2
	EU	24	MDCK3	79.2	26.7	116.5	45.8	100.0	4.2	50.0
A/South Australia/55/2014	AUS	24	MDCK2	37.5	9.4	20.6	0.0	37.5	0.0	0.0
	EU	24	MDCK2	37.5	14.6	30.0	16.7	50.0	0.0	0.0
A/Switzerland/9715293/2014	AUS	24	E5	58.3	12.1	41.3	25.0	58.3	0.0	16.7
	EU	24	E5	70.8	11.9	100.8	25.0	83.3	4.2	58.3

* Australian and European Vaccine strain

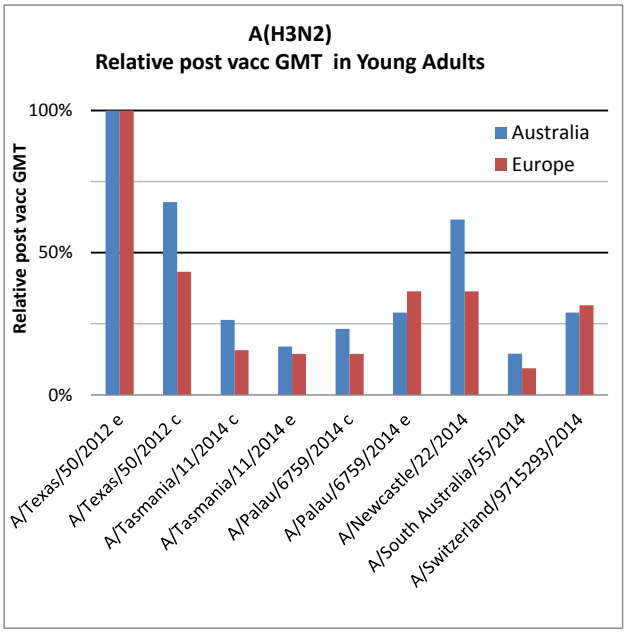
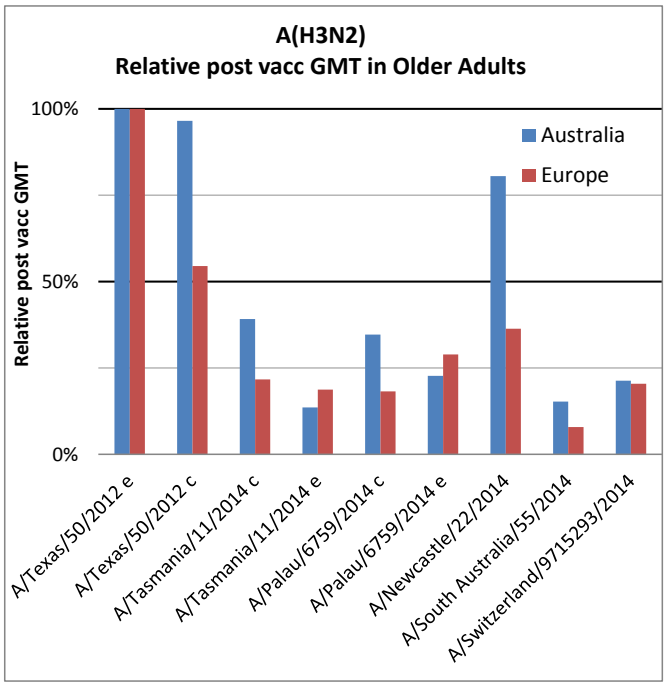


TABLE 4.11
Haemagglutination inhibition antibody titres
Influenza type A(H3N2) viruses – Older Adults

Antigen			Passage History	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
A/Texas/50/2012*	AUS	24	M1/C2,MDCK7	20.8	52.5	68.8	83.3	87.5	8.3	25.0
	EU	24	M1/C2,MDCK7	41.7	5.6	138.5	66.7	100.0	8.3	41.7
A/Texas/50/2012*	AUS	24	E5,E2	25.0	31.7	71.3	41.7	75.0	25.0	37.5
	EU	24	E5,E2	62.5	25.9	254.0	45.8	100.0	25.0	70.8
A/Tasmania/11/2014	AUS	24	MDCK3	12.5	27.0	27.9	45.8	45.8	0.0	4.2
	EU	24	MDCK3	33.3	29.1	55.0	58.3	79.2	0.0	20.8
A/Tasmania/11/2014	AUS	24	E6	16.7	5.8	9.7	4.2	12.5	0.0	0.0
	EU	24	E6	62.5	9.4	47.6	8.3	70.8	8.3	25.0
A/Palau/6759/2014	AUS	24	C2,MDCK1	12.5	23.3	24.7	33.3	50.0	0.0	0.0
	EU	24	C2,MDCK1	29.2	25.9	46.2	41.7	79.2	0.0	8.3
A/Palau/6759/2014	AUS	24	E6	20.8	7.6	16.2	4.2	29.2	0.0	12.5
	EU	24	E6	75.0	11.9	73.4	12.5	75.0	4.2	37.5
A/Newcastle/22/2014	AUS	24	MDCK3	20.8	42.5	57.4	66.7	79.2	4.2	20.8
	EU	24	MDCK3	45.8	29.1	92.4	54.2	95.8	4.2	33.3
A/South Australia/55/2014	AUS	24	MDCK2	20.8	6.8	10.9	4.2	20.8	0.0	0.0
	EU	24	MDCK2	16.7	11.9	20.0	16.7	25.0	0.0	0.0
A/Switzerland/9715293/2014	AUS	24	E5	29.2	7.4	15.2	8.3	25.0	4.2	12.5
	EU	24	E5	66.7	10.0	51.9	12.5	70.8	8.3	37.5

* Australian and European Vaccine strain



APPENDIX 5 - Influenza B

FIGURE 5.1
Antigenic cartographic representation of B/Victoria lineage HI analysis
(coloured dots represent recent viruses)

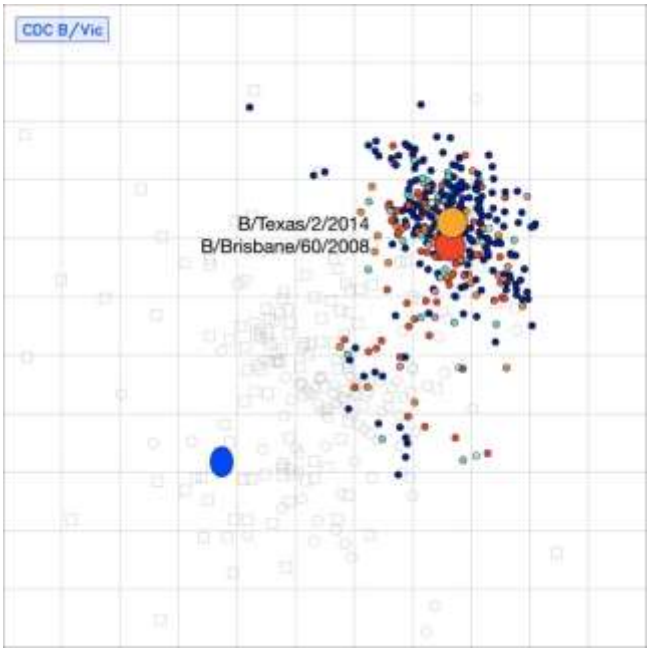


FIGURE 5.2
Antigenic cartographic representation of B/Yamagata HI
(Blue dots represent clade 2 viruses and red dots clade 3 viruses as determined by sequencing)

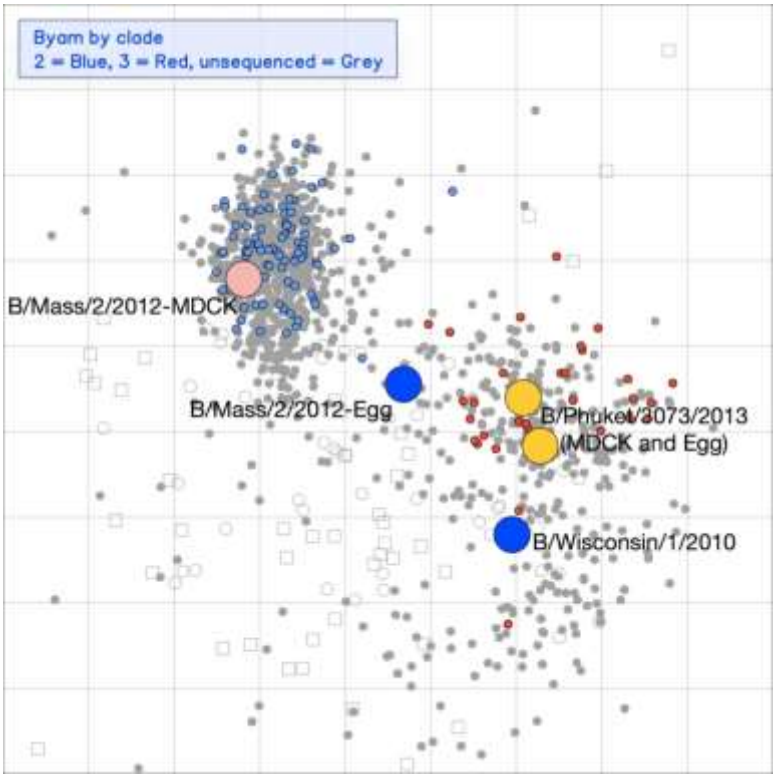


TABLE 5.2: B viruses (B/Victoria lineage) (1)

Haemagglutination Inhibition Assay - WHO Influenza Centre																
Reference Antisera																
	July 8, August 26, 2014		A	B	C	D	E	F	G	H	I	J	K	L		
	Sequenced		F1175-21D	F2428-21D	F2259-21D	F2256-22D	F2425-21D	F2424-21D	F2650-21D	F2253-22D	F2314-21D	F2315-21D	F2574-21D	F2897-21D		
			E4	MDCK3	E3	X,MDCK1	E4	E3	E3	E2	MDCK1	MDCK1	E4	MDCK2	Passage	Date
	Reference Antigens	**GP**	**MAL/2506**	**PHIL/6363**	**CAMB/30**	**BRIS/60**	**BRIS/60**	**BRIS/33**	**HK/90**	**SYD/508**	**S.AUS/11**	**DAR/40**	**S.AUS/81**	**BRIS/18**	**History**	
A	B/MALAYSIA/2506/2004	**4**	**640**	640	>2560	20	640	320	20	160	40	<20	1280	40	E5	
B	B/PHILIPPINES/6363/2009	**5**	320	**640**	1280	20	160	160	<20	160	20	<20	320	20	MDCK3	
C	B/CAMBODIA/30/2011	**5**	1280	640	**>2560**	20	640	640	20	320	40	20	1280	40	E3	
D	B/BRISBANE/60/2008	**1A**	20	<20	40	**640**	320	640	640	320	320	640	1280	640	X,MDCK5	
E	B/BRISBANE/60/2008	**1A**	320	640	>2560	320	**>2560**	>2560	320	>2560	160	640	>2560	640	E6	
F	B/BRISBANE/33/2008	**1A**	320	320	1280	320	1280	**>2560**	320	1280	160	640	>2560	320	E5	
G	B/HONG KONG/90/2008	**3**	320	320	1280	160	1280	>2560	**320**	1280	80	320	1280	320	E5	
H	B/SYDNEY/508/2010	**1B**	320	320	1280	320	1280	>2560	320	**1280**	160	640	>2560	320	E3	
I	B/STH AUSTRALIA/11/2012	**1A**	20	20	80	640	320	640	640	320	**320**	1280	1280	1280	MDCK4	
J	B/DARWIN/40/2012	**1A**	20	20	80	640	320	320	640	320	320	**1280**	1280	640	MDCK3	
K	B/STH AUSTRALIA/81/2012	**1A**	320	320	1280	320	>2560	>2560	320	1280	320	640	**>2560**	640	E4	
L	B/BRISBANE/18/2013	**1A**	20	20	80	640	320	640	640	320	320	1280	320	**1280**	MDCK3	
1	B/SINGAPORE/KK011/2014		20	20	80	1280	320	640	640	320	640	1280	>2560	1280	X,MDCK1	7/01/2014
2	B/STH AUSTRALIA/20/2014	**1A**	20	<20	80	640	160	320	320	160	320	1280	1280	640	MDCK1	2/07/2014
3	B/SYDNEY/19/2014		20	<20	40	640	320	320	640	160	320	1280	1280	1280	X,MDCK1	3/05/2014
4	B/SINGAPORE/GP132/2014		20	<20	80	640	320	320	320	320	320	1280	1280	640	X,MDCK1	16/01/2014
5	B/SINGAPORE/TT001/2014		20	20	80	640	320	640	640	320	640	1280	1280	1280	X,MDCK1	3/01/2014
6	B/SINGAPORE/EN018/2014		20	20	80	640	320	640	640	320	640	1280	1280	1280	X,MDCK1	14/01/2014
7	B/SINGAPORE/TT152/2014		40	40	80	640	320	640	1280	320	640	1280	1280	1280	X,MDCK1	4/02/2014
8	B/SINGAPORE/GP342/2014		20	40	80	640	320	640	640	320	320	1280	1280	640	X,MDCK1	13/02/2014
9	B/SINGAPORE/GP218/2014		20	20	80	640	320	640	640	320	320	1280	1280	640	X,MDCK1	6/03/2014
10	B/SINGAPORE/GP622/2014		20	40	80	640	320	640	640	320	640	1280	1280	1280	X,MDCK1	4/04/2014
11	B/SINGAPORE/GP674/2014		20	40	80	640	320	640	640	320	640	1280	1280	1280	X,MDCK1	14/04/2014
12	B/SINGAPORE/KK368/2014		20	20	80	640	320	640	640	320	320	1280	1280	1280	X,MDCK1	2/06/2014
13	B/KUMAMOTO/46/2014		20	20	80	640	320	640	640	320	640	1280	1280	1280	X, MDCK1	14/03/2014
14	B/PHILIPPINES/1/2014		40	20	80	640	320	640	640	320	640	1280	1280	1280	MDCK2	29/01/2014
15	B/PHILIPPINES/4/2014		160	320	1280	640	>2560	>2560	640	>2560	320	640	>2560	1280	MDCK2	19/02/2014
16	B/STH AUCKLAND/002/2014	**1A**	320	320	1280	640	>2560	>2560	320	>2560	320	640	>2560	640	X,MDCK1	1/04/2014
17	B/CHIANG RAI/273/2014	**1A**	20	40	80	640	320	320	640	320	640	1280	>2560	1280	MDCK2	15/05/2014
18	B/SINGAPORE/TT144/2014		20	40	80	320	320	640	640	320	320	640	1280	640	X,MDCK1	4/02/2014
19	B/SINGAPORE/GP514/2014		20	<20	40	320	160	320	160	160	320	640	1280	640	X,MDCK1	11/03/2014
20	B/SINGAPORE/KK187/2014		<20	<20	40	320	160	320	160	160	320	640	640	640	X,MDCK1	17/03/2014
21	B/SINGAPORE/KK357/2014		40	80	80	320	160	320	320	160	160	320	1280	640	X,MDCK1	29/05/2014
22	B/SINGAPORE/GP775/2014		40	20	80	160	320	320	640	320	320	640	1280	320	X,MDCK1	7/05/2014
23	B/PHILIPPINES/3/2014	**1A**	20	20	160	20	80	80	<20	<20	80	80	160	80	MDCK3	19/02/2014

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

Haemagglutination Inhibition Assay - WHO Influenza Centre																
Reference Antisera																
	September 9, 2014		A	B	C	D	E	F	G	H	I	J	K	L		
	Sequenced		F2254-21D	F1883-21D	F2898-21D	F2258-22D	F2312-21D	F2504-21d	F2507-21D	F3061-21D	F2570-21D	F3060-21D	F3067-21D	F3064-21D		
			E2	E4	E4	E4	x,mdck2	x,mdck2	E2	E3/E1	X,MDCK1	x,mdck1	MDCK1	E4	Passage	Date
	Reference Antigens	**GP**	**BRIS/3**	**FLORID/4**	**WISC/1**	**HBEI/158**	**MAL/412**	**WELL/3**	**BRIS/36**	**MASS/2**	**MASS/2**	**SYD/7**	**Phuk/3073**	**Phuk/3073**	**History**	
A	B/BRISBANE/3/2007	**2**	**640**	640	80	320	160	160	1280	320	640	80	40	640	E4	
B	B/FLORIDA/4/2006	**1**	1280	**>2560**	80	640	160	320	1280	640	1280	80	80	1280	E4	
C	B/WISCONSIN/1/2010	**3**	320	320	**80**	640	<20	160	640	320	80	80	80	640	E5	
D	B/HUBEI WUJIAGANG/158/2009	**3**	320	320	80	**640**	<20	160	640	320	160	80	80	640	E7	
E	B/MALAYSIA/412/2012	**2**	640	1280	80	640	**640**	1280	>2560	1280	>2560	320	640	640	X,MDCK3	
F	B/WELLINGTON/3/2012	**2**	640	640	40	160	160	**1280**	640	640	1280	80	80	80	X,MDCK2	
G	B/BRISBANE/36/2012	**2**	320	640	40	320	80	160	**1280**	320	640	40	<20	320	E3	
H	B/MASSACHUSETTS/02/2012	**2**	1280	1280	80	640	160	320	1280	**320**	640	80	40	1280	E3.E2	
I	B/MASSACHUSETTS/02/2012	**2**	640	640	40	160	320	640	640	320	**1280**	80	80	160	X,MDCK2	
J	B/SYDNEY/7/2014	**3**	320	160	80	320	80	320	320	640	160	**320**	320	320	X,MDCK2	
K	B/PHUKET/3073/2013	**3**	640	640	80	320	80	640	640	640	320	320	**320**	320	MDCK2	
L	B/PHUKET/3073/2013	**3**	640	320	80	640	<20	160	640	320	160	80	80	**1280**	E5	
	Test Antigens															
1	B/TASMANIA/3/2014		640	640	<20	80	320	640	640	640	1280	80	80	80	mdck1	15/08/2014
2	B/BRISBANE/33/2014		320	640	<20	160	160	320	640	320	640	80	40	80	MDCK2	10/07/2014
3	B/PHILIPPINES/5/2014		640	320	80	320	80	640	320	640	320	320	160	160	MDCK2	2/07/2014
4	B/BRISBANE/28/2014		320	320	80	320	160	320	640	640	320	320	320	320	MDCK2	27/06/2014
5	B/WELLINGTON/014/2014		640	320	160	640	320	640	640	1280	320	640	640	640	X,MDCK1	24/06/2014
6	B/NEWCASTLE/22/2014		640	320	80	640	80	640	320	640	320	320	320	320	MDCK2	11/08/2014
7	B/SINGAPORE/KK585/2014		320	160	40	160	40	320	160	320	160	320	160	320	X,MDCK1	8/07/2014
8	B/MALAYSIA/37/2014		640	640	160	640	<20	160	640	640	160	160	160	1280	X,MDCK1	12/06/2014
9	B/SOUTH AUSTRALIA/22/2014		160	80	40	320	<20	320	320	320	160	160	160	320	MDCK1	23/07/2014
10	B/BRISBANE/29/2014		320	640	80	320	80	320	160	320	160	320	160	160	MDCK2	2/07/2014
11	B/BRISBANE/32/2014		320	160	80	160	40	160	320	320	160	160	160	160	MDCK2	5/07/2014
12	B/VICTORIA/801/2014		320	160	80	160	80	160	320	320	160	160	160	160	mdck1	6/08/2014
13	B/WELLINGTON/004/2014		320	160	80	320	80	320	320	320	160	160	160	320	X,MDCK1	2/07/2014
14	B/WELLINGTON/005/2014		320	160	40	320	80	320	160	320	160	320	160	320	X,MDCK1	10/07/2014
15	B/WELLINGTON/009/2014		320	160	80	160	40	320	160	320	160	160	160	160	X,MDCK1	17/07/2014
16	B/WELLINGTON/010/2014		320	160	80	320	80	320	320	640	160	320	160	320	X,MDCK1	20/07/2014
17	B/CHRISTCHURCH/001/2014	**3**	320	160	40	160	<20	320	160	160	160	160	160	160	X,MDCK1	27/06/2014
18	B/SOUTH AUCKLAND/005/2014		320	160	40	160	<20	160	160	320	160	160	160	160	X,MDCK1	19/07/2014
19	B/SOUTH AUCKLAND/006/2014		320	160	80	160	<20	320	160	320	160	160	160	320	X,MDCK1	20/07/2014
20	B/WELLINGTON/011/2014		320	160	80	160	80	320	320	320	160	320	160	320	X,MDCK1	17/07/2014
21	B/NEWCASTLE/23/2014		160	160	80	160	40	320	160	320	160	320	160	160	MDCK1	11/08/2014
22	B/CHRISTCHURCH/501/2014	**3**	160	160	40	160	40	160	160	160	160	160	160	160	MDCK1	2/08/2014
23	B/BRISBANE/34/2014		320	160	80	320	40	320	320	320	160	160	160	160	MDCK2	12/07/2014
24	B/SYDNEY/22/2014		320	160	40	160	40	320	160	320	160	160	160	160	X,MDCK1	13/07/2014
25	B/VICTORIA/500/2014		160	80	40	160	40	320	160	320	80	320	160	160	MDCK1	11/08/2014
26	A/SYDNEY/1020/2014		160	80	40	160	40	320	160	320	80	160	160	160	MDCK1	7/08/2014
27	B/SOUTH AUSTRALIA/23/2014		320	160	40	160	<20	160	160	320	80	80	80	160	MDCK1	29/07/2014
28	A/CHRISTCHURCH/534/2014		160	80	40	160	<20	160	160	320	80	160	160	80	MDCK1	30/07/2014
29	B/VICTORIA/802/2014		160	80	40	160	<20	320	160	320	80	160	80	160	MDCK1	18/08/2014
30	B/BRISBANE/36/2014		320	160	40	160	<20	320	160	160	80	160	160	160	MDCK2	14/07/2014
31	B/PERTH/523/2014		160	80	40	160	<20	320	160	320	80	160	160	160	X,MDCK1	16/06/2014
32	B/PERTH/527/2014		160	80	40	160	<20	320	160	320	80	160	80	160	X,MDCK1	2/07/2014

TABLE 5.9
HI serology assays of influenza type B/Victoria viruses – Young Adults

Antigen			Passage History	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
B/Texas/2/2013	AUS	24	E7	29.2	23.8	55.0	50.0	62.5	8.3	29.2
	EU	24	E7	41.7	20.0	49.0	41.7	70.8	8.3	25.0

Please note: Australian & European Vaccines did not contain a B/Victoria-lineage strain

TABLE 5.10
HI serology assays of influenza type B/Victoria viruses – Older Adults

Antigen			Passage History	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
B/Texas/2/2013	AUS	24	E7	8.3	14.1	20.6	25.0	29.2	8.3	8.3
	EU	24	E7	20.8	17.8	27.5	37.5	50.0	8.3	16.7

Please note: Australian & European Vaccines did not contain a B/Victoria-lineage strain

TABLE 5.11
HI serology assays of influenza type B/Victoria viruses – Older Adults

Antigen			Passage History	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
B/Texas/2/2013	USA	24	E7	4.2	5.1	5.8	0.0	0.0	0.0	0.0

TABLE 5.12
HI serology assays of influenza type B/Yamagata viruses – Young Adults

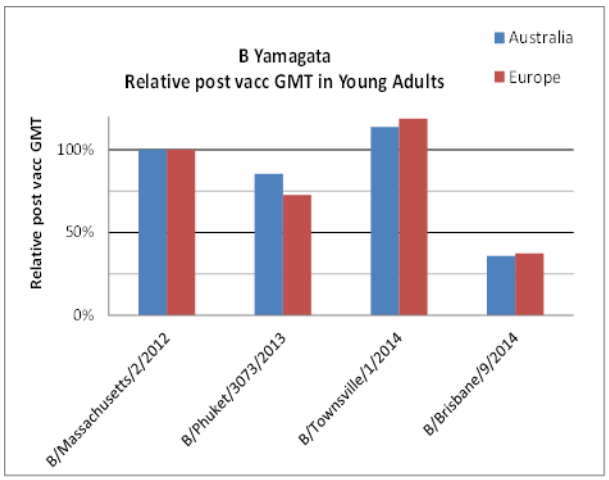
Antigen			Passage History	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
B/Massachusetts/2/2012*	AUS	24	E3,E1	59.1	54.8	273.4	68.2	100.0	40.9	90.9
	EU	24	E3,E1	58.3	92.4	380.5	75.0	100.0	45.8	83.3
B/Phuket/3073/2013	AUS	24	E1,E4	54.2	40.0	233.5	54.2	87.5	37.5	70.8
	EU	24	E1,E4	54.2	63.5	277.0	62.5	91.7	37.5	75.0
B/Townsville/1/2014	AUS	24	E4	54.2	65.4	310.9	70.8	95.8	37.8	80.0
	EU	24	E4	62.5	80.0	452.5	62.5	100.0	50.0	83.3
B/Brisbane/9/2014	AUS	24	E4	50.0	24.5	97.9	59.1	100.0	4.5	54.5
	EU	24	E4	66.7	29.1	142.5	45.8	83.3	20.8	62.5

*Australian and European Vaccine Strain

TABLE 5.13
HI serology assays of influenza type B/Yamagata viruses - Older Adults

Antigen			Passage History	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
B/Massachusetts/2/2012	AUS	24	E3,E1	25.0	54.1	87.6	70.8	83.3	33.3	45.8
	EU	24	E3,E1	45.8	44.9	160.0	62.5	91.7	41.7	66.7
B/Phuket/3073/2013	AUS	24	E1,E4	37.5	27.9	50.9	45.8	70.8	20.8	25.0
	EU	24	E1,E4	45.8	30.0	95.1	54.2	91.7	20.8	50.0
B/Townsville/1/2014	AUS	24	E4	37.5	37.8	80.0	54.2	87.5	29.2	37.5
	EU	24	E4	41.7	33.6	130.7	54.2	91.7	29.2	50.0
B/Brisbane/9/2014	AUS	24	E4	12.5	16.3	25.9	33.3	54.2	0.0	0.0
	EU	24	E4	50.0	14.6	49.0	33.3	83.3	0.0	8.3

*Australian and European Vaccine Strain



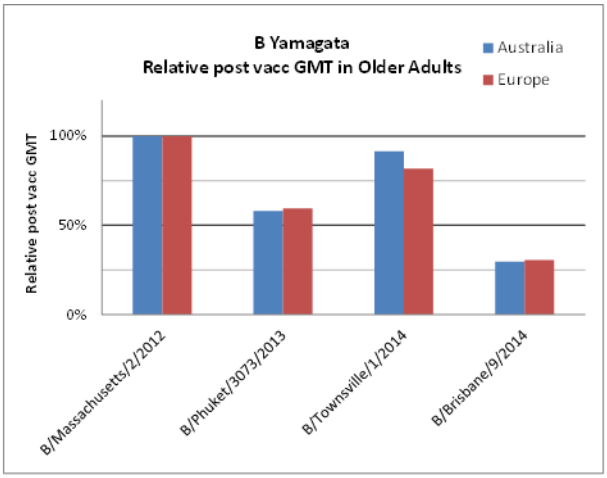


FIGURE 5.5
Phylogenetic relationships among influenza B HA genes
B/Victoria Lineage

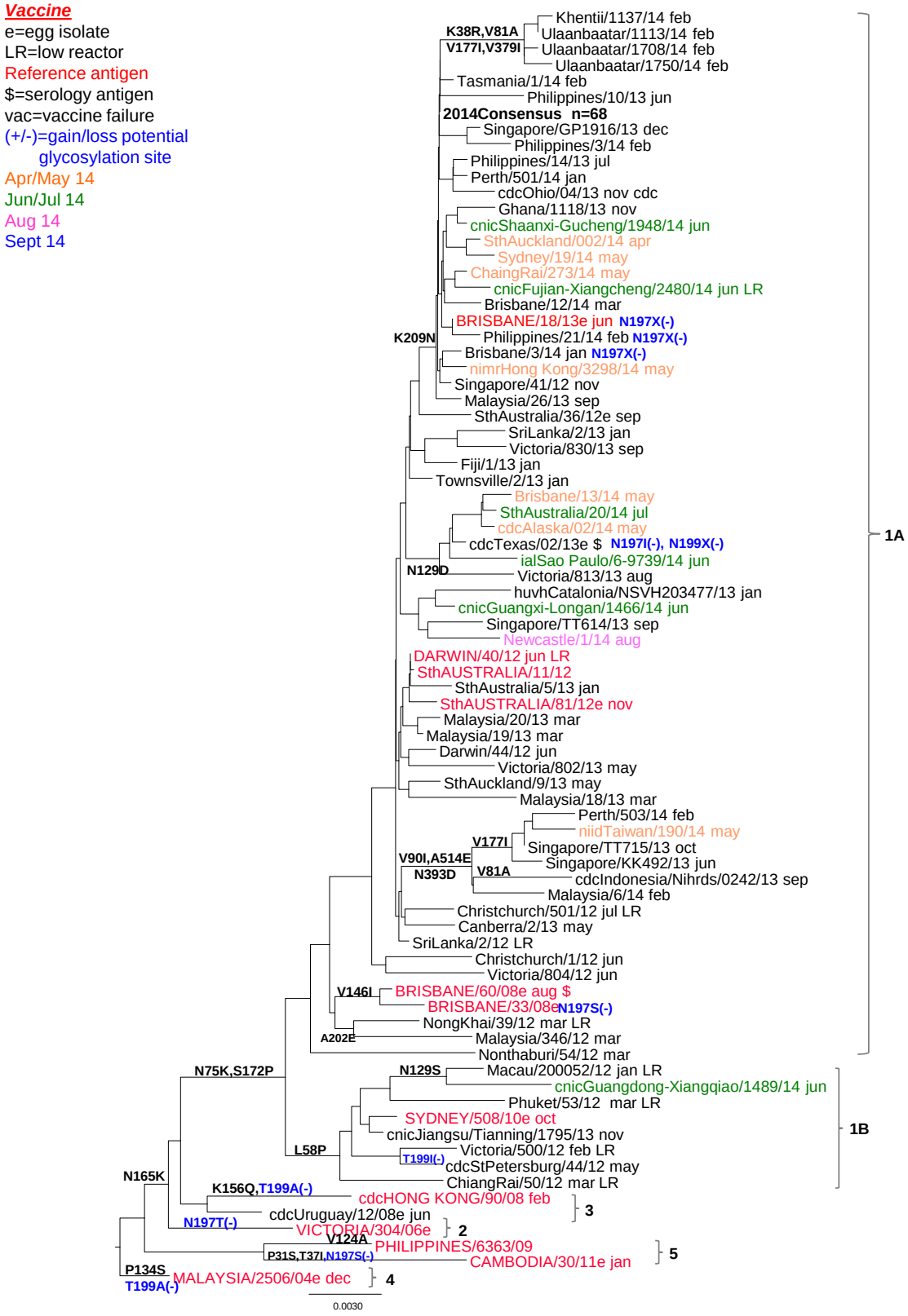


FIGURE 5.6
Phylogenetic relationships among influenza B neuraminidase genes
B/Victoria Lineage

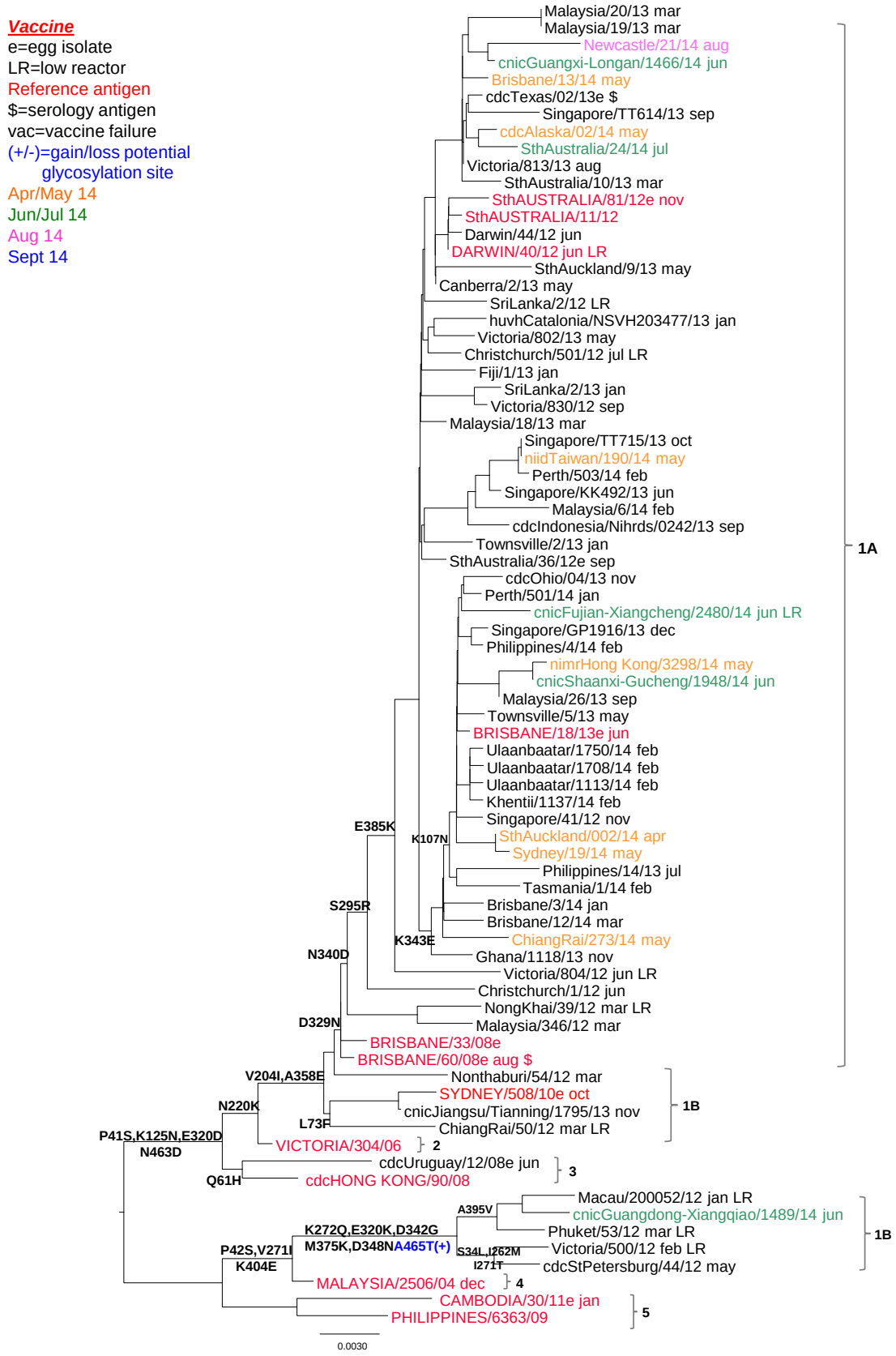


FIGURE 5.7
Phylogenetic relationships among influenza B HA genes
B/Yamagata Lineage

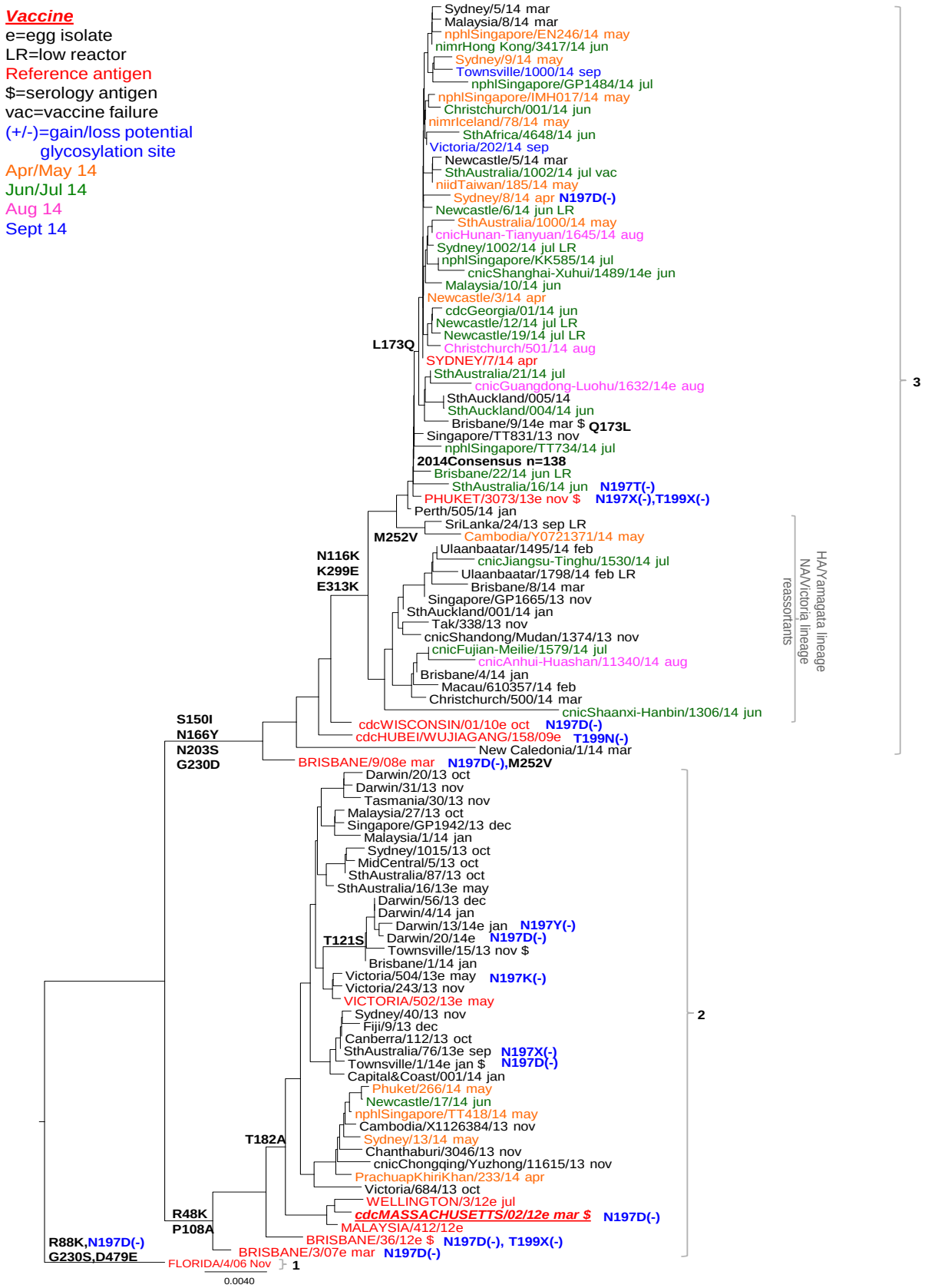


FIGURE 5.8
Phylogenetic relationships among influenza B neuraminidase genes
B/Yamagata Lineage

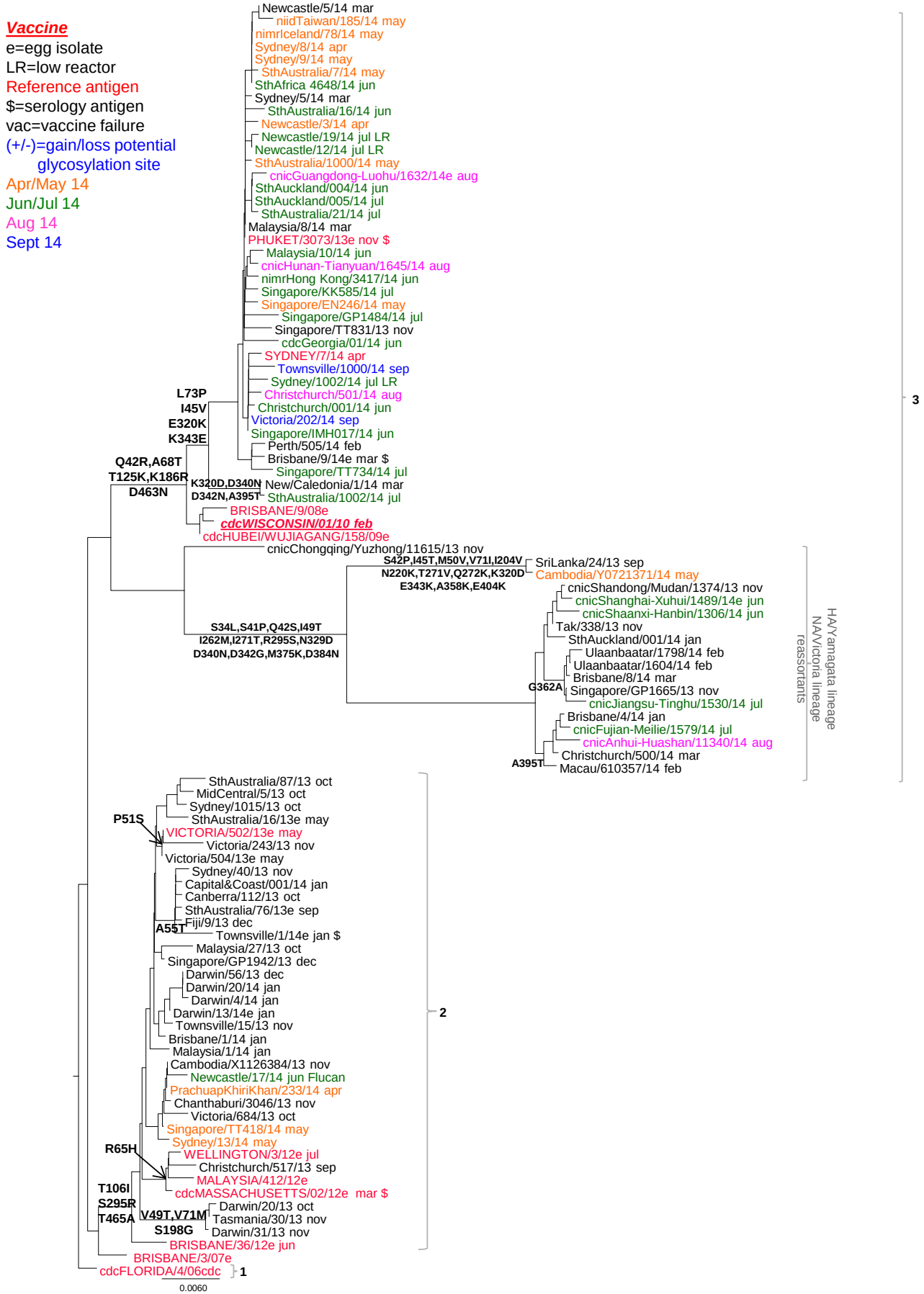


TABLE 5.7
Number of Amino Acid Differences (B/Victoria lineage) from Consensus B HA Sequence (n=68, 2014 sequences)

Virus	Number of amino acid differences to 2014 consensus
B/Brisbane/60/08e	2
B/South Australia/81/12e	2
B/Texas/02/13e	4
B/Brisbane/12/14	1
B/Malaysia/6/14	5
B/Ulaanbaatar/1708/14	4
B/Perth/503/14	6
B/Tasmania/1/14	0
B/South Australia/20/14	3
B/South Auckland/002/14	1

TABLE 5.8
Number of Amino Acid Differences (B/Yamagata lineage) from Consensus B HA Sequence (n=138, 2013 sequences)

Virus	Number of amino acid differences to 2014 consensus
B/Massachusetts/02/12e (2)	11
B/Wisconsin/01/10e (3)	5
B/Phuket/3073/13e (2)	2
B/Darwin/20/14e (2)	12
B/South Australia/1002/14 (3)	1
B/Singapore/NPHL14-GP557/14 (2)	13
B/Singapore/NPHL14-EN246/14 (3)	1
B/Brisbane/9/14e (3)	0
B/Newcastle/17/14 (2)	11
B/South Africa/4648/14 (3)	1

APPENDIX 6 - WHO Recommendation for Influenza Vaccines

World Health Organization
Organisation mondiale de la Santé

Weekly epidemiological record
Relevé épidémiologique hebdomadaire

10 OCTOBER 2014, 89th YEAR / 10 OCTOBRE 2014, 89e ANNÉE
No. 41, **2014**, **89**, 441-456
http://www.who.int/wer

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Recommended composition of influenza virus vaccines for use in the 2015 southern hemisphere influenza season

September 2014

Each year, WHO convenes technical consultations[1] in February and September to recommend viruses for inclusion in influenza vaccines[2] for use in the northern and southern hemisphere influenza seasons. This recommendation relates to the influenza vaccines for the forthcoming influenza season in the southern hemisphere (2015). A recommendation will be made in February 2015 relating to vaccines that will be used for the influenza season in the northern hemisphere (2015–2016). For countries in equatorial regions, epidemiological considerations influence which recommendation (February or September) individual national and regional authorities consider appropriate.

Influenza activity, February – September 2014

Between February and September 2014, 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 influenza B viruses.

In the northern hemisphere, influenza activity was high from February to April and started to decline from April onwards with the exception of a few countries. In the southern hemisphere, activity remained low from February until May when moderate to high activity was reported from a number of countries.

[1] See http://www.who.int/influenza/vaccines/virus/en/

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

Composition recommandée des vaccins antigrippaux pour la saison grippale 2015 dans l'hémisphère Sud

Septembre 2014

L'OMS convoque chaque année des consultations techniques[1] en février et en septembre pour recommander les virus devant entrer dans la composition des vaccins contre la grippe[2] qui seront utilisés pendant les saisons grippales dans l'hémisphère Nord et l'hémisphère Sud. La présente recommandation s'applique aux vaccins contre la grippe à utiliser pendant la prochaine saison grippale dans l'hémisphère Sud (2015). Une recommandation concernant les vaccins devant servir pendant la saison grippale dans l'hémisphère Nord (2015-2016) sera formulée en février 2015. Pour 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, février-septembre 2014

De février à septembre 2014, une activité grippale a été signalée en Afrique, dans les Amériques, en Asie, en Europe et en Océanie. Cette activité est passée de faible ou modérée à forte en raison de la circulation des virus grippaux A(H1N1)pdm09, A(H3N2) et B.

Dans l'hémisphère Nord, l'activité grippale a été forte de février à avril et a commencé à décliner à partir du mois d'avril, sauf dans quelques pays. Dans l'hémisphère Sud, l'activité est restée faible de février à mai, moment où un certain nombre de pays ont commencé à signaler une activité modérée à forte.

[1] Voir http://www.who.int/influenza/vaccines/virus/en/.

[2] La description du processus de sélection et de mise au point des virus grippaux vaccinaux est disponible à l'adresse http://www.who.int/gb/pip/pdf_files/Fluvaccvirusselection.pdf.

Influenza A(H1N1)pdm09 viruses

Influenza A(H1N1)pdm09 activity was variable in Africa, the Americas, Asia, Europe and Oceania. Regional and widespread outbreaks occurred in Asia, Europe and North America between February and April. Activity was low from May until September in the northern hemisphere. Regional outbreaks occurred in Brazil from May to August and in Paraguay during May and June. There were widespread outbreaks in the Plurinational State of Bolivia in June. Activity in Australia increased from May and caused widespread outbreaks in August and September. New Zealand had regional outbreaks in September. In general, low A(H1N1)pdm09 activity was recorded in Africa with the exception of Egypt where regional and widespread outbreaks were reported in February and March.

Influenza A(H3N2) viruses

Influenza A(H3N2) activity was generally moderate to high in parts of Africa, the Americas, Asia, Europe and Oceania. In Africa, local and regional outbreaks were reported in February and March in Egypt, Madagascar and Tunisia and during July and August in South Africa. In the Americas, local and regional outbreaks were reported by Canada, Mexico and the United States of America between February and March, while regional outbreaks occurred in a number of South American countries (Brazil, Colombia, Paraguay, Peru and Plurinational State of Bolivia) from May onwards. Widespread outbreaks occurred in Chile from June to August. In Asia regional outbreaks were reported by China, Japan and the Republic of Korea in February and March, in Singapore during June, and in Nepal in August. There were widespread outbreaks in Japan in February, Georgia and Israel in February and March, and Cambodia from May to July. In Europe, many countries reported regional or widespread outbreaks of A(H3N2) between February and April with co-circulation of A(H1N1) pdm09 virus. In Oceania, sporadic activity occurred from February until April. Regional outbreaks were reported in Australia from May until August with co-circulation of both A(H1N1)pdm09 and influenza B viruses. In September widespread A(H3N2) outbreaks occurred in Australia and regional outbreaks occurred in New Caledonia and New Zealand.

Influenza B viruses

In general influenza B activity was low in most of Africa and Europe with the exception of the Democratic Republic of the Congo and Egypt where regional outbreaks occurred in February and May respectively. In Asia, widespread and regional outbreaks occurred in Japan from February until May. Regional outbreaks were reported by China in February and March and by the Republic of Korea from February to April. Regional and widespread activity occurred in Canada from February to May. In Central and South America regional activity was reported in Paraguay from May to July, El Salvador in June, Brazil in July and August, and Nicaragua in September. In Oceania, regional outbreaks occurred in Australia from July onwards.

Virus grippaux A(H1N1)pdm09

L'activité de la grippe A(H1N1)pdm09 a été variable en Afrique, dans les Amériques, en Asie, en Europe et en Océanie. Des flambées d'ampleur régionale ou étendues se sont produites en Asie, en Europe et en Amérique du Nord entre février et avril. L'activité a été faible de mai à septembre dans l'hémisphère Nord. Des flambées régionales sont intervenues au Brésil de mai à août et au Paraguay en mai et juin. L'activité en Australie s'est accrue à partir du mois de mai et a provoqué des flambées étendues en août et septembre. La Nouvelle-Zélande a subi des flambées régionales en septembre. D'une manière générale, il a été enregistré une faible activité de la grippe A(H1N1)pdm09 en Afrique, sauf en Égypte où des flambées régionales ou étendues ont été notifiées en février et en mars.

Virus grippaux A(H3N2)

L'activité de la grippe A(H3N2) a généralement été modérée à forte dans certaines parties de l'Afrique, dans les Amériques, en Asie, en Europe et en Océanie. En Afrique, des flambées locales et régionales ont été rapportées en février et mars en Égypte, à Madagascar et en Tunisie et pendant les mois de juillet et août, en Afrique du Sud. Dans les Amériques, des flambées locales et régionales ont été signalées par le Canada, le Mexique et les États-Unis d'Amérique entre février et mars, tandis que des flambées régionales se produisaient dans un certain nombre de pays d'Amérique du Sud (Brésil, Colombie, État plurinational de Bolivie, Paraguay et Pérou) à partir du mois de mai. Des flambées étendues se sont produites au Chili de juin à août. En Asie, des flambées régionales ont été notifiées en Chine, au Japon et en République de Corée en février et mars, à Singapour au cours du mois de juin et au Népal en août. On a enregistré des flambées étendues au Japon en février, en Géorgie et en Israël en février et mars, ainsi qu'au Cambodge de mai à juillet. En Europe, de nombreux pays ont signalé des flambées régionales ou étendues de grippe A(H3N2) entre février et avril, avec une cocirculation de virus A(H1N1)pdm09. En Océanie, une activité sporadique est intervenue de février à avril. Des flambées régionales ont été notifiées en Australie de mai à août, avec une cocirculation des virus A(H1N1)pdm09 et B. En septembre, des flambées étendues de grippe A(H3N2) se sont produites en Australie et des flambées régionales ont touché la Nouvelle-Calédonie et la Nouvelle-Zélande.

Virus grippaux B

D'une manière générale, l'activité de la grippe B a été faible dans la plus grande partie de l'Afrique et de l'Europe, à l'exception de la République démocratique du Congo et de l'Égypte où des flambées régionales sont intervenues en février et en mai, respectivement. En Asie, des flambées étendues et régionales se sont produites au Japon de février à mai. Des flambées régionales ont été signalées en Chine en février et mars, et en République de Corée de février à avril. Une activité régionale et étendue s'est manifestée au Canada de février à mai. En Amérique centrale et en Amérique du Sud, une activité régionale a été rapportée par le Paraguay de mai à juillet, par El Salvador en juin, par le Brésil en juillet et août, et par le Nicaragua en septembre. Pour ce qui concerne l'Océanie, des flambées d'ampleur régionale se sont produites en Australie à partir du mois de juillet.

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

Zoonotic influenza infections caused by A(H5), A(H7N9) and A(H3N2)v viruses

From 18 February 2014 to 23 September 2014, 15 confirmed human cases of A(H5N1), 7 of which were fatal, were reported from Cambodia, China, Egypt and Indonesia. Highly pathogenic avian influenza A(H5N1) is present in poultry in these countries. Since December 2003, a total of 667 human cases with 393 deaths have been confirmed in 16 countries.[3] To date there has been no evidence of sustained human-to-human transmission. In addition a single fatal case of A(H5N6) was reported in China. This was the first reported human infection with this virus.

During this period 99 additional cases of avian influenza A(H7N9) virus infection were reported in China. Since February 2013, a total of 454 cases with at least 171 deaths have been confirmed[4].

Two cases of non-fatal A(H3N2)v were reported in the United States of America. No cases of A(H9N2) or A(H10N8) were reported in this period.

Antigenic and genetic characteristics of recent seasonal influenza viruses

Influenza A(H1N1)pdm09 viruses

Antigenic characteristics of A(H1N1)pdm09 viruses collected from February to September 2014 were assessed with panels of post-infection ferret antisera in haemagglutination inhibition (HI) tests. HI tests indicated that the vast 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 recently circulating viruses fell into two genetic clades, 6 and 7, which were antigenically indistinguishable. Most of the circulating viruses belonged to clade 6B while a small number of viruses from Africa and China belonged to clade 6C. A single virus from China belonged to clade 7. 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 viruses carried amino acid substitutions in the region corresponding to positions 153-157 of HA, often associated with propagation in cells.

Influenza A(H3N2) viruses

Antigenic characteristics of A(H3N2) viruses collected from February to September 2014 were assessed with panels of post-infection ferret antisera in HI and virus neutralization assays. While many recent A(H3N2) viruses were well inhibited by ferret antisera raised

L'ampleur et le type de l'activité grippale saisonnière dans le monde sont récapitulés dans le *Tableau 1*.

Infections grippales zoonotiques causées par les virus A(H5), A(H7N9) et A(H3N2)v

Du 18 février au 23 septembre 2014, 15 cas humains confirmés de grippe A(H5N1), dont 7 fatals, ont été notifiés par le Cambodge, la Chine, l'Égypte et l'Indonésie. La grippe aviaire A(H5N1) hautement pathogène est présente chez les volailles dans ces pays. Depuis décembre 2003, 667 cas humains au total, parmi lesquels 393 décès, ont été confirmés dans 16 pays.[3] À ce jour, il n'existe aucune preuve d'une transmission interhumaine soutenue. En outre, un seul cas mortel de grippe A(H5N6) a été signalé en Chine. Il s'agissait de la première infection humaine par ce virus notifiée.

Pendant la même période, 99 cas supplémentaires d'infection par le virus de la grippe aviaire A(H7N9) ont été rapportés en Chine. Depuis février 2013, 454 cas au total, dont au moins 171 décès, ont été confirmés.[4]

Deux cas de grippe A(H3N2)v non mortels ont été notifiés aux États-Unis d'Amérique. Aucun cas de grippe A(H9N2) ou de grippe A(H10N8) n'a été signalé sur cette période.

Caractéristiques antigéniques et génétiques des virus grippaux saisonniers récents

Virus grippaux A(H1N1)pdm09

Les caractéristiques antigéniques des virus A(H1N1)pdm09 recueillis de février à septembre 2014 ont été évaluées à l'aide de batteries de sérums de furet postinfection dans le cadre d'épreuves d'inhibition de l'hémagglutination (IH). Ces épreuves ont indiqué que la vaste 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) des virus A(H1N1) pdm09 a indiqué que les virus récemment en circulation se répartissaient en 2 clades génétiques, 6 et 7, impossibles à distinguer sur le plan antigénique. La plupart des virus circulants appartenaient au clade 6B, même si un petit nombre de virus provenant d'Afrique et de Chine se classaient dans le clade 6C. Un seul virus trouvé en Chine appartenait au clade 7. Un faible pourcentage des virus présentait une réactivité diminuée dans le cadre d'épreuves IH réalisées avec des immunsérums de furet dirigés contre la souche de référence A/California/7/2009; la plupart des virus concernés étaient porteurs de substitutions d'acide aminé dans la région correspondant aux positions 153-157 de l'HA, souvent associées à la propagation dans les cellules.

Virus grippaux A(H3N2)

Les caractéristiques antigéniques des virus A(H3N2) recueillis de février à septembre 2014 ont été évaluées au moyen de batteries d'immunsérums de furet postinfection dans le cadre d'épreuves d'inhibition de l'hémagglutination et de neutralisation virale. Même si de nombreux virus A(H3N2) récents étaient

[3] See http://www.who.int/influenza/human_animal_interface/Influenza_Summary_IRA_HA_interface_27June14.pdf

[4] Communication from Chinese Center for Disease Control and Prevention (CCDC)

[3] Voir http://www.who.int/influenza/human_animal_interface/Influenza_Summary_IRA_HA_interface_27June14.pdf.

[4] Communication émanant du *Chinese Center for Disease Control and Prevention* (CCDC).

Table 1 **Extent and type of influenza activity worldwide, from end of January to early September 2014**
Tableau 1 **Etendue et type d'activité grippale saisonnière dans le monde, janvier-septembre 2014**

Country, area or territory by geographical region	Week 5–8 – Semaine 5-8	Week 9–12 – Semaine 9-12	Week 13–16 – Semaine 13-16	Week 17–20 – Semaine 17-20	Week 21–24 – Semaine 21-24	Week 25–28 – Semaine 25-28	Week 29–32 – Semaine 29-32	Week 33–36 – Semaine 33-36
Africa – Afrique								
Algeria – Algérie	•H1(pdm09), •••H3, •B	•H1(pdm09), ••H3	•H1(pdm09), •H3, •B	0	•H1(pdm09), •B	•H1(pdm09), •B	0	0
Burkina Faso	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09)		•H3, •B			
Cameroon – Cameroun	•H1(pdm09), •H3, •B	•B	•H1(pdm09), •B	•H1(pdm09), ••H3, ••B	••H3, •B	•H1(pdm09), ••H3, •B	0	•B
Central African Republic – République centrafricaine	•H3, •B	•B						
Côte d'Ivoire	•H1(pdm09), ••H3, •B	0	•B	•H3, •B	•H3, •B	•H3, •B	•H3, •B	•H3, •B
Democratic Republic of the Congo – République démocratique du Congo	•H3, •••B	•H3, •B	•H3, •B	•H3, •B	•H3, •B	0		
Egypt – Egypte	•••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), •B
Ethiopia – Ethiopie	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B						
Ghana	•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	•H1(pdm09), •B
Kenya	•H1(pdm09), ••H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	0	0	•H3, •B
Madagascar	•••H3, •B	•H1(pdm09), ••H3, •B	•H1(pdm09), •H3, •B	•H3, •B	•B	•H3, ••B	•H1(pdm09), ••H3, •B	••H3, ••B
Mauritius – Maurice	•H1(pdm09), •H3	••H1(pdm09), ••H3, •B						
Morocco – Maroc	••H3	0	0	0	0	0	0	0
Mozambique	•H3, •B	•H3, •B	•H3, •B	0	0	0	0	0
Niger	•H1(pdm09), •B	•H1(pdm09)	•B					
Nigeria – Nigéria	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H3	•H1(pdm09), •H3	0	0	0
Rwanda	•H3	•H3, •B	•H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H3	
Senegal – Sénégal	•H1(pdm09), •H3	•H1(pdm09), •B	•H1(pdm09)	•H1(pdm09), •H3	•H1(pdm09)	•H3	••H3	
Sierra Leone	•A	0						
South Africa – Afrique du Sud		•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •H3	•H1(pdm09), ••H3, •B	•H1(pdm09), •••H3	•H1(pdm09), •••H3, •B	•H1(pdm09), ••H3, •B
Togo	•H3, ••B	•H3, •B						
Tunisia – Tunisie	•••H3	••H3	••H3, •B	•H3;•B	•H1(pdm09), •H3, •B			
Uganda – Ouganda	•B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B				
United Republic of Tanzania – République-Unie de Tanzanie	•H1(pdm09), ••H3	••H1(pdm09), •H3, •B	•H3, •B	•H1(pdm09), •H3, •B	•H3, •B	•H3, •B	0	0
Zambia – Zambie	0	•B	•B	•B	•B	•H3, •B	•H3, •B	•H3, •B

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

Country, area or territory by geographical region	Week 5–8 – Semaine 5-8	Week 9–12 – Semaine 9-12	Week 13–16 – Semaine 13-16	Week 17–20 – Semaine 17-20	Week 21–24 – Semaine 21-24	Week 25–28 – Semaine 25-28	Week 29–32 – Semaine 29-32	Week 33–36 – Semaine 33-36
America – Amériques								
Argentina – Argentine	•H1(pdm09), •H3	•B	•H3, •B	•H1(pdm09), •H3	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, ••B	•H1(pdm09), ••H3, ••B	•H3, •B
Bahamas		•H1(pdm09)						
Bolivia (Plurinational State of) – Bolivie (Etat plurinational de)	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H3	•H1(pdm09), •••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
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	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•••H3, •B	••••H3, ••B	••••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, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Costa Rica	•H1(pdm09), •H3	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H3, ••B	•H1(pdm09), •H3, ••B	•H3, ••B
Cuba	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09)	•H1(pdm09)	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•B
Dominican Republic – République dominicaine	•B	0	•H3, •B	•H3, •B	•H3	•H3	0	•H3, •B
Ecuador – Equateur	•H1(pdm09)	•H1(pdm09)	•H1(pdm09)	•H1(pdm09), •H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B
El Salvador	•H1(pdm09), •H3	0	0	•H1(pdm09)	•••B	•B	•B	0
France, French Guiana – Guyane française, France		•H1(pdm09), •H3	•H1(pdm09), •H3				•H3, •B	
France, Guadeloupe	•H3, •B	•H3, •B						
Guatemala	•H1	•H1(pdm09), •H3	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•B	•H1(pdm09), •H3, •B	0
Haiti – Haïti	0	0	0	0	•B		0	
Honduras	0	•B	•B	••B	••B	•H3, ••B	•H3, ••B	••B
Jamaica – Jamaïque	0	•B	•H3, •B	•B	•B	•B	•B	0
Mexico – Mexique	•••H1(pdm09), ••H3, •B	•••H1(pdm09), ••H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•B	•H1(pdm09), •H3, •B	0
Nicaragua	•H1(pdm09), •B	•B	0	•H1(pdm09)	0	•H3, •B	••B	•••B
Panama	0	•H1(pdm09)	•H1(pdm09), •H3	••H1(pdm09), ••B	•H1(pdm09), ••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09)
Paraguay	•H3, •B	•B	•H1(pdm09), •B	•H1(pdm09), •••H3, •••B	•H1(pdm09), •••H3, •B	•H1(pdm09), •••H3, •••B	•H1(pdm09), •••H3, •B	•H1(pdm09), ••H3, •B
Peru – Pérou	0	•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
Saint Kitts and Nevis – Saint-Kitts-et-Nevis		•H1(pdm09)						
Saint Vincent and the Grenadines – Saint-Vincent-et-les-Grenadines		•B						
Trinidad and Tobago – Trinité-et-Tobago	•B	•H3, •B						

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

Country, area or territory by geographical region	Week 5–8 – Semaine 5-8	Week 9–12 – Semaine 9-12	Week 13–16 – Semaine 13-16	Week 17–20 – Semaine 17-20	Week 21–24 – Semaine 21-24	Week 25–28 – Semaine 25-28	Week 29–32 – Semaine 29-32	Week 33–36 – Semaine 33-36
United Kingdom of Great Britain and Northern Ireland – Bermuda – Royaume-Uni et Irlande du Nord – Bermudes	•H1(pdm09)							
United States of America– 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	•H3, •B	•H3, •B	•H1(pdm09), •H3, •B	•H3, •B
Venezuela (Bolivarian Republic of) – Venezuela (République bolivarienne du)	•H1(pdm09), •H3, •B	•H3	•H3, •B	•B	•B	•H3, •B	•H3, •B	0
Asia – Asie								
Afghanistan	0	0						
Armenia – Arménie	•H1(pdm09), •H3	•H1(pdm09), •H3	•H3	0			0	
Azerbaijan – Azerbaïdjan	0	•B	•B	•B			0	
Bahrain – Bahreïn	••H1(pdm09), •B	••H1(pdm09), ••H3, ••B	•H3, ••B	••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	••H1(pdm09), •B	•H1(pdm09)	•H1(pdm09), •H3
Bangladesh	•B	•H1(pdm09), •B	•H1(pdm09), •B	•H3, •B	•H3, •B	•H3, •B		
Bhutan – Bhoutan	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B	•H3, •B
Cambodia – Cambodge	0	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3	••H1(pdm09), ••••H3, •B	••H1(pdm09), ••••H3, •B	••H1(pdm09), ••••H3, •B	•H1(pdm09), •••H3	•••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
Taiwan, China – Taïwan, 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
Cyprus – Chypre	•H1(pdm09), •H3							
Georgia – Géorgie	••H1(pdm09), ••••H3, •B	•H1(pdm09), ••••H3, •B	•H1(pdm09), •••H3, •B	••B	0		0	0
India – Inde	•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
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	•H3, •B
Iran (Islamic Republic of) – Iran (République islamique d')	•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	0
Iraq	0	•H1(pdm09)	0	•B	0	•H1(pdm09)	•H3	0
Israel – Israël	•••H1(pdm09), ••••H3, ••B	••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	•H3, •B	•H1(pdm09), •H3, •B	•H3
Jordan – Jordanie	•H3, •B	•H1(pdm09), •B	•H1(pdm09)	•H1(pdm09), •B		•H1(pdm09)		0
Kazakhstan	•H1(pdm09), ••H3, •B	•H1(pdm09), •••H3, •B	•H1(pdm09), •H3, •B	0	0	0	0	
Kyrgyzstan	•H1(pdm09), ••H3, •B	0	0	0	0	0	0	

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

Country, area or territory by geographical region	Week 5–8 – Semaine 5-8	Week 9–12 – Semaine 9-12	Week 13–16 – Semaine 13-16	Week 17–20 – Semaine 17-20	Week 21–24 – Semaine 21-24	Week 25–28 – Semaine 25-28	Week 29–32 – Semaine 29-32	Week 33–36 – Semaine 33-36
Lao People's Democratic Republic – République démocratique populaire lao	•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	0
Malaysia – Malaisie	•H1(pdm09), •H3, •B	0	•H3, •B	•H1(pdm09), •B				
Mongolia – Mongolie	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	0	0	0
Nepal – Népal	•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
Oman	•H1(pdm09), •H3, •B	••••H1(pdm09), ••H3	••••H1(pdm09), ••H3, •B	••••H1(pdm09), ••H3, ••B	••••H1(pdm09), ••H3, •B	•H1(pdm09), •H3, •B	••H1(pdm09), ••H3, •B	•H3, •B
Pakistan	•H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	•H1(pdm09)	•H1(pdm09)	•H1(pdm09)	0		
Philippines	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •B	•H3, •B	•H3, •B	•H3, •B
Qatar	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	0
Republic of Korea – République de Corée	••H1(pdm09), •••H3, •••B	••H1(pdm09), •••H3, •••B	•H1(pdm09), ••H3, •••B	•H1(pdm09), •H3, •B	•B	•H3	•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	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, •B
Sri Lanka	•H3	•H3	•H1(pdm09), •H3	•H1(pdm09), •H3	•H3, •B	•H3, •B	•H1(pdm09), •H3, •B	•H3
Thailand – Thaïlande	•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	
Turkey – Turquie	•H1(pdm09), ••H3, •B	••B	•H3, ••B	•B	0	0	0	0
Uzbekistan– Ouzbékistan	•H1(pdm09), •H3	•H1(pdm09), •H3	0	0	0	0	0	0
Vietnam – Viet Nam	•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	•H3, •B
Europe								
Albania – Albanie	••H1(pdm09), ••H3	•••H1(pdm09), •••H3	•H1(pdm09)				0	
Austria – Autriche	••••H1(pdm09), ••••H3, ••B	••••H1(pdm09), ••••H3, ••B	•••H1(pdm09), •••H3, ••B	•H1(pdm09), •B	•H1(pdm09)		0	
Belarus – Bélarus	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B			0	
Belgium – Belgique	••••H1(pdm09), ••••H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3	0		0	
Bosnia and Herzegovina – Bosnie-Herzégovine	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	0			0	
Bulgaria – Bulgarie	••••H1(pdm09), •••H3	•••H1(pdm09), ••H3	•H1(pdm09), •B	0	0		0	
Croatia – Croatie	••••H3, •B	••••H3, •B	••••H3, •B	•H3, •B			0	
Czech Republic – République tchèque	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H1(pdm09), •H3	•H3, •B	•H3		0	
Denmark – Danemark	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B		0	

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

Country, area or territory by geographical region	Week 5–8 – Semaine 5-8	Week 9–12 – Semaine 9-12	Week 13–16 – Semaine 13-16	Week 17–20 – Semaine 17-20	Week 21–24 – Semaine 21-24	Week 25–28 – Semaine 25-28	Week 29–32 – Semaine 29-32	Week 33–36 – Semaine 33-36
Estonia – Estonie	●●●●H1(pdm09), ●H3	●●●●H1(pdm09), ●H3	●●●H1(pdm09), ●H3	●A	0		0	
Finland – Finlande	●●●●H1(pdm09), ●●●●H3, ●B	●●●●H1(pdm09), ●●●H3	●H1(pdm09), ●H3	●H1(pdm09), ●H3, ●B			0	
France	●●●●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)	0
Germany – Allemagne	●●●H1(pdm09), ●●●H3, ●B	●●●H1(pdm09), ●●●H3, ●B	●●●H1(pdm09), ●●●H3, ●B	●●H1(pdm09), ●●H3, ●B	●H1(pdm09)		0	0
Greece – Grèce	●●●●H1(pdm09), ●●H3, ●B	●●●●H1(pdm09), ●●H3, ●B	●●●●H1(pdm09), ●●H3, ●B	●●●●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B		0	
Hungary – Hongrie	●●●●H1(pdm09), ●●H3, ●B	●●●●H1(pdm09), ●●●H3, ●B	●H1(pdm09), ●H3, ●B	0			0	
Iceland – Islande	●●●●H1(pdm09), ●●H3	●●●●H1(pdm09), ●●H3, ●●B	●●H1(pdm09), ●H3, ●B	●H1(pdm09), ●B	●H3, ●B		0	
Ireland – Irlande	●●●H1(pdm09), ●●●●H3, ●●B	●●H1(pdm09), ●●●●H3, ●B	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3, ●B	●H3, ●B		0	0
Italy – Italie	●●●●H1(pdm09), ●●●●H3, ●B	●●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3				0	
Latvia – Lettonie	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H3	●B		0	
Lithuania – Lituanie	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●H3	●H1(pdm09)		●H3	0
Luxembourg	●●●●H1(pdm09), ●●H3, ●B	●●●●H1(pdm09), ●●H3	●H1(pdm09), ●H3	●H3		0		
Malta – Malte						●H1(pdm09), ●B		0
Netherlands – Pays-Bas	●●●●H1(pdm09), ●●●●H3, ●B	●●●●H1(pdm09), ●●●●H3, ●B	●●●H1(pdm09), ●●●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B			
Norway – Norvège	●●●●H1(pdm09), ●●H3, ●B	●●●●H1(pdm09), ●●H3, ●B	●●●H1(pdm09), ●●H3, ●B	●●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3, ●B	●H3, ●B		
Poland– Pologne	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3	●H1(pdm09)	●H1(pdm09)	●A	0	0
Portugal	●●●●H1(pdm09), ●●●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●B	●B	0	●H1(pdm09)	0
Republic of Moldova – République de Moldavie	●H1(pdm09), ●●●H3	●H1(pdm09), ●●●H3	●H1(pdm09), ●●●H3	0	0	0	0	0
Romania – Roumanie	●H1(pdm09), ●H3, ●B	●●H1(pdm09), ●●●H3.●B	●H1(pdm09), ●●●H3.●B	●H3	0	0	0	0
Russian Federation – Fédération de Russie	●●H1(pdm09), ●●H3, ●B	●●H1(pdm09), ●●H3, ●B	●●H1(pdm09), ●●H3, ●●B	●●H1(pdm09), ●H3, ●●B	●H1(pdm09)	0	●H1(pdm09), ●H3, ●B	0
Serbia – Serbie	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●H1(pdm09), ●H3	0	0		
Slovakia – Slovaquie	●H1(pdm09), ●H3	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09)			
Slovenia – Slovénie	●H1(pdm09), ●●●●H3, ●B	●H1(pdm09), ●●●●H3, ●B	●H1(pdm09), ●●H3, ●B	●H3	0			
Spain – Espagne	●●●●H1(pdm09), ●●●H3, ●B	●●●H1(pdm09), ●●●H3, ●B	●H1(pdm09), ●H3, ●B	●H3, ●B	●H3, ●B	●H3, ●B	●A	0
Sweden – Suède	●●●●H1(pdm09), ●●●H3, ●B	●●●●H1(pdm09), ●H3, ●B	●●●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	0	0	0	0
Switzerland – Suisse	●●●●H1(pdm09), ●●●H3, ●B	●●●●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3, ●B					

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

Country, area or territory by geographical region	Week 5–8 – Semaine 5-8	Week 9–12 – Semaine 9-12	Week 13–16 – Semaine 13-16	Week 17–20 – Semaine 17-20	Week 21–24 – Semaine 21-24	Week 25–28 – Semaine 25-28	Week 29–32 – Semaine 29-32	Week 33–36 – Semaine 33-36
The former Yugoslav Republic of Macedonia – Ex-République Yougoslave de Macédoine	••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B					
Ukraine	••H1(pdm09), •••H3, •B	••H1(pdm09), •••H3, •B	••H1(pdm09), •••H3, •B	•H1(pdm09), •H3, •B	0	0	0	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	0	0
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
Australia, Tasmania – Australie, Tasmanie		•H3						
France, New Caledonia – Nouvelle Calédonie	•H1(pdm09)	•H1(pdm09), ••H3	•H1(pdm09), ••H3	•H1(pdm09), ••H3, •B	•H3	•H1(pdm09), •H3	•H1(pdm09), •H3	••H1(pdm09), •••H3
New Zealand – Nouvelle Zélande	•H1(pdm09)	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H1(pdm09), ••H3, •B	••H1(pdm09), ••H3, •B	••H1(pdm09), ••H3, ••B	•••H1(pdm09), •••H3, ••B
Palau – Palaos			•H3					

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
H3 = Influenza A(H3N2) – H3 = Grippe A(H3N2)
0 = All negative – Tout négatif

against cell-propagated reference viruses such as A/Victoria/361/2011 and A/Texas/50/2012, an increasing proportion was poorly inhibited by post-infection ferret antisera raised against these cell-propagated viruses as well as egg-propagated A/Texas/50/2012 (*Table 2*). The HA genes of viruses that were poorly inhibited by these ferret antisera fell into phylogenetic clades 3C.2a and 3C.3a. Compared to cell propagated A/Texas/50/2012 the HAs of clade 3C.2a viruses had amino acid changes at L3I, N144S, N145S, F159Y, K160T, N225D and Q311H while HAs of viruses in clade 3C.3a had amino acid changes in residues T128A, A138T, R142G, N145S, F159S and N225D. Viruses in these 2 new genetic clades were antigenically indistinguishable from each other 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 predominated in all countries reporting influenza B infections.

bien inhibés par des antisérums de furet dirigés contre des virus de référence propagés sur culture cellulaire tels que les virus A/Victoria/361/2011 et A/Texas/50/2012, un pourcentage croissant de ces virus était médiocrement inhibé par des immunsérums de furet postinfection dirigés contre les mêmes virus propagés sur culture cellulaire ainsi que contre des virus A/Texas/50/2012 propagés sur œufs (*Tableau 2*). Les gènes de l'HA des virus médiocrement inhibés par ces immunsérums de furet les rattachaient aux clades phylogénétiques 3C.2a et 3C.3a. Par rapport à la souche A/Texas/50/2012 propagée sur œufs, l'HA des virus du clade 3C.2a présentait des substitutions d'acides aminés en L3I, N144S, N145S, F159Y, K160T, N225D et Q311H, tandis que l'HA des virus du clade 3C.3a étaient porteurs de substitutions d'acides aminés au niveau des résidus T128A, A138T, R142G, N145S, F159S et N225D. Les virus de ces 2 nouveaux clades génétiques étaient impossibles à distinguer les uns des autres sur le plan antigénique dans le cadre des épreuves d'IH et de neutralisation.

Virus de la grippe B

Des virus grippaux B appartenant aux lignées B/Victoria/2/87 et B/Yamagata/16/88 ont circulé conjointement. Les virus de la lignée B/Yamagata/16/88 prédominaient dans l'ensemble des pays signalant des infections grippales B.

Table 2 **Haemagglutination inhibition reactions of influenza A(H3N2) viruses**
Tableau 2 **Réactions d'inhibition de l'hémagglutination avec des virus grippaux A(H3N2)**

				Reference ferret antisera – Antisérums de furet de référence							
		Collection date – Date de collecte	Passage history[1] – Historique de passages[1]	3C.1 Egg – Œuf TX/50	3C.1 SIAT TX/50	3C.3 Egg – Œuf WA/18	3C.2a MDCK NE/4	3C.3a MDCK CA/2	3C.3a SIAT PU/6759	3C.3a Egg – Œuf SZ/9715293	HA CLADE
Reference antigens – Antigènes de référence											
1	A/Texas/50/2012	2012-04-15	E5	**640**	320	320	320	80	80	320	3C.1
2	A/Texas/50/2012	2012-04-15	MK/MDCK1/SIAT2	320	**640**	320	640	320	320	320	3C.1
3	A/Washington/18/2013	2013-11-29	E5	320	320	**640**	320	20	80	320	3C.3
4	A/Nebraska/4/2014	2014-03-11	MDCK3	160	160	80	**160**	160	160	160	3C.2a
5	A/California/2/14	2014-01-16	MDCK1SIAT2	40	40	40	160	**160**	80	80	3C.3a
6	A/Palau/6759/2014	2014-03-26	SIAT2	40	40	20	80	80	**160**	80	3C.3a
7	A/Switzerland/9715293/2013	2013-12-06	E4/E2	160	40	80	320	80	160	**320**	3C.3a
Test antigens – Antigènes testés											
8	A/Hawaii/34/2014	2014-06-11	SIAT1	320	320	640	320	160	320	160	3C.3
9	A/Bolivia/841/2014	2014-06-30	SIAT2	320	320	160	320	160	320	160	3C.3
10	A/Brazil/45230/2014	2014-05-08	MDCK1/SIAT2	160	160	80	160	160	320	160	3C.3
11	A/Montana/6/2014	2014-06-04	SIAT1	80	80	80	1280	160	320	160	3C.2a
12	A/Alaska/33/2014	2014-06-17	SIAT1	80	40	40	160	160	320	160	3C.3a
13	A/Hawaii/26/2014	2014-06-27	SIAT1	80	40	20	160	160	320	80	3C.3a
14	A/Cambodia/585/2014	2014-05-17	SIAT2	80	40	40	320	320	320	320	3C.3a

Numbers in bold indicate homologous antiserum/antigen titres. – Les chiffres en caractères gras indiquent les titres d'antigènes/d'antisérum homologue.

[1] E, egg; MK, Monkey kidney cells; MDCK cells; MDCK-SIAT1 cells. – E, œuf; MK, cellules rénales de singe; cellules MDCK; cellules MDCK-SIAT1.

The HA genes of B/Yamagata/16/88 lineage viruses fell within genetic clades 2 or 3, with the majority being in clade 3 over recent months. Most of the clade 3 viruses from China were reassortants that carried the NA gene from the B/Victoria lineage. Viruses with HA genes in these clades could be distinguished antigenically in HI tests by some post-infection ferret antisera. Post-infection ferret antisera raised against the egg-propagated vaccine virus B/Massachusetts/2/2012 (a clade 2 virus) recognised the majority of recent viruses but with a significantly increased proportion of recently circulating viruses showing 4-fold reductions in HI titre compared to homologous titres (*Table 3*). Recent circulating viruses were generally better inhibited by ferret antisera raised against egg-propagated clade 3 viruses (e.g. B/Phuket/3073/2013).

The HA gene sequences of the vast majority of B/Victoria/2/87 lineage viruses belonged to the B/Brisbane/60/2008 genetic clade 1A. In HI tests with post-infection ferret antisera most 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. Some viruses recovered in China showed reduced HI titres compared to homologous titres.

Les gènes de l'hémagglutinine des virus de la lignée B/Yamagata/16/88 les rattachaient aux clades génétiques 2 ou 3, mais ces virus se sont classés en majorité dans le clade 3 au cours des derniers mois. La plupart des virus du clade 3 provenant de Chine étaient des réassortants porteurs du gène de la NA provenant de la lignée B/Victoria. Les virus présentant des gènes de l'HA qui les rattachaient à ces clades pouvaient être distingués sur le plan antigénique dans le cadre d'épreuves IH par certains immunsérums de furet postinfection. Les immunsérums de furet postinfection obtenus après inoculation du virus B/Massachusetts/2/2012 propagé sur œufs (un virus du clade 2) reconnaissaient la majorité des virus récents, mais avec une proportion notablement accrue des virus récemment en circulation présentant une réduction d'un facteur 4 du titre d'IH par rapport aux titres homologues (*Tableau 3*). Les virus récemment en circulation étaient en général mieux inhibés par des immunsérums de furet dirigés contre des virus du clade 3 propagés sur œufs (B/Phuket/3073/2013, par exemple).

Les séquences de gènes de l'HA de la grande majorité des virus de la lignée B/Victoria/2/87 les rattachaient au clade génétique 1A du virus B/Brisbane/60/2008. Dans le cadre d'épreuves IH avec des immunsérums de furet postinfection, la plupart des virus se sont révélés 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. Certains virus récoltés en Chine ont présenté des titres d'IH diminués par rapport aux titres homologues.

Table 3 **Haemagglutination inhibition reactions of influenza B (Yamagata lineage) viruses**
Tableau 3 **Réactions d'inhibition de l'hémagglutination avec des virus grippaux B (de la lignée Yamagata)**

Viruses – Virus	Genetic clade – Clade génétique	Collection date – Date de collecte	Passage history[2] – Historique de passages[2]	Haemagglution inhibition titre[1] – Titre d'inhibition de l'hémagglutination[1]					
				Post-infection ferret antisera – Immunsérums de furet postinfection					
				2 MDCK B/Estonia 55669/11	2 Egg – Œuf B/Mass 2/12	2 MDCK B/Mass 2/12	3 Egg – Œuf B/Wis 1/10	3 Egg – Œuf B/Stock 12/11	3 Egg – Œuf B/Phuket 3073/13
Reference viruses – Virus de référence									
B/Estonia/55669/2011	2	2011-03-14	MDCK1/MDCK1	**640**	320	640	80	80	160
B/Massachusetts/2/2012	2	2012-03-13	E3/E4	160	**1280**	320	320	1280	1280
B/Massachusetts/2/2012	2	2012-03-13	MDCK1/C2/MDCK3	640	1280	**640**	320	640	1280
B/Wisconsin/1/2010	3	2010-02-20	E3/E2	<	320	40	**320**	640	640
B/Stockholm/12/2011	3	2011-03-28	E4/E1	<	320	40	80	**320**	320
B/Phuket/3073/2013	3	2013-11-21	E4/E1	<	320	40	160	320	**640**
Test viruses – Virus testés									
B/Phuket/3073/2013	3	2013-11-21	MDCK2/MDCK1	80	320	160	20	320	640
B/Norway/1877/2014	3	2014-05-21	MDCK1	80	320	160	20	320	320
B/Norway/2011/2014	3	2014-06-19	MDCK1	40	320	80	20	320	320
B/Brisbane/9/2014	3	2014-03-24	E4/E1	<	160	40	160	320	320
B/Norway/2045/2014		2014-05-28	MDCK2	80	160	160	160	320	ND
B/Cameroon/1640/2014	2	2014-03-10	MDCK1/MDCK1	640	320	640	10	160	320
B/Cameroon/2082/2014	2	2014-03-20	MDCK1/MDCK1	640	160	640	10	160	160

Numbers in bold indicate homologous antiserum/antigen titres. – Les chiffres en caractères gras indiquent les titres d'antigènes/d'antisérum homologue.

[1] < = <10; ND = not done. – < = <10; NE = non effectué.

[2] E, egg; MDCK cells. – E, œuf; cellules MDCK.

Resistance to influenza antiviral drugs

Neuraminidase inhibitors

The majority of A(H1N1)pdm09 viruses tested were sensitive to oseltamivir and zanamivir. A small proportion of A(H1N1)pdm09 viruses with highly reduced inhibition (HRI) by oseltamivir were detected globally. In Japan, a small proportion (2.7%) showed HRI with oseltamivir and peramivir, and one virus showed reduced inhibition to zanamivir and laninamivir. In all cases resistance was due to a histidine to tyrosine substitution at amino acid 275 (H275Y) in the neuraminidase and the majority were from cases that were not treated with antiviral drugs. In one case there was an additional change (I223R) resulting in HRI by oseltamivir and peramivir and reduced inhibition by zanamivir and laninamivir. The vast majority of A(H3N2) and B viruses tested were sensitive to oseltamivir, peramivir, laninamivir and zanamivir.

Résistance aux antiviraux utilisés contre la grippe

Inhibiteurs de la neuraminidase

La majorité des virus A(H1N1)pdm09 testés étaient sensibles à l'oseltamivir et au zanamivir. Un faible pourcentage des virus A(H1N1)pdm09, dont l'inhibition par l'oseltamivir était fortement diminuée, a été détecté dans l'ensemble du monde. Au Japon, une faible proportion (2,7%) de ces virus présentaient une forte diminution de l'inhibition par l'oseltamivir et le peramivir et pour un virus, on a constaté une baisse de l'inhibition par le zanamivir et le laninamivir. Dans tous les cas, la résistance était due à la substitution d'une histidine par une tyrosine au niveau de l'acide aminé 275 (H275Y) de la neuraminidase et, en majorité, les virus provenaient de cas non traités par des antiviraux. Dans un cas, il existait une substitution supplémentaire (I223R) entraînant une forte diminution de l'inhibition par l'oseltamivir et le peramivir, et une baisse de l'inhibition par le zanamivir et le laninamivir. La grande majorité des virus de la grippe A(H3N2) et de la grippe B testés étaient sensibles à l'oseltamivir, au peramivir, au laninamivir et au zanamivir.

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 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. Five panels of sera from adults and older adults as well as two panels from children were from trials of egg-grown trivalent vaccine of the composition recommended for the northern hemisphere 2013-14 and southern hemisphere 2014 seasons (A/California/7/2009 (H1N1)pdm09-like, A/Texas/50/2012 (H3N2)-like and B/Massachusetts/2/2012-like viruses); one panel of sera from adults and older adults was from a trial of cell-grown trivalent vaccine of the same composition.

For the majority of panels tested, geometric mean HI titres of antibodies against representative recent A(H1N1)pdm09 viruses were not reduced significantly as compared to HI titres to the vaccine virus.

Geometric mean HI titres against clade 3C.3a A(H3N2) viruses were significantly reduced compared to HI titres against both cell-propagated and egg-propagated A/Texas/50/2012 viruses (average reductions for 3C.3a viruses compared to egg propagated A/Texas/50/2012: adults, 79%; older adults, 77%; children, 70%; average reductions compared to cell propagated A/Texas/50/2012: adults, 67%; older adults, 72%; children, 52%).

Serum panels were tested against representative recent B/Yamagata/16/88 lineage viruses of genetic groups 2 and 3 as well as against B/Victoria/2/87 lineage viruses. Geometric mean HI titres of antibodies against representative recent group 2 B/Yamagata/16/88 lineage viruses were not reduced significantly compared to HI titres to the vaccine virus. However, for a majority of panels tested, geometric mean HI titres against group 3 viruses were significantly reduced compared to HI titres against the group 2 vaccine virus. As expected, geometric mean HI titres to B/Victoria/2/87 lineage viruses also were reduced.

Inhibiteurs de la protéine M2

Le séquençage du gène M des virus A(H1N1)pdm09 et A(H3N2) a révélé que tous les virus analysés présentaient une substitution de la sérine par l'asparagine au niveau de l'acide aminé 31 (S31N) de la protéine M2, dont on sait qu'elle confère une résistance aux inhibiteurs de la protéine M2 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 un vaccin inactivé trivalent 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. Cinq batteries de sérums d'adultes et d'adultes plus âgés ainsi que 2 batteries de sérums d'enfants ont été rassemblées à partir d'essais portant sur un vaccin trivalent préparé sur œufs et ayant la composition recommandée pour la saison 2013-2014 dans l'hémisphère Nord et pour la saison 2014 dans l'hémisphère Sud (souches A/California/7/2009, (H1N1)pdm09, A/Texas/50/2012, (H3N2) et B/Massachusetts/2/2012); une batterie de sérums d'adultes et d'adultes plus âgés a été constituée à partir d'un essai étudiant un vaccin trivalent préparé sur culture cellulaire de même composition.

Pour la majorité des batteries de sérums testées, les titres d'IH d'anticorps dirigés contre des virus A(H1N1)pdm09 représentatifs récents n'avaient pas diminué significativement en moyenne géométrique par rapport aux titres d'IH contre le virus vaccinal.

En moyenne géométrique, les titres d'IH contre des virus A(H3N2) du clade 3C.3a avaient baissé significativement par rapport aux titres d'IH contre des virus de la souche A/Texas/50/2012 propagés sur culture cellulaire ou sur œufs (diminutions moyennes pour les virus 3C.3a par rapport aux virus A/Texas/50/2012 propagés sur œufs: adultes, 79%; adultes plus âgés, 77%; enfants, 70%; diminutions moyennes par rapport aux virus A/Texas/50/2012 propagés sur culture cellulaire: adultes, 67%; adultes plus âgés, 72%; enfants, 52%).

Des batteries de sérums ont été testées contre des virus de la lignée B/Yamagata/16/88 représentatifs récents, appartenant aux groupes génétiques 2 et 3, et contre des virus de la lignée B/Victoria/2/87. Les titres d'IH d'anticorps contre les virus de la lignée Yamagata/16/88 appartenant au groupe 2B représentatifs récents n'avaient pas diminué significativement en moyenne géométrique par rapport aux titres d'IH obtenus avec le virus vaccinal. Néanmoins, pour la majorité des batteries testées, les titres d'IH obtenus avec des virus du groupe 3 avaient significativement baissé en moyenne géométrique par rapport aux titres d'IH atteints avec le virus vaccinal appartenant au groupe 2. Comme on pouvait s'y attendre, les titres d'IH en réaction avec des virus de la lignée B/Victoria/2/87 avaient également diminué en moyenne géométrique.

Recommended composition of influenza virus vaccines for use in the 2015 southern hemisphere influenza season

A(H1N1)pdm09 viruses co-circulated in varying proportions with A(H3N2) and B viruses during the period February–September 2014, with outbreaks in several countries. The majority of A(H1N1)pdm09 viruses were antigenically similar to A/California/7/2009. Vaccines containing A/California/7/2009 – like 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 distinguishable from the previous vaccine virus A/Texas/50/2012 and more closely related to A/Switzerland/9715293/2013. Current vaccines containing A/Texas/50/2012 antigens induced antibodies in humans that reacted less well to A(H3N2) clade 3C.3a viruses.

Influenza B activity was reported in many countries. B/Yamagata/16/88 remained dominant over B/Victoria/2/87 lineage viruses. The majority of recent B/Victoria/2/87 lineage viruses were antigenically and genetically closely related to B/Brisbane/60/2008. Most recently isolated B/Yamagata/16/88 lineage viruses were antigenically distinguishable from the current vaccine virus B/Massachusetts/2/2012 (clade 2) and were more closely related to B/Phuket/3073/2013-like (clade 3) viruses. Current vaccines containing B/Massachusetts/2/2012 antigens induced anti-HA antibodies that reacted well to B/Yamagata/16/88 lineage clade 2 viruses; however, significant reductions in GMT were observed more frequently when testing clade 3 viruses.

Lists of candidate influenza vaccine viruses that are available or under development and reagents for vaccine standardization, including those for this recom-

It is recommended that vaccines for use in the 2015 influenza season (southern hemisphere winter) contain the following:

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

– an A/Switzerland/9715293/2013 (H3N2)-like virus;[a]

– a B/Phuket/3073/2013-like virus.

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

[a] A/South Australia/55/2014, A/Norway/466/2014 and A/Stockholm/6/2014 are A/Switzerland/9715293/2013-like viruses

Il est recommandé que les vaccins qui seront utilisés pendant la saison grippale 2015 (hiver dans l'hémisphère Sud) contiennent des virus appartenant aux souches suivantes:

– A/California/7/2009 (H1N1)pdm09;

– A/Switzerland/9715293/2013 (H3N2);[a]

– B/Phuket/3073/2013.

Il est recommandé que les vaccins quadrivalents contenant 2 virus de la grippe B renferment aussi les 3 virus ci-dessus et un virus de la souche B/Brisbane/60/2008.

[a] A/South Australia/55/2014, A/Norway/466/2014 et A/Stockholm/6/2014 sont des virus analogues à A/Switzerland/9715293/2013.

Composition recommandée pour les vaccins antigrippaux devant être utilisés pendant la saison grippale 2015 dans l'hémisphère Sud

Des virus grippaux A(H1N1)pdm09 ont circulé conjointement et en proportions variables avec des virus grippaux A(H3N2) et B de février à septembre 2014, avec l'apparition de flambées dans plusieurs pays. La majorité des virus A(H1N1)pdm09 étaient similaires sur le plan antigénique à la souche A/California/7/2009. Les vaccins contenant des antigènes de cette souche ont suscité chez l'homme la formation d'anticorps anti-HA à des titres analogues à ceux obtenus contre le virus vaccinal et contre des virus A(H1N1)pdm09 récents.

Des virus grippaux A(H3N2) ont été associés à des flambées dans plusieurs pays. La majorité des virus récents pouvaient être distingués sur le plan antigénique du virus vaccinal précédent A/Texas/50/2012 et étaient plus étroitement apparentés au virus A/Switzerland/9715293/2013. Les vaccins actuels contenant des antigènes de la souche A/Texas/50/2012 ont induit chez l'homme la formation d'anticorps réagissant bien avec les virus A(H3N2) du clade 3C.3a.

Une activité de la grippe B a été rapportée dans de nombreux pays, avec une prédominance des virus de la lignée B/Yamagata/16/88 sur ceux de la lignée B/Victoria/2/87. La majorité des virus de la lignée B/Victoria/2/87 étaient étroitement apparentés sur le plan antigénique et génétique à la souche B/Brisbane/60/2008. Les virus de la lignée B/Yamagata/16/88 les plus récemment isolés pouvaient être distingués sur le plan antigénique du virus vaccinal actuel B/Massachusetts/2/2012 (appartenant au clade 2) et étaient plus étroitement apparentés à la souche B/Phuket/3073/2013-like (clade 3). Les vaccins actuels contenant des antigènes du virus B/Massachusetts/2/2012 ont suscité la formation d'anticorps anti-HA réagissant bien avec les virus du clade 2 appartenant à la lignée B/Yamagata/16/88; néanmoins, on a observé plus fréquemment des baisses significatives de la moyenne géométrique des titres en testant des virus du clade 3.

La liste des virus candidats, disponibles ou en cours de mise au point, devant entrer dans la composition du vaccin antigrippal et des réactifs pour la standardisation des vaccins, y compris

mendation, can be found on the WHO website.[5] Candidate vaccine viruses for zoonotic influenza viruses are updated on the same website.

As in previous years, national or regional authorities approve the composition and formulation of vaccines 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.[6]

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: +61 2 6232 8564, 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: +44 1707 641050, email: enquiries@nibsc.org, website: http://www.nibsc.org/science_and_research/virology/influenza_resource_/full_reagent_update.aspx);

(iii) Division of Product 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: +81 42 561 6156); 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, 792 Elizabeth Street, Melbourne, Victoria 3000, Australia (fax: +61 393 429 329, 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: +81 42 561 6149 or +81 42 565 2498, email: whocc-flu@nih.go.jp;

(iii) the WHO Collaborating Centre for Surveillance, Epidemiology and Control of Influenza, Centers for

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

[6] See No. 47, 2012, pp. 461–476.

ceux sur lesquels porte cette recommandation, est consultable sur le site Web de l'OMS.[5] Les virus vaccinaux candidats pour les virus grippaux zoonotiques sont mis à jour sur le même site.

Comme les années précédentes, les autorités nationales ou régionales approuvent la composition et la formulation des vaccins dans chaque pays. Les autorités nationales de santé publique sont chargées de formuler des recommandations concernant l'utilisation de ces vaccins. L'OMS a publié des recommandations sur la prévention de la grippe.[6]

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: +61 2 6232 8564, courriel: influenza.standards@tga.gov.au; site Web: http://www.tga.gov.au);

ii) Division of Virology, National Institute for Biological Standards and Control, Health Protection Agency, Blanche Lane, South Mimms, Potters Bar, Hertfordshire, EN6 3QG, Royaume-Uni (télécopie: +44 1707 641050, courriel: enquiries@nibsc.hpa. org.uk, site Web: http://www.nibsc.org/science_and_research/virology/influenza_resource_/full_reagent_update.aspx);

iii) Division of Product Quality, 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: +81 42 561 6156).

Les souches de référence nécessaires à l'analyse antigénique peuvent être obtenues en s'adressant au:

i) WHO Collaborating Centre for Reference and Research on Influenza, VIDRL, 792 Elizabeth Street, Melbourne, Victoria 3000, Australie (télécopie: +61 393 429 329, site Web: http://www.influenzacentre.org, courriel: whoflu@influenzacentre.org);

ii) au 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: 81 42 561 6149 ou +81 42 565 2498, courriel: whocc-flu@nih.go.jp);

iii) au WHO Collaborating Center for Surveillance, Epidemiology and Control of Influenza, Centers for Disease Control

[5] Voir http://www.who.int/influenza/vaccines/virus/candidates_reagents/home, consulté en septembre 2013.

[6] Voir Nº 47, 2012, pp. 461-476.

Disease Control and Prevention, 1600 Clifton Road, Mail Stop G16, Atlanta, GA 30333, USA (fax: +1 404 639 0080, website: http://www.cdc.gov/flu/, email: influenzavirussurveillance@cdc.gov);

(iv) the WHO Collaborating Centre for Reference and Research on Influenza, MRC National Institute for Medical Research, The Ridgeway, Mill Hill, London NW7 1AA, UK (fax: +44 208 906 44 77, website: http://www.nimr.mrc.ac.uk/wic/, email: whocc@nimr.mrc.ac.uk);

(v) 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 Global Influenza Programme web site.[7] ■

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

and Prevention, 1600 Clifton Road, Mail Stop G16, Atlanta, GA 30333, États-Unis (télécopie: +1 404 639 0080, site Web: http://www.cdc.gov/flu/);

iv) au WHO Collaborating Centre for Reference and Research on Influenza, MRC National Institute for Medical Research, The Ridgeway, Mill Hill, London NW7 1AA, Royaume-Uni (télécopie: +44 208 906 4477, site Web: http://www.nimr.mrc.ac.uk/wic/);

v) ou au 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 (tél.: +8610 58900851, télécopie: +8610 58900851, 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.[7]

[7] Voir http://www.who.int/influenza.

How to obtain the WER through the Internet

(1) WHO WWW SERVER: Use WWW navigation software to connect to the WER pages at the following address: **http://www.who.int/wer/**

(2) An e-mail subscription service exists, which provides by electronic mail the table of contents of the WER, together with other short epidemiological bulletins. To subscribe, send a message to **listserv@who.int**. The subject field should be left blank and the body of the message should contain only the line subscribe wer-reh. A request for confirmation will be sent in reply.

WWW access • **http://www.who.int/wer**
E-mail • send message **subscribe wer-reh** to **listserv@who.int**
Fax: (+4122) 791 48 21/791 42 85
Contact: wantzc@who.int or wer@who.int

Comment accéder au REH sur Internet?

1) Par le serveur Web de l'OMS: A l'aide de votre logiciel de navigation WWW, connectez-vous à la page d'accueil du REH à l'adresse suivante: **http://www.who.int/wer/**

2) Il existe également un service d'abonnement permettant de recevoir chaque semaine par courrier électronique la table des matières du REH ainsi que d'autres bulletins épidémiologiques. Pour vous abonner, merci d'envoyer un message à **listserv@who**.int en laissant vide le champ du sujet. Le texte lui même ne devra contenir que la phrase suivante: subscribe wer-reh.

Accès WWW • **http://www.who.int/wer**
Courrier électronique • envoyer message **subscribe wer-reh à listserv@who.int**
Fax: +41-(0)22 791 48 21/791 42 85
Contact: wantzc@who.int ou wer@who.int

Monthly report on dracunculiasis cases, January–August 2014

In order to monitor the progress accomplished towards dracunculiasis eradication, district-wise surveillance indicators, a line list of cases and a line list of villages with cases are sent to WHO by the national dracunculiasis eradication programmes. Information below is summarized from these reports. ■

Rapport mensuel des cas de dracunculose, janvier-août 2014

Afin de suivre les progrès réalisés vers l'éradication de la dracunculose, les programmes nationaux d'éradication de la dracunculose envoient à l'OMS des indicateurs de surveillance des districts sanitaires, une liste exhaustive des cas ainsi qu'une liste des villages ayant signalé des cas. Les renseignements ci-dessous sont résumés à partir de ces rapports. ■

Country – Pays	Date of receipt of the report[a]– Date de réception du rapport[a]	Total no. of rumours[b] of suspected dracunculiasis cases in 2014 – Nombre total de rumeurs[b] de cas suspects de dracunculose en 2014	No. of new dracunculiasis cases reported between January and June 2014[c] – Nombre de nouveaux cas de dracunculose signalés de janvier à juin 2014[c]								Total no. of reported cases for the same months of 2013 – Nombre total de cas signalés pour les mêmes mois en 2013	Total no. of villages reporting cases in – Nombre total de villages signalant des cas en		Month of emergence of last reported indigenous case – Mois d'émergence du dernier cas autochtone signalé
			January – Janvier	February – Février	March – Mars	April – Avril	May – Mai	June – Juin	July – Juillet	August – Août	Total		2014	2013	
Endemic countries – Pays d'endémie															
Chad – Tchad	22 September 2014 – 22 septembre 2014	960	1	1	1	1	1	1	3	0	9	9	9	8	July 2014 – Juillet 2014
Ethiopia – Ethiopie	25 September 2014 – 25 septembre 2014	2752	0	0	0	0	0	2	0	0	2	7	2	5	June 2014 – Juin 2014
Mali	16 September 2014 – 16 septembre 2014	38	0	0	0	0	0	0	0	1	1	4	1	3	August 2014 – Août 2014
South Sudan[d] – Soudan du Sud[d]	9 October 2014 – 9 octobre 2014	418	0	0	3	4	4	8	22	22	63	99	38	70	August 2014 – Août 2014
Precertification countries – Pays au stade de la précertification															
Ghana	21 September 2014 – 21 septembre 2014	163	0	0	0	0	0	0	0	0	0	0	0	0	May 2010 – Mai 2010
Kenya	22 September 2014 – 22 septembre 2014	13	0	0	0	0	0	0	0	0	0	0	0	0	October 1994 – Octobre 1994
Sudan – Soudan	NR	12	0	0	0	0	0	0	0	NR	0	2	0	0	September 2013 – Septembre 2013
Total		**4356**	**1**	**1**	**4**	**5**	**5**	**11**	**25**	**23**	**75**	**121**	**50**	**86**	

Source: Ministries of Health – Ministères de la Santé.

[a] Each monthly report is due by the 20th of the following month. – Chaque rapport mensuel est attendu pour le 20 du mois suivant.

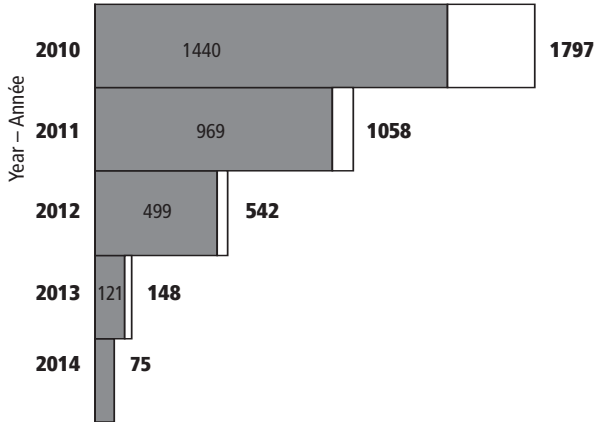
[b] Rumour of dracunculiasis. Information about an alleged case of dracunculiasis (Guinea-worm disease) obtained from any source (informants). – Rumeur de dracunculose. Information au sujet d'un cas présumé de dracunculose (maladie du ver de Guinée) obtenue à partir de n'importe quelle source (informateurs).

[c] The total number of dracunculiasis cases includes both indigenous and imported cases. – Le nombre total de cas de dracunculose regroupe les cas autochtones et les cas importés.

[d] Data regarding the total number of dracunculiasis cases reported in South Sudan for the month of July 2014 was updated from the latest report published (see No. 35, 2014, pp. 387–388). – Les données concernant le nombre total de cas de dracunculose signalés au Soudan du Sud pour le mois de juillet 2014 ont été mises à jour en se basant sur le dernier rapport publié (voir N° 35, 2014, pp. 387-388).

NR = Data not received. – Données non reçues.

Number of dracunculiasis cases reported worldwide, 2010–2014 – Nombre de cas de dracunculose signalés dans le monde, 2010-2014



The value outside the bar indicates the total number of dracunculiasis cases reported for that year. – La valeur à l'extérieur de la barre indique le nombre total de cas de dracunculose signalés pour l'année en question.

The shaded portion and the number inside the bar indicate reported dracunculiasis cases for that period compared with the number of cases reported in 2014. – La portion colorée et le nombre à l'intérieur de la barre indiquent le nombre de cas de dracunculose au cours de cette période comparativement au nombre de cas signalés en 2014.