RECOMMENDATION FOR SEASONAL INFLUENZA VACCINE COMPOSITION FOR NEW ZEALAND FOR 2016

Dr Graeme Benny
Heath Group, ESR

Dr Q Sue Huang
Director, WHO National Influenza Centre

Dr Don Bandaranayake
Peer Reviewer
Public Health Physician, ESR-NCBID

RECOMMENDATION FOR SEASONAL INFLUENZA VACCINE COMPOSITION FOR NEW ZEALAND FOR 2016

A report prepared for the Ministry of Health
as part of the 2015/16 contract
(Service Description: Health Group)

by

Dr Q Sue Huang

Director, WHO National Influenza Centre

Liza Lopez

Senior Analyst

Tim Wood

Senior Analyst

Namrata Prasad

Analyst

October 2015

Client Report

FW15049

Disclaimer

This report or document (the Report) is given by the Institute of Environmental Science and Research Limited (ESR) solely for the benefit of the Ministry of Health, Public Health Services Providers and other Third Party Beneficiaries as defined in the Contract between ESR and the Ministry of Health, and is strictly subject to the conditions laid out in that Contract.

Neither ESR nor any of its employees makes any warranty, express or implied, or assumes any legal liability or responsibility for use of the Report or its contents by any other person or organisation.

Acknowledgements

We would like to thank the general practitioners and their staff, the local surveillance coordinators, regional virology laboratories (Auckland, Waikato, Wellington, and Christchurch), and medical officers of health involved in influenza surveillance for their time and cooperation. We would also like to acknowledge the WHO National Influenza Centre at ESR for the provision of laboratory data and ESR's Information Management Group for assisting in the running of the electronic flu database. Special thanks also go to:

- Dr Don Bandaranayake for peer reviewing this report.
- The Ministry of Health for providing the funding for Sentinel GP surveillance, HealthStat, Healthline and ICD code based hospital surveillance, part of SARI surveillance
- The WHO Collaborating Centre in Melbourne for providing further characterisations of the influenza isolates.
- The National Institute of Communicable Diseases, Johannesburg in South Africa and Department of Health and Ageing (DOHA) in Australia for sharing information on their influenza activity.
- The Therapeutic Goods Administration, DOHA for hosting the Australian Influenza Vaccine Committee.
- The Southern Hemisphere Influenza and Vaccine Effectiveness Research and Surveillance (SHIVERS) project funded by US Department of Health and Human Services, Centers for Disease Control and Prevention (CDC) (1U01IP000480). The project is a five year research cooperative agreement between ESR and US CDC's National Center for Immunization and Respiratory Diseases (NCIRD) Influenza Division. The SHIVERS project is a multi-centre and multi-disciplinary collaboration between ESR, Auckland District Health Board, Counties Manukau District Health Board, University of Otago, University of Auckland, participating sentinel general practices, Primary Health Organisations (Procare, Auckland and East Tamaki Healthcare), Auckland Regional Public Health Service, the US Centres for Disease Control and Prevention and WHO Collaborating Centre at St Jude Children's Hospital in Memphis, USA.
- 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 Canberra on 8 October 2015 to consult on the influenza vaccine composition for 2016 for New Zealand, Australia and South Africa. The recommended composition for trivalent vaccines was:

- A(H1N1) an A/California/7/2009 (H1N1)pdm09 - like virus
- A(H3N2) an A/Hong Kong/4801/2014 (H3N2) - like virus
- B a B/Brisbane/60/2008 - like virus (belonging to B/Victoria lineage)

Quadrivalent vaccines contain the above three viruses and plus one more vaccine component:

- B a B/Phuket/3073/2013 - like virus (belonging to B/Yamagata lineage)

CONTENTS

LIST OF TABLES

LIST OF FIGURES

Table 1. Influenza Vaccine Recommendations for New Zealand, 1991–2015

Decision		Use year	A H3N2	A H1N1	B (Trivalent)	B (Quadrivalent)
NZ & WHO*	2015	2016	A/Hong Kong/4801 /2014	A/California/7/2009	B/Brisbane/60/2008	B/Phuket/3073/2013
NZ & WHO*	2014	2015	A/Switzerland/9715293/2013	A/California/7/2009	B/Phuket/3073/2013	B/Brisbane/60/2008
NZ & WHO*	2013	2014	A/Texas/50/2012	A/California/7/2009	B/Massachusetts/2/2012	B/Brisbane/60/2008
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

1. INFLUENZA EPIDEMIOLOGY

1.1. World-wide influenza activity, February to September 2015

Between February 2015 and September 2015, influenza activity was reported in Africa, the Americas, Asia, Europe and Oceania. Activity varied from sporadic to widespread and was associated with the circulation of influenza A(H1N1)pdm09, A(H3N2) and 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 several 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 Africa between February and April. Widespread outbreaks occurred in the Indian subcontinent between February and July. Sporadic activity was reported in North America. Activity decreased from May until September in the northern hemisphere. In Central and South America, activity was low in general with the exception of Cuba which reported regional outbreaks in August. In Africa, widespread A(H1N1)pdm09 activity occurred in South Africa from May to July. Sporadic A(H1N1)pdm09 activity was reported in Australia and New Zealand.

Influenza A(H3N2)

Influenza A(H3N2) activity was generally moderate to high in the Americas, Asia, Europe and Oceania. In the Americas, widespread outbreaks were reported by the United States of America in February while widespread and regional outbreaks occurred in some central and South American countries such as Brazil, Ecuador, El Salvador and Paraguay from May or June onwards.

In Asia, regional and widespread outbreaks were reported in February and March by Japan, and in March by Israel. Regional outbreaks were reported in June by China Hong Kong Special Administrative Region, June and July by Cambodia, and July and August by China. In the European region, many countries reported regional or widespread outbreaks of A(H3N2) in February and March with co-circulation of A(H1N1)pdm09 and influenza B. Activity was low in Africa with the exception of Madagascar which reported regional outbreaks in February and March. Activity was high in Australia and moderate in New Zealand.

Influenza B

Influenza B activity was generally variable in Africa, the Americas, Asia, Europe and Oceania. Moderate to high activity was reported by many European countries between February and April. In Asia, widespread outbreaks occurred in Kazakhstan in February and in Georgia in February and March. Regional outbreaks occurred in China in February and March and in Japan from February to April.

In Africa, the Democratic Republic of the Congo and Madagascar reported regional outbreaks in February to April, and February and March, respectively. Activity was low in the rest of Africa. Regional and widespread outbreaks were reported by the United States of America from

February to March. In South America, regional influenza B outbreaks were reported in Paraguay in August but in general activity was low in other countries. In Oceania, regional and widespread outbreaks occurred in Australia from June onwards, and in New Zealand from July to September.

(Abridged from the Weekly Epidemiological Record, 2015 90(41):545-560).

Zoonotic influenza infections

From 24 February 2015 to 21 September 2015, one human infection with an A(H5N6) virus was reported by China and 69 confirmed human cases of A(H5N1) were reported by China (3), Egypt (64) and Indonesia (2). Highly pathogenic avian influenza A(H5) is present in poultry in these countries. Since December 2003, a total of 844 cases with 449 deaths have been confirmed in 16 countries. To date there has been no evidence of sustained human-to-human transmission.

During this period 105 additional human cases of avian influenza A(H7N9) virus infection have been reported in China. Since February 2013, a total of 667 cases with 275 deaths have been reported.

Four A(H9N2) human cases were reported in this period, one in China, one in Bangladesh and two in Egypt. The associated disease in all cases was mild with the viruses from China belonging to the A/chicken/Hong Kong/Y280/97 genetic lineage and the virus from Bangladesh belonging to the A/quail/Hong Kong/G1/97 genetic lineage. Sequence data from one Egyptian case indicated the virus was genetically similar to previous G1-lineage A(H9N2) poultry viruses detected in Egypt.

Two cases of A(H1N1)v, one being fatal, and two cases of A(H3N2)v were reported in the United States of America.

(Abridged from the Weekly Epidemiological Record, 2015 90(41):545-560).

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 2015. Influenza A(H3N2) virus was the predominant strain which accounted for 36.2% (775/2138) of isolates, while 28.8% (615/2138) were B/Yamagata lineage, 13.5% (228/2138) were B/Victoria lineage and 10.9% (233/2138) were A(H1N1)pdm09 (Table 2.1 in Appendix 2).

1.2. Influenza activity in Australia, February to September 2015

Influenza activity in Australia in 2015 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 2015 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 peaked during the week ending 23 August. The peak ILI rate was similar to 2012 and 2014. Among 2333 ILI samples tested, 29.7% were positive for influenza with 19.8% of influenza B and 9.9% of influenza A.

- **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 activity similar to 2014; the Northern Territory data showed the similar trend within the range reported in recent seasons.

- **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 2015 peaked in the middle of August (week ending 23 August), close to the peak rate observed in 2014.

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 11 September 2015, there have been 74,220 laboratory-confirmed notifications of influenza diagnosed and reported to NNDSS. Of these, 62% of cases were reported as influenza B and 38% influenza A (29% A(unsubtyped), 6% A(H3N2) and 2% A(H1N1)pdm09). Less than 1% were reported as either influenza A & B co-detections. In addition, one third of notifications of influenza reported this year have been in children aged less than 15 years. Notification rates have been highest among those aged 5-9 years and over 85 years with a secondary peak in those aged 35-44 years. Overall, the 2015 notification data have been the highest since 2010, probably due to more testing.

- **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 14 September 2015. There were 1,235 Australian influenza viruses subtyped by the WHO CC, with 44% influenza A(H3N2), 9% A(H1N1)pdm09 and 46% influenza B. The majority of influenza B viruses were from B/Yamagata lineage. All 903 tested influenza viruses were sensitive to oseltamivir (neuraminidase inhibitor) 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. Overall, 24% of the respiratory viral tests conducted over this period were 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. Since 1 April 2015, 6.7% of influenza patients have been admitted directly to ICU. The majority of admissions have been with influenza B (54%). Around 45% of the cases were 65 years of age or older and 70% of all cases have known medical co-morbidities.

- **Queensland public hospital admissions (EpiLog).** EpiLog is a web based application developed by Queensland Health. This surveillance system generates admission records for confirmed influenza cases through interfaces with the inpatient information and public laboratory databases. Records are also generated manually. Admissions data reported are based on date of reported onset. Up to 13 September 2015, there were 1108 admissions, including 109 to intensive care units. There has been a broad age distribution of influenza-associated hospitalisations, with high numbers in the 0-9 and over 50 years age groups. The median age of hospitalised cases is 52 years with a range of less than one to 99 years.

- **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. Between 1 July 2015 and 13 September 2015, there have been 49 hospitalisations associated with severe complications of influenza reported. The median age of these cases was 3.2 years. Of the 46 cases where the influenza type is known, 31 were associated with influenza B infection. Overall the average duration of hospitalisation was 4.5 days with 16 cases requiring admission to ICU (ICU admission status is currently unknown for two cases). Slightly less than 50% of cases report presence of one or more underlying chronic condition.

- **Death associated with influenza and pneumonia.** Nationally reported influenza deaths are notified by jurisdictions to the NNDSS. So far in 2015, 74 influenza associated deaths have been notified to the NNDSS, with a median age of 84 years (range 4 to 102 years). Influenza type A(H3N2) and B infections are the predominant cause of the influenza associated deaths in older age groups. 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 2015, No.8, 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 2015

Influenza surveillance in South Africa in 2015 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 (90%) as well as a few

paediatricians and primary health care clinics across the country. In 2014, a total of 104 doctors and primary health care nurses from 8 of 9 South African 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 with Severe Acute Respiratory Infections (SARI). This programme includes 4 hospitals covering KwaZulu-NTAL, Gauteng, and North West Provinces.

- **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 2 government funded primary health care clinics in two provinces of South Africa. Detailed epidemiologic data are collected on all patients.

- **SARI/pneumonia surveillance programme.** The SARI surveillance programme was established in 2009 and it monitors SARI cases in hospitalised patients. Detailed epidemiologic data are collected on all patients. This programme currently includes 6 hospitals as 5 sentinel sites covering 5 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.

In 2015, a total of 4382 suspected influenza specimens were processed up to week 34. Of which, 760 influenza viruses were detected. This gave an overall detection rate of 17% compared with 19% in 2014. Among all detected influenza viruses, influenza A was detected in 651. Of which, 372 (57%) Influenza A(H1N1)pdm09 and 278 (43%) influenza A(H3N2. Of the influenza positive cases, 14% (108/760) were influenza B with 89 B/Yamagata lineage and only 2 B/Victoria lineage strains and 9 not lineage-determined.

A total of 27 seasonal influenza A(H3N2) viruses were sequenced and they were clustered genetically in group 3C.2a subgroup.

A total of 26 influenza A(H1N1)pdm09 viruses were sequenced and most of them were clustered genetically in subgroup 6B.

A total of 13 influenza B/Yamagata lineage viruses were sequenced and most of them were clustered genetically in clade 3.

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

2. INFLUENZA ACTIVITY IN NEW ZEALAND IN 2015

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, SHIVERS sentinel general practice based ILI surveillance, HealthStat GP surveillance, Healthline - telephone health advice service) and hospital-based surveillance (SHIVERS SARI surveillance, Ministry of Health data on publicly funded hospital discharges, laboratory-based non-sentinel surveillance for outpatients and hospital in-patients).

2.1. Community-based surveillance

2.1.1 ESR's sentinel GP-based surveillance

The national sentinel GP-based surveillance system, began in 1989 and is part of the WHO's Global Influenza Programme. It is operated nationally by the ESR and locally by influenza surveillance co-ordinators in the public health services (PHS). Sentinel surveillance usually operates in the winter, from May to September (weeks 18–39). Local surveillance co-ordinators are recruited to general practices within their region and participate voluntarily. Where possible, the number of practices recruited is proportional to the size of the population in each District Health Board (DHB) covered by the PHS (approximately one practice for every 50,000 people).

GPs are required to record the number of consultations for influenza-like illness (ILI) each week and the age group of the patient (<1, 1–4, 5–19, 20–34, 35–49, 50–64, 65+), for each case patient who meets the case definition for ILI, on a standardised form.

For sentinel surveillance, ILI is defined as "an acute upper respiratory tract infection characterised by an abrupt onset and two of the following: fever, chills, headache, and myalgia"[3].

Each participating practice collected three respiratory samples (ie, a nasopharyngeal or throat swab) weekly, one each from the first ILI patient examined on Monday, Tuesday and Wednesday. For general practices with a registered patient population of more than 10,000, a total of six nasopharyngeal or throat swabs were collected weekly, two each from the first two ILI patients examined on Monday, Tuesday and Wednesday. The practices forwarded these samples either to the WHO National Influenza Centre at ESR or to hospital virology laboratories in Auckland, Waikato or Christchurch for virus characterisation. Laboratory identification included molecular detection using the polymerase chain reaction (PCR), isolation of the virus or direct detection of viral antigens. Influenza viruses were typed as A or B. Influenza A viruses were further sub-typed as A(H3N2) or A(H1N1)pdm09. Influenza B viruses were further lineage-typed as B/Yamagata or B/Victoria lineage.

Information on the number of ILI consultations and swabs sent from each DHB was forwarded to ESR each week (Monday to Sunday) by local co-ordinators. ILI consultation data was received by Wednesday of the following week. Likewise, virology laboratories reported to ESR weekly on the total number of swabs received from each DHB and the influenza viruses identified, and updated details on influenza types and sub-types from previous weeks. ESR reports national information on epidemiological and virological surveillance of influenza weekly, monthly and yearly to relevant national and international organisations, including the WHO, with reports published on the ESR website: https://surv.esr.cri.nz/virology.php.

Consultation rates were calculated using the registered patient populations of the participating practices as a denominator. From 1991 to 2009, the denominator for the age-specific ILI rate calculation was based on New Zealand census data as participating practices did not provide age-specific patient population data. The assumption was that the age distribution of the practice patient population was the same as the New Zealand population. Since 2010, age-specific patient population denominators were available from participating practices for the consultation rate calculations.

The national level of ILI activity is described using a set of threshold values. Based on New Zealand's ILI consultation rates during 2000–2013 (excluding the pandemic year, 2009), levels of ILI activity for baseline, normal seasonal ILI, higher than expected ILI activity and severe epidemic level are described by using different ILI consultation rates (Table 2).

Table 2. ILI activity threshold

Term used		Consultation rate (per 100,000 population)
Baseline		≤36
Normal seasonal activity	low	37–70
	moderate	71–110
	high	111–149
Higher than expected		150–399
Severe epidemic		≥400

In 2015, 64 sentinel practices were recruited from 18 of 20 DHBs under ESR's sentinel GP-based surveillance. Some sentinel practices did not report every week. The average number of practices participating per week was 59, with an average patient population roll of 303,416 approximately 6.7% of the New Zealand population. From week 18 (the week ending 3 May 2015) through week 35 (the week ending 30 August 2015), a total of 3352 consultations for ILI were reported from the 18 DHBs. It is estimated that ILI resulting in a visit to a general practitioner affected over 49,821 New Zealanders (1.1% of total population). The cumulative incidence of ILI consultation during this period was 1104.8 per 100,000 population. The average weekly ILI consultation rate during this period was 59.8 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) (Figure 1) and also compared with the same period during 2009–2014 (

Figure 2). Influenza consultation activity remained below the seasonal threshold level from weeks 18 to 26 in 2015, and then increased to a peak in week 33 (10–16 August 2015), with a consultation rate of 148.5 per 100,000 patient population. The peak occurred a week later than the first peak in 2014 (week 32, 52.7 per 100,000 patient population) and four weeks earlier than the peak in 2013 (week 37, 47.3 per 100,000 patient population).

Figure 1. Weekly consultation rates for influenza-like illness in New Zealand in 2015 in comparison to the average seasonal curve in 2000–2013 (excluding 2009)

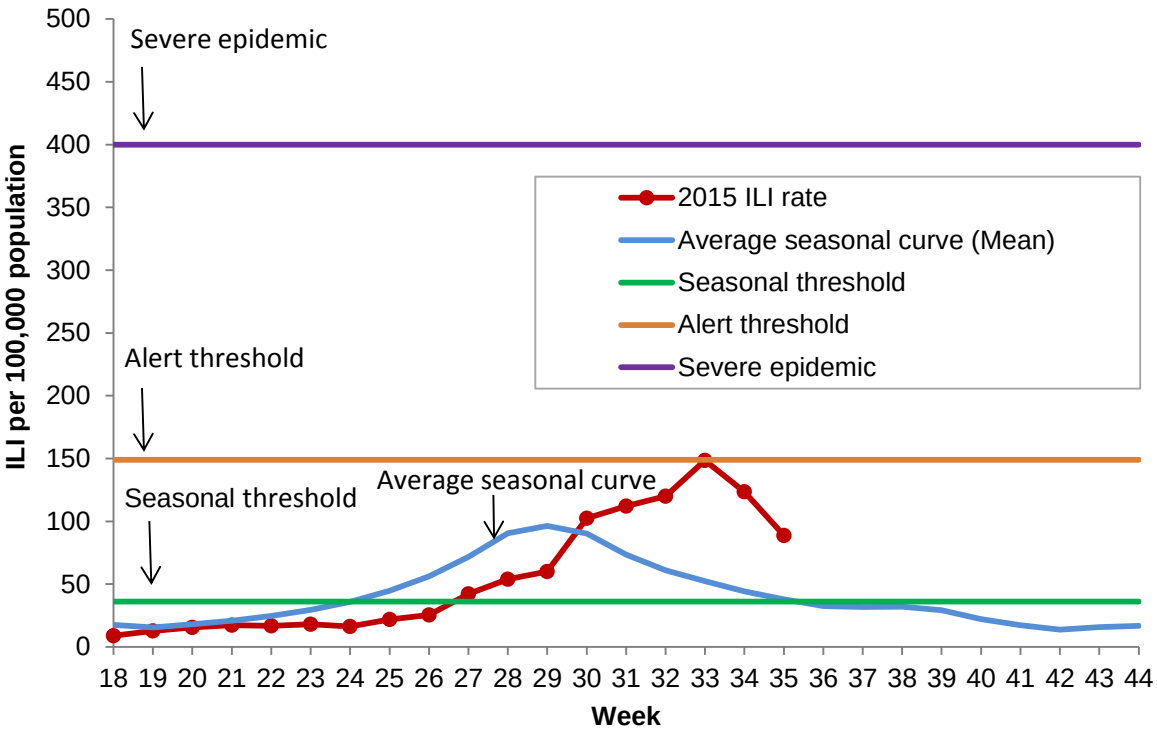
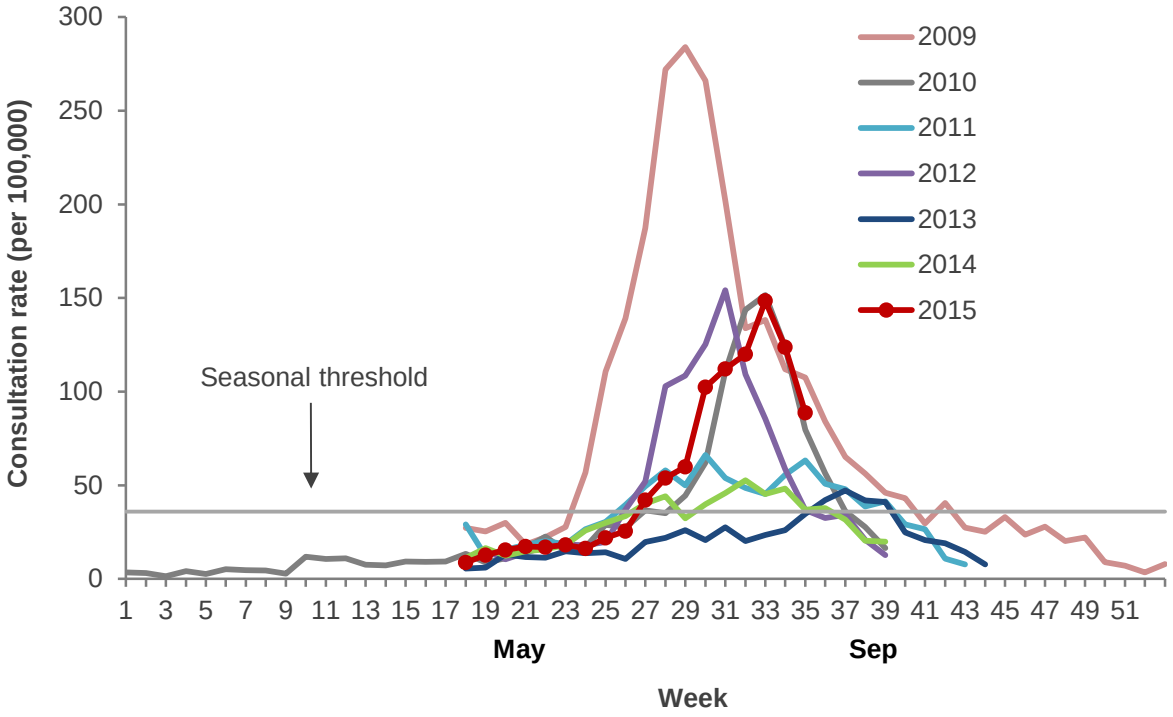
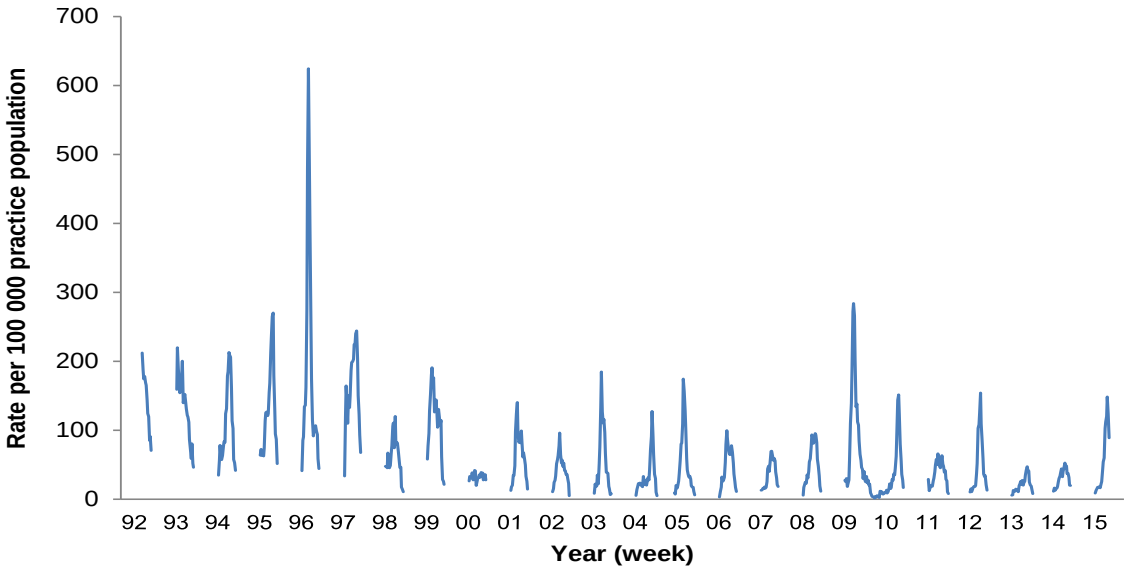


Figure 2. Weekly Consultation Rates for Influenza-like Illness in New Zealand, 2009-2015



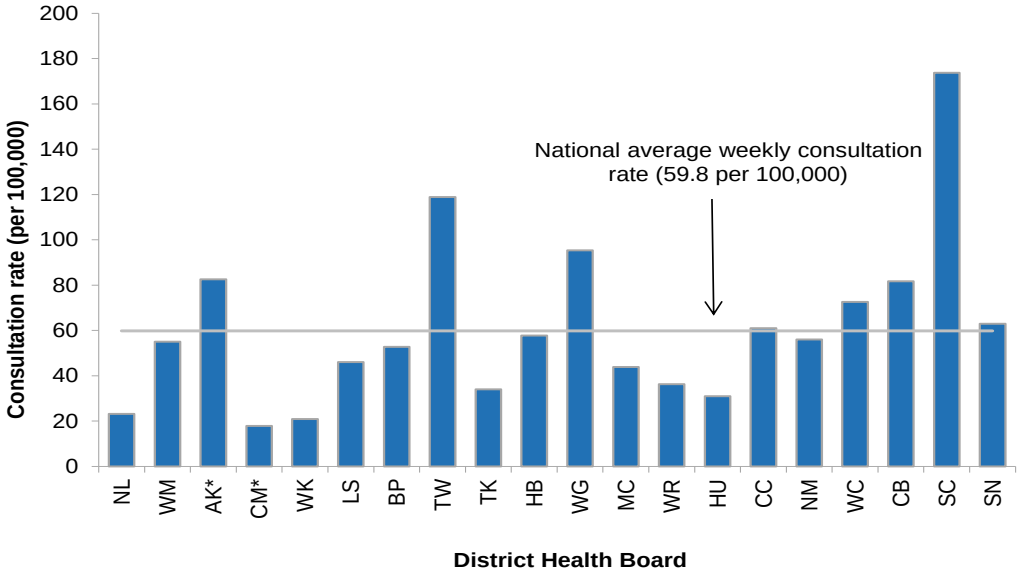
Weekly national ILI consultation rates for the study period were compared with the weekly consultation rates for ILI in 1992–2015 (Figure 3). The peak ILI rate in 2015 was the sixth highest during 2000–2015.

Figure 3. Weekly Consultation Rates for Influenza-like Illness in New Zealand, 1992–2015



As in previous years, 2015 consultation rates for ILI varied greatly among DHBs (Figure 4). From week 18 (the week ending 3 May 2015) through week 35 (the week ending 30 August 2015), South Canterbury DHB had the highest consultation rate (173.7 per 100,000), followed by Tairawhiti (118.9 per 100,000), and Whanganui (95.3 per 100,000).

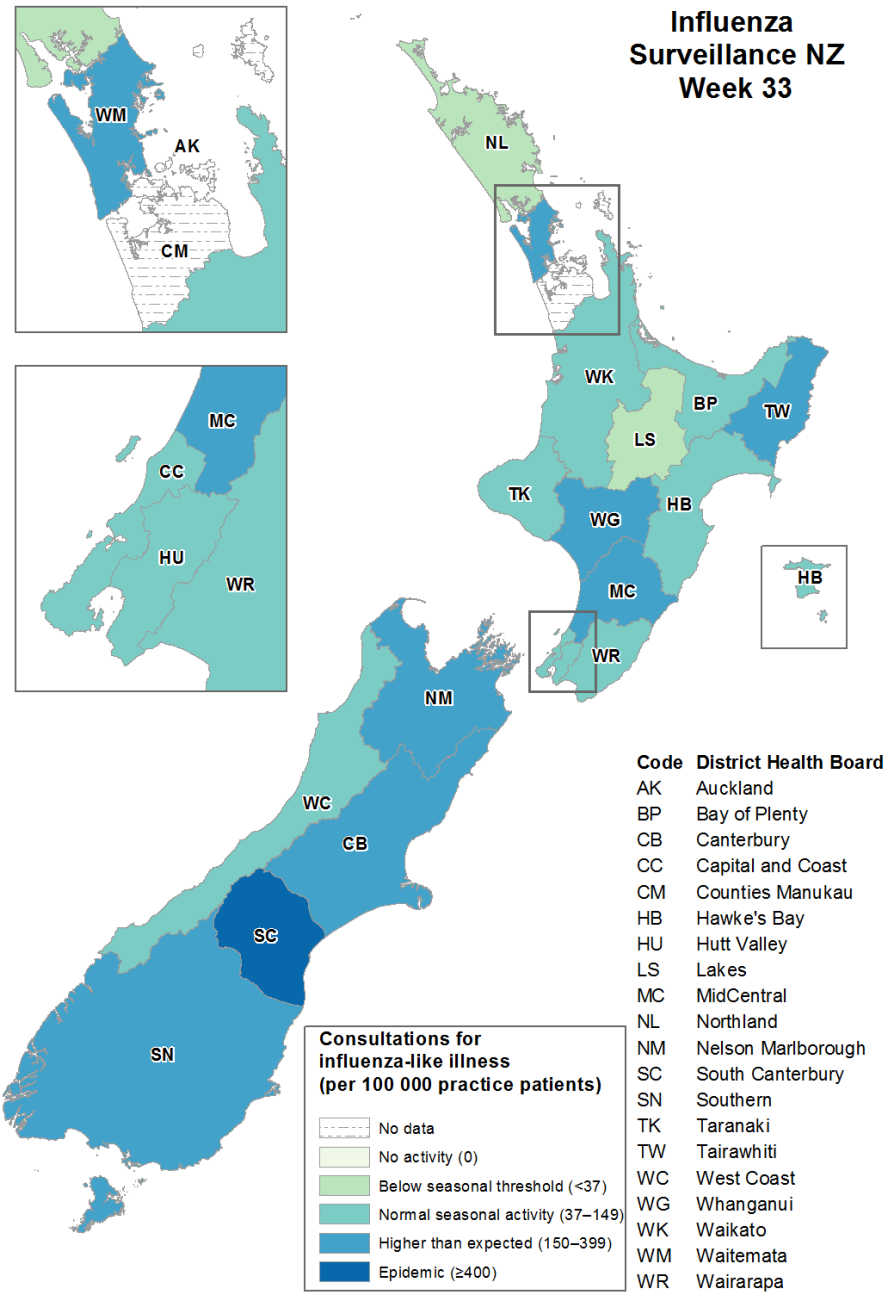
Figure 4. Average weekly consultation rate for influenza-like illness by District Health Board, 2015



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

Figure 5 shows ILI consultations among DHBs during the peak week 33 (10–16 August 2015). South Canterbury (589.8 per 100,000, 54 cases) and Whanganui (385.5 per 100,000, 20 cases) DHBs had the highest consultation rates.

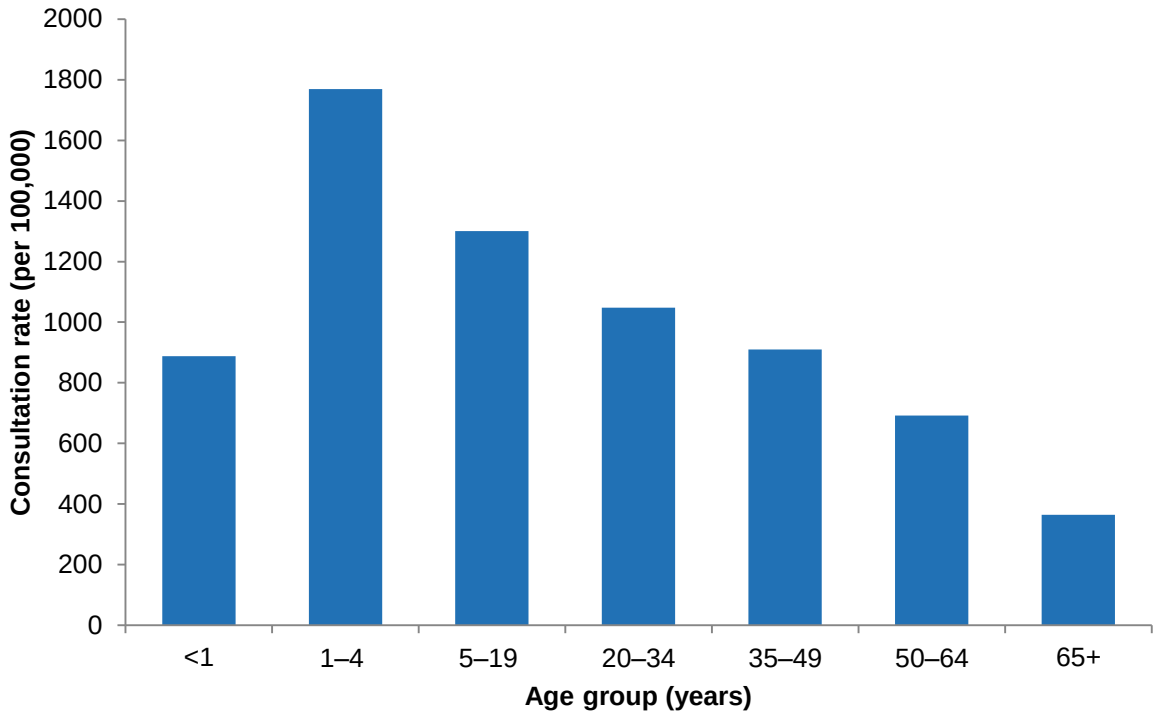
Figure 5. ILI consultation rates by District Health Board for the peak week 33 (10–16 August 2015)



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).

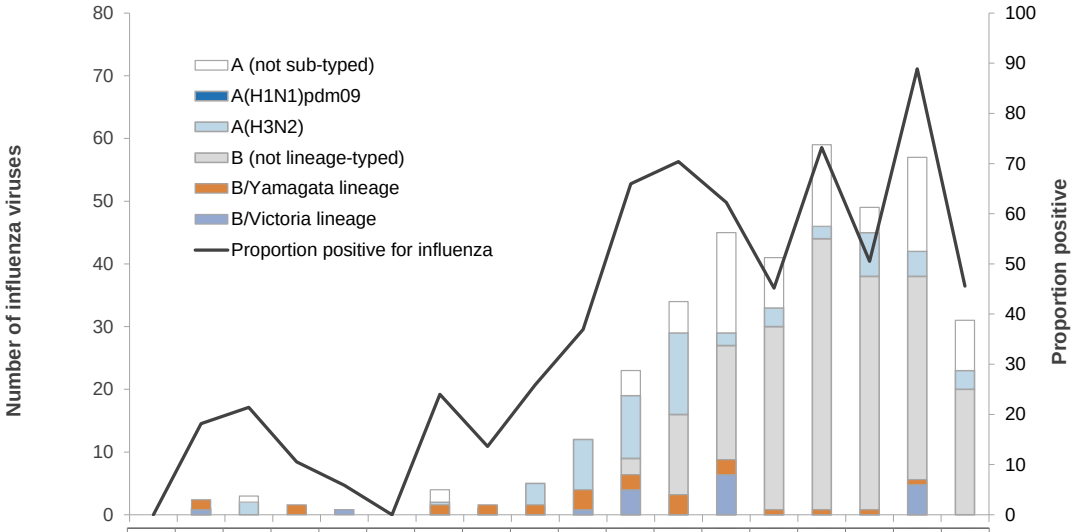
From week 18 (the week ending 3 May 2015) through week 35 (the week ending 30 August 2015), the highest cumulative ILI consultation rates were recorded among children aged 1–4 years (1768.7 per 100,000 age group population) and those aged 5–19 years (1301.0 per 100,000) (Figure 6). The lowest rates were in the ≥65 years (364.3 per 100,000).

Figure 6. Sentinel Average Cumulative Consultation Rates for ILI by Age Group, 2015



A total of 823 swabs were sent to virology laboratories from sentinel GPs during week 18 (ending 3 May 2015) through week 35 (ending 30 August 2015). From these swabs, 415 influenza viruses were identified. This gave an overall detection rate of 50.4%. Based on the sentinel surveillance data, influenza B viruses have been the predominant type for the most of the winter season in 2015 (Figure 7): 226 B (not lineage-typed), 28 B/Yamagata lineage including 18 B/Massachusetts/02/2012-like and two B/Massachusetts/02/2012-like, and 22 B/Victoria lineage including 14 B/Brisbane/60/2008-like. Influenza A co-circulated throughout this winter season: 76 A (not sub-typed) and 63 A(H3N2) including five A/Switzerland/9715293/2013 (H3N2)-like viruses.

Figure 7. Number of influenza viruses reported by type and week from sentinel surveillance for weeks 18–35 in 2015



	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
A (not sub-typed)	0	0	1	0		0	2	0	0	0	4	5	16	8	13	4	15	8
A(H1N1)pdm09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A(H3N2)	0	1	2	0	0	0	1	1	4	10	10	13	2	3	2	7	4	3
B (not lineage-typed)	0	0	0	0	0	0	1	0	1	2	9	16	27	30	44	38	38	20
B/Yamagata lineage	0	2	0	2	0	0	2	2	2	4	3	4	3	1	1	1	1	0
B/Victoria lineage	0	1	0	0	1	0	0	0	0	1	5	0	8	0	0	0	6	0

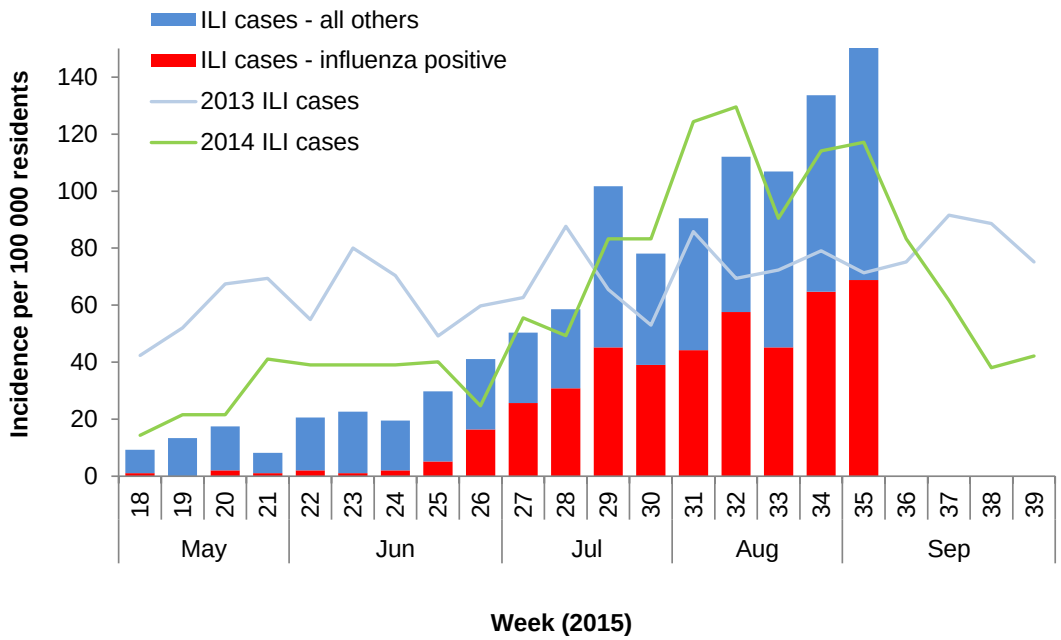
2.1.2 SHIVERS sentinel practice based influenza-like illness (ILI) surveillance

In the 16 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.

SHIVERS community-based ILI surveillance which started on 27 April 2015 is now is in its third year. 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, 27 April – 30 August 2015



From 27 April to 30 August 2015, a total of 1141 ILI cases were identified. 12.6% were children aged less than 5 years and 5.8% were adults 65 years and older. 1036 were enrolled patients residing in ADHB and CMDHB. This gives a cumulative ILI incidence of 1064.8 per 100,000 patient population (Table 3). Among the 981 tested ILI cases who were enrolled ADHB and CMDHB residents, 440 (44.9%) were positive for influenza viruses. This gives an ILI related influenza incidence of 452.3 per 100,000 patient population.

Table 3. Demographic characteristics of ILI and influenza cases, 27 April – 30 August 2015

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	**1141**	**487**	**45.1**	**1036**	**1064.8**	**440**	**452.3**
Age group (years)							
<1	11	0	0.0	8	694.4	0	0.0
1 to 4	133	31	23.3	124	1834.6	31	458.6
5 to 19	381	195	51.2	354	1598.0	179	808.0
20 to 34	169	74	43.8	152	743.7	65	318.1
35 to 49	227	108	47.6	201	926.6	92	424.1
50 to 64	154	56	36.4	134	872.2	51	331.9
65 to 79	55	22	40.0	52	702.0	21	283.5
80 and over	11	1	9.1	11	472.9	1	43.0
Unknown	0	0	-	0	-	0	-
Ethnicity							
Maori	61	30	49.2	49	715.7	24	350.6
Pacific Peoples	108	59	54.6	99	431.0	53	230.7
Asians	192	94	49.0	170	1108.6	83	541.3
European and others	774	301	38.9	718	1377.7	280	537.3
Unknown	6	3	50.0	0	0.0	0	0.0
DHB							
Auckland	929	393	42.3	910	1481.6	381	620.3
Counties Manukau	101	51	50.5	100	278.8	50	139.4
Sex							
Female	664	263	39.6	597	1160.2	234	454.8
Male	477	224	47.0	439	957.8	206	449.4
Unknown	0	0	-	0	-	0	-

Between 27 April to 30 August 2015, a total of 1113 ILI specimens were tested for influenza viruses (Table 4) and 493 (44.3%) were positive with more influenza A (284) than influenza B (209) viruses: influenza A (not sub-typed) (132), influenza A(H3N2) (152) including A/Switzerland/9715293/2013-like (16), influenza B/Yamagata lineage (107) including B/Phuket/3073/2013-like (48), B/Victoria lineage (62) including B/Brisbane/60/2008-like (22), influenza B not lineage-typed (40). There were 34 co-detections of influenza and non-influenza viruses among ILI specimens.

Between 27 April to 30 August 2015, a total of 966 ILI specimens were tested for non-influenza viruses and 257 (26.6%) were positive with the following viruses: respiratory syncytial virus (104), rhinovirus (47), parainfluenza virus type 1 (3), parainfluenza virus type 2 (17), parainfluenza virus type 3 (40), adenovirus (24), human metapneumovirus (25) and enterovirus (18). 238 ILI specimens (92.6%) had single virus detection and 19 (7.4%) had multiple virus detection.

Table 4. Influenza and non-influenza respiratory viruses among ILI cases, 27 April 2015 – 30 August 2015

Influenza viruses	**ILI**
	Cases
No. of specimens tested	1113
No. of positive specimens (%)[1]	493 (44.3)
Influenza A	284
A (not subtyped)	132
A (H1N1)pdm09	0
A(H1N1)pdm09 by PCR	0
A/California/7/2009 (H1N1) - like	0
A(H3N2)	152
A(H3N2) by PCR	136
A/Switzerland/9715293/2013 (H3N2) - like	16
Influenza B	209
B (lineage not determined)	40
B/Yamagata lineage	107
B/Yamagata lineage by PCR	59
B/Phuket/3073/2013 - like	48
B/Victoria lineage	62
B/Victoria lineage by PCR	40
B/Brisbane/60/2008 - like	22
Influenza and non-influenza co-detection (% +ve)	34 (6.9)

Non-influenza respiratory viruses	**ILI**
	Cases
No. of specimens tested	966
No. of positive specimens (%)[1]	257 (26.6)
Respiratory syncytial virus (RSV)	104
Parainfluenza 1 (PIV1)	3
Parainfluenza 2 (PIV2)	17
Parainfluenza 3 (PIV3)	40
Rhinovirus (RV)	47
Adenovirus (AdV)	24
Human metapneumovirus (hMPV)	25
Enterovirus	18
Single virus detection (% of positives)	238 (92.6)
Multiple virus detection (% of positives)	19 (7.4)

[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 27 April to 30 August 2015, the temporal distribution of the number and proportion of the influenza viruses and non-influenza respiratory viruses is shown in Figure 9 and Figure 10. Influenza A(H3N2) was the predominant strain during this period. Since week 34 (17–23 August), more influenza B viruses were detected.

Figure 9. Temporal distribution of the number and proportion of influenza viruses from ILI specimens, 27 April – 30 August 2015, by type and week

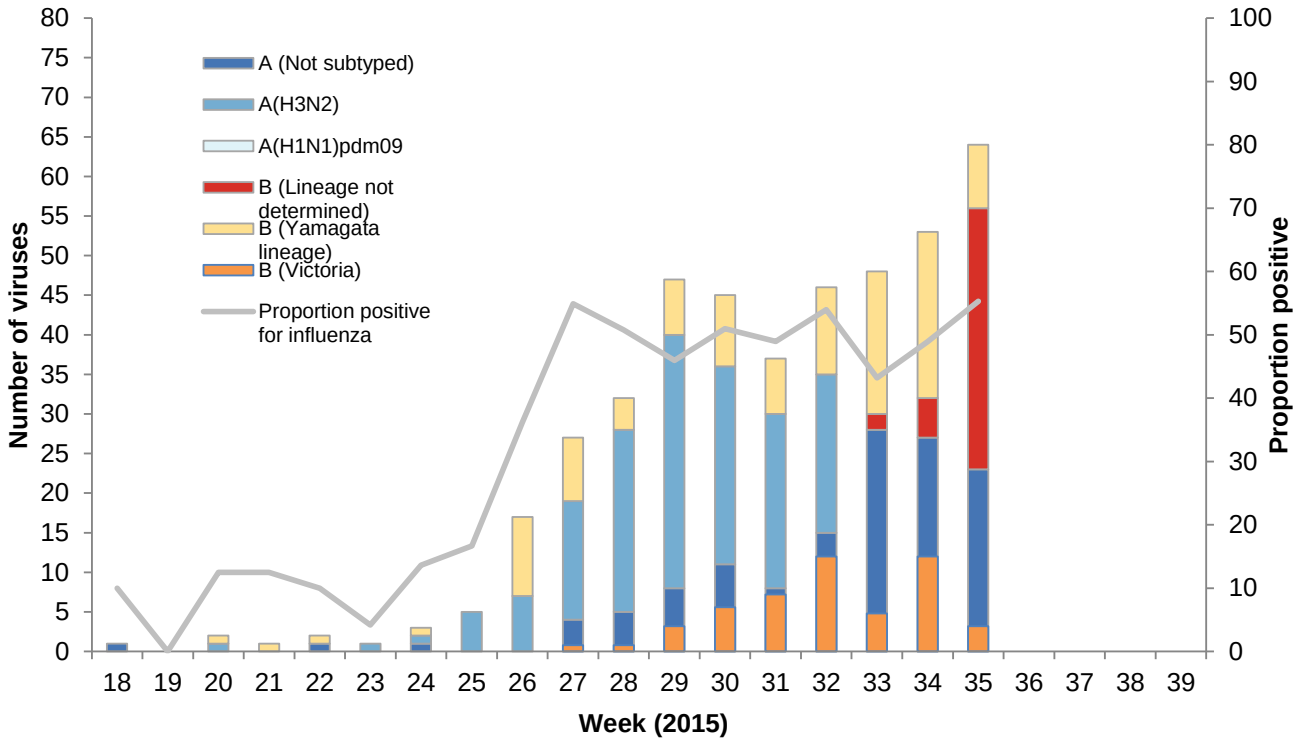
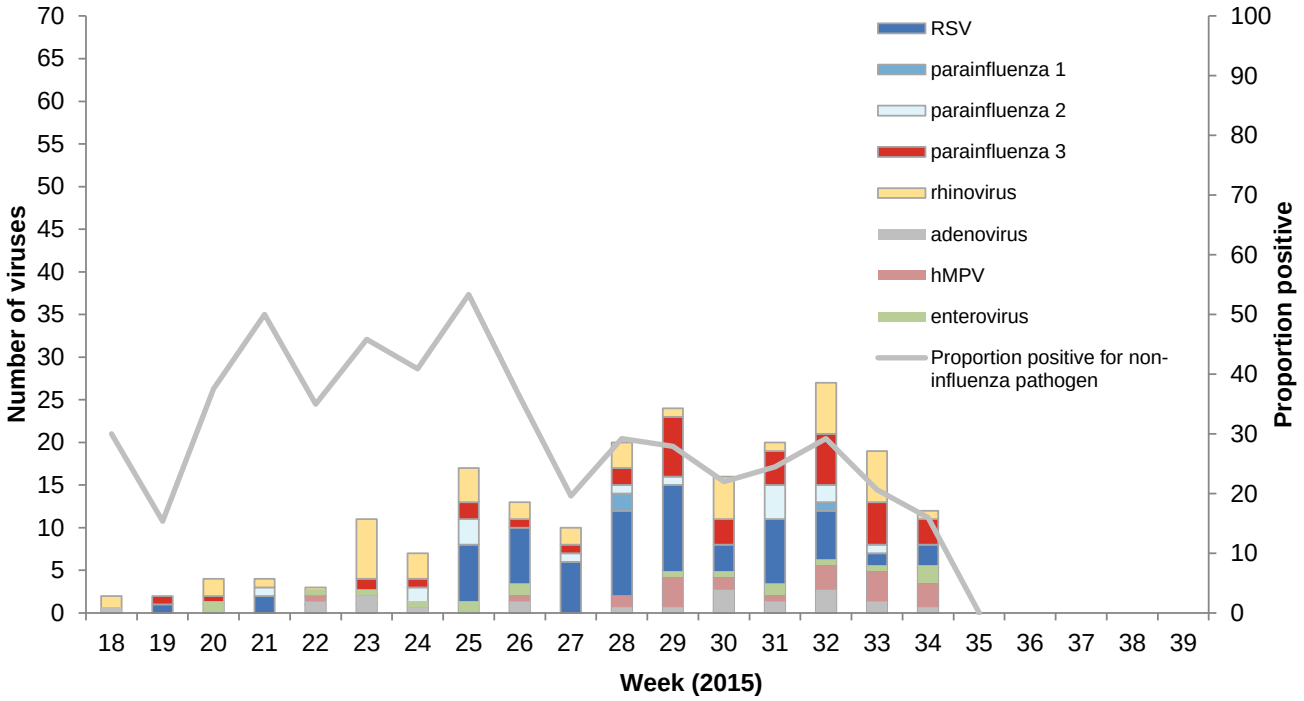


Figure 10. Temporal distribution of the number and proportion of non-influenza viruses from ILI specimens, 27 April – 30 August 2015, by type and week



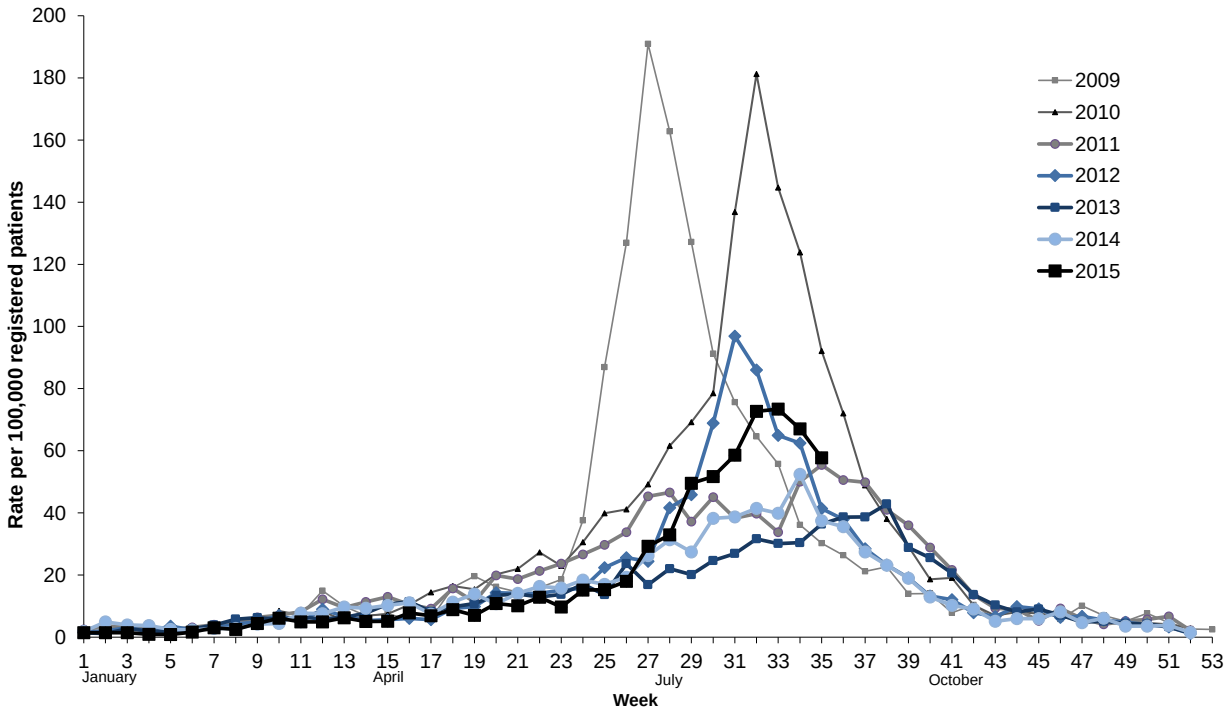
2.1.3 HealthStat GP-based surveillance

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, 2009–2015. 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.

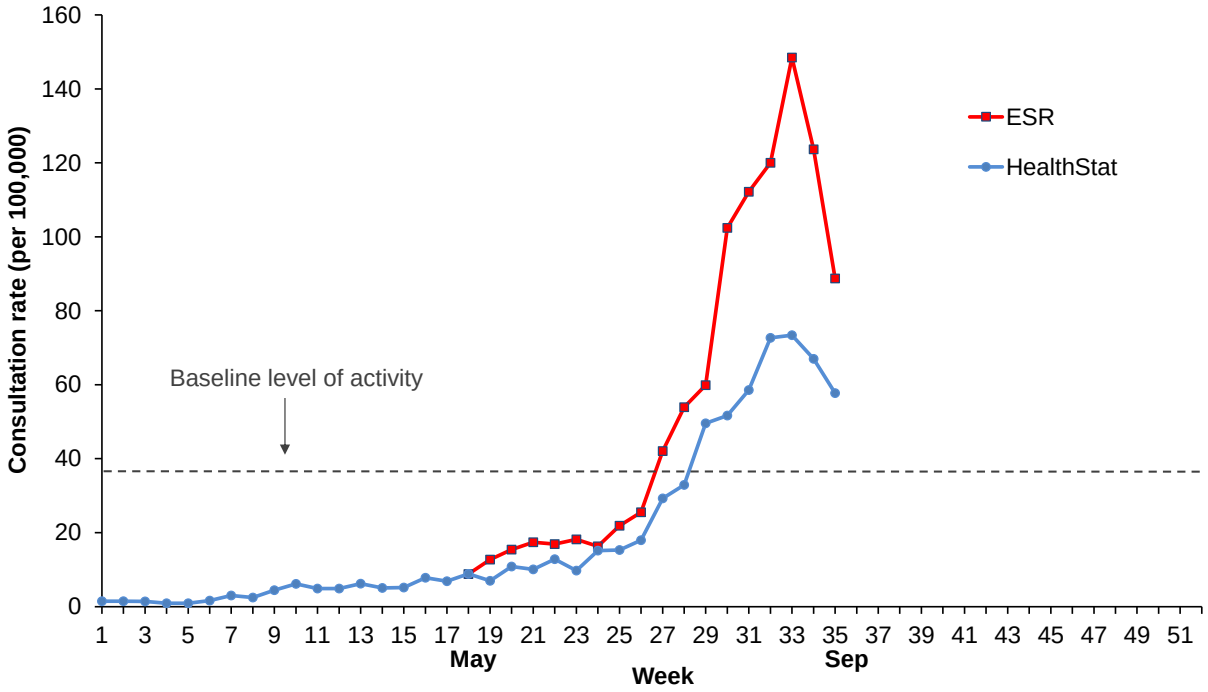
Figure 11. HealthStat ILI consultation rates by week, 2009–2015



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

Between weeks 29 and 35, ESR's sentinel GP surveillance has a higher ILI rate than Healthstat sentinel practices (Figure 12 below).

Figure 12. ESR and HealthStat sentinel GP-based ILI rates comparison, 2015



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).

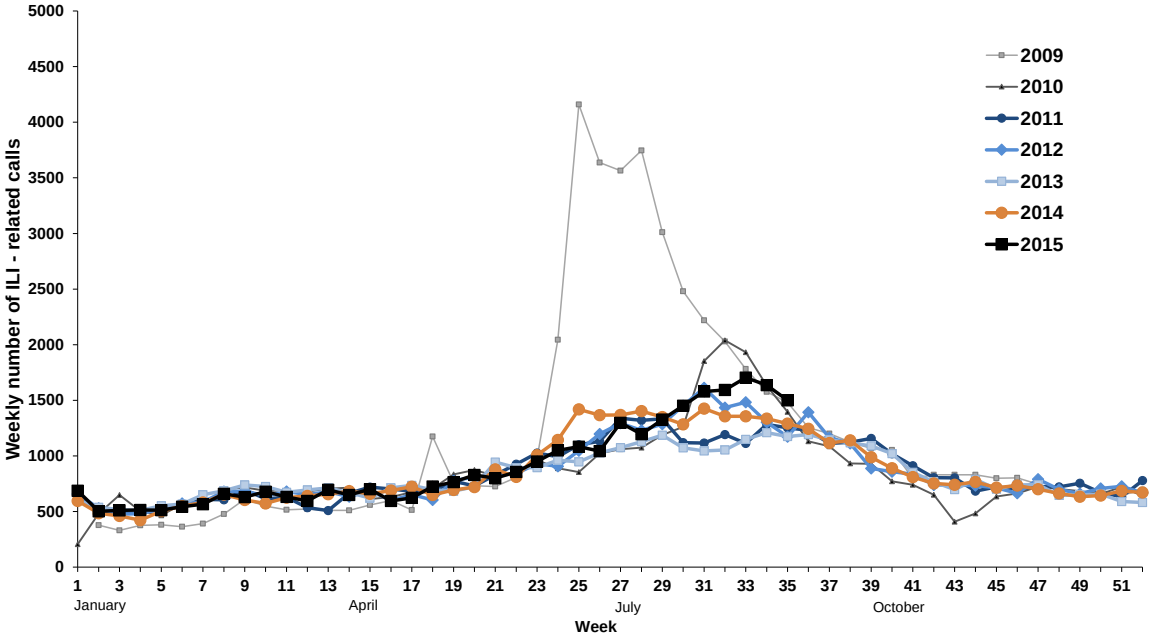
Analysis is frequency based with alarms raised by identifying statistical deviations (aberations) from previous calls. Data are reported for all ages and in five age bands (0–4, 5–14, 15–44, 45–64, 65+ years). The analysis of the call frequency is based on the cumulative summation (CUSUM) algorithm implemented 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 2009–2015. Healthline calls in 2015 were similar to years 2010–2014, though the rate is higher than average for the latter part of the season.

Figure 13. Weekly number of ILI-related calls to Healthline, 2009–2015

Data source: Healthline NZ



2.2 Hospital-based surveillance

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

In this active surveillance system inpatients with suspected respiratory infections admitted overnight to any of the four 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 was 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 2013 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 27 April to 30 August 2015, there were 49 545 acute admissions to ADHB and CMDHB hospitals. A total of 3353 patients with suspected respiratory infections were assessed in these hospitals. Of these, 1511 (45.1%) patients met the SARI case definition. Among these SARI patients, 241 (22.4%) had influenza viruses detected. Table 5 shows the admission diagnoses/syndromes of the suspected respiratory infections and SARI cases and influenza positive cases since start of the SARI surveillance.

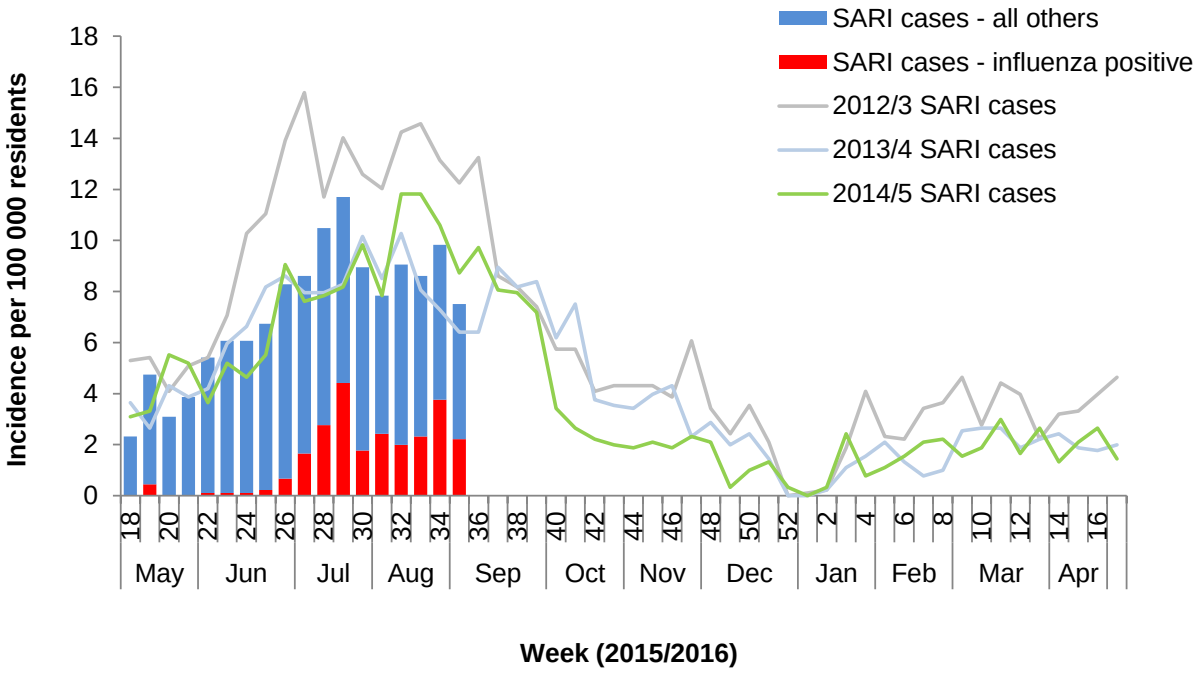
Table 5. Admission diagnoses/syndromes of suspected respiratory infections and SARI cases, 27 April – 30 August 2015

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]	129 (4.0)	54	75	41.9	40	14	35.0	43	7	16.3
Suspected croup	25 (0.8)	12	13	48.0	8	2	25.0	6	0	0.0
Suspected bronchiolitis (in children)	551 (17.0)	276	275	50.1	198	15	7.6	184	5	2.7
Suspected pneumonia	927 (28.6)	528	399	57.0	373	66	17.7	197	30	15.2
Exacerbation of asthma	312 (9.6)	93	219	29.8	57	13	22.8	119	6	5.0
Exacerbation of childhood chronic lung disease[2]	50 (1.5)	13	37	26.0	4	2	50.0	15	2	13.3
Exacerbation of adult chronic lung disease[3]	342 (10.6)	83	259	24.3	54	12	22.2	130	17	13.1
Respiratory failure	27 (0.8)	4	23	14.8	3	0	0.0	15	1	6.7
Febrile illness with respiratory symptoms[4]	482 (14.9)	321	161	66.6	251	92	36.7	97	22	22.7
Other suspected acute respiratory infection	380 (11.7)	125	255	32.9	87	25	28.7	163	24	14.7
Not provided	12 (0.4)	2	10	16.7	1	0	0.0	7	1	14.3
TOTAL	3237 (100.0)	1511	1726	46.7	1076	241	22.4	976	115	11.8

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

Of the 1511 SARI cases identified from 27 April to 30 August 2015, 1170 were residents of ADHB and CMDHB, giving the SARI incidence rate of 129.2 per 100,000 population (Figure 14 and Table 6). Among the 972 tested SARI cases who were ADHB and CMDHB residents, 226 (23.3%) had positive influenza virus results. This gives a SARI related influenza incidence of 25.0 per 100,000 population (Figure 14 and Table 6).

Figure 14. Weekly resident SARI and influenza positive cases during 27 April – 30 August 2015 and previous seasons (2012/3, 2013/4 and 2014/5) SARI cases



During 27 April to 30 August 2015, the 1511 SARI cases give a SARI proportion of 30.5 per 1000 acute hospitalisations (Table 6). Of these SARI cases, 40.8% were children aged less than 5 years and 15.8% were adults 65 years and older. 99 SARI cases have been admitted to ICU and 18 deaths were reported during this period.

Table 6. Demographic characteristics of SARI cases and related influenza cases, 27 April – 30 August 2015

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	**49545**	**3353**	**1511 (45.1)**	**30.5**	**241 (22.4)**	**1170**	**129.2**	**226**	**25.0**
Age group (years)									
<1	1987		319	160.5	25 (9.7)	297	2199.0	23	170.3
1 to 4	3863		298	77.1	27 (11.7)	260	491.7	25	47.3
5 to 19	5728		75	13.1	14 (26.4)	62	32.2	12	6.2
20 to 34	9009		83	9.2	35 (44.9)	80	38.4	34	16.3
35 to 49	7429		103	13.9	31 (32.6)	99	51.8	30	15.7
50 to 64	8380		144	17.2	52 (39.7)	139	92.3	49	32.6
65 to 79	7928		144	18.2	33 (26.6)	140	191.6	33	45.2
80 and over	5221		94	18.0	20 (24.7)	93	396.9	20	85.4
Unknown	0		251		4 (15.4)	0	-	0	-
Ethnicity									
Maori	6550		291	44.4	46 (19.7)	257	258.4	42	42.2
Pacific Peoples	10702		491	45.9	98 (23.8)	476	345.0	95	68.8
Asians	7614		111	14.6	20 (20.2)	104	49.4	19	9.0
European and others	24317		368	15.1	73 (23.9)	333	82.9	70	17.4
Unknown	348		250	0	4 (15.4)	0	0.0	0	0.0
Hospitals									
ADHB	27896	1717	633	22.7	134 (29.4)	423	96.9	126	28.9
CMDHB	21649	1636	878	40.6	107 (17.3)	747	159.2	100	21.3
Sex									
Female	25919		611	23.6	128 (24.9)	572	123.0	123	26.4
Male	23625		648	27.4	109 (20.4)	597	135.5	103	23.4
Unknown	1		252		4 (14.8)	1	-	0	-

From 27 April to 30 August 2015, 1156 SARI specimens have been tested by PCR and 264 (22.8%) were positive for influenza viruses with more influenza A (188) than influenza B (76) viruses (Table 7): A(H3N2) (100) including A/Switzerland/9715293/2013 (2), influenza A (not sub-typed) (88), influenza B (76) including B/Yamagata lineage (8), B/Victoria lineage (4), influenza B not lineage determined (64). There were 4 co-detections of influenza and non-influenza viruses among SARI specimens.

From 27 April to 30 August 2015, 500 SARI specimens were tested for non-influenza respiratory viruses (Table 7). Of these, 274 (54.8%) were positive with the following viruses: respiratory syncytial virus (134), rhinovirus (61), parainfluenza virus type 1 (1), parainfluenza virus type 2 (5), parainfluenza virus type 3 (24), adenovirus (63), human metapneumovirus (20) and enterovirus (7). 235 SARI specimens (85.8%) had single virus detection and 39 (14.2%) had multiple virus detection.

Table 7. Influenza and non-influenza respiratory viruses among SARI cases, 27 April 2015 – 30 August 2015

Influenza viruses	**SARI**		
	Cases	**ICU**	**Deaths**
No. of specimens tested	1156	93	9
No. of positive specimens (%)[1]	264 (22.8)	13 (14.0)	2 (22.2)
Influenza A	188	8	2
A (not subtyped)	88	6	1
A (H1N1)pdm09	0	0	0
A(H1N1)pdm09 by PCR	0	0	0
A/California/7/2009 (H1N1) - like	0	0	0
A(H3N2)	100	2	1
A(H3N2) by PCR	98	2	1
A/Switzerland/9715293/2013 (H3N2) - like	2	0	0
Influenza B	76	5	0
B (lineage not determined)	64	4	0
B/Yamagata lineage	8	1	0
B/Yamagata lineage by PCR	0	0	0
B/Phuket/3073/2013 - like	8	1	0
B/Victoria lineage	4	0	0
B/Victoria lineage by PCR	2	0	0
B/Brisbane/60/2008 - like	2	0	0
Influenza and non-influenza co-detection (% +ve)	4 (1.5)	0 (0.0)	0 (0.0)

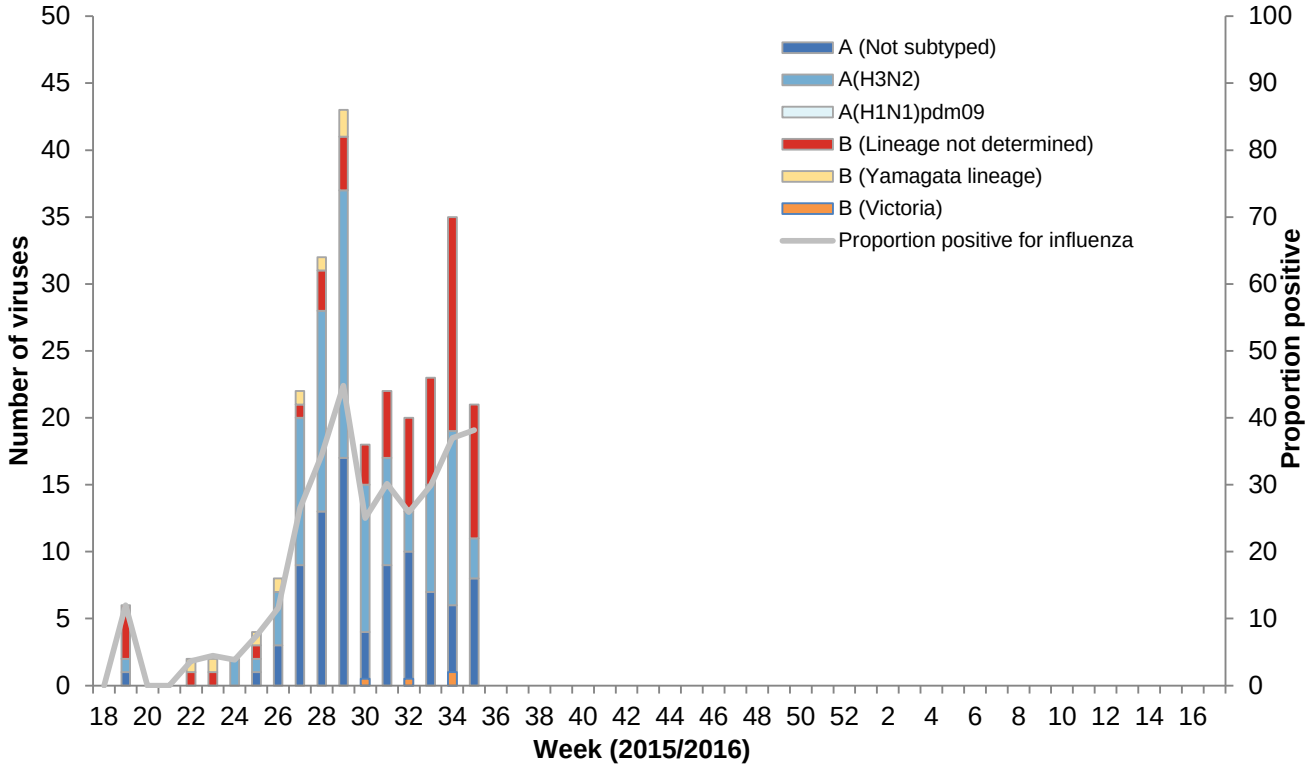
Non-influenza respiratory viruses	**SARI**		
	Cases	**ICU**	**Deaths**
No. of specimens tested	500	14	2
No. of positive specimens (%)[1]	274 (54.8)	7 (50.0)	0 (0.0)
Respiratory syncytial virus (RSV)	134	2	0
Parainfluenza 1 (PIV1)	1	0	0
Parainfluenza 2 (PIV2)	5	1	0
Parainfluenza 3 (PIV3)	24	0	0
Rhinovirus (RV)	61	0	0
Adenovirus (AdV)	63	4	0
Human metapneumovirus (hMPV)	20	1	0
Enterovirus	7	1	0
Single virus detection (% of positives)	235 (85.8)	5 (71.4)	0
Multiple virus detection (% of positives)	39 (14.2)	2 (28.6)	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 Figure 15 and Figure 16. Influenza A(H3N2) was the predominant strain during 27 April to 30 August 2015.

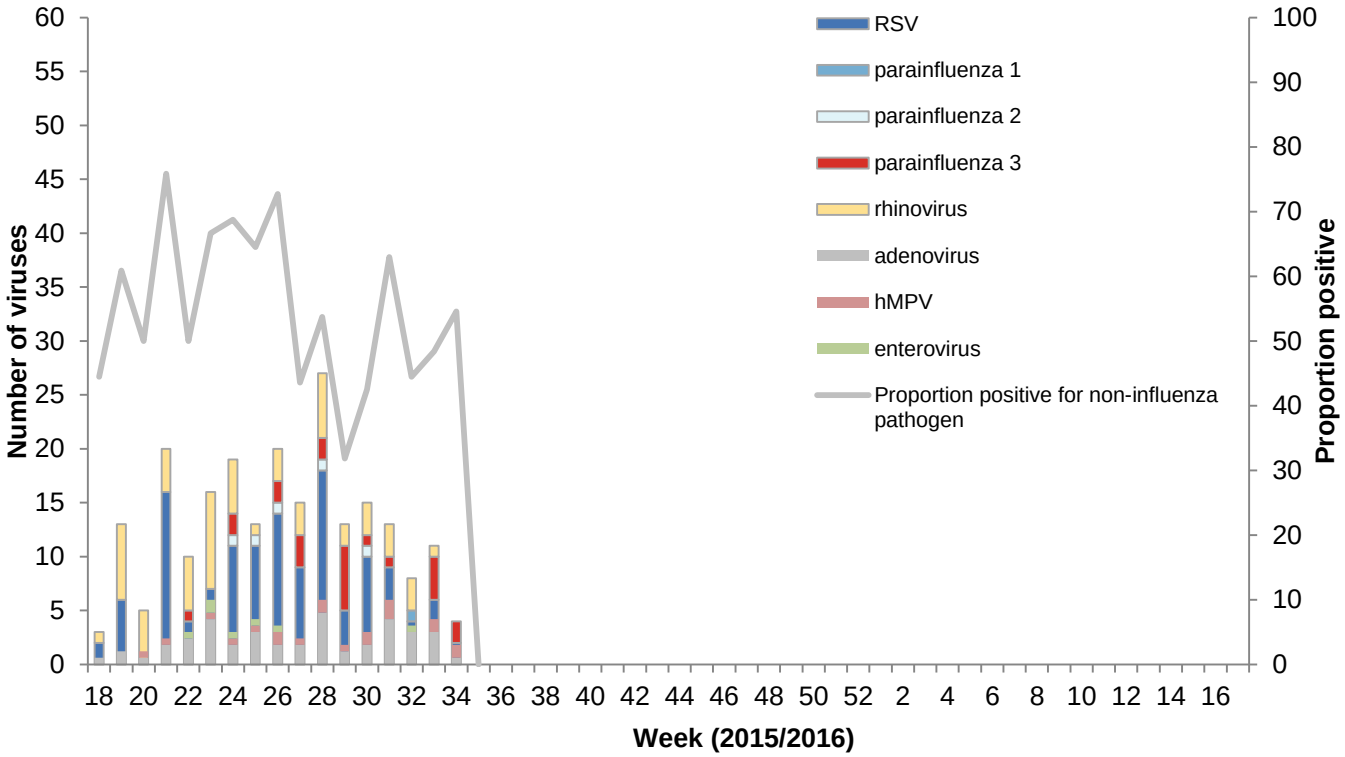
Figure 15. Temporal distribution of the number and proportion of influenza viruses from SARI specimens, 27 April – 30 August 2015, by type and week

*



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 30 August 2015, by type and week



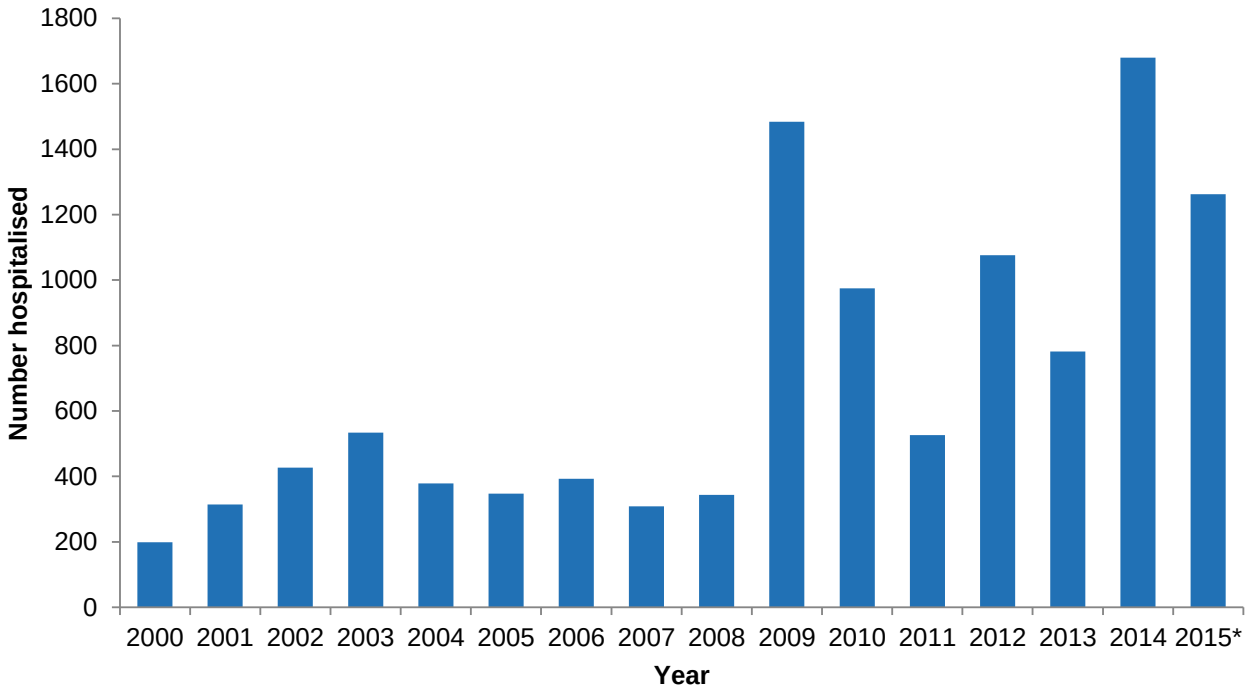
*Figures for recent weeks will be underestimates due to time lag in receiving laboratory test results

2.2.2 Ministry of Health data on publicly funded hospital discharges

Hospitalisation data for influenza (ICD-10AM-VI code I (J09-J11) for 2015 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 2000–2015. 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 2 September 2015, there were a total of 1263 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 2015.

Figure 17. Influenza hospital discharges, 2000–2015*



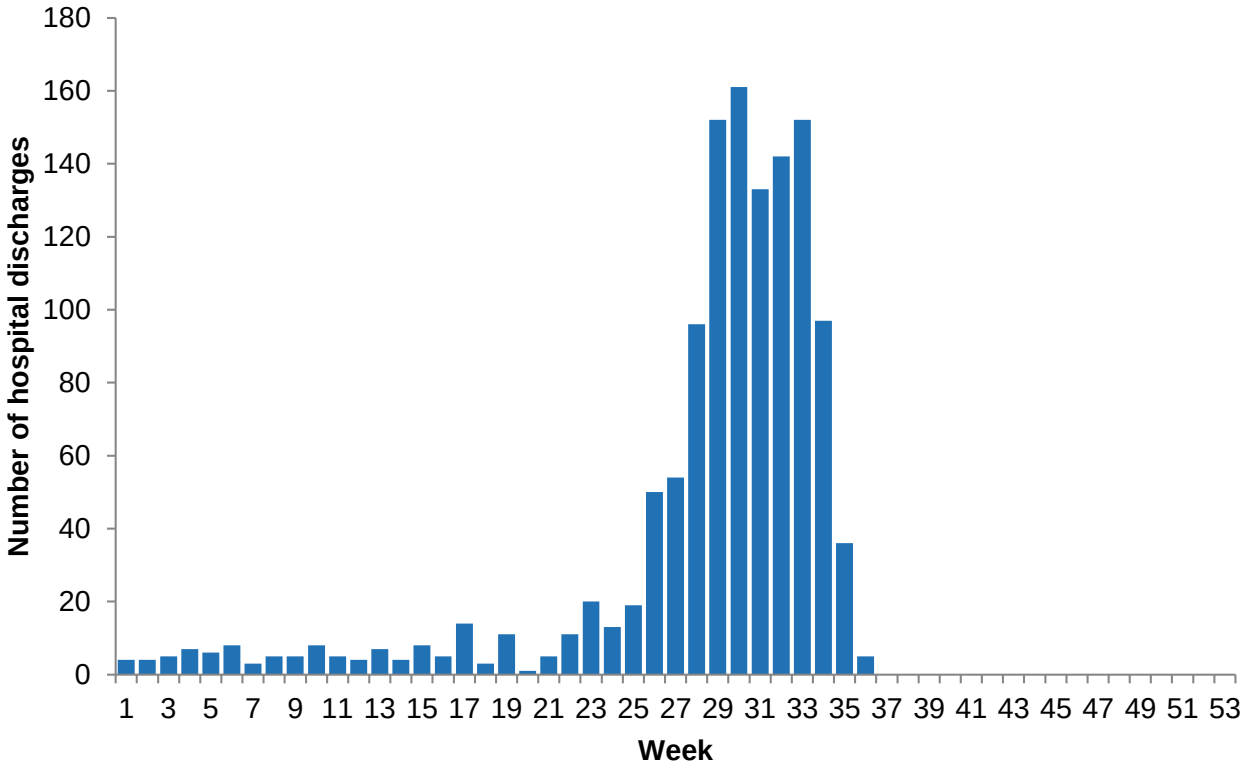
*Data from 1 Jan to 2 September only.

Source: Ministry of Health, NMDS (Hospital Events)

Figure 18 shows influenza hospitalisations by week discharged. The high number of hospitalisations (554) occurred in July (week 27–31).

Figure 18. Influenza hospital discharges by week, 2015*

*Data from 1 Jan to 2 September only.

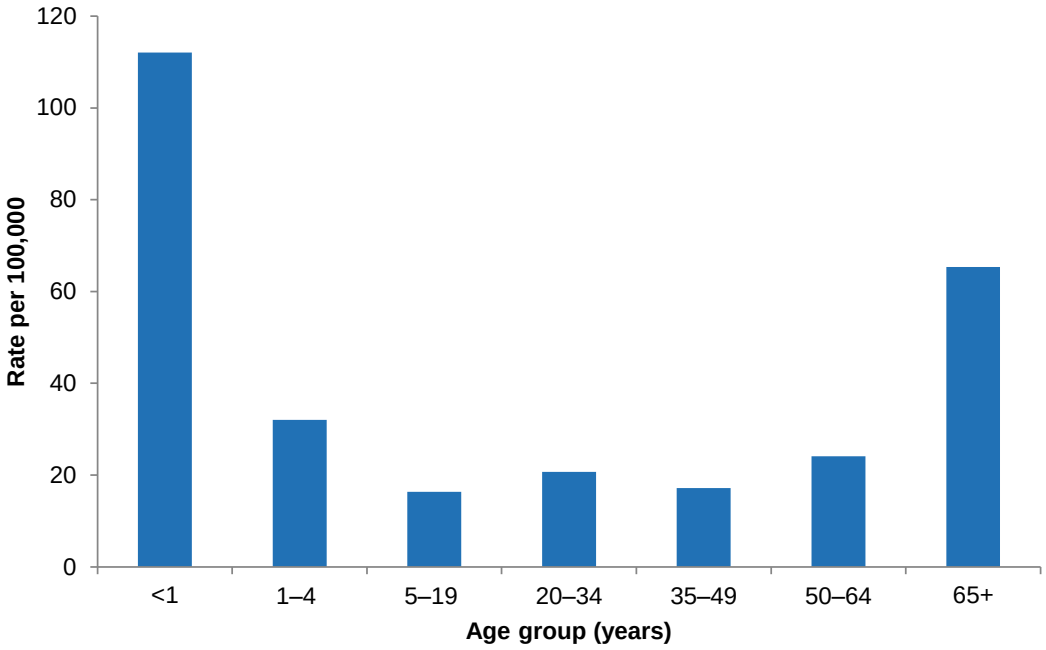


Source: Ministry of Health, NMDS (Hospital Events)

From 1 January to 2 September 2015, the highest influenza hospitalization rates were recorded among young infants aged less than one year old (Figure 19), with rates of 112.1 per 100,000 age group population. This was followed by ≥65 years (65.3 per 100,000) and 1–4 years old (32.0 per 100,000).

Figure 19. Influenza hospital discharge rates by age group, 2015*

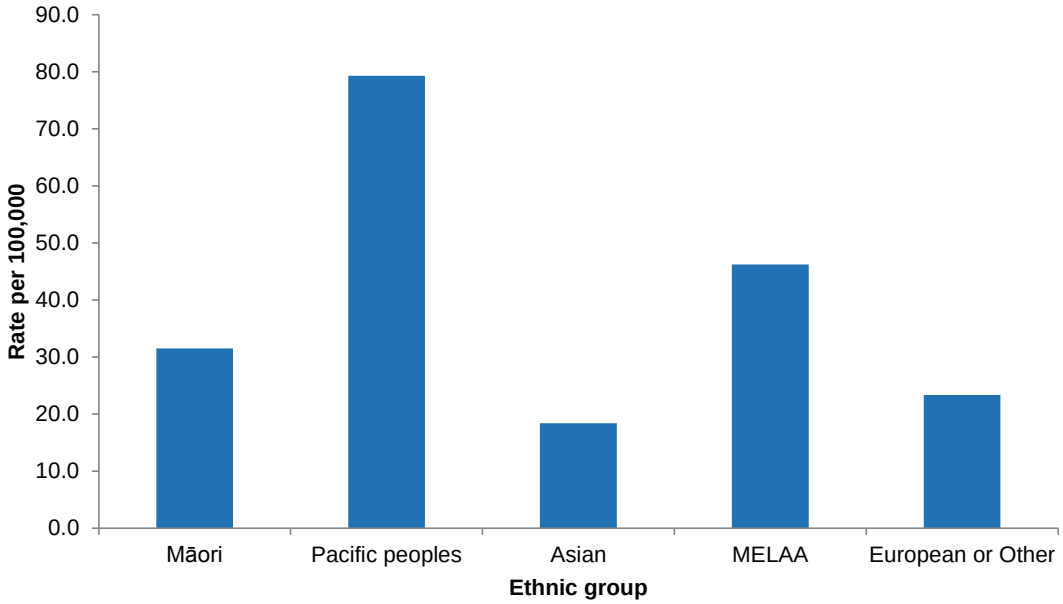
*Data from 1 Jan to 2 September only.



Source: Ministry of Health, NMDS (Hospital Events)

The ethnic distribution of influenza hospitalisations in 2015 is shown in Figure 20. Pacific peoples had the highest hospitalisation rate (79.3 per 100,000, 220 hospitalisations) followed by MELAA (46.2 per 100,000, 23 hospitalisations). Asian ethnic group had the lowest rate of hospitalisations (18.4 per per 100,000, 94 hospitalisations).

Figure 20. Hospital discharge rates by prioritised ethnic group, 2015*



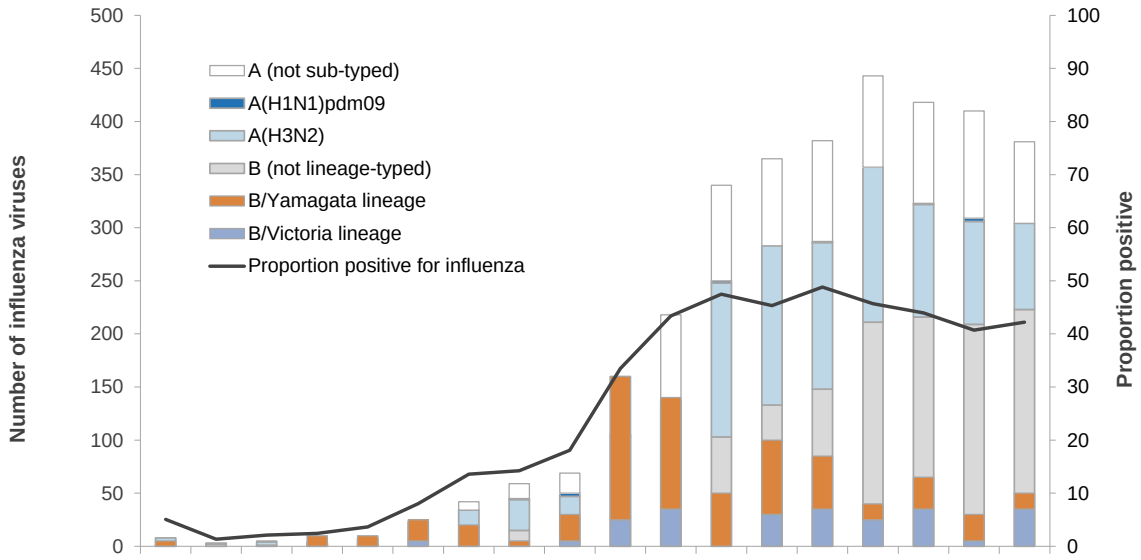
*Data from 1 Jan to 2 September only. Source: Ministry of Health, NMDS (Hospital Events)

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 six hospital virology laboratories in Auckland, Waikato, Bay of Plenty, Wellington, Christchurch and Dunedin. ESR collates year-round national laboratory data on influenza from mainly hospital in-patient and outpatients during routine viral diagnosis.

A total of 12,405 non-sentinel swabs were received during 1 January to 30 August 2015. Among them, 3649 influenza viruses were identified. This gave an overall detection rate of 29.4%. Among all sub-typed and lineage-typed influenza viruses, the predominant strain was influenza A(H3N2) (1236) including 66 A/Switzerland/9715293/2013 (H3N2)-like and 15 A/Texas/50/2012 (H3N2)-like, followed by B/Yamagata lineage (131) including 96 B/Phuket/3073/2013-like and four B/Massachusetts/02/2012-like, B/Victoria lineage (48) including 35 B/Brisbane/60/2008-like and B (not lineage typed) (1383), and A(H1N1)pdm09 (29) including six A/California/7/2009 (H1N1)-like viruses. There were 822 A (not sub-typed) and 1365 B (not lineage-typed) (Figure 21). Note: one laboratory did not provide the number of swabs tested and two laboratories joined in July 2015.

Figure 21. Number of influenza viruses reported by type and week from non-sentinel surveillance for weeks 18–35 in 2015



	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
A (not sub-typed)	0	0	1	1	1		8	14	19	55	81	90	82	95	86	95	101	77
A(H1N1)pdm09	0	0	0	1	0	0	0	1	3	1	0	2	0	1	0	1	3	0
A(H3N2)	7	1	3	1	6	19	31	29	31	76	87	145	150	138	146	106	97	81
B (not lineage-typed)	1	2	1	1	1	4	3	15	16	28	50	103	133	148	211	216	209	223
B/Yamagata lineage	1	0	0	2	2	4	4	1	5	27	21	10	14	10	3	6	5	3
B/Victoria lineage	0	0	0	0	0	1	0	0	1	5	7	0	6	7	5	7	1	7

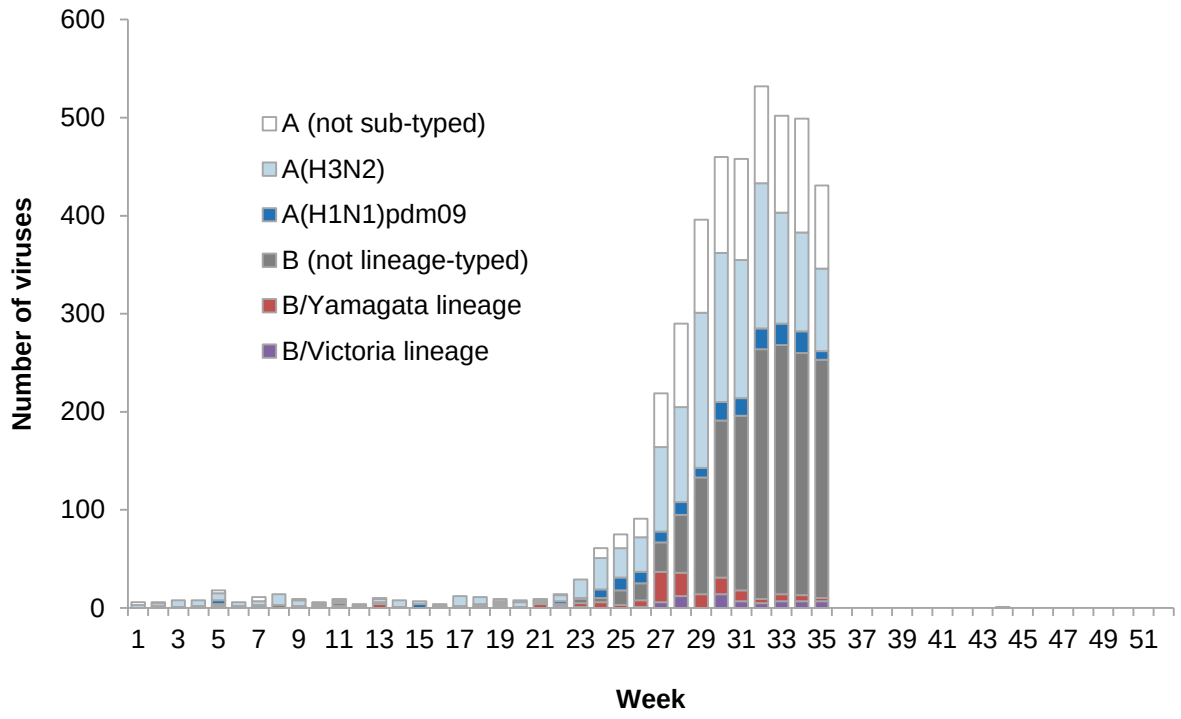
*data shown is from week 18 only.

3. NEW ZEALAND STRAIN CHARACTERISATIONS

3.1 Circulating strains in 2015

A total of 4064 influenza viruses were detected from sentinel and non-sentinel surveillance in 2015, from 1 January to 30 August (Figure 22). More influenza A (2226) were detected than influenza B (1838). Among all sub-typed and lineage-typed viruses, A(H3N2) (1299) was the predominant strain, including 71 A/Switzerland/9715293/2013 (H3N2) and 15 A/Texas/50/2012 (H3N2)-like. It was followed by B/Yamagata lineage (159) including 114 B/Phuket/3073/2013-like and six B/Massachusetts/02/2012-like, B/Victoria lineage (70) including 49 B/Brisbane/60/2008-like viruses. Only a small number of A(H1N1)pdm09 (29) were detected, including six A/California/7/2009 (H1N1)-like. There were 1609 B (not lineage-typed) and 898 A (not sub-typed).

Figure 22. Total influenza viruses by type and week reported for weeks 1–35, 2015



The influenza virus detections by type and subtype for weeks 1 to 35, 2015 is shown in Table 8.

Table 8. Influenza viruses by type and subtype for weeks 1–35, 2015

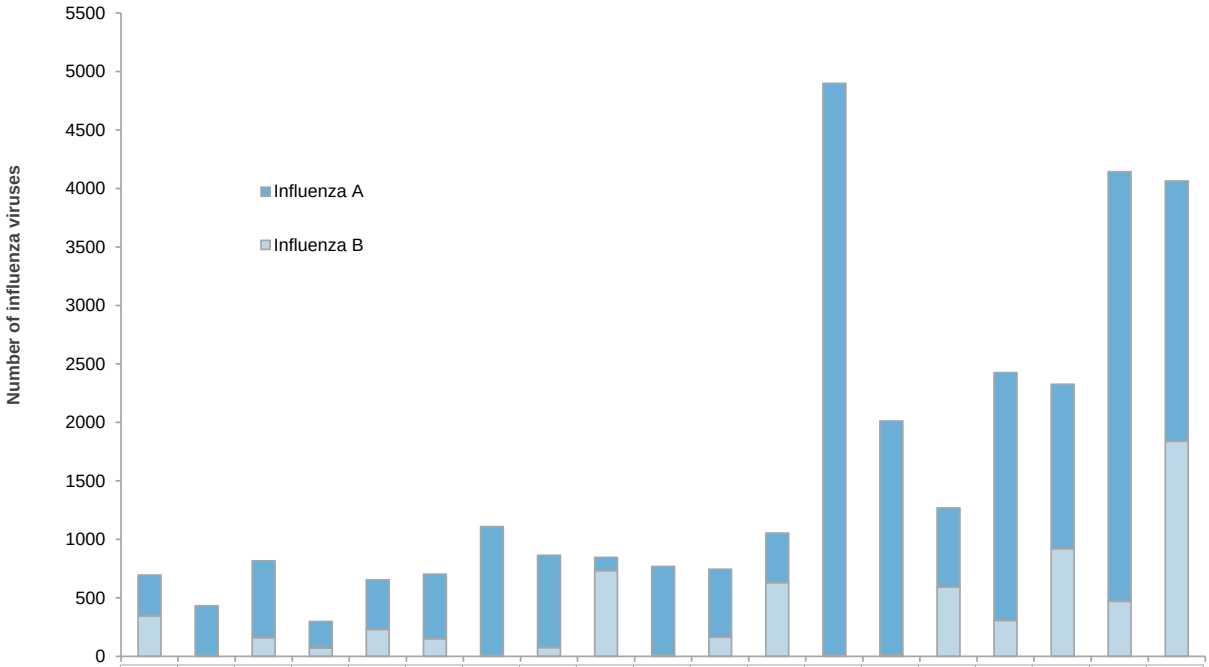
Viruses	All viruses (%)	Sub-typed & lineage-typed (%)
Influenza A (not sub-typed)	**898 (22.1)**	
Influenza A(H1N1)pdm09	**29 (0.7)**	**29 (1.9)**
A(H1N1)pdm09 by PCR	23 (0.6)	23 (1.5)
A/California/7/2009 (H1N1)-like	6 (0.1)	6 (0.4)
Influenza A(H3N2)	**1299 (32.0)**	**1299 (83.4)**
A(H3N2) by PCR	1213 (29.8)	1213 (77.9)
A/Switzerland/9715293/2013 (H3N2)-like	71 (1.7)	71 (4.6)
A/Texas/50/2012 (H3N2)-like	15 (0.4)	15 (1.0)
Influenza B (not lineage-typed)	**1609 (39.6)**	
B/Yamagata lineage	**159 (3.9)**	**159 (10.2)**
B/Yamagata lineage by PCR	39 (1.0)	39 (2.5)
B/Phuket/3073/2013	114 (2.8)	114 (7.3)
B/Massachusetts/02/2012-like	6 (0.1)	6 (0.4)
B/Victoria lineage	**70 (1.7)**	**70 (4.5)**
B/Brisbane/60/2008-like	49 (1.2)	49 (3.1)
B/Victoria lineage by PCR	21 (0.5)	21 (1.3)
Total	**4064 (100.0)**	**1557 (100.0)**

Influenza A viruses (2226/4064 or 54.8% of all viruses) co-circulated with influenza B viruses (1838/4064 or 45.2% of all viruses). The influenza A(H3N2) strain represented 32.0% (1299/4064) of all viruses and 83.4% (1299/1557) of all sub-typed and lineage-typed viruses. Influenza B/Yamagata lineage virus represented 3.9% (159/4064) of all viruses and 10.2% (159/1557) of all sub-typed and lineage-typed viruses. Influenza B/Victoria lineage virus represented 1.7% (70/4064) of all viruses and 4.5% (70/1557) of all sub-typed and lineage-typed viruses. The influenza A(H1N1)pdm09 virus represented 0.7% (29/4064) of all viruses and 1.9% (29/1557) of all sub-typed and lineage-typed viruses.

3.2 Predominant strains during 1990–2015

Figure 23 shows the number and percentage of typed influenza viruses from 1990 to 2015. Influenza A is the most frequent predominant influenza type. Of 19 influenza seasons during 1997–2015, influenza A predominated in 16 seasons whereas influenza B only predominated in two seasons (2005 and 2008). There was one season (1997) with equal proportion of influenza A and B circulation.

Figure 23. Influenza viruses by type, 1997–2015



	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Influenza A (%)	50	100	80	76	65	78	100	91	13	99	78	40	100	100	53	87	60	89	55
Influenza B (%)	50	0	20	24	35	22	0	9	87	1	22	60	0	0	47	13	40	11	45

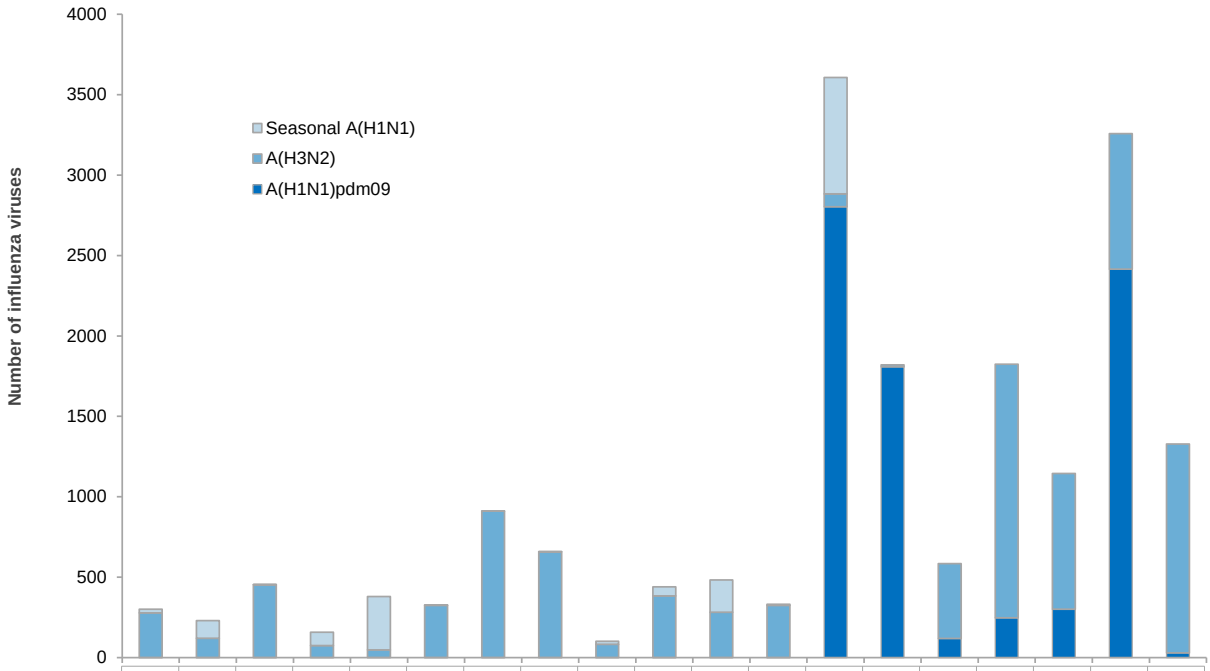
Figure 24 shows the number and percentage of all sub-typed influenza A viruses from 1997 to 2015 (excluding influenza A not sub-typed). Overall, the patterns of the predominant influenza A subtypes among all sub-typed A viruses during 1997–2015 are described below:

- Influenza A(H3N2) strain predominated for 14 seasons (1997, 1998, 1999, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2011, 2012, 2013 and 2015). 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 A(H1N1)pdm09 strain has become the predominant strain for three seasons in 2009, 2010 and 2014.

- Seasonal influenza A(H1N1) strain predominated in two seasons (2000 and 2001) with associated relatively low hospitalisations (228 in 2000 and 379 in 2001). It has not been detected in New Zealand since 2010.

Figure 24. Influenza A viruses by subtypes 1997–2015



	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Seasonal A(H1N1)	8	48	0	52	87	1	0	0	18	13	42	2	20	0	0	0	0	0	0
A(H3N2)	92	52	100	48	13	99	100	100	82	87	58	98	2	1	80	86	74	26	98
A(H1N1)pdm09	0	0	0	0	0	0	0	0	0	0	0	0	78	99	20	14	26	74	2

* The data of influenza A not sub-typed was excluded from this graph.

Figure 25 shows the number and percentage of all B viruses from 1990 to 2015 (excluding influenza B not lineage-typed). Overall, the patterns of the predominant influenza B among all lineage-typed B viruses during 1990–2015 are described below:

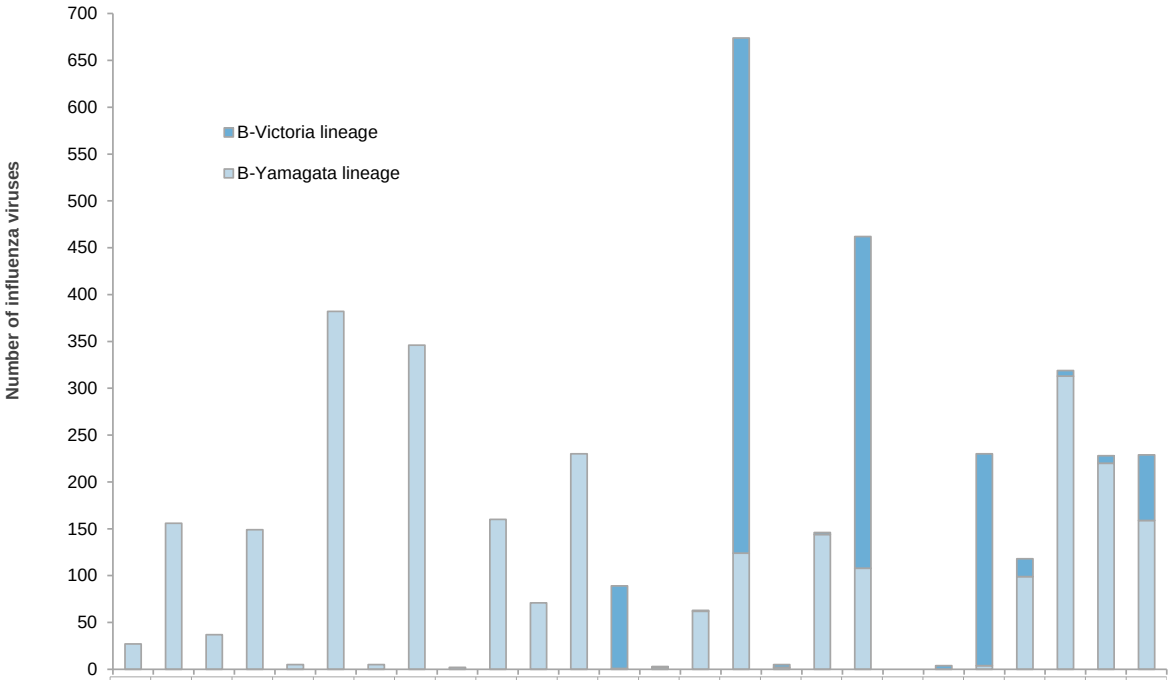
- Influenza B/Yamagata lineage was the only lineage circulating in New Zealand during

  1990–2001. Relatively high number of influenza B viruses were recorded in 1995 and 1997.

- Since the introduction of the B/Victoria lineage viruses into New Zealand in 2002, this lineage has co-circulated with B/Yamagata lineage viruses. During 2002–2011, B/Victoria lineage viruses predominated over the B/Yamagata lineage viruses in every three years in New Zealand (2002, 2005, 2008 and 2011). In 2005, the disease burden was high in children aged 5–19 years with associated deaths in 3 children.

- B/Yamagata lineage viruses was the predominant lineage over B/Victoria lineage virus during 2012–2015.

Figure 25. Influenza B viruses by lineages, 1990–2015



	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	15
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	4	31
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	96	69

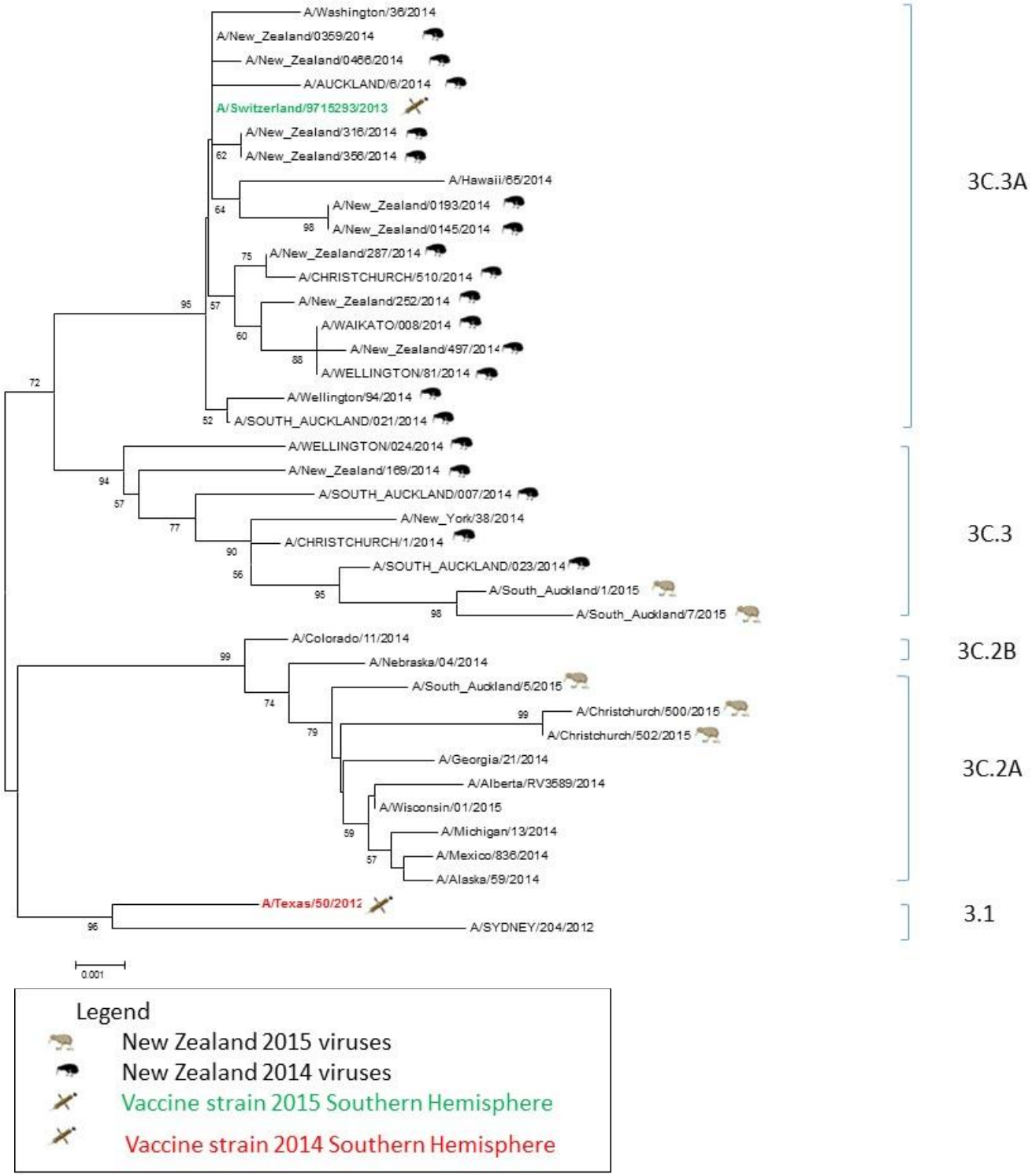
3.3 Influenza A(H1N1)pdm09

Representative of influenza A(H1N1)pdm09 isolates were antigenically typed at the WHO National Influenza Centre at ESR using rabbit antisera supplied by the WHO Collaborating Centre (WHOCC) in Melbourne. Some of these isolates were also sent to WHOCC-Melbourne and CDC-Atlanta. During 1 January to 8 September 2015, a total of 8 influenza A(H1N1)pdm09 isolates were antigenically typed using antisera against A/California/7/2009 (H1N1)pdm09-like virus. Of them, 5 (62.5%, 5/8) were antigenically related to the reference strain A/California/7/2009 (H1N1)pdm09 and 3 (37.5%, 3/8) had reduced reactivity against the same reference strain.

3.4 Seasonal influenza A(H3N2)

Representative seasonal influenza A(H3N2) 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. During 1 January to 8 September 2015, a total of 80 influenza A(H3N2) isolates were antigenically typed using antisera against A/Switzerland/9715293/2013 (H3N2)-like virus. Of them, 12 (15%, 12/80) were antigenically related to the reference strain A/Switzerland/9715293/2013 (H3N2) and 68 (85%, 68/80) had reduced reactivity against the same reference strain. Genetically, most of influenza A(H3N2) viruses fell into group 3C.2a (CDC designations).

Figure 26. Phylogenetic relationships among influenza A(H3N2) haemagglutinin genes



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. During 1 January to 8 September 2015, a total of 162 B/Yamagata lineages isolates were antigenically typed using antisera against B/Phuket/3073/2013-like virus. Of them, 107 (66%, 107/162) were antigenically related to the reference strain B/Phuket/3073/2013-like and 55 (34%, 55/162) had reduced reactivity against the same reference strain. In addition, a total of 102 B/Victoria lineage isolates were antigenically typed using antisera against B/Brisbane/60/2008-like virus. Of them, 89 (87%, 89/102) were antigenically related to the reference strain B/Brisbane/60/2008-like and 13 (13%, 13/102) had reduced reactivity against the same reference strain.

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 2015, fluorometric neuraminidase inhibition assay was used to test a total of 290 influenza viruses against oseltamivir and 291 against zanamivir. All viruses were sensitive to both oseltamivir and zanamivir (Table 9 and Table 10).

Table 9. Antiviral susceptibility to oseltamivir for influenza viruses, 2006–2015

Influenza type/sub-type	2006	2007	2008	2009	2010	2011**	2012**	2013	2014	2015
Influenza B										
Number of isolates tested	1	132	306	-	1	244	117	316	167	207
Mean IC50 (nM)	42.3	37.5	26.5	-	13.1	30.6	13.4	14.3	27.4	-
Median IC50 (nM)	42.3	34.1	23.5	-	13.1	29.0	11.3	13.2	20.9	17.8
Standard Deviation (nM)	-	22.5	16.9	-	-	14.9	8.5	8.1	18.5	13.8
Minimum IC50* (nM)	42.3	0.9	0.2	-	13.1	4.1	3.5	0.1	2.9	0.5
Maximum IC50 (nM)	42.3	97.4	87.8	-	13.1	182.7	64.9	51.1	111.7	88.8
Influenza A(H3N2)										
Number of isolates tested	189	45	120	-	1	224	355	321	164	77
Mean IC50 (nM)	0.7	0.4	0.3	-	0.2	0.4	0.4	0.3	0.5	-
Median IC50 (nM)	0.7	0.3	0.3		0.2	0.4	0.4	0.3	0.4	0.5
Standard Deviation (nM)	0.3	0.3	0.2	-	-	0.2	0.2	0.2	0.4	0.5
Minimum IC50 (nM)	0.1	0.1	0.0	-	0.2	0.1	0.0	0.1	0.2	0.0
Maximum IC50 (nM)	1.4	1.1	1.1	-	0.2	1.5	1.4	0.9	3.3	2.5
Seasonal influenza A(H1N1)										
Number of isolates tested	18	136	4	25	-	-	-	-	-	-
Mean IC50 (nM)	1.3	0.8	767.7	1385.3	-	-	-	-	-	-
Median IC50 (nM)	0.9	0.7	657.2	707.5	-	-	-	-	-	-
Standard Deviation (nM)	0.9	0.6	287.3	1995.5	-	-	-	-	-	-
Minimum IC50 (nM)	0.2	0.1	572.5	305.2	-	-	-	-	-	-
Maximum IC50 (nM)	3.0	2.7	1184.0	7912.0	-	-	-	-	-	-
Influenza A(H1N1)pdm09										
Number of isolates tested	-	-	-	483	334	29	93.0	75	667	6
Mean IC50 (nM)	-	-	-	0.4	0.7	0.5	0.3	0.4	0.9	-
Median IC50 (nM)	-	-	-	0.3	0.6	0.5	0.3	0.3	0.4	0.4
Standard Deviation (nM)	-	-	-	0.2	0.4	0.3	0.2	0.2	6.1	0.3
Minimum IC50 (nM)	-	-	-	0.1	0.0	0.2	0.1	0.1	0.1	0.3
Maximum IC50 (nM)	-	-	-	1.4	2.0	1.3	316.2	1.4	146.2	0.5

*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 excluded in mean and standard deviation calculations: two influenza B viruses in 2011 and two pandemic influenza A(H1N1)pdm09 viruses in 2012.

Table 10. Antiviral susceptibility to zanamivir for influenza viruses, 2013–2015

Influenza type/sub-type	2013	2014	2015
Influenza B			
Number of isolates tested	314	168	207
Mean IC50 (nM)	1.3	1.4	-
Median IC50 (nM)	1.2	1.1	1.2
Standard Deviation (nM)	0.8	0.9	0.5
Minimum IC50* (nM)	0.0	0.4	0.3
Maximum IC50 (nM)	5.6	5.3	4.4
Influenza A(H3N2)			
Number of isolates tested	324	157	78
Mean IC50 (nM)	0.3	0.4	
Median IC50 (nM)	0.3	0.4	0.6
Standard Deviation (nM)	0.2	0.3	0.4
Minimum IC50 (nM)	0.1	0.2	0.3
Maximum IC50 (nM)	1.4	2.5	2.1
Influenza A(H1N1)pdm09			
Number of isolates tested	72	671	6
Mean IC50 (nM)	0.2	0.3	
Median IC50 (nM)	0.2	0.3	0.3
Standard Deviation (nM)	0.2	0.2	0.1
Minimum IC50 (nM)	0.0	0.1	0.2
Maximum IC50 (nM)	1.1	1.6	0.4

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.

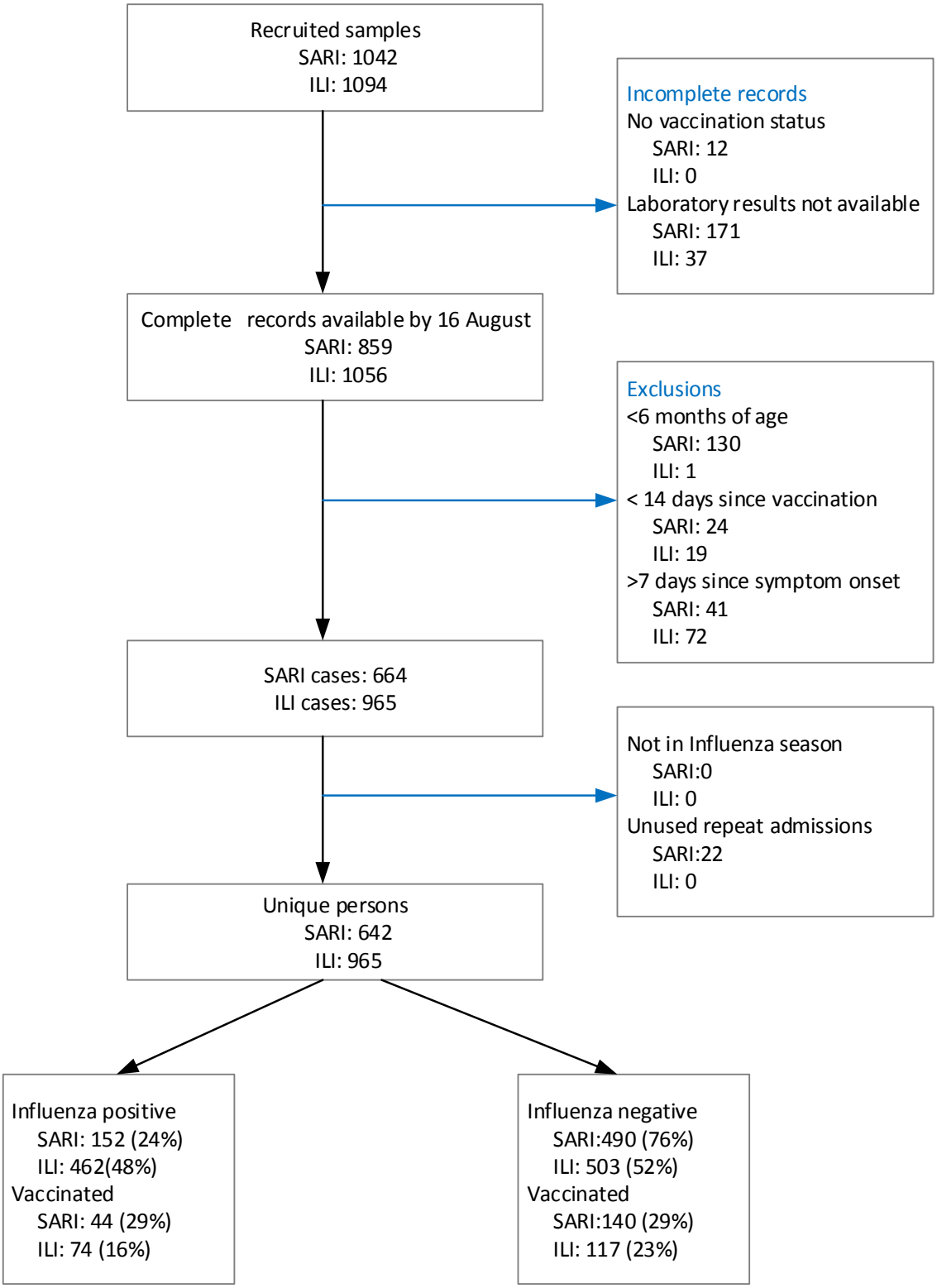
Using the case test-negative design to estimate adjusted VE as previously described [2], we estimated the effectiveness of seasonal trivalent inactivated influenza vaccine in preventing laboratory-confirmed influenza in patients hospitalised with severe acute respiratory infections (SARI) and in patients presenting to general practice with an influenza-like illness (ILI) during the influenza season. The influenza season was defined as starting when there were two

consecutive weeks with two or more cases; The data contributed to I-GIVE project for the WHO vaccine strain selection meeting in September for southern hemisphere countries.

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.

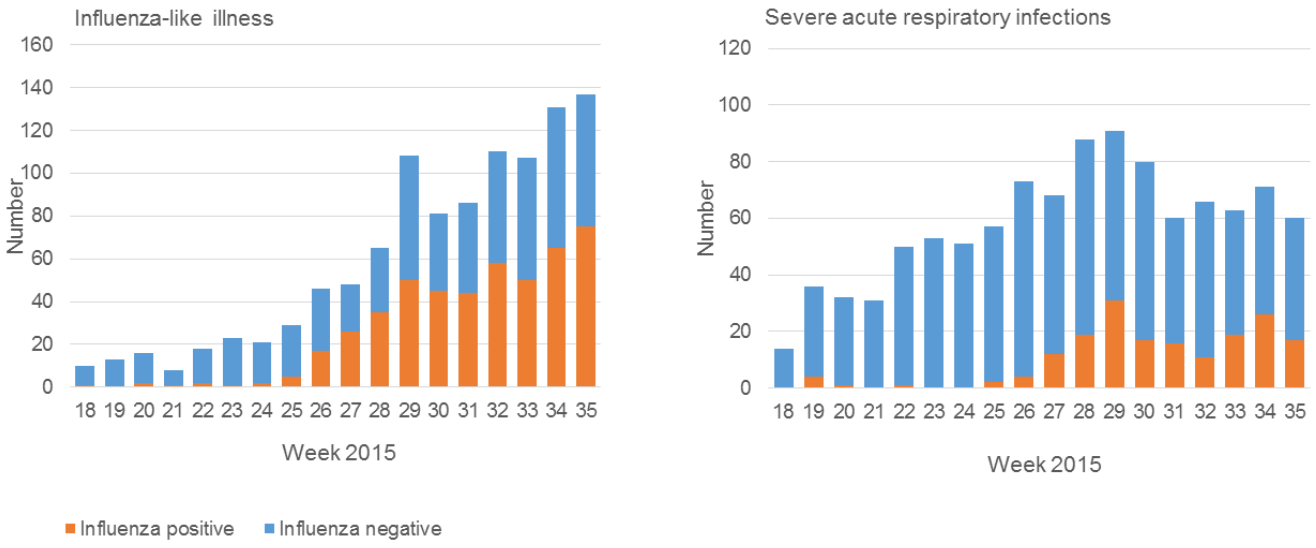
A total of 642 SARI and 965 ILI patients were included in the analysis, of whom 152 (24%) and 462 (48%) were influenza virus positive, respectively. Of the 152 SARI admissions who tested influenza virus positive, 44 (29%) were vaccinated, compared with 140 of the 490 (29%) who tested negative. Of the 462 ILI patients who tested influenza virus positive, 74 (16%) were vaccinated compared with 117/503 (23%) who tested negative (Figure 27).

Figure 27. Flowchart of all selected, recruited and tested patients with influenza-like illness and severe acute respiratory infection for influenza vaccine effectiveness analysis, New Zealand, 2015 influenza season



Temporal distribution of ILI and SARI cases and associated influenza cases is shown in Figure 28.

Figure 28. Number of Influenza-like illness and severe acute respiratory infection cases and associated influenza positive by calendar week, New Zealand, 2015 influenza season



Vaccine effectiveness

For ILI cases there were 462 influenza positive of which 74 had at least one dose of the 2015 seasonal vaccination. For SARI there were 152 influenza positive of which 44 had received vaccination (Figure 2). The proportion vaccinated did not change throughout the season.

For ILI cases the crude VE against all circulating influenza strains was 37% (95% CI: 13 to 54). When adjustment was undertaken for age, week of presentation, sex and ethnicity the overall VE was 42% (95% CI: 16 to 60), for the dominant circulating subtype A(H3N2) 24% (95% CI: -24 to 53), and for B of any type 60% (95% CI: 31 to 77), B/Yamagata 75% (95%CI: 43 to 89). For ages 6m to 17 years adjusted VE was 56% (95% CI: 1 to 80), for 18 to 64 years 32% (95% CI: -6 to 56), and 65 years and older 66% (95% CI: -115 to 95). From 184 samples of Type A(H3N2) there were 52 genetic group 3C.2a identified. Of these 8 were vaccinated, giving a VE of 57% (95% CI: -15 to 84) (Table 12).

Influenza positive cases for SARI were significantly more likely to be adults (18 to 45 years and 46-64 years) and smokers than SARI cases that were influenza-negative. There was no significant difference when comparing by underlying disease status, income, self-reported health status, sex or ethnicity.

For SARI cases the crude VE against all circulating influenza strains for one or more vaccine doses was -2% (95% CI: -52 to 32). After adjustment for age, and week of admission the overall VE was 40% (95% CI: 2 to 63). Adjusted VE for subtype A(H3N2) was 50% (95% CI: -3 to 76), and for B of any type 42% (95% CI: -30 to 74). For ages 18 to 64 years 37% (95% CI: -

17 to 66), and for 65 years and older 42% (95% CI: -44 to 76). There was insufficient data to report VE estimates for age group 6m to 17 years.

Table 11. Crude and adjusted models showing estimated influenza vaccine effectiveness by age group, by influenza virus type, subtype and clade

Influenza type & age group	Influenza positive			Influenza negative			Unadjusted		Adjusted*	
	Number vaccinated	Total	%	Number vaccinated	Total	%	VE %	95%CI	VE %	95%CI
SARI										
Overall	44	152	29	140	490	29	-2	-52 to 32	40	2 to 63
6 mo-17 yrs	3	42	7	25	270	9	NA	NA	NA	NA
18-64 yrs	23	81	28	48	126	38	36	-18 to 65	37	-17 to 66
≥65 yrs	18	29	62	67	94	71	34	-58 to 72	42	-44 to 76
A(H3N2)	16	56	29	140	490	29	0	-84 to 46	50	-3 to 76
Influenza B	11	47	23	140	490	29	24	-54 to 62	42	-30 to 74
ILI										
Overall	74	462	16	117	503	23	37	13 to 54	42	16 to 60
6 mo-17 yrs	10	205	5	20	214	9	50	-9 to 77	56	1 to 80
18-64 yrs	48	235	20	68	258	26	28	-9 to 53	32	-6 to 56
≥65 yrs	16	22	73	29	31	94	82	-2 to 97	66	-115 to 95
A(H3N2)	38	184	21	117	503	23	14	-30 to 43	24	-24 to 53
Clade 3C.2a	8	52	15	117	503	23	40	-31 to 73	57	-15 to 84
Any influenza B	21	196	11	117	503	23	60	35 to 76	60	31 to 77
B/Victoria	5	55	9	117	503	23	67	15 to 87	61	-7 to 86
B/Yamagata	8	99	8	117	503	23	75	43 to 89	75	43 to 89

CI: Confidence interval; ILI: Influenza-like illness; NA: not applicable, as there were insufficient data to report VE estimates; SARI: severe acute respiratory infections.

*ILI adjusted for six age groups (<6 years, 6-17, 18-45, 46-64, 65-79, and ≥80 years), week in season, sex and ethnicity (Māori, Pacific peoples and Other)

*SARI adjusted for six age groups (<6 years, 6-17, 18-45, 46-64, 65-79, and ≥80 years) and week in season.

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 2015 influenza season, 233 A(H1N1)pdm09 viruses were received at the Melbourne WHOCC from 10 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 8 A(H1N1)pdm09 isolates tested at ESR by hemagglutination inhibition assay during the period of 1 January to 8 September 2015, 5 (62.5%, 5/8) were antigenically closely related to the reference strain A/California/7/2009 (H1N1)pdm09. A total of 3 influenza A(H1N1)pdm09 viruses from New Zealand were forwarded to WHOCC in 2015.

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 3.2 and 3.3 in Appendix 3). Many of these low reactors had changes in the HA gene in the 153-158 amino acid region which has been shown to reduce reactivity in HI assays but as these changes were mostly not in the original clinical samples. These mutations appear to be artefacts caused by isolation in MDCK cells or in eggs. In addition, a total of 32 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 2015 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 southern hemisphere 2015 seasons (H1 component: A/California/7/2009 (H1N1)pdm09-like,). 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 90(41), and Tables 3.6 & 3.7 in Appendix 3). (*Abridged from the Weekly Epidemiological Record, 2015 90(41):545-560 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 2015 influenza season, 775 A(H3N2) 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(H3N2) strains. The antiserum used for antigenic typing was the rabbit/sheep antisera raised against A/Switzerland/9715293/2013-like strain. Of the 80 A(H3N2) isolates tested at ESR by hemagglutination inhibition assay during the period of 1 January to 8 September 2014, 12 (15%, 12/80) had reduced reactivity against the reference strain A/Switzerland/9715293/2013. A total of 51 A(H3N2) viruses from New Zealand were forwarded to WHOCC.

A(H3N2) viruses have become increasingly difficult to test with 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 (RBC), thus interfering with the inhibition of viruses between HA and RBC 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. However, about 35% of these viruses have a drop in HA titre to a point whereby these viruses cannot be assayed by HI anymore. Alternatively virus neutralization assays such as the microneutralization or plaque reduction assays can be used where the NA binding is not relevant. In addition, a significant proportion of viruses (approximately 25%) have low or no HA titre with guinea pig RBC even though there is ample virus present (as detected by other methods).

Among all A(H3N2) isolates analysed with 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/Switzerland/9715293/2013 viruses, with only 1.7% of viruses tested at the Melbourne CC showing ≥8 fold reduction in HI titre compared to homologous titres. This figure rose substantially (to 18.7%) when a ≥4 fold reduction was used. In contrast when ferret sera raised to egg grown A/Switzerland/9715293/2013 viruses were used marked reductions in titres compared to the homologous titres were observed with 49.4% of recent viruses showing ≥8 fold reduction and 81.2% fold reduction in HI titre (Figure 4.1, Tables 4.4 and 4.5 in Appendix 4). In addition, a total of 70 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 sub-clade 3C2a 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, serum panels were tested against viruses representative of circulating viruses belonging to genetic groups 3C2a, 3C3a and 3C3b. Geometric mean HI titres of antibodies against the majority of cell-propagated 3C2a viruses were reduced significantly compared to HI titres to the vaccine virus, when measured against egg-propagated A/Switzerland/9715293/2013 virus but not when compared to cell-propagated A/Switzerland/9715293/2013 virus. Geometric mean micro-neutralization titres of antibodies against 2 of 3 cell propagated 3C2a viruses tested were reduced significantly compared to micro-neutralization titres against cell-propagated A/Switzerland/9715293/2013 virus. (WER 90(41), and Tables 4.12 and 4.13 in Appendix 4). (*Abridged from the Weekly Epidemiological Record, 2015 90(41):545-560 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 circulating viruses were in genetic sub-clade 3C2a (the most representative strain being A/Hong Kong/4801/2014) whereas the 2015 vaccine strain A/Switzerland/9715293/2013 was in sub-clade 3C3a. However, although most of recent circulating A(H3N2) viruses reacted equally well with ferret sera raised to CELL-propagated A/Switzerland strain and to CELL-propagated A/Hong Kong/4801/2014 strain, these viruses reacted much better with the ferret sera raised to EGG-propagated A/Hong Kong/4801/2014 strain than EGG-propagated A/Switzerland strain. Therefore, an A/Hong Kong/4801/2014-like virus was selected to replace the A/Switzerland/9715293/2013-like virus for updating the southern hemisphere A(H3N2) vaccine component. 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/Hong Kong/4801/2014 - 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/Phuket/3073/2013) 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/Phuket/3073/2013 is the current reference strain) continued to be isolated worldwide in 2015. B/Yamagata lineage viruses predominated in all countries reporting influenza B infections, however, more B/Victoria lineage viruses circulated in late winter season in New Zealand and Australia.

903 influenza B isolates were received in 2015 by the Melbourne WHOCC from 12 countries. The majority of isolates (615) were typed as B/Yamagata lineage with the remaining being

B/Victoria-lineage viruses (288). When B/Victoria-lineage viruses were reacted with ferret sera raised against egg grown B/Brisbane/60/2008-like virus, most 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 one virus showed 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/Phuket/3073/2013-like viruses (Figure 5.2 in Appendix 5). The majority of recent viruses were well covered by ferret sera raised to either cell (99.6%) or egg propagated B/Phuket/3073/2013-like viruses (Figure 5.2 in Appendix 5). HI assays in Tables 5.3, 5.5 (Appendix 5) were performed at the Melbourne WHOCC. In addition, sequence analysis of the HA1 gene of recent isolates showed that recent isolates fell into one of the two major lineages of B viruses (B/Victoria/2/87 or B/Yamagata/16/88) consistent with their antigenic typing. The B/Victoria lineage viruses mostly grouped in the B/Brisbane/60/2008 group (all group 1A) with signature amino acid changes at S172P, N75K, N165K. B/Yamagata lineage fell into the B/Phuket/3073/2013-like virus group (clade 3) and B/Massachusetts/2/2012 virus group (clade 2), with the majority of viruses falling in clade 3 (Figures 5.4, and 5.6 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 5.5 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 5.7 in Appendix 5). Furthermore, Serum panels were tested against representative recent B/Yamagata/16/88 lineage and B/Victoria/2/87 lineage viruses. Geometric mean HI titres of antibodies against representative recent B/Yamagata/16/88 lineage viruses were not reduced significantly compared to HI titres to the vaccine virus. However, geometric mean HI titres against B/Victoria/2/87 lineage viruses were reduced in panels from trials of trivalent vaccine not containing a B/Victoria/2/87 lineage antigen. (WER 90(41), Tables 5.9, 5.10, 5.11, 5.12 in Appendix 5). (*Abridged from the Weekly Epidemiological Record, 2015 90(41):545-560 and a report to AIVC by Dr Ian Barr, WHO Collaborating Centre for Influenza, Melbourne)*

In summary, influenza B viruses of the B/Victoria/2/87 and B/Yamagata/16/88 lineages co-circulated, with viruses of the B/Yamagata/16/88 lineage predominating in many countries. In Australia and New Zealand, a rapid increase in the proportion of B/Victoria/2/87 lineage viruses was observed from June and they became the predominant lineage by August 2015. Based on all of the epidemiological, antigenic, genetic and serological data, the WHO Consultative Group recommended the B component of the vaccines containing a B/Victoria/2/87 lineage virus (B/Brisbane/60/2008-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 2016 is:

- A(H1N1) an A/California/7/2009 (H1N1)pdm09 - like virus
- A(H3N2) an A/Hong Kong/4801/2014 (H3N2) - like virus
- B a B/Brisbane/60/2008 - like virus (belonging to B/Victoria lineage)

Quadrivalent vaccines contain the above three viruses and plus one more vaccine component:

- 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 2016 season should contain the following:

A (H1N1):	an A/California/7/2009 (H1N1)**-**like strain,	15 µg HA per dose
A (H3N2):	an A/Hong Kong/4801/2014 (H3N2)-like strain,	15 µg HA per dose
B:	a B/Brisbane/60/2008**-**like strain,	15 µg HA per dose

It is recommended that quadrivalent vaccines containing two influenza B viruses include the above three viruses and a B/Phuket/3073/2013-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 2015

AIVC Members 2015

The details of the Australian Influenza Vaccine Committee Members can be accessed from the website below:

https://www.tga.gov.au/committee/australian-influenza-vaccine-committee-aivc

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

TABLE 2.1 Influenza Viruses Analysed at the Melbourne WHO CC 1 February – 16 September 2015

Country	A(H1N1) pdm09	A(H3N2)	A Un-subtyped	B Yam	B Vic	Mixed	Total
Australia	131	598	221	455	225	1	**1631**
Cambodia	14	40	0	0	0	0	**54**
Fiji	0	6	1	6	0	0	**13**
Macau	1	21	0	9	0	0	**31**
Malaysia	2	2	0	0	0	0	**4**
New Zealand	3	51	1	99	54	0	**208**
New Caledonia	0	0	0	27	0	0	**27**
Philippines	7	4	0	0	0	0	**11**
Singapore	30	38	0	15	6	0	**89**
South Africa	6	4	2	0	0	0	**12**
Sri Lanka	34	4	1	1	0	0	**40**
Thailand	5	7	0	3	3	0	**18**
Total	**233**	**775**	**226**	**615**	**288**	**1**	**2138**
%	10.9%	36.2%	10.6%	28.8%	13.5%	0%	100%

APPENDIX 3 – Influenza A(H1N1)pdm09

FIGURE 3.1 Antigenic cartographic representation of A(H1N1)pdm09 HI analysis

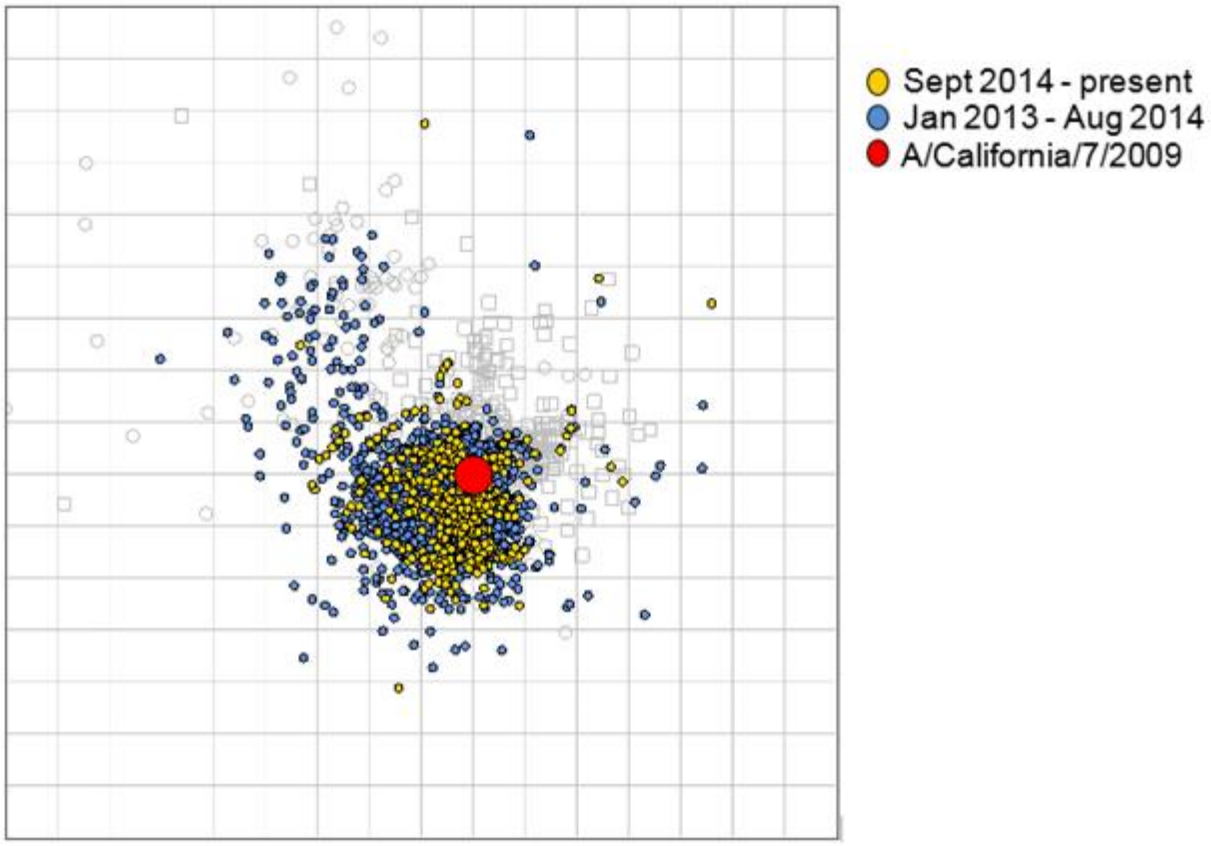


TABLE 3.2 – (H1N1)pdm09 viruses (1)

Haemagglutination Inhibition Assay - WHO Influenza Centre															
Reference Antisera															
	Sequenced		A	B	C	D	E	F	G	H	I	J	K		
	Sequence in progress														
	September 15, 2015		F2257-13D	F2255-13D	F2771-13D	F2525-09D	F2524-7D	F2522-10D	F2505-14D	F2854-14D	F2894-13D	F3151-14D	F3168-14D	Passage	Sample
			E4	C2,M5	E2	MDCK2	E4	E5	MDCK4	E3	E5	E5	E3	Details	Date
	Reference Antigens	**Clade**	**CAL/7**	**ILLINOIS/9**	**CHCH/16**	**VIC/918**	**BRIS/70**	**VIC/637**	**BRIS/96**	**S.AUS/17**	**BRIS/28**	**NCAL/58**	**Tas/24**		
A	A/CALIFORNIA/7/2009		**2560**	2560	1280	1280	2560	2560	320	640	1280	1280	1280	E7	
B	A/ILLINOIS/9/2007		2560	**5120**	1280	1280	2560	2560	320	640	2560	1280	2560	C2,M8	
C	A/CHRISTCHURCH/16/2010		2560	1280	**5120**	1280	2560	2560	1280	640	2560	2560	2560	E3	
D	A/VICTORIA/918/2010	**4**	5120	2560	2560	**2560**	5120	2560	320	1280	2560	2560	2560	MDCK4	
E	A/BRISBANE/70/2011		2560	1280	1280	1280	**2560**	2560	640	640	1280	1280	1280	E5	
F	A/VICTORIA/637/2012	**7**	160	<80	<80	80	320	**640**	160	<80	80	<80	<80	E5	
G	A/BRISBANE/96/2012	**6A**	320	160	320	<80	160	320	**2560**	160	320	80	160	MDCK6	
H	A/STH AUSTRALIA/17/2013	**7**	1280	1280	1280	640	1280	1280	640	**640**	1280	1280	1280	E4	
I	A/BRISBANE/28/2013	**7**	2560	1280	1280	1280	2560	1280	1280	640	**1280**	1280	1280	E6	
J	A/NEW CALEDONIA/58/2014	**6B**	1280	1280	1280	1280	2560	1280	640	640	1280	**1280**	1280	E3	
K	A/TASMANIA/24/2014	**6B**	2560	1280	1280	1280	2560	2560	640	640	1280	1280	**1280**	E3	
	Test Antigens														
1	A/SYDNEY/65/2015		5120	5120	5120	2560	5120	5120	1280	1280	2560	2560	2560	MX,S1	5/07/2015
2	A/SRI LANKA/35/2015		5120	5120	5120	2560	5120	5120	2560	2560	5120	5120	5120	MDCK1	3/07/2015
3	A/STH AFRICA/3801/2015		5120	5120	2560	1280	5120	2560	1280	1280	2560	2560	2560	MDCK2	29/06/2015
4	A/PERTH/71/2015		5120	5120	2560	2560	5120	5120	1280	1280	2560	2560	5120	MX,M1	22/07/2015
5	A/PERTH/81/2015		5120	5120	2560	2560	5120	5120	1280	1280	2560	2560	5120	MX,M1	31/07/2015
6	A/PERTH/103/2015		5120	5120	5120	2560	5120	5120	640	1280	2560	2560	5120	MX,M1	6/08/2015
7	A/SYDNEY/75/2015		5120	5120	2560	2560	5120	5120	640	1280	2560	2560	2560	MX,S1	6/07/2015
8	A/SYDNEY/62/2015		2560	2560	2560	1280	2560	2560	1280	1280	2560	2560	2560	MX,S1	25/06/2015
9	A/BRISBANE/142/2015		2560	1280	1280	640	1280	2560	320	640	1280	1280	1280	MDCK2	13/07/2015
10	A/STH AUCKLAND/14/2015		2560	1280	1280	1280	2560	2560	640	640	1280	1280	2560	SX,S1	28/03/2015
11	A/PERTH/47/2015		2560	2560	2560	1280	2560	2560	640	640	1280	2560	2560	MX,M1	10/06/2015
12	A/STH AFRICA/3167/2015		2560	2560	2560	1280	2560	2560	640	640	2560	1280	2560	MDCK1	2/06/2015
13	A/STH AFRICA/2442/2015		2560	1280	1280	1280	1280	2560	320	640	1280	1280	1280	MDCK2	17/05/2015
14	A/STH AFRICA/2519/2015		2560	2560	1280	1280	1280	2560	320	640	1280	1280	2560	MDCK3	
15	A/STH AFRICA/2659/2015		2560	2560	2560	1280	2560	2560	640	1280	2560	2560	2560	MDCK2	20/05/2015
16	A/STH AFRICA/3407/2015		2560	2560	2560	1280	2560	2560	640	640	2560	2560	2560	MDCK2	
17	A/STH AFRICA/3452/2015		2560	2560	2560	1280	2560	2560	1280	1280	2560	2560	1280	MDCK2	18/06/2015
18	A/PERTH/56/2015		2560	2560	1280	1280	1280	2560	320	640	1280	1280	2560	MX,M1	7/07/2015
19	A/NEWCASTLE/1004/2015	**6B**	2560	2560	2560	1280	2560	2560	320	640	2560	2560	2560	SIAT1	10/08/2015
20	A/BRISBANE/1007/2015		2560	5120	2560	2560	5120	2560	320	1280	2560	2560	2560	SIAT1	30/07/2015
21	A/TASMANIA/1010/2015		2560	2560	2560	1280	2560	2560	640	640	1280	2560	2560	SIAT1	23/07/2015
22	A/VICTORIA/1007/2015		2560	2560	1280	1280	2560	2560	320	640	1280	1280	1280	SIAT1	20/07/2015
23	A/PERTH/70/2015		2560	2560	2560	1280	2560	2560	1280	640	2560	2560	2560	MX,M1	23/07/2015
24	A/PERTH/96/2015		2560	5120	2560	2560	2560	2560	640	1280	2560	2560	5120	MX,M1	5/08/2015
25	A/SYDNEY/1009/2015		2560	2560	2560	1280	2560	2560	640	640	2560	2560	2560	SIAT1	14/07/2015
26	A/SYDNEY/1025/2015		2560	2560	1280	1280	2560	2560	320	640	1280	1280	2560	SIAT1	27/07/2015
27	A/SYDNEY/1027/2015		2560	2560	2560	1280	2560	2560	640	640	2560	2560	2560	SIAT1	27/07/2015
28	A/BRISBANE/143/2015		1280	1280	1280	640	1280	1280	320	640	1280	1280	1280	S3,M1	1/07/2015
29	A/SRI LANKA/15/2015		1280	1280	640	640	1280	1280	320	320	640	1280	1280	MDCK1	8/05/2015
30	A/SRI LANKA/17/2015		1280	1280	1280	640	1280	>10240	320	320	1280	>10240	1280	MDCK1	13/05/2015
31	A/SRI LANKA/33/2015		1280	1280	1280	1280	2560	2560	320	640	1280	1280	1280	MDCK1	2/07/2015
32	A/STH AFRICA/3577/2015		1280	1280	1280	640	1280	1280	320	320	640	1280	1280	MDCK2	
33	A/SYDNEY/74/2015		1280	1280	640	640	1280	1280	320	320	640	640	1280	MX,M1	28/06/2015
34	A/STH AFRICA/1805/2015		80	<80	<80	<80	<80	80	80	80	160	80	<80	MDCK3	

TABLE 3.3 – (H1N1)pdm09 viruses (2)

Haemagglutination Inhibition Assay - WHO Influenza Centre															
Reference Antisera															
	Sequenced		A	B	C	D	E	F	G	H	I	J	K		
	August 11, 2015		F2257-13D	F2255-13D	F2771-13D	F2525-09D	F2524-7D	F2522-10D	F2505-14D	F2854-14D	F2894-13D	F3151-14D	F3168-14D	Passage	Sample
			E4	C2,MDCK5	E2	MDCK2	E4	E5	MDCK4	E3	E5	E5	E3	Details	Date
	Reference Antigens	**Clade**	**CAL/7**	**ILLINOIS/9**	**CHCH/16**	**VIC/918**	**BRIS/70**	**VIC/637**	**BRIS/96**	**STH AUS/17**	**BRIS/28**	**NCAL/58**	**Tas/24**		
A	A/CALIFORNIA/7/2009		**2560**	2560	1280	1280	1280	1280	320	320	1280	1280	1280	E7	
B	A/ILLINOIS/9/2007		1280	**2560**	1280	1280	2560	1280	320	320	1280	1280	1280	C2,MDCK8	
C	A/CHRISTCHURCH/16/2010		1280	1280	**5120**	1280	2560	2560	1280	640	1280	1280	2560	E3	
D	A/VICTORIA/918/2010	**4**	1280	1280	1280	**640**	1280	1280	640	640	1280	1280	1280	MDCK4	
E	A/BRISBANE/70/2011		2560	1280	1280	1280	**2560**	2560	640	640	2560	1280	2560	E5	
F	A/VICTORIA/637/2012	**7**	80	<80	<80	<80	<80	**640**	320	<80	80	<80	<80	E5	
G	A/BRISBANE/96/2012	**6A**	160	160	160	<80	160	320	**1280**	160	320	160	160	MDCK6	
H	A/SOUTH AUSTRALIA/17/2013	**7**	1280	1280	1280	640	1280	1280	1280	**640**	2560	1280	1280	E4	
I	A/BRISBANE/28/2013	**7**	1280	1280	1280	640	1280	2560	640	640	**2560**	1280	1280	E6	
J	A/NEW CALEDONIA/58/2014	**6B**	2560	2560	2560	1280	2560	2560	640	1280	2560	**2560**	2560	E3	
K	A/TASMANIA/24/2014	**6B**	2560	1280	1280	1280	2560	2560	640	640	1280	1280	**1280**	E3	
	Test Antigens														
1	A/CANBERRA/54/2015		5120	5120	5120	2560	5120	5120	2560	2560	5120	5120	5120	MDCK1	15/07/2015
2	A/CANBERRA/55/2015		5120	5120	5120	2560	5120	5120	640	1280	2560	2560	2560	SIAT1	18/07/2015
3	A/VICTORIA/537/2015		2560	2560	2560	1280	2560	2560	640	640	2560	2560	2560	SIAT2	9/07/2015
4	A/CANBERRA/50/2015		2560	2560	2560	1280	2560	2560	640	640	2560	2560	2560	SIAT1	15/07/2015
5	A/CANBERRA/47/2015	**6B**	2560	2560	1280	640	2560	2560	640	640	2560	1280	2560	siat2	11/07/2015
6	A/SINGAPORE/EN003/2015		2560	2560	2560	1280	1280	1280	640	640	1280	1280	2560	X2,MDCK1	1/05/2015
7	A/BRISBANE/125/2015		2560	2560	2560	1280	2560	2560	640	640	2560	2560	2560	MDCK2	30/06/2015
8	A/BRISBANE/126/2015		2560	2560	1280	1280	2560	2560	640	640	1280	1280	1280	MDCK2	1/07/2015
9	A/BRISBANE/131/2015		2560	2560	2560	1280	2560	2560	640	640	2560	1280	2560	MDCK2	6/07/2015
10	A/SINGAPORE/GP698/2015		2560	2560	2560	1280	2560	2560	640	640	2560	2560	2560	X1,MDCK1	21/05/2015
11	A/SINGAPORE/GP793/2015		2560	2560	2560	1280	2560	2560	640	640	2560	1280	2560	X1,MDCK1	28/05/2015

12	A/SINGAPORE/KK393/2015		2560	2560	2560	1280	2560	2560	640	640	1280	1280	2560	X1,MDCK1	15/05/2015
13	A/SINGAPORE/TT481/2015		2560	2560	1280	640	1280	2560	640	640	1280	1280	1280	X1,MDCK1	27/05/2015
14	A/SINGAPORE/GP1085/2015	**6B**	2560	1280	1280	1280	2560	2560	640	640	1280	1280	2560	X1,MDCK1	19/06/2015
15	A/SINGAPORE/GP1207/2015		2560	1280	1280	1280	1280	2560	640	2560	1280	2560	2560	X1,MDCK1	25/06/2015
16	A/SINGAPORE/KK600/2015		2560	2560	1280	1280	2560	2560	640	640	1280	1280	1280	X1,MDCK1	17/06/2015
17	A/SINGAPORE/TT808/2015	**6B**	2560	1280	1280	640	1280	1280	320	320	1280	640	1280	X1,MDCK1	22/06/2015
18	A/CAMBODIA/FSS30343/2015		2560	2560	2560	1280	2560	2560	640	640	2560	2560	2560	MDCK1	2/06/2015
19	A/CAMBODIA/FSS39385/2015	**6B**	2560	1280	2560	1280	2560	2560	640	640	2560	2560	2560	MDCK1	16/06/2015
20	A/CANBERRA/35/2015		1280	1280	1280	640	1280	1280	320	320	1280	1280	1280	MDCK2	1/07/2015
21	A/CANBERRA/39/2015		1280	1280	1280	640	1280	1280	320	320	640	640	640	MDCK1	6/07/2015
22	A/PHILIPPINES/5/2015		1280	1280	1280	640	1280	1280	320	320	1280	1280	1280	mdck2	5/03/2015
23	A/PHILIPPINES/6/2015		1280	640	640	640	1280	640	320	640	1280	640	1280	mdck2	18/03/2015
24	A/PHILIPPINES/7/2015	**6B**	1280	1280	1280	640	1280	640	320	640	1280	1280	1280	mdck2	20/03/2015
25	A/BRISBANE/129/2015		1280	640	640	640	1280	1280	320	320	1280	1280	1280	MDCK2	6/07/2015
26	A/SINGAPORE/GP681/2015	**6B**	1280	1280	1280	640	2560	1280	640	640	1280	1280	1280	X1,MDCK1	19/05/2015
27	A/SINGAPORE/GP915/2015	**6B**	1280	1280	1280	640	1280	1280	320	320	1280	1280	1280	X1,MDCK1	9/06/2015
28	A/CAMBODIA/FSS28958/2015		1280	1280	640	640	1280	1280	320	320	640	1280	1280	MDCK1	18/05/2016
29	A/SINGAPORE/IMH004/2015	**6B**	320	320	320	160	320	640	640	320	320	320	320	X1,MDCK1	23/02/2015

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

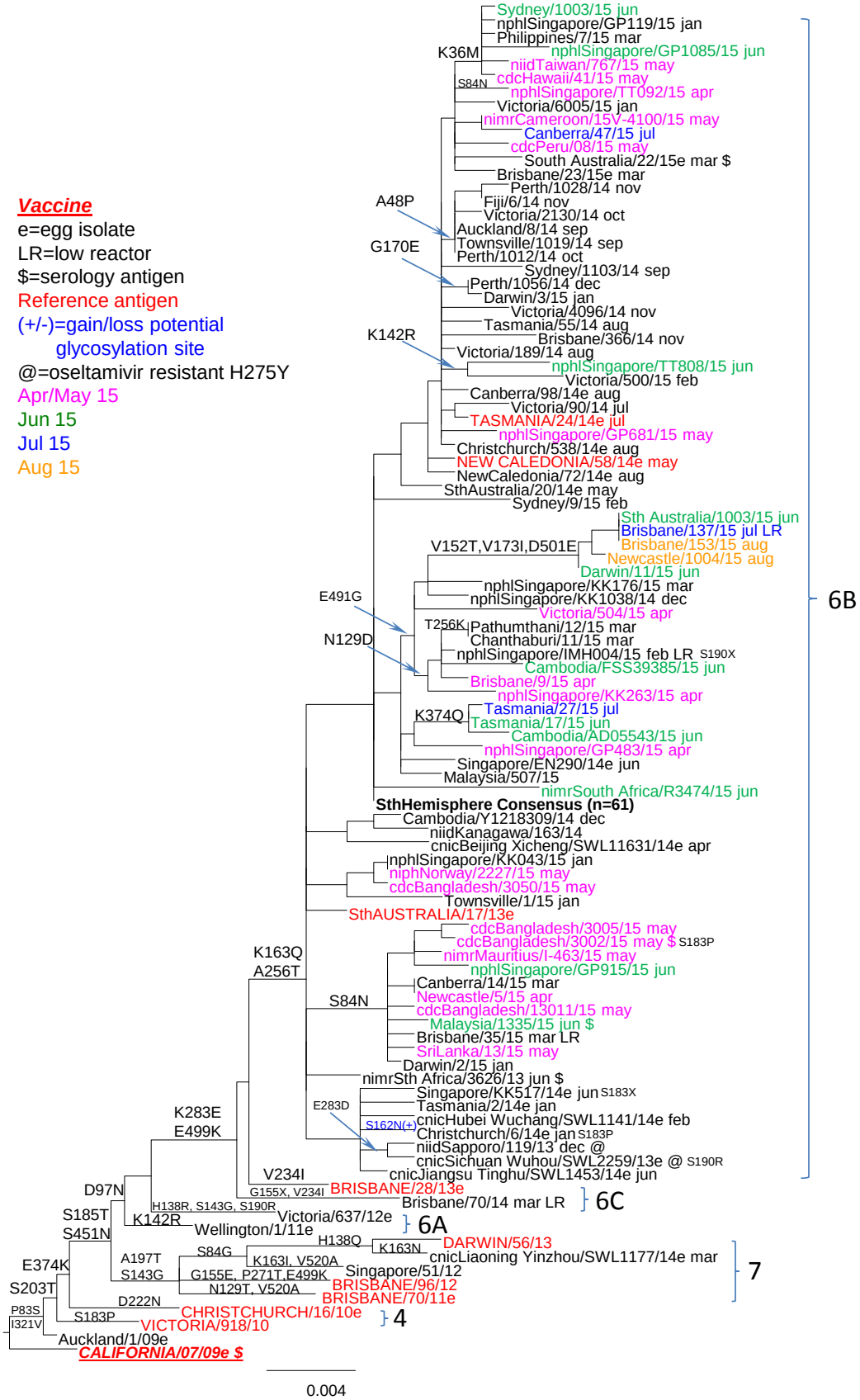


FIGURE 3.3 Phylogenetic relationships among influenza A(H1N1)pdm09 N1 neuraminidase genes

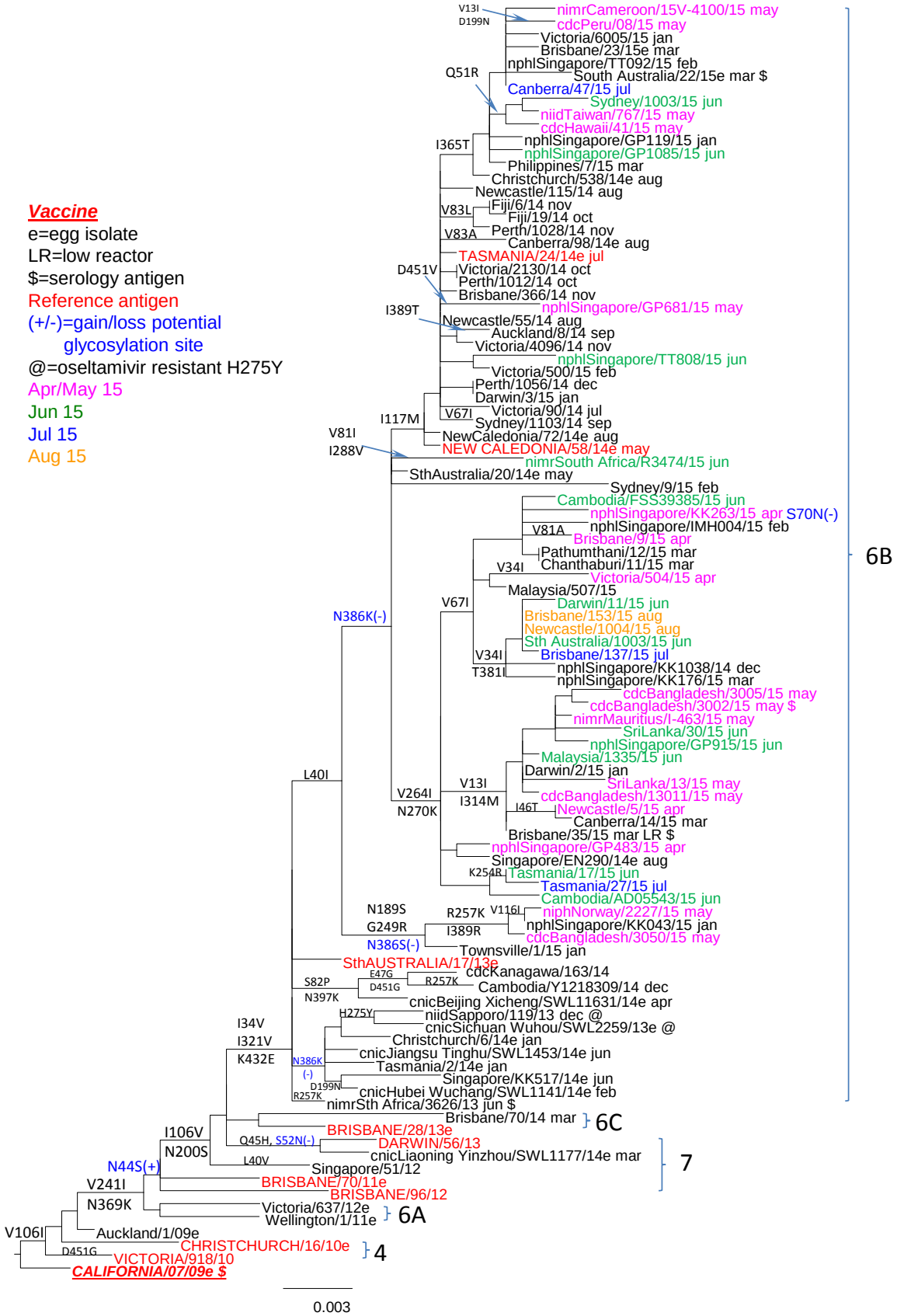


TABLE 3.6 Haemagglutination inhibition antibody titres

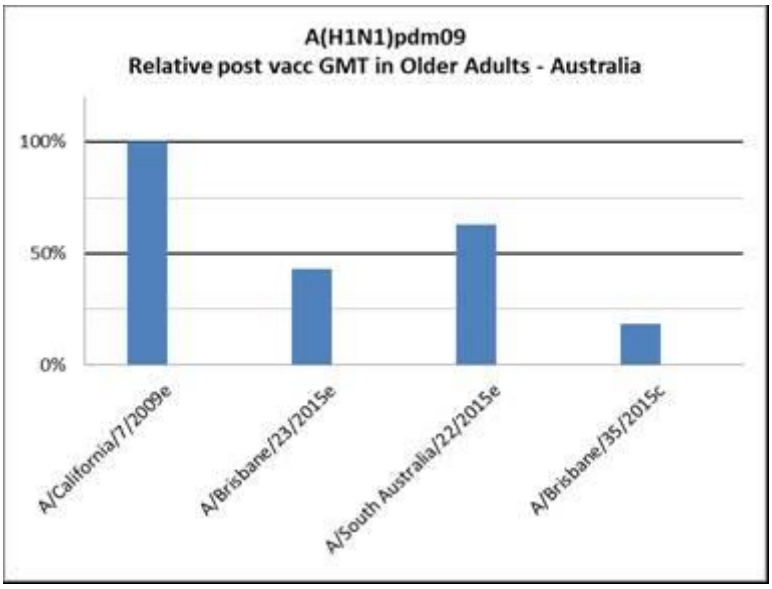
Influenza type A(H1N1)pdm09 vaccine component – Young Adults (n=24)

Antigen	Clade	Passage History	% Rise	GMT		%>/=40		%>/=160	
				Pre	Post	Pre	Post	Pre	Post
A/California/7/2009	6B	E6	75.0	25.2	169.5	50.0	95.8	8.3	75.0
A/Brisbane/23/2015	6B	E2	70.8	9.7	71.3	20.8	83.3	4.2	41.7
A/South Australia/22/2015	6B	E2	58.3	19.4	95.1	33.3	87.5	4.2	54.2
A/Brisbane/35/2015	6B	MDCK5	58.3	7.5	30.0	4.2	70.8	0.0	4.2

TABLE 3.7 Haemagglutination inhibition antibody titres

Influenza type A(H1N1)pdm09 vaccine component – Older Adults (n=24)

Antigen	Clade	Passage History	% Rise	GMT		%>/=40		%>/=160	
				Pre	Post	Pre	Post	Pre	Post
A/California/7/2009	6B	E6	79.2	12.2	134.5	20.8	95.8	12.5	62.5
A/Brisbane/23/2015	6B	E2	75.0	8.4	58.2	12.5	79.2	4.2	29.2
A/South Australia/22/2015	6B	E2	79.2	10.0	84.8	12.5	95.8	4.2	37.5
A/Brisbane/35/2015	6B	MDCK5	58.3	6.7	25.2	12.5	54.2	0.0	4.2



APPENDIX 4 - Influenza A (H3N2)

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 4.3: A(H3) viruses (2)

HI performed by CDC, Atlanta, USA

HEMAGGLUTINATION INHIBITION REACTIONS OF INFLUENZA H3 VIRUSES (WITH 20nM OSELTAMIVIR, 4 HA UNITS/50 MICROLITERS (2014/08/28)

		REFERENCE FERRET ANTISERA																	
		3C.1			3C.3		3C.2b	3C.2a		3C.3a									
		EGG	MDCK	SIAT	MDCK	EGG	MDCK	MDCK	EGG	MDCK	EGG	SIAT	EGG	SIAT	EGG	HA	SEQ.	DATE	
	REFERENCE ANTIGENS	TX/50	TX/50	TX/50	NY/39	WA/18	LA/39	NE/4	JA/72	CA/2	NY/5	NY/5	PU/6759	PU/6759	SZ/9715293	GROUP	CHANGE	COLL.	PASS.
1	A/TEXAS/50/2012	640	1280	320	320	320	320	320	640	80	80	80	80	80	320	3C.1		2012/04/15	E5
2	A/TEXAS/50/2012	640	2560	640	640	640	640	1280	1280	320	160	640	160	640	320	3C.1		2012/04/15	M1/C2
3	A/TEXAS/50/2012	320	1280	640	320	320	320	640	640	320	160	320	160	320	320	3C.1		2012/04/15	M1/C1S2
4	A/NEW YORK/39/2012	160	640	160	320	160	160	320	320	160	80	160	80	160	160	3C.3		2012/10/20	C2S2
5	A/WASHINGTON/18/2013	320	1280	320	320	640	320	320	320	20	80	80	80	80	320	3C.3		2013/11/29	E5
6	A/LOUISIANA/39/2013	160	640	160	160	160	320	320	320	80	80	80	80	40	40	3C.2b		2013/12/29	C1S2
7	A/NEBRASKA/04/2014	160	160	160	80	80	80	160	160	160	80	160	80	160	160	3C.2a		2014/03/11	C3
8	A/SAKAI/72/2014	40	80	20	40	40	20	320	320	40	20	80	40	160	80	3C.2a		2014/03/13	C2+C1/S2
9	A/CALIFORNIA/02/14	40	80	40	40	40	40	160	160	160	80	160	80	80	80	3C.3a		2014/01/16	C1S2
10	A/NEW YORK/05/14	160	1280	1280	320	320	320	160	640	2560	2560	1280	1280	640	1280	3C.3a		2014/01/21	E4
11	A/NEW YORK/05/14	40	80	40	40	40	40	160	160	160	80	160	80	320	160	3C.3a		2014/01/21	S2
12	A/PALAU/6759/2014	160	1280	1280	320	320	320	320	640	2560	5120	1280	1280	1280	1280	3C.3a		2014/03/26	E5
13	A/PALAU/6759/2014	40	80	40	40	20	40	80	80	80	80	160	80	160	80	3C.3a		2014/03/26	S2
14	A/SWITZERLAND/9715293/2013	160	80	40	40	80	80	320	160	80	80	160	80	160	320	3C.3a		UNKN	E4/E2
	TEST ANTIGENS																		
15	A/HAWAII/20/2014	320	1280	320	320	640	160	640	QNS	320	160	320	160	320	160			2014/06/13	S1
16	A/HAWAII/30/2014	320	1280	320	320	1280	160	640	QNS	320	160	320	160	320	320	3C.3		2014/05/28	S1
17	A/HAWAII/34/2014	320	1280	320	320	640	160	320	QNS	160	80	320	80	320	160	3C.3		2014/06/11	S1
18	A/HAWAII/25/2014	160	640	160	160	640	160	320	QNS	320	160	320	160	320	160	3C.3		2014/07/01	S1
19	A/HAWAII/31/2014	320	640	160	320	640	160	320	QNS	320	160	320	80	320	160	3C.3		2014/05/30	S1
20	A/HAWAII/32/2014	320	640	160	320	640	160	320	QNS	320	80	320	160	320	160	3C.3		2014/06/03	S1
21	A/UTAH/16/2014	80	640	160	320	640	160	160	QNS	160	80	160	80	160	80	3C.3b		2014/06/18	S1
22	A/NEVADA/09/2014	80	160	80	80	80	40	160	QNS	160	80	160	40	160	80	3C.3	Y94H F159Y L194P	2014/04/05	E3
23	A/MARYLAND/17/2014	160	320	80	160	80	80	320	QNS	160	80	160	80	320	160	3C.3	S124N N225D	2014/06/29	M1/S1
24	A/MONTANA/06/2014	160	320	80	160	80	80	1280	QNS	160	40	320	80	320	160	3C.2a		2014/06/04	S1
25	A/MINNESOTA/17/2014	80	160	80	80	40	40	320	QNS	320	80	320	160	320	320	3C.3a		2014/07/10	S1
26	A/NORTH CAROLINA/18/2014	80	160	80	80	40	40	320	QNS	160	80	320	80	320	160	3C.3a		2014/07/04	S1
27	A/NORTH CAROLINA/19/2014	80	160	80	80	40	80	320	QNS	320	160	320	160	320	160	3C.3a		2014/06/25	MX/S1
28	A/ALASKA/31/2014	40	160	40	80	20	20	320	QNS	160	80	320	160	320	160	3C.3a		2014/06/26	S1
29	A/ALASKA/34/2014	160	160	40	80	40	40	320	QNS	160	40	160	80	320	160	3C.2a		2014/07/05	S3
30	A/NEBRASKA/06/2014	80	160	40	80	40	40	320	QNS	320	80	320	80	320	160	3C.3a		2014/06/19	S1
31	A/ALASKA/30/2014	40	80	40	40	20	20	160	QNS	160	80	160	80	320	160	3C.3a		2014/06/27	S1
32	A/ALASKA/32/2014	40	80	40	80	20	40	320	QNS	160	80	320	80	320	160	3C.3a		2014/06/24	S1
33	A/ALASKA/33/2014	80	80	40	80	40	40	160	QNS	160	80	160	80	320	160	3C.3a		2014/06/17	S1
34	A/HAWAII/26/2014	80	80	40	80	5	40	160	QNS	160	80	320	80	320	80	3C.3a		2014/06/27	S1
35	A/TEXAS/36/2014	80	80	40	40	40	40	320	QNS	80	40	80	80	160	80	3C.2a		2014/06/13	S3
36	A/BOLIVIA/841/2014	320	1280	320	320	160	80	320	QNS	160	80	320	160	320	160	3C.3		2014/06/30	S2
37	A/BRAZIL/45230/2014	160	640	160	320	80	80	160	QNS	160	80	160	80	320	160	3C.3		2014/05/08	C1/S2
38	A/CAMBODIA/0585/2014	80	160	40	80	40	80	320	QNS	320	160	320	160	320	320	3C.3a		2014/05/17	S2
	Sequence in GISAID																		

TABLE 4.4 – A(H3) viruses

			Haemagglutination Inhibition Assay - WHO Influenza Centre															
			Reference Antisera															
	Sequenced		A	B	C	D	E	F		G	H	I	J	K	L			
	August 27, 2015 Part A & B		F2573-15D	F3127 - 13D	F3130 - 13D	F3165-14D	F3152 - 14D	F3194 - 13D	F3150 - 14D	F3257-13D	F3304-13D	F3309-13D	F3126-13D	F3129-13D	F3367-13D	F3364-13D	Passage	Sample
	With oseltamivir		M1/C2,M3	E5	M1	E5	S1/S4	E5	SIAT1	M1,S2	E4	SIAT2	E4	M1/S1	E3	M2,S1	History	Date
	Reference Antigens	**Clade**	**Tex/50**	**S.AUS /55**	**S.AUS /55**	**Switz**	**Switz**	**N.Cal /71**	**N.Cal /71**	**N.Cal /104**	**BRIS/47**	**FIJI/2**	**Newc/22**	**Newc/22**	**BRIS/82**	**BRIS/82**		
A	A/TEXAS/50/2012	**3c.1**	**640**	320	160	160	640	320	320	640	320	160	320	640	40	160	M1/C2,M6	
B	A/STH AUSTRALIA/55/2014	**3c.3a**	160	**320**	160	160	640	160	160	160	80	80	160	320	<40	40	E5	
C	A/STH AUSTRALIA/55/2014	**3c.3a**	80	160	**160**	80	320	160	160	320	320	160	40	80	<40	80	M3	
D	A/SWITZ/9715293/2013	**3c.3a**	640	320	80	**640**	320	160	2560	320	320	80	320	40	<40	160	E5	
E	A/SWITZ/9715293/2013	**3c.3a**	160	320	320	160	**640**	160	320	1280	320	160	80	80	<40	80	S1/S3	
F	A/NEW CAL/71/2014	**3c.2a**	80	80	40	40	160	**1280**	160	2560	640	160	40	80	40	160	E6	
G	A/NEW CAL/104/2014	**3c.2a**	160	160	160	160	320	320	320	**1280**	640	320	80	80	<40	160	M1/S2	
H	A/BRISBANE/47/2015	**3c.2a**	80	80	80	80	160	640	80	1280	**1280**	320	80	160	40	160	E4	
I	A/FIJI/2/2015	**3c.2a**	160	320	320	160	1280	320	640	1280	1280	**640**	160	160	<40	640	SIAT3	
J	A/NEWCASTLE/22/2014	**3c.3b**	80	80	40	<40	160	160	<40	160	160	80	**320**	640	40	40	E5	
K	A/NEWCASTLE/22/2014	**3c.3b**	320	160	160	160	320	320	320	320	320	160	2560	**2560**	<40	320	M6/S1	
L	A/BRISBANE/82/2015	**3c.2a**	40	160	80	40	160	1280	640	1280	1280	640	40	80	**160**	nt	E3	
	Test Antigens																	
1	A/VICTORIA/835/2015	**3c.2a**	160	640	320	320	1280	640	1280	2560	2560	1280	160	160	160	2560	SIAT1	1/08/2015
2	A/CAMBODIA/FSS30389/2015		160	320	320	160	640	320	320	640	640	320	80	80	40	640	SIAT2	22/06/2015
3	A/CAMBODIA/Z0722378/2015	**3c.2a**	160	320	320	160	640	320	320	640	640	320	40	40	<40	320	SIAT1	15/07/2015
4	A/VICTORIA/826/2015		160	640	320	160	640	640	1280	1280	640	640	160	80	<40	320	SIAT1	24/07/2015
5	A/CAMBODIA/FSS28525/2015		160	320	160	80	640	160	160	640	640	320	40	40	<40	320	SIAT2	4/06/2015
6	A/CAMBODIA/Z0727315/2015		160	320	160	160	640	640	1280	1280	640	640	80	80	<40	1280	SIAT1	5/06/2015
7	A/CAMBODIA/Z0727325/2015	**3c.2a**	160	320	160	160	640	320	640	1280	640	640	80	80	40	160	SIAT1	28/06/2015
8	A/SYDNEY/55/2015		160	160	160	80	640	160	160	320	320	80	640	640	<40	160	MX,S1	16/06/2015
9	A/VICTORIA/849/2015	**3c.3**	320	320	160	160	640	320	640	640	320	160	1280	2560	40	160	SIAT1	10/08/2015
10	A/VICTORIA/304267/2015		640	320	160	320	640	640	1280	640	320	160	2560	2560	<40	160	MDCK1	11/08/2015
11	A/SINGAPORE/KK461/2015		80	320	160	80	320	160	160	640	640	320	40	40	<40	160	X1,S2	28/05/2015
12	A/SINGAPORE/TT764/2015		80	320	160	80	320	160	160	640	640	320	40	40	<40	160	X1,S2	15/06/2015
13	A/CAMBODIA/FSS30236/2015		80	320	160	80	320	320	320	640	640	320	40	40	<40	320	SIAT2	8/06/2015
14	A/VICTORIA/818/2015	**3c.3**	320	320	160	80	320	160	160	320	320	160	640	1280	<40	160	SIAT2	19/07/2015
15	A/SYDNEY/57/2015	**3c.2a**	160	320	160	160	320	320	320	640	640	320	40	40	<40	160	MX,S1	19/06/2015

16	A/VICTORIA/837/2015	**3c.2a**	160	320	160	160	320	160	320	640	640	320	40	40	<40	320	SIAT1	3/08/2015
17	A/VICTORIA/861/2015	**3c.3b**	160	160	160	80	320	160	160	320	160	80	640	640	<40	80	SIAT1	10/08/2015
18	A/VICTORIA/853/2015	**3c.2a**	80	320	160	80	320	160	320	640	640	320	40	40	<40	320	SIAT2	7/08/2015
19	A/STH AUCKLAND/15/2015	**3c.2a**	80	160	160	80	320	160	320	1280	640	320	40	40	<40	640	MX, S1	2/07/2015
20	A/TAURANGA/4/2015	**3c.2a**	80	160	160	80	320	160	320	1280	640	320	40	<40	40	640	MX, S1	2/07/2015
21	A/SYDNEY/68/2015		160	160	160	80	320	320	160	320	320	160	640	640	nt	nt	MX,S2	16/06/2015
22	A/SINGAPORE/TT895/2015	**3c.2a**	40	160	160	80	160	160	160	320	320	160	40	<40	<40	160	X1,S2	26/06/2015
23	A/SYDNEY/60/2015	**3c.2a**	80	160	160	80	160	160	160	320	320	320	40	<40	<40	160	MX,S1	22/06/2015
24	A/HONG KONG/7127/2014		40	80	80	80	160	160	160	640	320	160	<40	<40	nt	nt	MX,M1	
25	A/STH AFRICA/3720/2015		40	80	80	40	160	80	160	640	160	80	<40	<40	<40	80	M1,S1	
26	NYMCX-261(HK/7127/2014)		80	80	40	40	160	1280	160	2560	640	160	40	160	40	160	X,E1	
27	A/VICTORIA/852/2015	**3c.2a**	<40	80	40	40	160	80	80	320	160	160	<40	<40	<40	80	SIAT2	11/08/2015
28	NYMCX-263(HK/4801/2014)		80	40	<40	40	80	1280	80	1280	1280	160	40	80	40	320	X,E1	
29	NYMCX-263B(HK/4801/2014)		80	40	<40	40	80	1280	80	1280	640	160	<40	40	40	160	X,E1	
30	A/SINGAPORE/TT265/2015		<40	160	40	40	80	160	160	160	160	160	<40	<40	<40	80	X1,S2	20/04/2015
31	A/STH AUCKLAND/18/2015	**3c.2a**	<40	80	40	40	80	160	160	320	80	160	40	<40	40	320	MX, S1	15/07/2015
32	A/VICTORIA/1000/2015	**3c.3**	640	40	<40	160	40	80	40	160	160	40	1280	2560	<40	160	E3	17/06/2015
33	NYMCX-263A(HK/4801/2014)		80	40	<40	40	40	1280	80	2560	640	160	40	<40	<40	80	X,E1	

TABLE 4.5 – A(H3) viruses

Haemagglutination Inhibition Assay - WHO Influenza Centre																
Reference Antisera																
	Sequenced		A	B	C	D	E	F	G	H	I	J	K	L		
	August 13, 2015 Part A & B		F2573-15D	F3127 - 13D	F3130 - 13D	F3165-14D	F3152 - 14D	F3194 - 13D	F3150 - 14D	F3257-13D	F3304-13D	F3309-13D	F3126-13D	F3129 - 13D	Passage	Sample
	With oseltamivir		M1/C2,M3	E5	MDCK1	E5	S1/S4	E5	SIAT1	M1,SIAT2	E4	SIAT2	E4	M1/SIAT1	History	Date
	Reference Antigens	**Clade**	**Tex/50**	**S.AUS/55**	**S.AUS/55**	**Switz/ 9715293**	**Switz/ 9715293**	**New Cal/71**	**New Cal/71**	**New Cal/104**	**BRIS/47**	**FIJI/2**	**NEWC/22**	**NEWC/22**		
A	A/TEXAS/50/2012	**3c.1**	**640**	320	160	160	640	320	640	640	640	160	640	640	M1/C2,M5	
B	A/STH AUSTRALIA/55/2014	**3c.3a**	80	**320**	160	160	640	160	160	160	80	80	160	320	E5	
C	A/STH AUSTRALIA/55/2014	**3c.3a**	80	160	**160**	80	320	80	160	320	160	80	80	80	M3	
D	A/SWITZERLAND/9715293/2013	**3c.3a**	640	320	80	**640**	320	160	2560	640	320	160	320	40	E5	
E	A/SWITZERLAND/9715293/2013	**3c.3a**	160	320	320	160	**640**	160	640	640	640	160	80	80	S1/S4	
F	A/NEW CALEDONIA/71/2014	**3c.2a**	80	80	40	40	160	**640**	80	1280	1280	160	40	80	E6	
G	A/NEW CALEDONIA/71/2014	**3c.2a**	320	640	320	160	640	640	**640**	1280	640	640	160	80	S4	
H	A/NEW CALEDONIA/104/2014	**3c.2a**	80	160	80	80	160	320	320	**1280**	640	320	80	40	M1/S2	
I	A/BRISBANE/47/2015	**3c.2a**	160	160	80	80	320	2560	160	>5120	**2560**	640	160	160	E4	
J	A/FIJI/2/2015	**3c.2a**	160	320	320	160	640	320	320	1280	640	**320**	80	40	SIAT3	
K	A/NEWCASTLE/22/2014	**3c.3b**	160	160	80	40	160	320	40	160	320	80	**320**	640	E5	
L	A/NEWCASTLE/22/2014	**3c.3b**	320	160	160	160	640	320	320	320	320	160	2560	**2560**	M6/S1	
	Test Antigens															
1	A/CAMBODIA/Z0727331/2015	**3c.2a**	320	640	1280	320	1280	640	640	2560	1280	640	80	80	M3,S1	8/06/2015
2	A/VICTORIA/810/2015	**3c.3b**	80	320	160	80	640	320	320	640	640	320	40	40	S2	10/07/2015
3	A/SINGAPORE/GP355/2015		160	320	320	160	640	320	320	1280	640	640	40	40	X1,S1	13/03/2014
4	A/SINGAPORE/GP521/2015		160	320	320	160	640	320	320	1280	1280	640	80	40	X1,S2	21/04/2015
5	A/CHRISTCHURCH/507/2015	**3c.2a**	160	320	320	160	640	320	320	640	640	320	80	40	S2	14/07/2015
6	A/BRISBANE/130/2015	**3c.2a**	160	640	320	160	640	640	640	1280	1280	640	160	80	S2	6/07/2015
7	A/BRISBANE/132/2015	**3c.2a**	160	320	160	80	640	320	320	640	640	320	80	40	S3	29/06/2015
8	A/SINGAPORE/GP744/2015		160	320	320	160	640	640	640	1280	640	640	80	40	X1,S1	25/05/2015
9	A/CHRISTCHURCH/504/2015	**3c.2a**	160	640	320	160	640	320	640	1280	640	640	160	80	SIAT2	9/07/2015
10	A/TASMANIA/1005/2015	**3c.3b**	160	160	160	80	320	320	80	320	320	80	640	1280	SIAT2	30/06/2015
11	A/NEWCASTLE/1002/2015	**3c.2a**	80	160	160	80	320	160	320	640	640	320	40	40	SIAT2	1/07/2015
12	A/VICTORIA/945/2015		80	320	160	80	320	320	320	640	320	320	80	40	SIAT1	3/05/2015
13	A/SINGAPORE/GP464/2015		80	160	160	80	320	160	320	640	640	320	40	40	X1,S1	9/04/2015
14	A/SINGAPORE/GP574/2015		80	160	160	80	320	160	160	320	640	320	80	40	X1,S1	28/04/2015
15	A/SINGAPORE/KK231/2015		80	160	160	80	320	160	160	640	640	160	80	160	X1,S1	24/03/2015

16	A/BRISBANE/128/2015	**3c.2a**	80	320	160	80	320	160	160	640	640	320	40	<40	M3,S1	16/06/2015
17	A/CAMBODIA/Z0727320/2015	**3c.2a**	80	160	160	80	320	160	320	1280	640	320	40	40	M3,S1	11/06/2015
18	A/SINGAPORE/GP669/2015		40	80	80	80	160	160	160	320	320	160	<40	<40	X1,S1	15/05/2015
19	A/SINGAPORE/GP822/2015		40	80	80	40	160	160	160	320	320	160	<40	<40	X1,S1	2/06/2015
20	A/SINGAPORE/TT408/2015		40	80	80	40	160	160	160	320	160	160	<40	<40	X1,S1	25/05/2015
21	A/SINGAPORE/GP929/2015		40	160	160	80	160	160	160	640	640	160	<40	<40	X1,S1	10/06/2015
22	A/SINGAPORE/TT763/2015		40	160	80	40	160	160	160	640	320	160	<40	<40	X1,S1	15/06/2015
23	A/CHRISTCHURCH/505/2015	**3c.2a**	80	160	80	80	160	160	160	320	320	160	40	<40	SIAT2	10/07/2015
24	A/BRISBANE/127/2015	**3c.2a**	40	80	80	40	160	160	160	640	320	320	40	<40	M2,S1	24/06/2015
25	A/TOWNSVILLE/16/2015	**3c.2a**	40	160	80	80	160	160	160	320	320	160	<40	40	M3,S1	19/06/2015
26	A/BRISBANE/134/2015	**3c.2a**	40	160	80	80	160	80	160	320	320	160	<40	<40	M3,S1	21/06/2015
27	A/CAMBODIA/Z0709311/2015	**3c.2a**	80	80	80	80	160	160	160	1280	320	160	40	40	M2,S1	29/06/2015
28	A/VICTORIA/948/2015	**3c.2a**	40	160	80	40	160	80	160	320	320	160	<40	<40	SIAT2	22/07/2015
29	A/CAMBODIA/FSS30499/2015		40	80	80	40	160	160	160	320	320	160	<40	<40	Siat1	23/06/2015
30	A/CAMBODIA/Z0727313/2015		40	80	80	40	160	80	160	640	320	160	<40	<40	M2,S1	8/05/2015
31	A/CAMBODIA/Z0727326/2015	**3c.2a**	80	160	160	80	160	160	320	1280	640	320	80	40	M3,S1	25/06/2015
32	A/CAMBODIA/Z0727330/2015	**3c.2a**	80	80	80	80	160	160	320	1280	640	320	40	40	M2,S1	29/06/2015

FIGURE 4.2

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

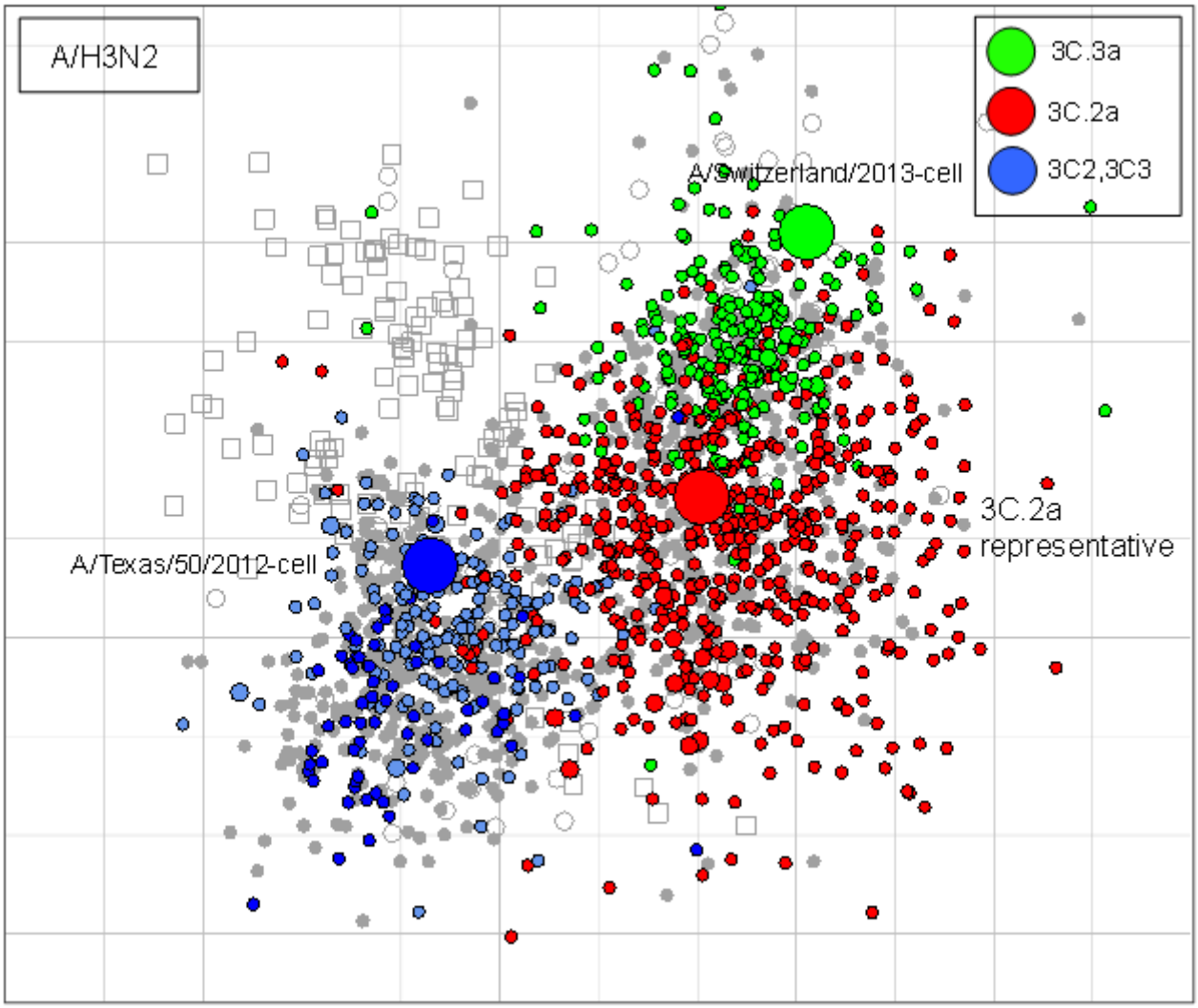


FIGURE 4.2 Phylogenetic relationships among influenza HA genes

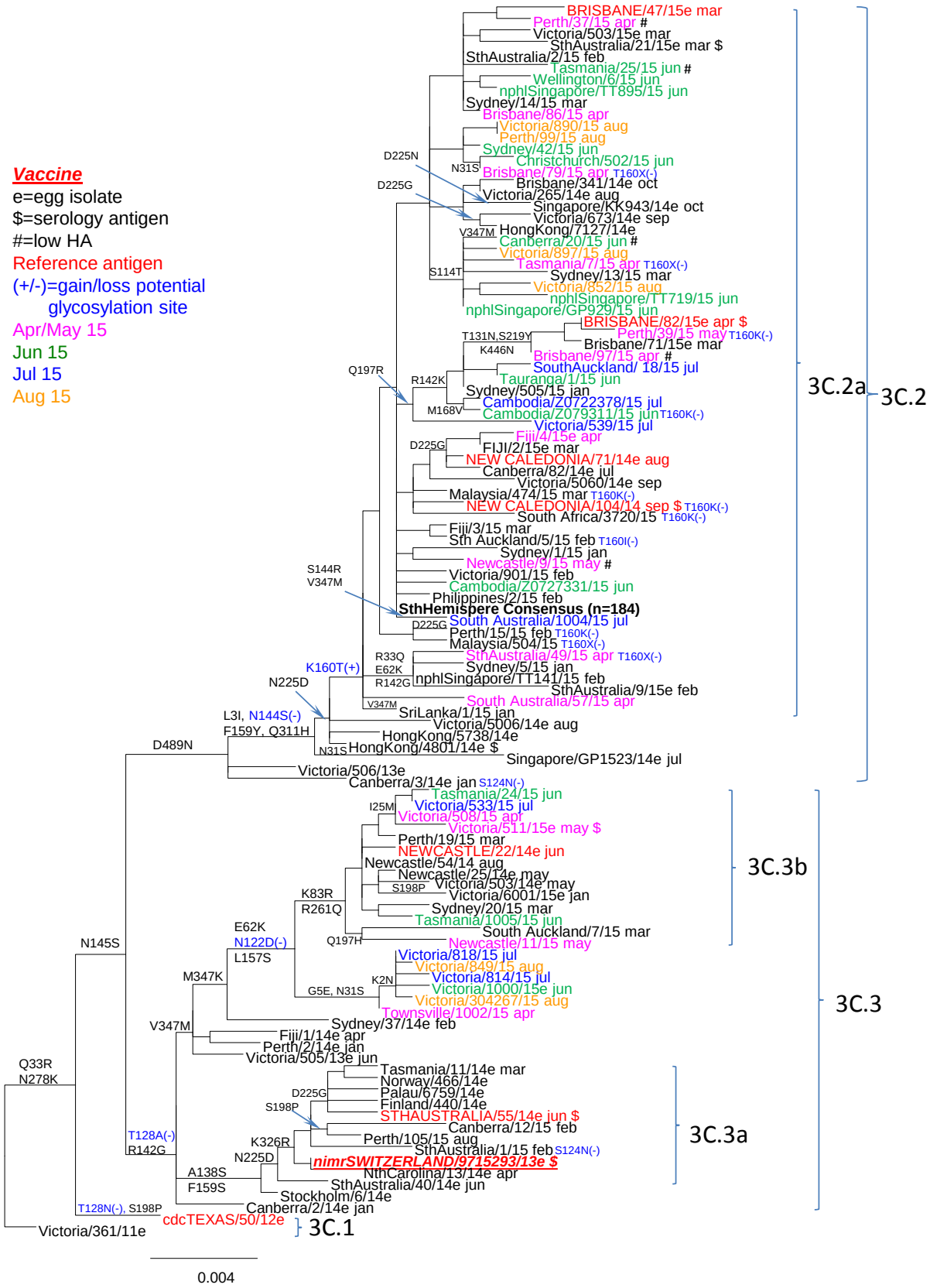


FIGURE 4.3 Phylogenetic relationships among influenza N2 Neuraminidase genes

TABLE 4.12 Haemagglutination inhibition antibody titres
Influenza type A(H3N2) viruses – Young Adults (n=24)

Antigen	Clade	Passage History	+/- Oselt	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
A/Switzerland/9715293/2013	3C3a	E5		54.2	77.7	261.4	100.0	100.0	16.7	70.8
A/Switzerland/9715293/2013	3C3a	SIAT1/SIAT7		62.5	69.2	239.7	100.0	100.0	25.0	70.8
A/Switzerland/9715293/2013	3C3a	SIAT1/SIAT7	oselt	66.7	49.0	213.6	87.5	100.0	8.3	70.8
A/Switzerland/9715293/2013	3C3a	E5	oselt	66.7	47.6	232.9	79.2	100.0	8.3	66.7
A/New Caledonia/71/2014	3C2a	E6		75.0	30.0	119.9	45.8	91.7	4.2	50.0
A/New Caledonia/71/2014	3C2a	E6	oselt	70.8	25.2	123.4	33.3	87.5	0.0	50.0
A/New Caledonia/104/2014	3C2a	MDCK1/SIAT3		87.5	38.9	195.8	70.8	100.0	16.7	66.7
A/New Caledonia/104/2014	3C2a	MDCK1/SIAT3	oselt	58.3	15.9	75.5	20.8	79.2	0.0	33.3
A/Brisbane/47/2015	3C2a	E4		62.5	47.6	195.8	79.2	95.8	12.5	58.3
A/Brisbane/47/2015	3C2a	E4 - oselt	oselt	66.7	36.7	151.0	58.3	87.5	8.3	50.0
A/Victoria/511/2015	3C3b	SIAT4	oselt	33.3	30.0	71.3	54.2	95.8	0.0	20.8
A/Victoria/511/2015	3C3b	E3	oselt	79.2	31.7	151.0	45.8	95.8	0.0	54.2
A/South Australia/55/2014	3C3a	E5	oselt	75.0	24.5	169.5	25.0	91.7	0.0	62.5
A/South Australia/21/2015	3C2a	E4	oselt	87.5	33.6	207.5	54.2	87.5	4.2	66.7
A/Brisbane/82/2015	3C2a	E3	oselt	62.5	40.0	179.6	66.7	91.7	4.2	58.3
A/Hong Kong/4801/2014	3C2a	E6	oselt	79.2	30.8	160.0	41.7	91.7	4.2	54.2

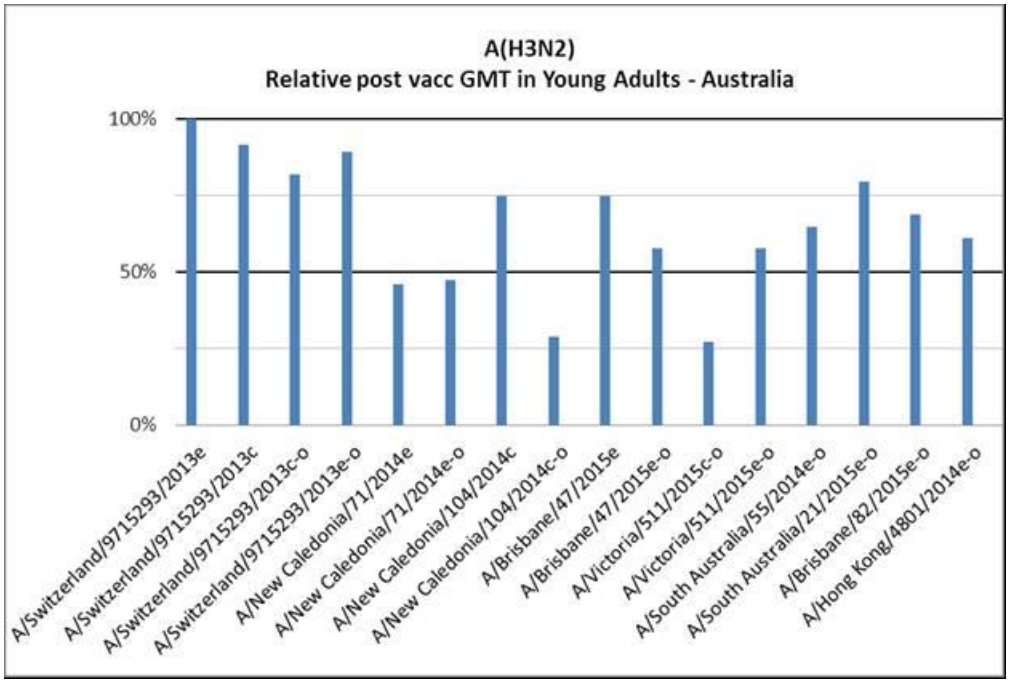
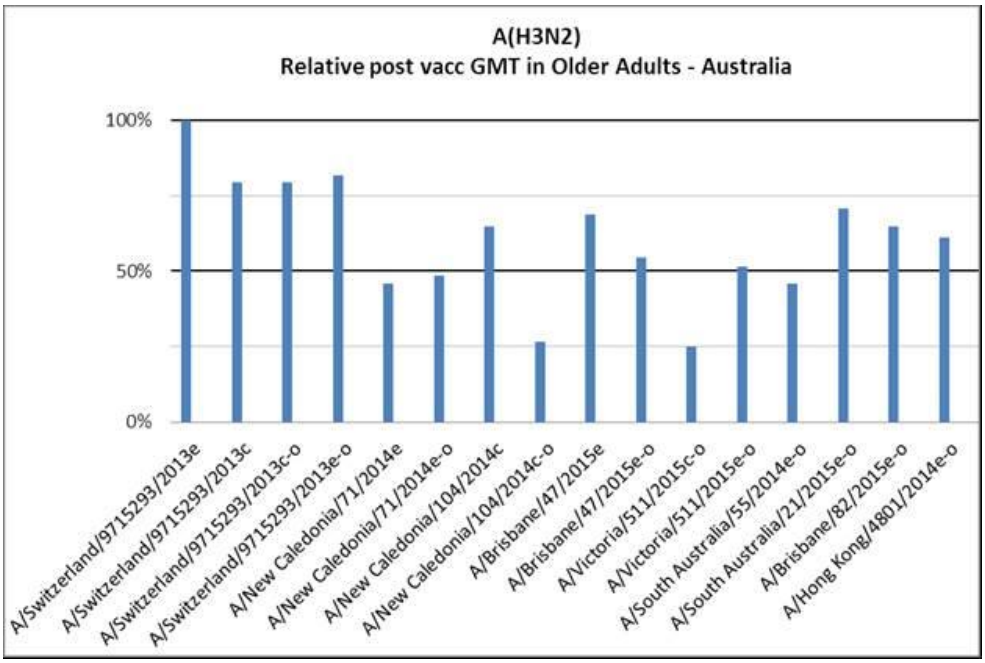


TABLE 4.13

Haemagglutination inhibition antibody titres

Influenza type A(H3N2) viruses – Older Adults (n=24)

Antigen	Clade	Passage History	+/- Oselt	% Rise	GMT		%>/=40		%>/=160	
					Pre	Post	Pre	Post	Pre	Post
A/Switzerland/9715293/2013	3C3a	E5		79.2	51.9	369.7	79.2	100.0	16.7	83.3
A/Switzerland/9715293/2013	3C3a	SIAT1/SIAT7		79.2	46.2	293.4	79.2	100.0	12.5	83.3
A/Switzerland/9715293/2013	3C3a	SIAT1/SIAT7	oselt	83.3	31.7	293.4	58.3	100.0	12.5	79.2
A/Switzerland/9715293/2013	3C3a	E5	oselt	75.0	34.6	302.0	58.3	100.0	8.3	83.3
A/New Caledonia/71/2014	3C2a	E6		83.3	28.3	169.5	41.7	87.5	12.5	70.8
A/New Caledonia/71/2014	3C2a	E6	oselt	83.3	20.6	179.6	25.0	87.5	8.3	75.0
A/New Caledonia/104/2014	3C2a	MDCK1/SIAT3		87.5	30.0	239.7	50.0	95.8	12.5	79.2
A/New Caledonia/104/2014	3C2a	MDCK1/SIAT3	oselt	83.3	14.1	97.9	16.7	87.5	12.5	45.8
A/Brisbane/47/2015	3C2a	E4		83.3	43.6	254.0	70.8	95.8	12.5	79.2
A/Brisbane/47/2015	3C2a	E4 - oselt	oselt	83.3	30.8	201.6	50.0	87.5	12.5	75.0
A/Victoria/511/2015	3C3b	SIAT4	oselt	70.8	19.4	92.4	29.2	87.5	8.3	37.5
A/Victoria/511/2015	3C3b	E3	oselt	83.3	25.2	190.3	33.3	91.7	12.5	75.0
A/South Australia/55/2014	3C3a	E5	oselt	79.2	24.5	169.5	25.0	91.7	0.0	62.5
A/South Australia/21/2015	3C2a	E4	oselt	83.3	30.0	261.4	45.8	87.5	16.7	79.2
A/Brisbane/82/2015	3C2a	E3	oselt	83.3	35.6	239.7	54.2	91.7	16.7	70.8
A/Hong Kong/4801/2014	3C2a	E6	oselt	83.3	30.0	226.3	37.5	87.5	8.3	79.2



APPENDIX 5 - Influenza B

FIGURE 5.1

Antigenic cartographic representation of B/Victoria lineage HI analysis

(coloured dots represent recent viruses)

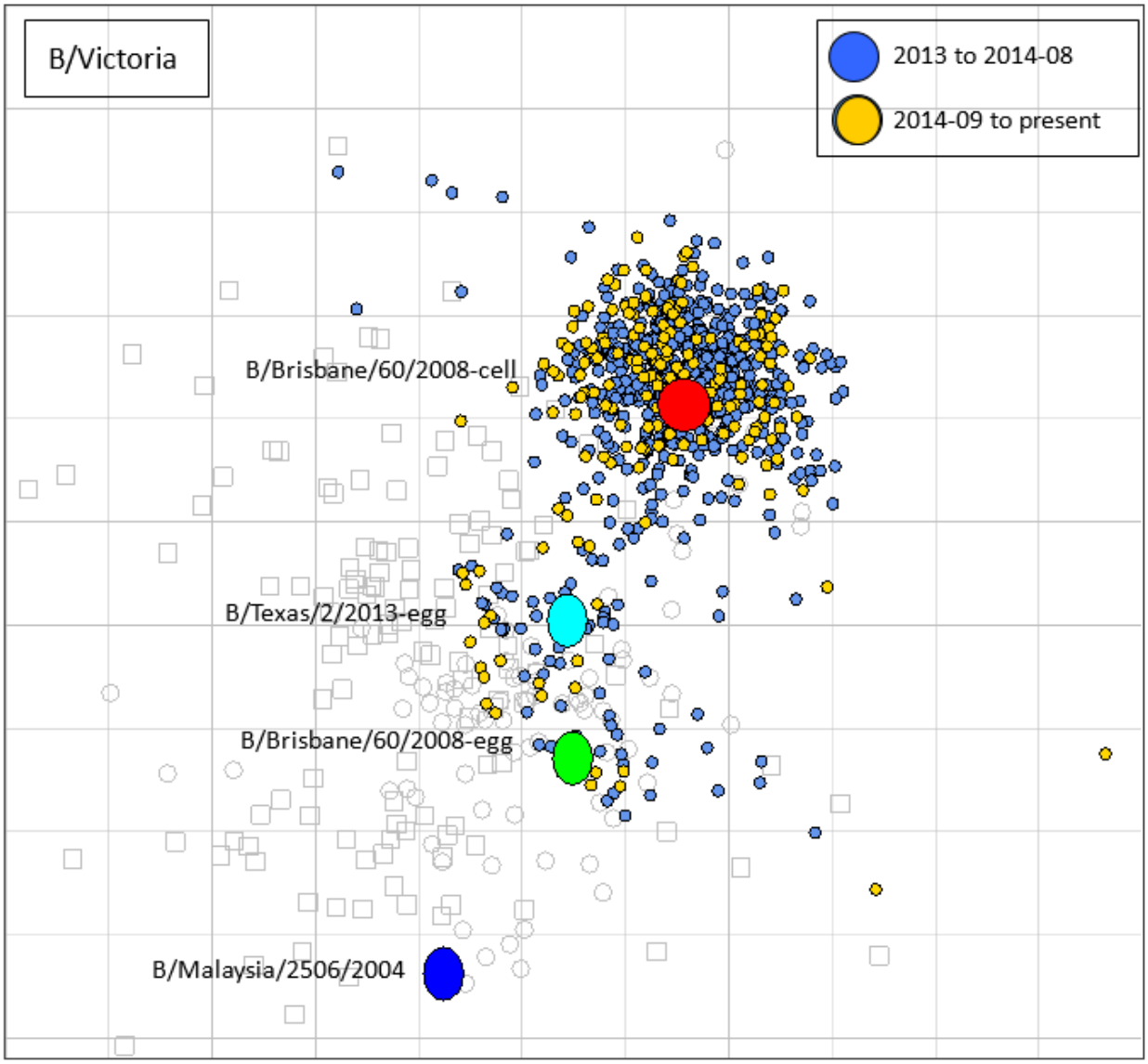


FIGURE 5.2

Antigenic cartographic representation of B/Yamagata HI

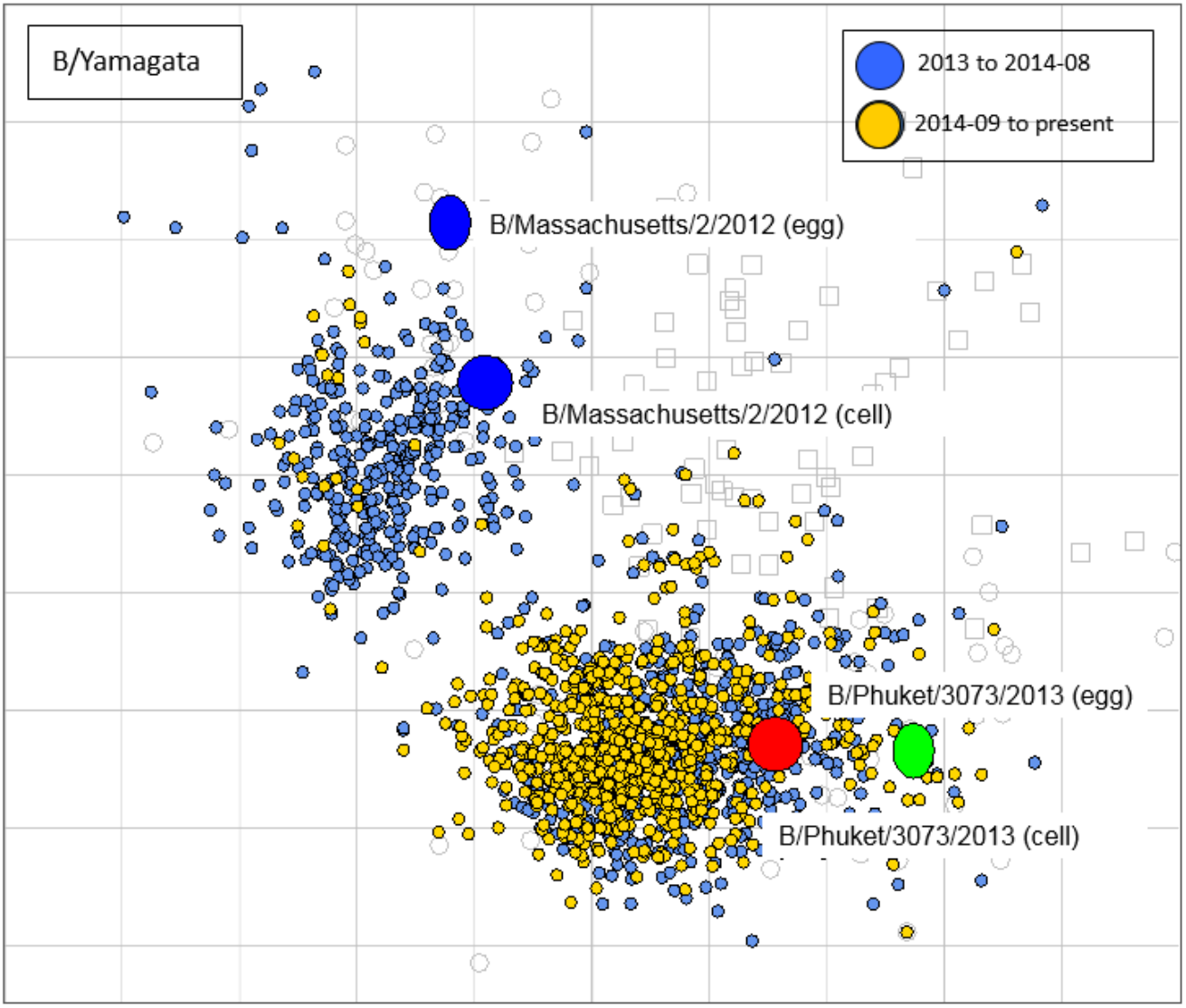


TABLE 5.3: B viruses (B/Victoria lineage) (1)

Haemagglutination Inhibition Assay - WHO Influenza Centre																
Reference Antisera																
	Sequenced		A	B	C	D	E	F	G	H	I	J	K	L		
	September 1, 2015		F1175-21D	F2428-21D	F2256-22D	F2425-21D	F2424-21D	F2650-21D	F2253-22D	F2314-21D	F2315-21D	F2574-21D	F2897-21D	F3228-21D		
			E4	M3	MX,M1	E4	E3	E3	E2	MDCK1	MDCK1	E4	MDCK2	E6	Passage	Sample
	Reference Antigens	**Clade**	**MAL/2506**	**PHIL/6363**	**BRIS/60**	**BRIS/60**	**BRIS/33**	**HK/90**	**SYD/508**	**S.AUS/11**	**DAR/40**	**S.Aus/81**	**BRIS/18**	**TEX/02**	**History**	**Date**
A	B/MALAYSIA/2506/2004	**4**	**640**	640	20	640	320	20	160	20	<20	640	20	640	E5	
B	B/PHILIPPINES/6363/2009		320	**640**	40	640	320	40	320	20	20	640	20	320	MDCK3	
C	B/BRISBANE/60/2008	**1A**	20	20	**320**	160	320	320	160	160	640	640	320	320	MX,M5	
D	B/BRISBANE/60/2008	**1A**	160	160	160	**1280**	1280	160	640	80	320	1280	320	>2560	E6	
E	B/BRISBANE/33/2008	**1A**	160	160	160	640	**1280**	160	640	80	320	640	320	>2560	E5	
F	B/HONG KONG/90/2008	**3**	160	320	160	1280	>2560	**320**	1280	80	320	1280	320	>2560	E5	
G	B/SYDNEY/508/2010	**1B**	160	160	160	640	1280	160	**640**	80	320	640	320	>2560	E3	
H	B/STH AUSTRALIA/11/2012	**1A**	20	40	320	160	320	320	160	**160**	640	640	640	640	MDCK3	
I	B/DARWIN/40/2012	**1A**	<20	20	320	160	320	160	160	160	**640**	640	640	320	MDCK3	
J	B/STH AUSTRALIA/81/2012	**1A**	160	320	160	1280	>2560	160	1280	80	320	**1280**	320	>2560	E5	
K	B/BRISBANE/18/2013	**1A**	20	40	320	320	320	320	160	320	640	1280	**640**	640	MDCK3	
L	B/TEXAS/02/2013		320	320	160	1280	>2560	320	1280	160	320	1280	320	**>2560**	E7	
1	B/WELLINGTON/35/2015		<20	40	640	160	640	320	160	320	640	640	320	320	SX,M1	13/07/2015
2	B/BRISBANE/139/2015		<20	20	320	160	320	160	160	160	640	640	320	320	MDCK2	30/06/2015
3	B/BRISBANE/141/2015		<20	20	320	160	160	160	160	160	320	640	320	320	MDCK2	28/06/2015
4	B/BRISBANE/157/2015		20	20	320	160	320	320	160	160	640	640	320	320	MDCK2	30/06/2015
5	B/SINGAPORE/GP839/2015		<20	40	320	160	320	320	160	160	640	640	640	640	X1,M1	3/06/2015
6	B/VICTORIA/847/2015	**1A**	<20	20	320	160	320	320	160	160	640	640	640	640	MDCK1	3/08/2015
7	B/DARWIN/22/2015	**1A**	<20	20	320	160	320	320	160	160	640	640	320	320	MDCK1	30/07/2015
8	B/TOWNSVILLE/7/2015	**1A**	<20	40	320	160	320	320	160	160	640	640	320	320	MDCK2	6/07/2015
9	B/BRISBANE/180/2015		<20	20	320	160	320	160	160	160	640	640	320	320	MDCK2	9/07/2015
10	B/BRISBANE/191/2015		<20	40	320	160	320	320	160	320	640	640	320	320	MDCK2	14/07/2015
11	B/BRISBANE/171/2015		<20	20	320	160	320	160	160	160	640	640	320	320	MDCK2	6/07/2015
12	B/WELLINGTON/14/2015	**1A**	20	40	320	160	320	320	160	320	640	640	640	320	MX,M1	15/07/2015
13	B/STH AUCKLAND/10/2015		20	40	320	160	320	320	160	320	640	640	640	320	MX,M1	28/06/2015

14	B/STH AUCKLAND/11/2015		20	40	320	160	320	320	160	320	640	640	640	320	MX,M1	28/06/2015
15	B/STH AUCKLAND/12/2015		<20	20	320	160	320	160	160	160	640	640	320	320	MX,M1	24/06/2015
16	B/STH AUCKLAND/16/2015	**1A**	20	20	320	160	320	320	160	160	640	640	320	320	MX,M1	15/06/2015
17	B/WELLINGTON/25/2015		<20	40	320	160	320	320	160	320	640	640	320	640	SX,M1	1/07/2015
18	B/CHRISTCHURCH/10/2015		<20	20	320	160	320	320	160	160	640	640	320	320	MX,M1	3/07/2015
19	B/WELLINGTON/34/2015		<20	40	320	320	640	320	160	320	640	640	640	640	SX,M1	16/07/2015
20	B/WELLINGTON/36/2015	**1A**	<20	40	320	160	320	320	160	160	640	640	320	320	MX,M1	17/07/2015
21	B/DUNEDIN/1/2015	**1A**	20	40	320	160	320	320	160	320	640	640	640	640	MX,M1	15/07/2015
22	B/BRISBANE/137/2015		<20	40	160	80	160	160	80	80	160	320	160	160	MDCK2	25/06/2015
23	B/BRISBANE/149/2015		<20	<20	160	80	160	160	80	80	320	320	160	160	MDCK3	22/06/2015
24	B/BRISBANE/159/2015		40	80	160	640	640	160	640	80	320	640	320	640	MDCK3	23/06/2015
25	B/SINGAPORE/GP895/2015	**1A**	<20	20	160	160	160	160	160	160	640	320	320	320	X2,M1	8/06/2015
26	B/VICTORIA/832/2015		<20	20	160	160	160	160	80	160	640	640	320	320	MDCK1	24/07/2015
27	B/VICTORIA/843/2015	**1A**	<20	20	160	160	160	160	80	160	320	640	320	320	MDCK1	31/07/2015
28	B/VICTORIA/861/2015	**1A**	<20	20	160	160	160	160	80	160	320	320	320	320	MDCK1	11/08/2015
29	B/BRISBANE/169/2015		<20	20	160	80	160	80	80	80	320	320	160	160	MDCK2	5/07/2015
30	B/TOWNSVILLE/9/2015		<20	20	160	80	160	160	80	160	320	640	320	320	MDCK2	11/07/2015
31	B/BRISBANE/184/2015		<20	20	160	80	160	80	80	80	160	320	160	160	MDCK2	11/07/2015
32	B/BRISBANE/185/2015	**1A**	<20	20	160	80	160	160	80	160	320	320	320	320	MDCK2	14/07/2015
33	B/BRISBANE/186/2015	**1A**	40	80	160	640	1280	160	640	80	320	640	160	1280	MDCK2	13/07/2015
34	B/SINGAPORE/GP895/2015	**1A**	320	160	80	640	640	80	320	40	160	640	160	>2560	E3	8/06/2015

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

Haemagglutination Inhibition Assay - WHO Influenza Centre																
Reference Antisera																
	Sequenced		A	B	C	D	E	F	G	H	I	J	K	L		
	July 24,10,2; May 29; Apr 30; Mar 19, 2015		F1175-21D	F2428-21D	F2256-22D	F2425-21D	F2424-21D	F2650-21D	F2253-22D	F2314-21D	F2315-21D	F2574-21D	F2897-21D	F3228-21D		
			E4	MDCK3	MX,M1	E4	E3	E3	E2	MDCK1	MDCK1	E4	MDCK2	E6	Passage	Date
	Reference Antigens	**Clade**	**MAL/2506**	**PHIL/6363**	**BRIS/60**	**BRIS/60**	**BRIS/33**	**HK/90**	**SYD/508**	**S.AUS/11**	**DAR/40**	**S.AUS/81**	**BRIS/18**	**TEXAS/2**	**History**	
A	B/MALAYSIA/2506/2004	**4**	**1280**	640	40	1280	640	40	320	20	20	1280	40	640	E5	
B	B/PHILIPPINES/6363/2009		640	**1280**	80	640	320	80	640	40	40	1280	80	640	MDCK3	
C	B/BRISBANE/60/2008	**1A**	40	20	**640**	640	640	640	640	640	1280	>2560	1280	1280	MX,M5	
D	B/BRISBANE/60/2008	**1A**	320	320	320	**>2560**	>2560	320	>2560	160	320	>2560	640	>2560	E6	
E	B/BRISBANE/33/2008	**1A**	320	320	320	>2560	**>2560**	320	>2560	160	640	>2560	640	>2560	E5	
F	B/HONG KONG/90/2008	**3**	320	640	320	>2560	>2560	**640**	>2560	160	320	>2560	640	>2560	E5	
G	B/SYDNEY/508/2010	**1B**	320	320	320	>2560	>2560	640	**>2560**	160	320	>2560	640	>2560	E3	
H	B/STH AUSTRALIA/11/2012	**1A**	20	40	320	320	320	320	320	**320**	640	1280	640	640	MDCK3	
I	B/DARWIN/40/2012	**1A**	20	40	320	320	320	640	160	320	**640**	1280	640	640	MDCK3	
J	B/STH AUSTRALIA/81/2012	**1A**	160	320	160	1280	>2560	320	1280	160	320	**>2560**	320	>2560	E5	
K	B/BRISBANE/18/2013	**1A**	40	40	640	320	640	640	320	640	1280	>2560	**1280**	1280	MDCK3	

L	B/TEXAS/02/2013		320	320	320	>2560	>2560	320	>2560	320	640	>2560	640	**>2560**	E7	
1	B/STH AUSTRALIA/79/2015		40	40	640	320	320	640	320	320	640	1280	640	640	MDCK1	5/07/2015
2	B/STH AUSTRALIA/1015/2015	**1A**	20	40	640	320	640	640	320	320	1280	1280	640	640	MDCK1	2/07/2015
3	B/NEWCASTLE/18/2015		20	40	640	320	640	640	320	320	1280	1280	640	640	mdck1	21/06/2015
4	B/NEWCASTLE/1005/2015	**1A**	20	40	640	320	640	640	320	320	640	1280	640	1280	MDCK1	30/06/2015
5	B/TASMANIA/5/2015	**1A**	40	80	640	320	640	640	320	320	640	1280	640	1280	MDCK1	29/06/2015
6	B/TASMANIA/6/2015		40	40	640	320	640	640	320	320	1280	>2560	1280	1280	mdck1	7/07/2015
7	B/DARWIN/15/2015		20	40	640	320	320	640	320	320	640	1280	640	640	MDCK1	2/07/2015
8	B/SOUTH AUSTRALIA/75/2015		20	40	640	320	320	640	320	320	640	1280	640	640	MDCK1	26/06/2015
9	B/SOUTH AUSTRALIA/78/2015		40	40	640	320	640	640	320	320	640	1280	1280	640	MDCK1	2/07/2015
10	B/BRISBANE/117/2015		40	20	640	320	640	640	320	320	640	1280	640	640	MDCK2	16/06/2015
11	B/BRISBANE/124/2015		40	40	640	320	640	640	320	320	640	1280	640	640	MDCK2	19/06/2015
12	B/BRISBANE/125/2015		20	20	640	320	640	640	320	320	640	1280	640	640	MDCK2	22/06/2015
13	B/BRISBANE/128/2015		40	20	640	320	640	640	320	320	1280	1280	640	640	S1,M1	22/06/2015
14	B/TASMANIA/2/2015	**1A**	<20	20	320	160	320	320	160	160	320	640	640	320	MDCK1	15/06/2015
15	B/BRISBANE/104/2015		<20	<20	320	80	160	320	80	160	320	640	320	320	MDCK2	10/06/2015
16	B/NONTHABURI/8/2015		20	40	320	160	320	320	160	320	640	1280	640	320	mdck4	2/03/2015
17	B/NEWCASTLE/7/2015		20	40	320	160	320	320	160	160	640	640	640	320	MDCK1	31/05/2015

18	B/STH AUSTRALIA/49/2015	**1A**	20	40	320	160	320	320	160	160	640	640	640	320	MDCK1	4/06/2015
19	B/WELLINGTON/3/2015	**1A**	<20	20	320	160	320	320	160	160	640	640	320	320	MX, M1	20/05/2015
20	B/PERTH/24/2015	**1A**	<20	20	320	160	320	320	160	320	640	1280	640	320	MX,M1	28/05/2015
21	B/BRISBANE/55/2015	**1A**	20	20	320	160	320	320	160	160	320	640	320	320	MDCK2	8/05/2015
22	B/VICTORIA/805/2015		20	20	320	160	320	320	320	320	640	1280	640	640	MDCK1	7/07/2015
23	B/LOPBURI/2/2015		<20	40	320	160	320	320	160	320	640	1280	640	640	mdck3	10/02/2015
24	B/BANKGKOK/22/2015	**1A**	80	80	320	640	1280	320	320	160	640	1280	640	1280	mdck1	27/04/2015
25	B/DARWIN/17/2015	**1A**	320	320	320	>2560	>2560	320	1280	160	640	>2560	640	>2560	mdck1	7/07/2015
26	B/NEW CALEDONIA/27/2015	**1A**	320	320	320	1280	>2560	320	1280	160	320	>2560	640	>2560	E3	23/04/2015
27	B/BRISBANE/46/2015	**1A**	320	160	320	1280	1280	320	640	160	320	1280	320	>2560	E4	28/04/2015
28	B/BRISBANE/73/2015	**1A**	<20	20	160	80	160	80	40	80	80	160	80	80	MDCK2	25/05/2015
29	B/SYDNEY/11/2015	**1A**	<20	20	160	80	160	160	160	80	320	320	320	320	MX,M1	1/06/2015
30	B/DARWIN/14/2015	**1A**	<20	<20	160	80	160	320	80	80	320	320	320	320	MDCK1	28/06/2015
31	B/BRISBANE/107/2015		<20	<20	160	80	160	160	80	160	320	320	320	320	MDCK2	12/06/2015
32	B/PERTH/25/2015	**1A**	<20	20	80	160	80	320	160	80	160	320	80	160	MX,M1	28/05/2015

FIGURE 5.4 Phylogenetic relationships among influenza B HA genes

B/Victoria Lineage

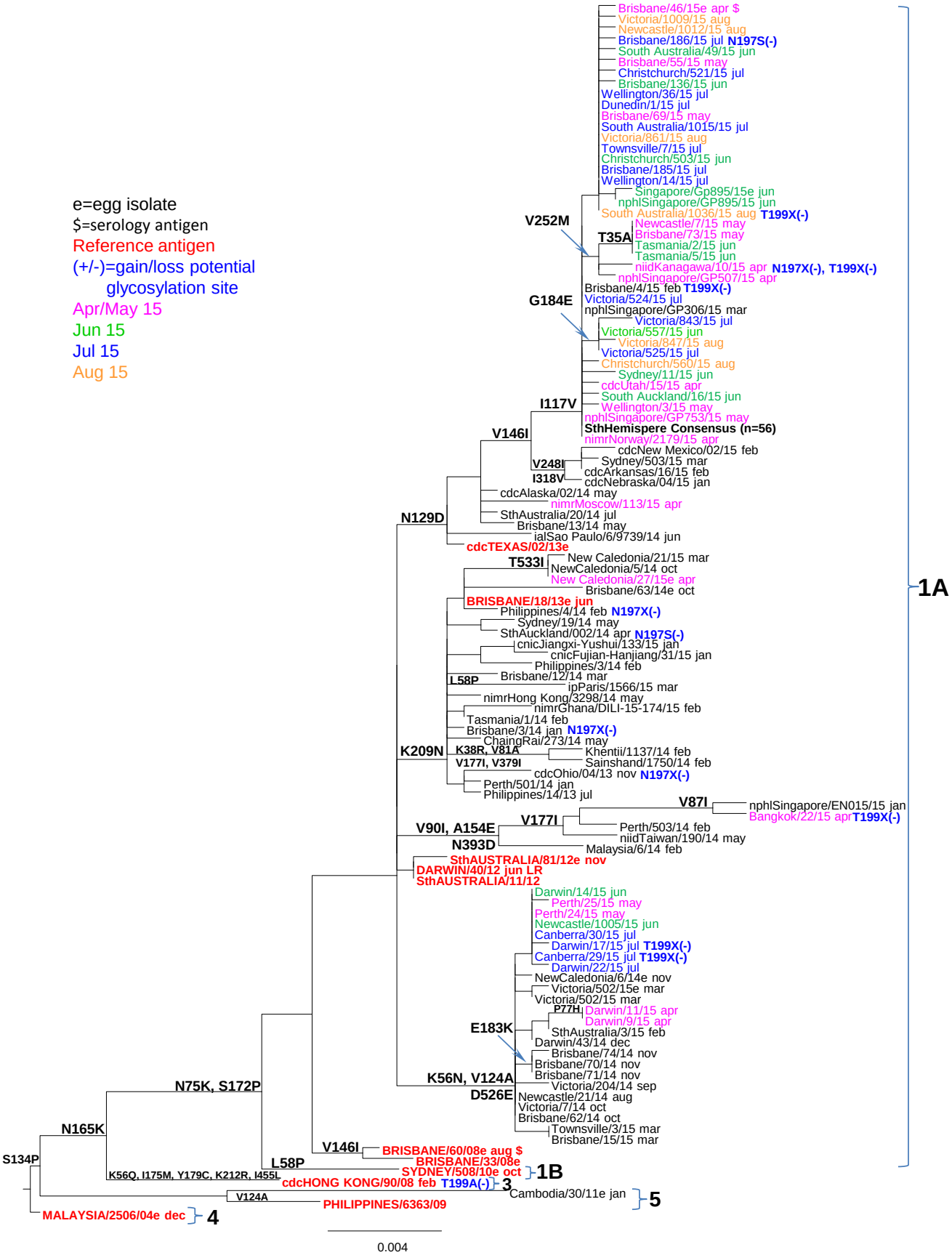


FIGURE 5.5 Phylogenetic relationships among influenza B neuraminidase genes

B/Victoria Lineage

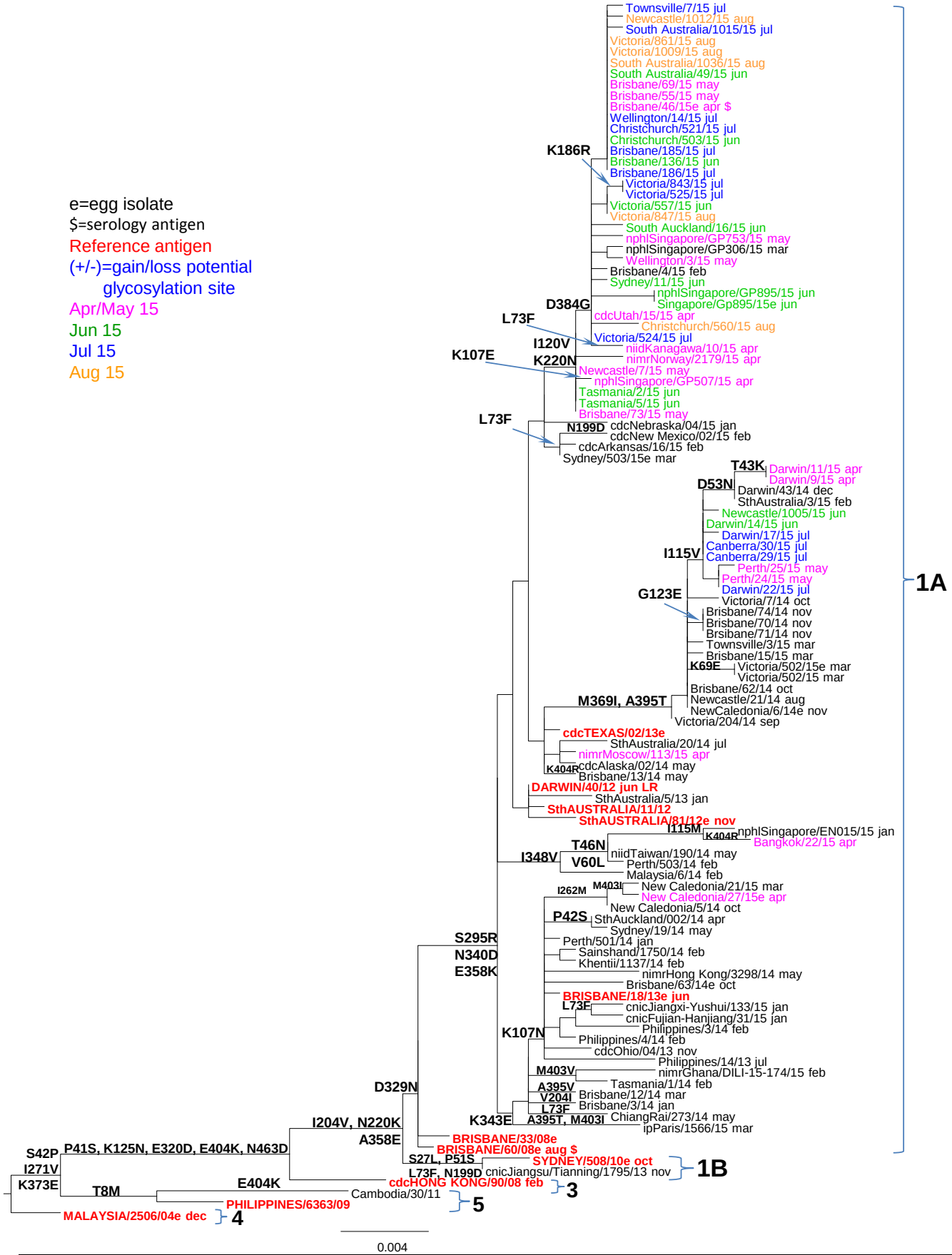


FIGURE 5.6 Phylogenetic relationships among influenza B HA genes
B/Yamagata Lineage

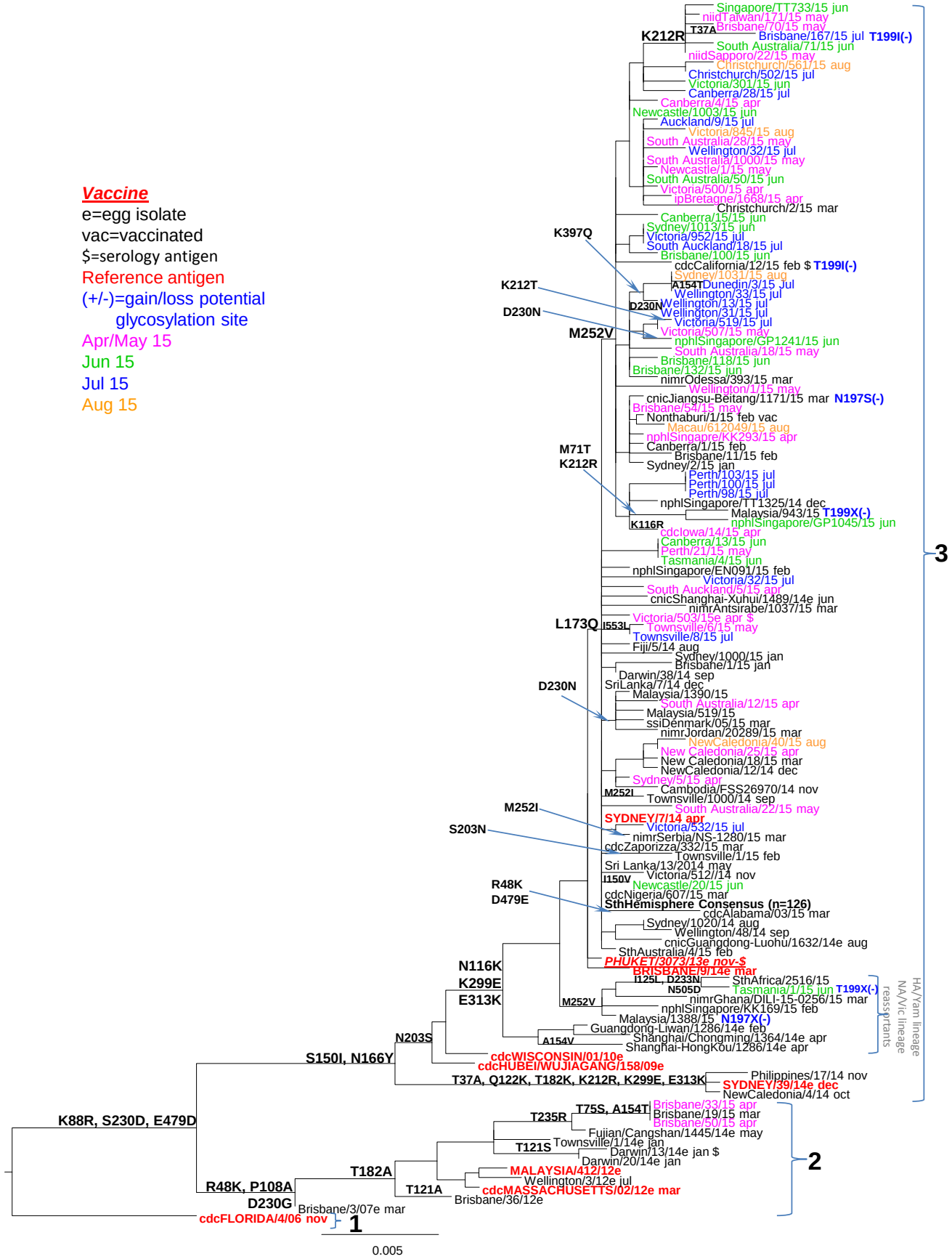


FIGURE 5.7 Phylogenetic relationships among influenza B neuraminidase genes B/Yamagata Lineage

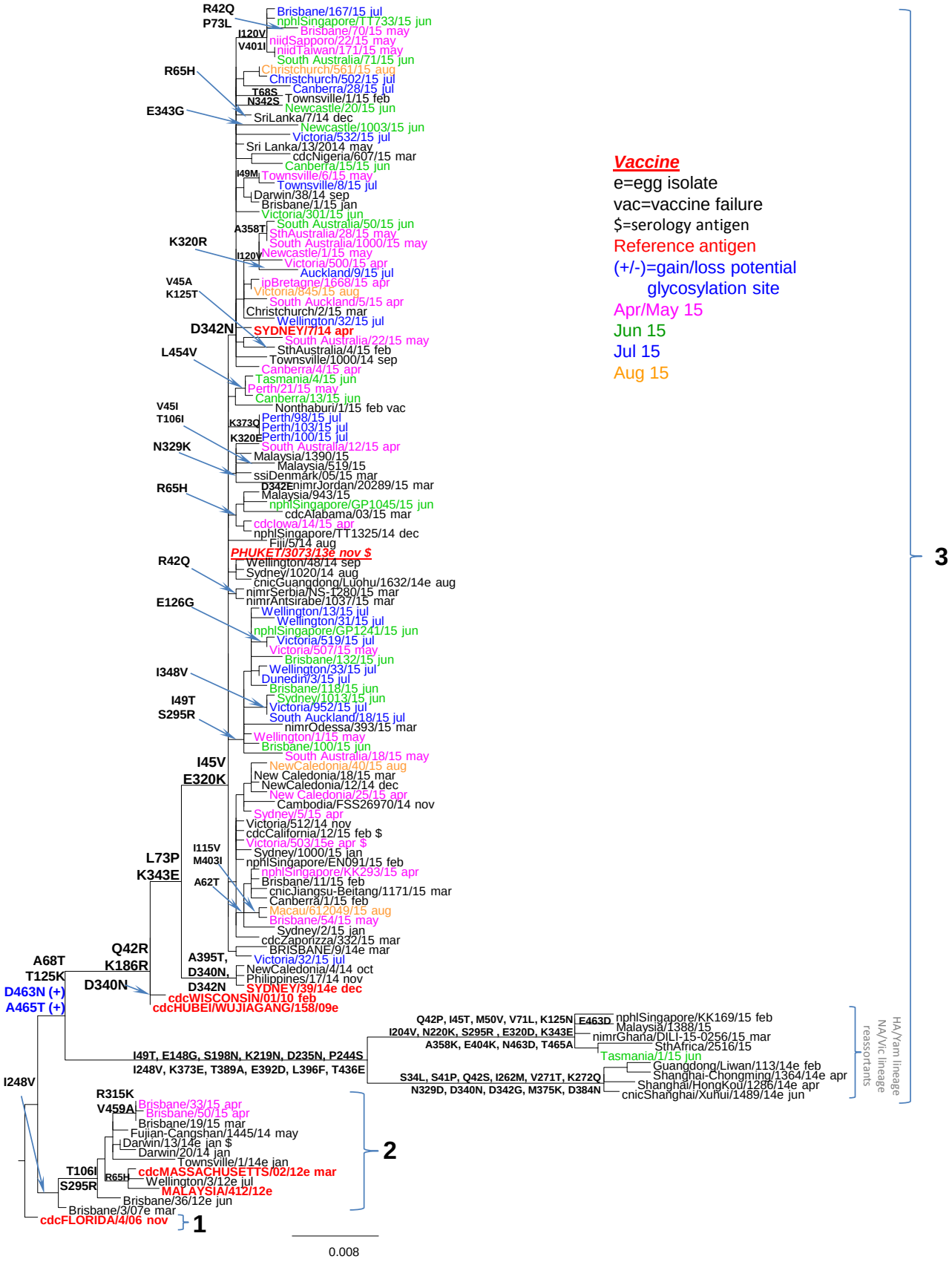


TABLE 5.9 Haemagglutination inhibition antibody titres

Influenza type B Victoria vaccine component – Young Adults (n=24)

Antigen	Clade	Passage History	% Rise	GMT		%>/=40		%>/=160	
				Pre	Post	Pre	Post	Pre	Post
B/Brisbane/60/2008	1A	E6	12.5	15.0	21.8	37.5	45.8	4.2	12.5
B/Texas/02/2013	1A	E7	16.7	21.2	35.6	45.8	54.2	12.5	20.8
B/Brisbane/46/2015	1A	E4	20.8	41.2	82.3	66.7	83.3	33.3	50.0

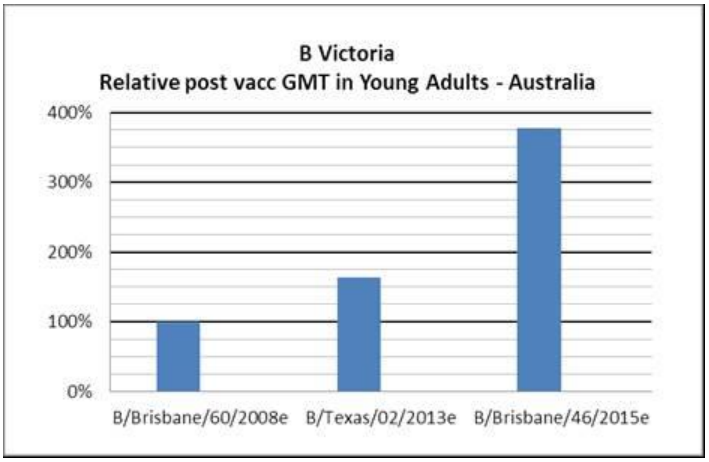


TABLE 5.10 Haemagglutination inhibition antibody titres

Influenza type B Victoria vaccine component – Older Adults (n=24)

Antigen	Clade	Passage History	% Rise	GMT		%>/=40		%>/=160	
				Pre	Post	Pre	Post	Pre	Post
B/Brisbane/60/2008	1A	E6	12.5	8.9	13.0	12.5	25.0	4.2	4.2
B/Texas/02/2013	1A	E7	25.0	10.3	18.3	20.8	37.5	8.3	12.5
B/Brisbane/46/2015	1A	E4	37.5	17.3	34.6	33.3	58.3	12.5	29.2

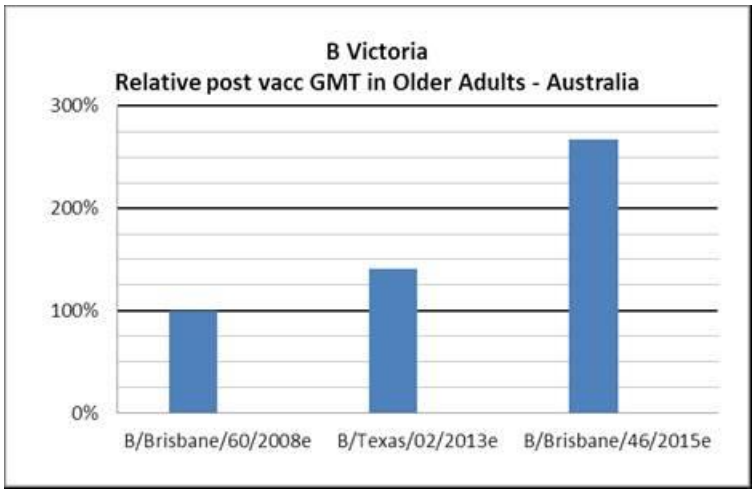


TABLE 5.11 Haemagglutination inhibition antibody titres

Influenza type B Yamagata vaccine component – Young Adults (n=24)

Antigen	Clade	Passage History	% Rise	GMT		%>/=40		%>/=160	
				Pre	Post	Pre	Post	Pre	Post
B/Phuket/3073/2013	3	E1/E4	62.5	27.5	109.9	50.0	87.5	8.3	45.8
B/Phuket/3073/2013	3	MDCK2	50.0	11.6	41.2	25.0	58.3	4.2	37.5
B/Darwin/13/2014	2	E4	45.8	127.0	380.5	91.7	100.0	58.3	87.5
B/Victoria/503/2015	3	MDCK2	45.8	18.9	49.0	41.7	66.7	4.2	33.3
B/Victoria/503/2015	3	E2	62.5	21.8	77.7	45.8	79.2	8.3	37.5

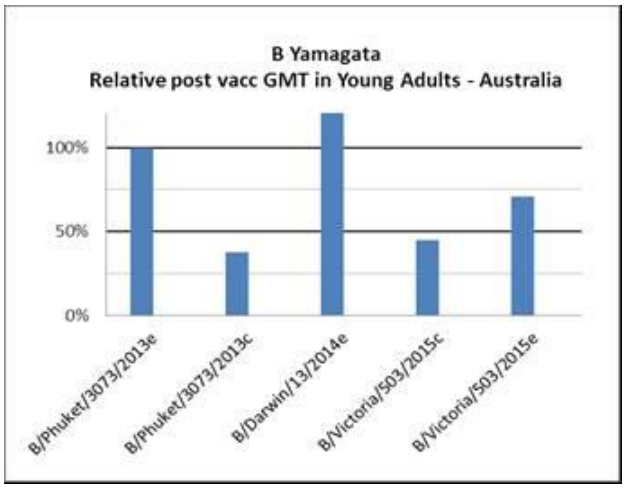
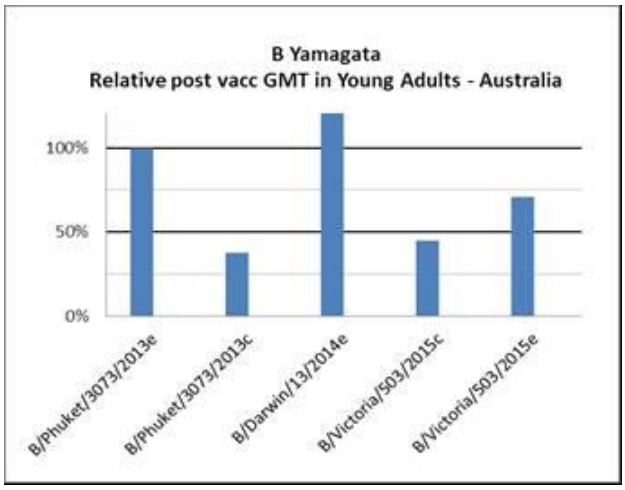


TABLE 5.12 Haemagglutination inhibition antibody titres

Influenza type B Yamagata vaccine component – Older Adults (n=24)

Antigen	Clade	Passage History	% Rise	GMT		%>/=40		%>/=160	
				Pre	Post	Pre	Post	Pre	Post
B/Phuket/3073/2013	3	E1/E4	58.3	12.6	49.0	33.3	79.2	0.0	12.5
B/Phuket/3073/2013	3	MDCK2	54.2	6.5	20.0	4.2	41.7	0.0	0.0
B/Darwin/13/2014	2	E4	50.0	61.7	174.5	75.0	100.0	37.5	66.7
B/Victoria/503/2015	3	MDCK2	66.7	7.5	27.5	8.3	62.5	0.0	4.2
B/Victoria/503/2015	3	E2	66.7	11.6	55.0	16.7	75.0	0.0	29.2



APPENDIX 6 - WHO Recommendation for Influenza Vaccines

World Health Organization
Organisation mondiale de la Santé

Weekly epidemiological record
Relevé épidémiologique hebdomadaire

9 OCTOBER 2015, 90th YEAR / 9 OCTOBRE 2015, 90e ANNÉE
No. 41, **2015**, **90**, 545–560
http://www.who.int/wer

Contents

Sommaire

WORLD HEALTH ORGANIZATION
Geneva

ORGANISATION MONDIALE DE LA SANTÉ
Genève

Annual subscription / Abonnement annuel
Sw. fr. / Fr. s. 346.–

10.2015
ISSN 0049-8114
Printed in Switzerland

Recommended composition of influenza virus vaccines for use in the 2016 southern hemisphere influenza season

September 2015

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 (2016). A recommendation will be made in February 2016 relating to vaccines that will be used for the influenza season in the northern hemisphere (2016–2017). For countries in equatorial regions, epidemiological considerations influence which recommendation (February or September) individual national and regional authorities consider appropriate.

Seasonal influenza activity, February 2015 – September 2015

Between February 2015 and September 2015, influenza activity was reported in Africa, the Americas, Asia, Europe and Oceania. Activity varied from sporadic to widespread and was associated with the circulation of influenza A(H1N1)pdm09, A(H3N2) and 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 several 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/; accessed September 2015.

[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; accessed September 2015.

Composition recommandée des vaccins antigrippaux devant être utilisés pendant la saison grippale 2016 dans l'hémisphère Sud

Septembre 2015

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 la saison grippale 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 (2016). Une recommandation concernant les vaccins devant servir pendant la saison grippale dans l'hémisphère Nord (2016-2017) sera émise en février 2016. Pour les pays des régions équatoriales, les autorités nationales et régionales s'appuieront sur des considérations d'ordre épidémiologique pour déterminer, cas par cas, la recommandation qu'il convient d'appliquer (février ou septembre).

Activité de la grippe saisonnière, février-septembre 2015

De février à septembre 2015, une activité grippale a été signalée en Afrique, dans les Amériques, en Asie, en Europe et en Océanie. Cette activité est passée de sporadique à étendue. Elle était associée à 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, plusieurs pays faisant cependant exception à cette tendance. Dans l'hémisphère Sud, l'activité est restée faible de février à mai, un certain nombre de pays signalant ensuite une activité modérée à forte.

[1] Voir http://www.who.int/influenza/vaccines/virus/en/; consulté en septembre 2015.

[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; consulté en septembre 2015.

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 Africa between February and April. Widespread outbreaks occurred in the Indian subcontinent between February and July. Sporadic activity was reported in North America. Activity decreased from May until September in the northern hemisphere. In Central and South America, activity was low in general with the exception of Cuba which reported regional outbreaks in August. In Africa, widespread A(H1N1)pdm09 activity occurred in South Africa from May to July. Sporadic A(H1N1)pdm09 activity was reported in Australia and New Zealand.

Influenza A(H3N2) activity was generally moderate to high in the Americas, Asia, Europe and Oceania. In the Americas, widespread outbreaks were reported by the United States of America in February while widespread and regional outbreaks occurred in some central and South American countries such as Brazil, Ecuador, El Salvador and Paraguay from May or June onwards.

In Asia, regional and widespread outbreaks were reported in February and March by Japan, and in March by Israel. Regional outbreaks were reported in June by Hong Kong Special Administrative Region of China, in June and July by Cambodia, and in July and August by China. In the European region, many countries reported regional or widespread outbreaks of A(H3N2) in February and March with co-circulation of A(H1N1)pdm09 and influenza B. Activity was low in Africa with the exception of Madagascar which reported regional outbreaks in February and March. Activity was high in Australia and moderate in New Zealand.

Influenza B activity was generally variable in Africa, the Americas, Asia, Europe and Oceania. Moderate to high activity was reported by many European countries between February and April. In Asia, widespread outbreaks occurred in Kazakhstan in February and in Georgia in February and March. Regional outbreaks occurred in China in February and March and in Japan from February to April.

In Africa, the Democratic Republic of the Congo and Madagascar reported regional outbreaks in February to April, and February and March, respectively. Activity was low in the rest of Africa. Regional and widespread outbreaks were reported by the United States of America from February to March. In South America, regional influenza B outbreaks were reported in Paraguay in August but in general activity was low in other countries. In Oceania, regional and widespread outbreaks occurred in Australia from June onwards, and in New Zealand from July to September.

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

Zoonotic influenza infections caused by A(H5), A(H7N9), A(H9N2), A(H1N1)v and A(H3N2)v viruses

From 24 February 2015 to 21 September 2015, one human infection with an A(H5N6) virus was reported

Grippe 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 étendue sont apparues en Asie, en Europe et en Afrique du Nord entre février et avril. Des flambées étendues sont survenues sur le sous-continent indien de février à juillet. Une activité sporadique a été signalée en Amérique du Nord. L'activité grippale a diminué de mai à septembre dans l'hémisphère Nord. En Amérique centrale et en Amérique du Sud, elle a été faible en général, sauf à Cuba, qui a notifié des flambées régionales au mois d'août. En Afrique, une activité étendue de la grippe A(H1N1)pdm09 a touché l'Afrique du Sud de mai à juillet. La grippe A(H1N1)pdm09 a aussi produit une activité sporadique en Australie et en Nouvelle-Zélande.

Grippe A(H3N2). L'activité de la grippe A(H3N2) a généralement été modérée à forte dans les Amériques, en Asie, en Europe et en Océanie. Dans les Amériques, des flambées étendues ont été signalées par les États-Unis d'Amérique en février, tandis que certains pays d'Amérique centrale et d'Amérique du Sud tels que le Brésil, l'Équateur, El Salvador et le Paraguay subissaient des flambées d'ampleur étendue ou régionale de mai à juin.

En Asie, des flambées étendues ou régionales ont été notifiées en février et mars au Japon et en mars en Israël. Des flambées régionales ont été signalées en juin par la Région administrative spéciale de Hong Kong de la République populaire de Chine, en juin et juillet par le Cambodge et en juillet et en août par la Chine. Dans la Région européenne, de nombreux pays ont notifié des flambées régionales ou étendues de grippe A(H3N2) en février et mars, avec une co-circulation des grippes A(H1N1)pdm09 et B. L'activité a été faible en Afrique, sauf à Madagascar, où des flambées régionales ont été notifiées en février et mars. Elle a aussi été forte en Australie et modérée en Nouvelle-Zélande.

Grippe B. L'activité a été généralement variable en Afrique, dans les Amériques, en Asie, en Europe et en Océanie. Une activité modérée à forte a été signalée par de nombreux pays européens entre février et avril. En Asie, des flambées étendues ont touché le Kazakhstan en février et la Géorgie en février et mars. Des flambées régionales sont survenues en Chine en février et en mars et au Japon de février à avril.

En Afrique, la République démocratique du Congo a rapporté des flambées régionales de février à avril et Madagascar pendant les mois de février et d'avril. L'activité a été faible dans le reste de l'Afrique. Des flambées régionales ou étendues ont été notifiées par les États-Unis d'Amérique de février à mars. En Amérique du Sud, des flambées régionales de grippe B ont été signalées au Paraguay en août, mais l'activité est restée faible en général dans les autres pays. En Océanie, des flambées d'ampleur étendue ou régionale se sont produites en Australie à partir du mois de juin et en Nouvelle-Zélande de juillet à septembre.

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), A(H9N2), A(H1N1)v et A(H3N2)v

Du 24 février 2015 au 21 septembre 2015, une infection humaine par un virus A(H5N6) a été notifiée par la Chine et 69 cas

Table 1 **Extent and type of influenza activity worldwide, February – September 2015**
Tableau 1 **Etendue et type d'activité grippale saisonnière dans le monde, février-septembre 2015**

Country, area or territory by geographical region– Pays, région ou territoire par région géographique	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, ●B	●●H1(pdm09), ●H3, ●B	●H1(pdm09)	0	0	0	0
Burkina Faso	0	●B	●B	●H1(pdm09), ●B	●H1(pdm09), ●B	●H3, ● B	●B	
Cameroon – Cameroun	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●B	●H1(pdm09), ●H3	●H1(pdm09), ●H3, ●B
Côte d'Ivoire	●H3	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B
Democratic Republic of the Congo – République démocratique du Congo	●●●H3, ●●●B	●●H3, ●●●B	●●H1(pdm09), ●●●B					
Egypt – Egypte	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	0	0	0	0	●H1(pdm09), ●B
Ghana	●H1(pdm09), ●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
Madagascar	●●●H3, ●●●B	●●●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
Mauritius – Maurice		●H1(pdm09), ●H3	●H3, ●B	●B	●H1(pdm09)			
Morocco – Maroc	●●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3	●H1(pdm09), ●H3	0	0	0	0	
Mozambique	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●H1(pdm09), ●H3	●H3, ●B	●H1(pdm09), ●B	●H1(pdm09), ●B	●H1(pdm09)	●H1(pdm09)
Nigeria – Nigéria	●H1(pdm09), ●H3, ●B	●B	H3, B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	
Rwanda	0	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3	●H1(pdm09), ●H3,	●H1(pdm09), ●H3,	●H1(pdm09), ●H3, ●B	0	
Senegal – Sénégal	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●B	●H1(pdm09), ●B	●B	0	
South Africa – Afrique du Sud	●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
Tunisia – Tunisie	●●●●H1(pdm09), ●H3, ●B	●●●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3, ●B	●H1(pdm09), ●H3	0	0	0	
United Republic of Tanzania – République-Unie de Tanzanie	●H3	●H3, ●B	0	●H3, ●B	●H3, ●B	●H3	●H3	
Zambia – Zambie	●H3, ●B	●H3, ●B	●H3, ●B	●H1(pdm09)	●H1(pdm09), ●B	●H1(pdm09)	●A, ●B	
Americas – Amériques								
Argentina – Argentine	●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
Barbados – Barbades	●H3,	●B	0	0	0	0	0	
Bolivia (Plurinational State of) – Bolivie (Etat plurinational de)	0	●B	●H3, ●B	●H3, ●B	●H3, ●B	●H3, ●B	●H1(pdm09), ●H3, ●B	●H3, ●B
Brazil – Brésil	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●●H3, ●B	●H1(pdm09), ●●●●H3, ●B	●H1(pdm09), ●●●●H3, ●B	●H1(pdm09), ●●●●H3, ●B	●H1(pdm09), ●●●●H3, ●●B	●H1(pdm09), ●●●●H3, ●●B

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

Country, area or territory by geographical region– Pays, région ou territoire par région géographique	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
Canada	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B	•H3, •B		
Chile – Chili	•H1(pdm09), •H3, •B	•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
Colombia – Colombie	•H1(pdm09), •H3, •B	•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
Costa Rica	•H3	•H3	0	0	0	•H3		
Cuba	•H1(pdm09), •H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H3	•H1(pdm09), •B	••H1(pdm09), •B	•••H1(pdm09)	••H1(pdm09), •B
Dominica – Dominique	•H1(pdm09)	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	0	0	0	0	
Dominican Republic – République dominicaine	•H1(pdm09),	•H1(pdm09),	•H1(pdm09),	•H1(pdm09), •B	•H1(pdm09)	•H1(pdm09)	•H1(pdm09), •B	•H1(pdm09), •B
Ecuador – Equateur	••H1(pdm09), •••H3	•H1(pdm09), •H3	•H3, •B,	•••H3	•••H3	•••H3,	•••H3, ••B	
El Salvador	•H3	•H1(pdm09), •H3	••H1(pdm09)	•H1(pdm09), •H3, •B	•H1(pdm09), •••H3, •B	•H1(pdm09), •••H3	••H3	
France, French Guiana – Guyane française, France	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H3, •B	
France, Guadeloupe	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B	0	0	0	0	
France, Martinique	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	0	0	0		
Guatemala	•H3	•H3	•H3	•H3	•H3	•H3		
Honduras	0	0	0	•B	0	0	0	
Jamaica – Jamaïque	•H3, •B	•H3	•B	•H3	0	0		
Mexico – Mexique	••H1(pdm09), ••H3, •B	••H1(pdm09), •H3, ••B	••H3, ••B	••H3, ••B	••H3, •B	••H3	•H3	•H3
Nicaragua	0	0	0	0	0	0	0	
Panama	0	0	0	0	0	•H3	•H3	•H3
Paraguay	•B	•H1(pdm09), •B	•B	•H1(pdm09), ••H3, •B	•••H1(pdm09), ••••H3, •B	•••H1(pdm09), ••••H3, •B	••H1(pdm09), ••H3, •••B	•H1(pdm09), •H3, •B
Peru – Pérou	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09), •H3, B	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, ••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3
Saint Vincent and the Grenadines – Saint-Vincent-et-les-Grenadines	•H3	0	0	0	0	0	0	
Trinidad and Tobago – Trinité-et-Tobago	0	•H1(pdm09)	0	0	0	0	0	
Bermuda – Bermudes	0	•H3	0	0	0	0	0	
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						•H3	••H3, ••B	•H3, •B

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

Country, area or territory by geographical region– Pays, région ou territoire par région géographique	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
Venezuela (Bolivarian Republic of) – Venezuela (République bolivarienne du)	•B	•H3	•H3	•H3	0	•H3	•H3	
Asia – Asie								
Armenia – Arménie	0	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, •B			
Azerbaijan – Azerbaïdjan	••H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B			
Bahrain – Bahreïn	••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	••H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•B	•H1(pdm09)	
Bangladesh	H1(pdm09), H3, B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •H3	••H1(pdm09), •H3	•H1(pdm09), •H3	
Bhutan – Bhoutan	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09)	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •B
Cambodia – Cambodge	•H3	•H1(pdm09), •H3	•H1(pdm09), •H3	•H3	•H1(pdm09), •••H3	•H1(pdm09), •••H3	•••H3, •B	•••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
Cyprus – Chypre	•H3, •B							
Georgia – Géorgie	•H3, ••••B	•H1(pdm09), •H3, ••••B	•H1(pdm09), •H3	•H1(pdm09), •H3	•H1(pdm09)	•H3	0	
India – Inde	•••H1(pdm09), •H3, •B	••••H1(pdm09), •H3, •B	•••H1(pdm09), •H3, •B	•H1(pdm09)	•H1(pdm09), B	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •B
Indonesia – Indonésie	•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
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), •B	•H3	•H3
Iraq	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•B	0	0	0	•H1(pdm09), •H3	0
Israel – Israël	•H1(pdm09), •H3, •B	•H1(pdm09), •••H3, •B	•H1(pdm09), •H3, •B	0	0	0	0	
Japan – Japon	•H1(pdm09), ••••H3, •••B	•H1(pdm09), •••H3, •••B	•H1(pdm09), ••H3, •••B	•H3, ••B	•H3, ••B	•H1(pdm09), •H3, •B	•H3	
Jordan – Jordanie	•H1(pdm09), •H3, •B	•••H1(pdm09), •H3, •B	•••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09)	
Kazakhstan	•H1(pdm09), ••••H3, ••••B	•H1(pdm09), •H3, •B	•H3, •B	0	0	0	0	
Kyrgyzstan	•H1(pdm09), •H3, •B	•B	0					
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	•H3, •B	•H1(pdm09), •H3,

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

Country, area or territory by geographical region– Pays, région ou territoire par région géographique	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
Malaysia – Malaysie	0	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B			
Mongolia – Mongolie	•H3, •B	•H3, •B	•H3, •B	•B	•H3	0	0	
Nepal – Népal	••H1(pdm09), •B	•••H1(pdm09), •H3, •B	•••H1(pdm09), •H3, •B	••H1(pdm09), •B	0	0	0	
Oman	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09)	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B
Pakistan	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	0	0			
Philippines	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H1(pdm09)	•H1(pdm09), •H3	•H3	•H1(pdm09), •H3	•H3	
Qatar	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B	•H1(pdm09), •B
Republic of Korea – République de Corée	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B	•B			
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,	
Sri Lanka	•B	••H1(pdm09), •H3, •B	••H1(pdm09), •B	•H1(pdm09), •A, •B	•••A, •B	•••A, •B	•••A, •B	
Thailand – Thaïlande	••H1(pdm09), •H3, •B	••H1(pdm09), •H3, •B	••H1(pdm09), •H3	•H3	•H1(pdm09), •H3, •B	•H1(pdm09), •H3	•H1(pdm09), •H3, •B	
Turkey – Turquie	•H1(pdm09), •H3, •B	•••H1(pdm09), •H3, •••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B	0		
Uzbekistan – Ouzbékistan	•B	•B	•B	0				
Viet Nam	•H1(pdm09), ••H3, •B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, ••B	•H1(pdm09), ••H3, ••B	•H1(pdm09), ••H3, •B	•H1(pdm09), ••H3, •B	••H3, •B	
Europe								
Albania – Albanie	•H1(pdm09), •H3	••H3, •B	•B	0				
Austria – Autriche	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B					
Belarus – Bélarus	•H1(pdm09), •H3, •B	•H3, •B	•H3, •B	0	0	0	•H3	0
Belgium – Belgique	•H1(pdm09), ••••H3, •B	•H1(pdm09), •H3, ••••B	•H1(pdm09), •B	•B	0	0		
Bulgaria – Bulgarie	•H1(pdm09), •••H3, •B	•H1(pdm09), ••H3, •B	•H1(pdm09), •H3, •B	•B	0	0	0	
Croatia – Croatie	•H1(pdm09), ••••H3, •B	•H1(pdm09), ••••H3, •B	•B	•H1(pdm09), •B				
Czech Republic – République tchèque	•H1(pdm09), ••••H3, •B	•H1(pdm09), •H3, •B	•B	•B				
Denmark – Danemark	•H1(pdm09), ••••H3, •B	••••H1(pdm09), ••••H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •B	•H1(pdm09), •H3, •B	•H3, •B	•B	•H1(pdm09), •B
Estonia – Estonie	•H1(pdm09), ••••H3, •B	•H1(pdm09), ••••H3, ••••B	•B, •H3	•B	•B	0	•B	0
Finland – Finlande	•H1(pdm09), ••••H3, •B	••••H3, ••••B	•H3, •B	•H3, •B	0	0		

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

Country, area or territory by geographical region– Pays, région ou territoire par région géographique	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
France	•H1(pdm09), ••••H3, ••••B	•H1(pdm09), •H3, ••••B	•H1(pdm09), •H3, ••••B	•H1(pdm09), •B	•B	•B	•H1(pdm09), •H3	•H3
Germany – Allemagne	•H1(pdm09), ••••H3, •B	•H1(pdm09), ••••H3, •B	•H1(pdm09), •H3, •••B	•H1(pdm09), •B	•H1(pdm09), •B		•H3	•H1(pdm09), •H3, •B
Greece – Grèce	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•B	0			
Hungary – Hongrie	•H1(pdm09), ••••H3, •B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B	0				
Iceland – Islande	•H1(pdm09), ••••H3, •B	•H1(pdm09), ••••H3, •B	•H1(pdm09), •H3, •••B	•H3, •B	•H3, •B	•H3	•H3	
Ireland – Irlande	•H1(pdm09), ••••H3, •B	••••H1(pdm09), ••••H3, ••••B	•H1(pdm09), •H3, ••B	•H3, •B	•B	•B		
Italy – Italie	••••H1(pdm09), •••H3, •B	••H1(pdm09), •••H3, •••B	•H1(pdm09), •H3, •B					
Latvia – Lettonie	••••H1(pdm09), ••••H3, •B	••••H1(pdm09), ••••H3, ••••B	•H1(pdm09), •H3, •B	•B	•B			
Lithuania – Lituanie	•H1(pdm09), ••••H3, •B	•H1(pdm09), ••••H3, •B	•H1(pdm09), •H3, •••B	•B				
Luxembourg	••••H1(pdm09), ••••H3, ••••B	•••H1(pdm09), •••H3, •••B	•H1(pdm09), •H3, •B	0				
Malta – Malte	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•B	0			
Netherlands – Pays-Bas	•H1(pdm09), ••••H3, •B	•H1(pdm09), •H3, •••B	•H1(pdm09), •H3, •••B	•H1(pdm09), •H3, •B	•B	0	•H3	•B
Norway – Norvège	•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
Poland – Pologne	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•B, •H3	0			
Portugal	•H1(pdm09), •H3, ••••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B	0			
Republic of Moldova – République de Moldavie	•••H1(pdm09), •H3, •••B	•••H1(pdm09), •H3, •••B	•••H1(pdm09), •H3, •••B	•H1(pdm09), •H3, •B	0			
Romania – Roumanie	•H1(pdm09), •H3, •••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •B	0			
Russian Federation – Fédération de Russie	•H1(pdm09), •••H3, •••B	•H1(pdm09), •••H3, ••B	•H1(pdm09), •••H3, ••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B			
Serbia – Serbie	••••H1(pdm09), •H3, •B	••••H1(pdm09), ••••H3, •B	•H1(pdm09), ••H3, ••B	•B				
Slovakia – Slovaquie	•H1(pdm09), ••H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•B	0			
Slovenia – Slovénie	••••H1(pdm09), •H3, •B	•H1(pdm09), •H3, ••••B	•H1(pdm09), •H3, •••B	•B	0			
Spain – Espagne	•H1(pdm09), ••••H3, •B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B			
Sweden – Suède	•H1(pdm09), ••••H3, •B	•H1(pdm09), ••••H3, ••••B	•H1(pdm09), •H3, •••B	•H1(pdm09), •H3, •••B	•B			

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

Country, area or territory by geographical region– Pays, région ou territoire par région géographique	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
Switzerland – Suisse	•H1(pdm09), ••••H3, •B	••••H1(pdm09), ••••H3, ••••B	•H1(pdm09), •H3, •B					
The former Yugoslav Republic of Macedonia – Ex-République yougoslave de Macédoine	•H1(pdm09), •H3, •B							
Ukraine	•H1(pdm09), •H3, ••••B	•H1(pdm09), •H3, ••B	•H1(pdm09), •H3, •B	•H1(pdm09)	0			
United Kingdom – Royaume-Uni	•H1(pdm09), ••••H3, •B	•H1(pdm09), ••••H3, ••••B	•H1(pdm09), •H3, •••B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H3, •B	•H3, •B	•H3, •B
Oceania – Océanie								
Australia – Australie	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, ••B	•H1(pdm09), •••H3, •••B	•H1(pdm09), ••••H3, ••••B	•H1(pdm09), ••••H3, ••••B	•H1(pdm09), ••••H3, ••••B
Fiji – Fidji	•H3, •B	•H3, •B	•H3	•H3	•H3	•H3	•H3	•B
France, New Caledonia – France, Nouvelle Calédonie	•H3, •B	•B	•B	•B	•B			
New Zealand – Nouvelle Zélande	0	0	0	•H1(pdm09), •H3, •B	•H1(pdm09), •H3, •B	•H1(pdm09), •••H3, •••B	•H1(pdm09), ••••H3, ••••B	•H1(pdm09), ••••H3, •••B

Data in above table were provided by the Global Influenza Surveillance and Response System and other partners.

• = Sporadic activity – Activité sporadique
•• = Local activity – Activité locale
••• = Regional activity – Activité régionale
•••• = Widespread activity – Activité étendue

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

by China and 69 confirmed human cases of A(H5N1) were reported by China (3), Egypt (64) and Indonesia (2). Highly pathogenic avian influenza A(H5) is present in poultry in these countries. Since December 2003, a total of 844 cases with 449 deaths have been confirmed in 16 countries. To date there has been no evidence of sustained human-to-human transmission.

During this period 105 additional human cases of avian influenza A(H7N9) virus infection have been reported in China. Since February 2013, a total of 667 cases with 275 deaths have been reported.

Four A(H9N2) human cases were reported in this period, one in China, one in Bangladesh and 2 in Egypt. The associated disease in all cases was mild with the viruses from China belonging to the A/chicken/Hong Kong/Y280/97 genetic lineage and the virus from Bangladesh

humains confirmés d'infection par un virus A (H5N1) ont été signalés par la Chine (3), l'Égypte (64) et l'Indonésie (2). La grippe aviaire fortement pathogène A(H5) était présente chez les volailles dans ces pays. Depuis décembre 2003, 844 cas au total, dont 449 décès, ont été confirmés dans 16 pays. À ce jour, on ne dispose d'aucune preuve d'une transmission interhumaine soutenue.

Sur cette période, 105 cas humains supplémentaires d'infection par le virus grippal aviaire A(H7N9) ont été signalés en Chine. Depuis février 2013, 667 cas au total, dont 275 décès, ont été notifiés.

Quatre cas humains d'infection par le virus A (H9N2) ont été signalés sur cette même période dont l'un en Chine, le deuxième au Bangladesh et les deux autres en Égypte. Pour l'ensemble des cas, la maladie associée a été bénigne, les virus détectés en Chine appartenant à la lignée A/chicken/Hong Kong/Y280/97 et le virus

belonging to the A/quail/Hong Kong/G1/97 genetic lineage. Sequence data from one Egyptian case indicated the virus was genetically similar to previous G1-lineage A(H9N2) poultry viruses detected in Egypt.

Two cases of A(H1N1)v, one being fatal, and 2 cases of A(H3N2)v were reported in the United States of America.

Antigenic and genetic characteristics of recent seasonal influenza viruses

Influenza A(H1N1)pdm09 viruses

Antigenic characteristics of A(H1N1)pdm09 viruses collected from February 2015 to August 2015 were assessed with panels of post-infection ferret antisera in haemagglutination inhibition (HI) tests. HI tests indicated that the A(H1N1)pdm09 viruses were antigenically homogeneous and closely related to the vaccine virus A/California/7/2009. Sequence analysis of the haemagglutinin (HA) genes of A(H1N1)pdm09 viruses indicated that most of the recently circulating viruses belonged to genetic clade 6B, which continues to diversify.

Influenza A(H3N2) viruses

A(H3N2) viruses collected from February 2015 to August 2015 fell into the phylogenetic clades 3C.2 and 3C.3. Viruses in sub-clade 3C.2a are now predominant in all regions of the world. Sub-clade 3C.3a and 3C.3b viruses continued to circulate but represented the minority of viruses in this reporting period.

Antigenic characteristics of A(H3N2) viruses were assessed with panels of post-infection ferret antisera in HI and virus neutralization assays. Antigenic characterization of 3C.2a viruses remained technically challenging because many viruses had low or undetectable haemagglutination activity and required the use of modified HI and virus neutralization assays for analysis. Most recent A(H3N2) 3C.2a viruses were well inhibited by ferret antisera raised against cell-propagated reference A/Switzerland/9715293/2013 (3C.3a) virus, indicating that 3C.2a and 3C.3a viruses remain antigenically related. Ferret antisera raised against reference cell-propagated 3C.2a viruses also well inhibited a majority of viruses tested, although inhibition was somewhat reduced against 3C.3a viruses, indicating that some 3C.2a and 3C.3a viruses were antigenically distinguishable.

Egg propagation is known to introduce additional changes that may affect antigenicity. Such changes have been particularly problematic for recent A(H3N2) viruses. Ferret antisera raised against egg-propagated 3C.2a viruses, including A/Hong Kong/4801/2014, generally inhibited recently circulating viruses better than antisera raised to egg-propagated A/Switzerland/9715293/2013 virus (*Table 2*).

isolé au Bangladesh, à la lignée A/quail/Hong Kong/G1/97. Les données de séquençage obtenues pour un cas égyptien ont indiqué que le virus impliqué était similaire sur le plan génétique aux virus A(H9N2 de la lignée G1, détectés en Égypte, qui infectaient antérieurement les volailles.

Deux cas de grippe A(H1N1)v, dont un mortel, et 2 cas de grippe A(H3N2)v ont été notifiés aux États-Unis d'Amérique.

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 août 2015 ont été évaluées à l'aide de batteries de sérums de furets postinfection dans le cadre d'épreuves d'inhibition de l'hémagglutination (IH). Ces épreuves ont révélé que ces virus A(H1N1)pdm09 étaient 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 la plupart des virus récemment en circulation appartenaient au clade génétique 6B, qui continue de se diversifier.

Virus grippaux A(H3N2)

Les virus A(H3N2) recueillis de février à août 2015 appartenaient aux clades phylogénétiques 3C.2 et 3C.3. Les virus du sous-clade 3C.2a sont maintenant prédominants dans toutes les régions du monde. Des virus des sous-clades 3C.3a et 3C.3b ont continué de circuler, mais ils représentaient une minorité parmi les virus isolés pendant cette période de rapport.

Les caractéristiques antigéniques des virus A(H3N2) 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. La caractérisation antigénique des virus du sous-clade 3C.2a reste techniquement très difficile car nombre d'entre eux ont une activité d'hémagglutination faible, voire indétectable, et imposent l'utilisation d'épreuves d'IH ou de neutralisation virale modifiées pour leur analyse. Les virus A(H3N2) du sous-clade 3C.2a les plus récents étaient bien inhibés par des immunsérums de furet dirigés contre des virus de référence propagés sur culture cellulaire A/Switzerland/9715293/2013 (3C.3a), ce qui indique que les virus des sous-clades 3C.2a et 3C.3a restent apparentés sur le plan antigénique. Les immunsérums de furet dirigés contre des virus de référence propagés sur culture cellulaire du sous-clade 3C.2a inhibaient également bien la majorité des virus testés, même si l'inhibition était quelque peu diminuée face à des virus du sous-clade 3C.3a, ce qui révèle que certains virus des sous-clades 3C.2a et 3C.3a pouvaient être distingués sur le plan antigénique.

On sait que la propagation sur des œufs introduits des modifications supplémentaires pouvant influer sur l'antigénicité. De telles modifications ont été particulièrement problématiques pour les virus A (H3N2) récents. Des immunsérums de furet dirigés contre des virus propagés sur œufs du sous-clade 3C.2a, y compris la souche A/Hong Kong/4801/2014, inhibaient généralement les virus récemment en circulation plus efficacement que des immunsérums dirigés contre la souche A/Switzerland/9715293/2013 propagés sur œufs (*Tableau 2*).

Table 2 **Antigenic analysis of influenza A(H3N2) viruses – Plaque reduction neutralisation (MDCK-SIAT)**
Tableau 2 **Analyse antigénique des virus grippaux A(H3N2) – Séroneutralisation par réduction des plages de lyse (cellules MDCK-SIAT)**

Viruses – Virus	Genetic group – Groupe génétique	Collection date – Date de collecte	Passage history[a] – Historique des passages[a]	Neutralisation titre – Titre de neutralisation				
				Post-infection ferret antisera – Immunsérums de furet postinfection				
				A/HK 7295/14 3C.2a	A/HK 4801/14 3C.2a	A/Switz 9715923/13 3C.3a	A/Switz 9715923/13 3C.3a	A/Neth 525/14 3C.3b
				Cell – Cellule	Egg – Œuf	Cell – Cellule	Egg – Œuf	Cell – Cellule
Reference viruses – Virus de de référence								
A/Hong Kong/7295/2014	3C.2a	2014-08-07	MDCK3	**320**	80	80	80	40
A/Hong Kong/4801/2014	3C.2a	2014-02-26	E6	640	**320**	40	40	80
A/Switzerland/ 9715293/2013	3C.3a	2013-12-06	SIAT1/SIAT2	20	20	**160**	20	20
A/Switzerland/ 9715293/2013	3C.3a	2013-12-06	E4/E2	80	40	40	**320**	40
A/Netherlands/525/2014	3C.3b	2014-12-17	SIAT2/SIAT1	80	40	80	80	**1280**
Test viruses – Virus testés								
A/Moldova/111.07/2015	3C.2a	2015-02-10	MDCK2/SIAT1	320	80	40	40	40
A/South Africa/R3777/2015	3C.2a	2015-06-26	MDCK2/SIAT1	320	80	80	80	80
A/South Africa/R3803/2015	3C.2a	2015-06-29	MDCK2/SIAT1	160	80	40	80	40
A/South Africa/R3778/2015	3C.2a	2015-06-29	MDCK2/SIAT1	160	40	20	20	10
A/Iasi/177050/2015	3C.3a	2015-02-04	MDCK1/SIAT1	80	40	80	80	40
A/Behoririka/355/2015	3C.3a	2015-02-04	MDCK1/SIAT1	80	40	80	40	80
A/Manjakaray/612/2015	3C.3a	2015-02-23	MDCK1/SIAT1	160	80	80	80	80
A/Stockholm/19/2015	3C.3b	2015-02-25	MDCK0/SIAT1	320	80	80	80	1280
A/Sweden/16/2015	3C.3b	2015-03-05	MDCK1/SIAT1	320	160	80	80	640

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

[a] E, egg ; MDCK, cell line ; MDCK-SIAT, cell line. – E, oeuf; MDCK, lignée cellulaire ; MDCK-SIAT, lignée cellulaire.

Influenza B viruses

Influenza B viruses of the B/Victoria/2/87 and the B/Yamagata/16/88 lineages co-circulated with viruses of the B/Yamagata/16/88 lineage predominating in many countries. In Australia and New Zealand a rapid increase in the proportion of B/Victoria/2/87-lineage viruses was observed from June and they became the predominant lineage by August 2015.

The HA gene sequences of the B/Yamagata/16/88 lineage viruses fell into genetic clades 2 and 3, with the vast majority in clade 3. In HI assays, recently circulating B/Yamagata/16/88-lineage viruses were inhibited by post-infection ferret antisera raised against the egg or cell-propagated virus B/Phuket/3073/2013 (clade 3), the virus recommended for use in vaccine for the 2015 southern and 2015-2016 northern hemisphere influenza seasons.

All of the HA gene sequences of B/Victoria/2/87 lineage viruses fell into genetic clade 1A. In HI assays recent

Virus grippaux 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 étant prédominants dans de nombreux pays. En Australie et en Nouvelle-Zélande, une augmentation rapide du pourcentage de virus appartenant à la lignée B/Victoria/2/87 a été observée à partir du mois de juin et ces virus étaient devenus prédominants en août 2015.

Les séquences de gènes de l'hémagglutinine des virus de la lignée B/Yamagata/16/88 les rattachaient aux clades génétiques 2 et 3, la grande majorité appartenant au clade 3. Lors des épreuves d'IH, les virus de la lignée B/Yamagata/16/88 récemment en circulation étaient inhibés par des immunsérums de furet postinfection dirigés contre la souche B/Phuket/3073/2013 (clade 3) propagée sur œufs ou sur culture cellulaire, virus qu'il était recommandé de faire entrer dans la composition du vaccin antigrippal à utiliser pendant la saison grippale 2015 dans l'hémisphère Sud et 2015-2016 dans l'hémisphère Nord.

Toutes les séquences de gènes de l'HA des virus de la lignée B/Victoria/2/87 les rattachaient au clade génétique 1A. Dans le

viruses were well inhibited by post-infection ferret antisera raised against either B/Brisbane/60/2008 or B/Texas/2/2013 viruses; these vaccine viruses were recommended for use in the 2015-2016 quadrivalent influenza vaccine.

Resistance to influenza antiviral drugs

Neuraminidase inhibitors

All but 3 influenza A(H1N1)pdm09 viruses tested were sensitive to the neuraminidase inhibitors. Two viruses showed reduced inhibition by oseltamivir and peramivir, due to a H275Y substitution in the neuraminidase. Both of these viruses remained sensitive to zanamivir and laninamivir. One A(H1N1)pdm09 virus had moderately reduced inhibition to oseltamivir, but contained no unique neuraminidase amino acid substitutions.

The great majority of influenza A(H3N2) viruses tested were sensitive to the neuraminidase inhibitors. However, 7 viruses showed reduced inhibition to one or more of the neuraminidase inhibitors. Of these, one virus showed reduced inhibition to oseltamivir, peramivir and zanamivir and carried an R292K neuraminidase substitution and another virus showed reduced inhibition to zanamivir associated with a D151A neuraminidase substitution. Five viruses showed reduced inhibition to only oseltamivir, of which 4 carried an S331R neuraminidase substitution and one an E119V neuraminidase substitution. Two additional viruses showed reduced inhibition to zanamivir, but remained sensitive to oseltamivir, peramivir and laninamivir, with both carrying a Q136K substitution in the neuraminidase.

The majority of influenza B/Yamagata-like viruses were sensitive to neuraminidase inhibitors, but 12 viruses carried a D197N substitution in the neuraminidase that resulted in reduced oseltamivir and peramivir inhibition. Two viruses also showed reduced oseltamivir and peramivir inhibition due to an I221T neuraminidase substitution. Two further B/Yamagata viruses showed reduced inhibition to at least one of the neuraminidase inhibitors. One had reduced oseltamivir and peramivir inhibition and contained an H273Y neuraminidase substitution and the other virus had reduced peramivir inhibition and carried a T146I neuraminidase substitution.

All B/Victoria-like viruses tested were sensitive to the neuraminidase inhibitors apart from 3 viruses which showed reduced inhibition to peramivir. One virus contained no unique neuraminidase amino acid substitutions while 2 other viruses had neuraminidase amino acid substitutions D432G or N151T.

M2 inhibitors

M gene sequencing of A(H1N1)pdm09 and A(H3N2) viruses revealed that all but one of those analysed had an amino acid substitution S31N of the M2 protein which is known to confer resistance to the M2 inhibitors, amantadine and rimantadine.

cadre des épreuves d'IH, les virus récents étaient bien inhibés par des immunsérums de furet postinfection dirigés contre les souches B/Brisbane/60/2008 ou B/Texas/2/2013, recommandées pour entrer dans la composition du vaccin antigrippal quadrivalent 2015-2016.

Résistance aux antiviraux utilisés contre la grippe

Inhibiteurs de la neuraminidase

Tous les virus grippaux A(H1N1)pdm09 testés sauf 3 étaient sensibles aux inhibiteurs de la neuraminidase. Deux virus ont présenté une diminution de l'inhibition par l'oseltamivir et le peramivir, due à la présence d'une substitution H275Y de la neuraminidase. Ces deux virus étaient restés sensibles au zanamivir et au laninamivir. Pour un virus A(H1N1)pdm09, on a constaté une baisse modérée de l'inhibition par l'oseltamivir, mais ce virus ne présentait pas de substitution d'acide aminé particulière de la neuraminidase.

La grande majorité des virus grippaux A(H3N2) testés étaient sensibles aux inhibiteurs de la neuraminidase. Néanmoins, 7 virus ont manifesté une diminution de l'inhibition par un ou plusieurs de ces inhibiteurs. Pour l'un de ces virus, on a aussi relevé une baisse de l'inhibition par l'oseltamivir, le peramivir et le zanamivir ainsi que la présence d'une substitution R292K de la neuraminidase et chez un autre d'entre eux, une diminution de l'inhibition par le zanamivir, associée à une substitution D151A de la neuraminidase. Cinq virus présentaient une inhibition réduite par l'oseltamivir, 4 d'entre eux étaient porteurs d'une substitution S331R de la neuraminidase et un d'une substitution E119V au même niveau. Deux autres virus ont manifesté une moindre inhibition par le zanamivir, mais sont restés sensibles à l'oseltamivir, au peramivir et au laninamivir, l'un et l'autre étant porteurs d'une substitution Q136K de la neuraminidase.

La majorité des virus grippaux de la souche B/Yamagata étaient sensibles aux inhibiteurs de la neuraminidase, mais 12 d'entre eux étaient porteurs de la substitution D197N de la neuraminidase, qui entraînait une diminution de leur inhibition par l'oseltamivir et le peramivir. Deux virus manifestaient aussi une moindre inhibition par l'oseltamivir et le peramivir due à une substitution I221T de la neuraminidase. Deux autres virus de la souche B/Yamagata présentaient une baisse de l'inhibition par au moins un des inhibiteurs de la neuraminidase. L'un était moins inhibé par l'oseltamivir et le peramivir et contenait une substitution H273Y de la neuraminidase et l'autre manifestait une inhibition réduire par le peramivir et était porteur d'une substitution T146I de la neuraminidase.

Tous les virus de la souche B/Victoria testés se sont révélés sensibles aux inhibiteurs de la neuraminidase, sauf 3 qui présentaient une diminution de l'inhibition par le peramivir. L'un de ces virus ne contenait aucune substitution d'acide aminé particulière de la neuraminidase, tandis que 2 autres étaient porteurs des substitutions d'acide aminé D432G ou N151T de la neuraminidase.

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 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.

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 or quadrivalent inactivated vaccines. For A(H1N1)pdm09 and A(H3N2) viruses, virus neutralization assays were used for a subset of sera. One panel of sera from adults and one from older adults were from trials of egg-grown trivalent vaccine of the composition recommended for the southern hemisphere 2015 season (A/California/7/2009 (H1N1) pdm09-like, A/Switzerland/9715293/2013 (H3N2)-like and B/Phuket/3073/2013-like viruses); in addition, one panel of sera from children who had received egg-grown quadrivalent vaccine of the composition recommended for the northern hemisphere 2014-2015 season (A/California/7/2009 (H1N1)pdm09-like, A/Texas/50/2012 (H3N2)-like, B/Massachusetts/02/2012-like and B/Brisbane/60/2008-like viruses) was used for analysis of A(H1N1)pdm09 and B viruses in one laboratory.

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

For A(H3N2), serum panels were tested against viruses representative of circulating viruses belonging to genetic groups 3C.2a, 3C.3a and 3C.3b. Geometric mean HI titres of antibodies against the majority of cell-propagated 3C.2a viruses were reduced significantly compared to HI titres to the vaccine virus, when measured against egg-propagated A/Switzerland/9715293/2013 virus but not when compared to cell-propagated A/Switzerland/9715293/2013 virus. Geometric mean microneutralization titres of antibodies against 2 of 3 cell-propagated 3C.2a viruses tested were reduced significantly compared to microneutralization titres against cell-propagated A/Switzerland/9715293/2013 virus.

Serum panels were tested against representative recent B/Yamagata/16/88 lineage viruses as well as against a few B/Victoria/2/87 lineage viruses. Geometric mean HI titres of antibodies against most representative recent B/Yamagata/16/88 lineage viruses were not reduced significantly compared to HI titres to the vaccine virus. As expected, geometric mean HI titres to B/Victoria/2/87 lineage viruses were reduced in panels from trials of trivalent vaccines not containing a B/Victoria/2/87 lineage antigen.

Recommended composition of influenza virus vaccines for use in the 2016 southern hemisphere influenza season

Influenza A(H1N1)pdm09 viruses co-circulated in varying proportions with A(H3N2) and B viruses during the period February 2015 – September 2015, with outbreaks reported 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

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

Au moyen d'épreuves d'inhibition de l'hémagglutination, on a mesuré la présence d'anticorps dirigés contre des isolements de virus récents dans des batteries de sérums provenant d'enfants, d'adultes et d'adultes plus âgés ayant reçu un vaccin inactivé trivalent ou quadrivalent contre la grippe saisonnière. Pour les virus A(H1N1)pdm09 et A(H3N2, on a mis en œuvre des épreuves de neutralisation virale sur un sous-ensemble de sérums. Une batterie de sérums d'adultes et une autre d'adultes plus âgés provenaient d'essais visant à évaluer un vaccin trivalent préparé sur œufs et ayant la composition recommandée pour la saison grippale 2015 dans l'hémisphère Sud (souches A/California/7/2009, (H1N1)pdm09, A/Switzerland/9715293/2013, (H3N2) et B/Phuket/3073/2013); en outre, une batterie de sérums d'enfants ayant reçu un vaccin quadrivalent préparé sur œufs, présentant la composition recommandée pour la saison grippale 2014-2015 dans l'hémisphère Nord (souches A/California/7/2009, (H1N1)pdm09, A/Texas/50/2012, (H3N2), B/Massachusetts/02/2012 et B/Brisbane/60/2008) a été utilisée pour analyser des virus (H1N1)pdm09 et B dans un laboratoire.

Les moyennes géométriques des titres d'IH d'anticorps dirigés contre la majorité des virus A(H1N1)pdm09 représentatifs récents ne présentaient pas de diminution significative par rapport aux titres d'IH obtenus avec le virus vaccinal.

Concernant les virus A(H3N2), des batteries de sérums ont été testées contre des virus représentatifs des virus circulants appartenant aux groupes génétiques 3C.2a, 3C.3a et 3C.3b. En moyenne géométrique, les titres d'IH contre des virus du clade 3C.3a avaient baissé significativement par rapport aux titres d'IH dirigés contre la souche A/Switzerland/9715293/2013 propagée sur œufs, mais pas par rapport aux titres d'IH obtenus contre la souche A/Switzerland/9715293/2013 propagée sur culture cellulaire. Les moyennes géométriques des titres de microneutralisation face à 2 des 3 virus du sous-clade 3C.3a propagés sur culture cellulaire testés ont présenté une baisse significative par rapport aux titres de microneutralisation obtenus contre la souche A/Switzerland/9715293/2013 propagée sur culture cellulaire.

Des batteries de sérums ont été testées contre des virus représentatifs récents de la lignée B/Yamagata/16/88 et contre quelques virus de la lignée B/Victoria/2/87. En moyenne géométrique, les titres d'IH d'anticorps dirigés contre des virus récents de la lignée B/Yamagata/16/88 n'ont pas présenté de baisse significative par rapport aux titres d'IH obtenus avec le virus vaccinal. Comme on s'y attendait, les moyennes géométriques des titres d'IH d'anticorps contre des virus de la lignée B/Victoria/2/87 présentaient une diminution significative dans les batteries de sérums provenant d'essais de vaccins trivalents ne contenant pas d'antigène de cette lignée.

Composition recommandée pour les vaccins antigrippaux devant être utilisés pendant la saison grippale 2016 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 2015, avec la survenue 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

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 related to cell-propagated 3C.2a reference viruses.

Influenza B viruses of the B/Victoria/2/87 and the B/Yamagata/16/88 lineages co-circulated, with viruses of the B/Yamagata/16/88 lineage predominating in many countries. In Australia and New Zealand a rapid increase in the proportion of B/Victoria/2/87-lineage viruses was observed from June and they became the predominant lineage by August 2015.

It is recommended that trivalent vaccines for use in the 2016 southern hemisphere influenza season contain the following:

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

– an A/Hong Kong/4801/2014 (H3N2)-like virus;

– a B/Brisbane/60/2008-like virus.

It is recommended that quadrivalent vaccines containing 2 influenza B viruses contain the above 3 viruses and a B/Phuket/3073/2013-like virus.

Il est recommandé que les vaccins trivalents qui seront utilisés pendant la saison grippale 2016 dans l'hémisphère Sud contiennent:

– une souche A/California/7/2009 (H1N1)pdm09;

– une souche A/Hong Kong/4801/2014 (H3N2);

– une souche B/Brisbane/60/2008.

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/Phuket/3073/2013.

Lists of candidate influenza vaccine viruses that are available or under development and reagents for vaccine standardization, including those for this recommendation, can be found on the WHO website.[3] 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.[4]

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

(i) Immunobiology, Office of Laboratories and Scientific Services, Monitoring and Compliance Division, Therapeutic Goods Administration, P.O. Box 100, Woden ACT, 2606 Australia (fax: +61 2 6232 8564, email: influenza.reagents@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);

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 étaient apparentés sur le plan antigénique aux virus de référence propagés sur culture cellulaire du sous-clade 3C.2a.

Des virus grippaux B de la lignée B/Victoria/2/87 ont circulé conjointement avec des virus de la lignée B/Yamagata/16/88 prédominante dans de nombreux pays. En Australie et en Nouvelle-Zélande, on a observé un accroissement rapide du pourcentage de virus appartenant à la lignée B/Victoria/2/87 à partir du mois de juin, qui est devenue prédominante en août 2015.

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 ceux sur lesquels porte cette recommandation, est consultable sur le site Web de l'OMS.[3] 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 employés 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.[4]

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 Laboratories and Scientific Services, Monitoring and Compliance Division, Therapeutic Goods Administration, P.O. Box 100, Woden ACT, 2606 Australie (télécopie: +61 2 6232 8564, courriel: influenza.reagents@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_.aspx);

[3] See http://www.who.int/influenza/vaccines/virus/candidates_reagents/home, accessed September 2015.

[4] See No. 47, 2012, pp. 461–476.

[3] Voir http://www.who.int/influenza/vaccines/virus/candidates_reagents/home, consulté en septembre 2015.

[4] Voir N° 47, 2012, pp. 461-476.

(iii) Division of Biological Standards and Quality Control, Center for Biologics Evaluation and Research, Food and Drug Administration, 10905 New Hampshire Avenue, Silver Spring, Maryland, 20993, USA (fax: +1 301 480 9748), email: cbershippingrequests@fda.hhs.gov);

(iv) Influenza Virus Research Center, 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 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 Worldwide Influenza Centre, The Francis Crick Institute, Mill Hill Laboratory, The Ridgeway, Mill Hill, London NW7 1AA, UK (fax: +44 208 906 44 77, website: http://www.crick.ac.uk/research/worldwide-influenza-centre, email: whocc@crick.ac.uk);

(v) or the WHO Collaborating Centre for Reference and Research on Influenza, National Institute for Viral Disease Control and Prevention, China CDC, 155 Changbai Road, Changping District, 102206, Beijing, P.R. China. (tel./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 website.[5] ■

iii) Division of Biological Standards and Quality, Center for Biologics Evaluationand Research, Food and Drug Administration, 10905 New Hampshire Avenue, Silver Spring, Maryland, 20993, États Unis d'Amérique (télécopie: +1 301 480 9748), courriel: cbershippingrequests@fda.hhs.gov);

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); courriel: flu-vaccine@nih.go.jp).

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) 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) WHO Collaborating Center for Surveillance, Epidemiology and Control of Influenza, Centers for Disease Control and Prevention, 1600 Clifton Road, Mail Stop G16, Atlanta, GA 30333, États Unis d'Amérique (télécopie: +1 404 639 0080, site Web: http://www.cdc.gov/flu/, courriel: influenzavirussurveillance@cdc.gov);

iv) the Worldwide Influenza Centre, The Francis Crick Institute, Mill Hill Laboratory, The Ridgeway, Mill Hill, Londres, NW7 1AA, Royaume-Uni (télécopie: +44 208 906 44 77, site Web: http://www.crick.ac.uk/research/worldwide-influenza-centre, courriel: whocc@crick.ac.uk);

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./télécopie: +86 10 5890 0851, 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.[5] ■

[5] See http://www.who.int/influenza; accessed September 2015.

[5] Voir http://www.who.int/influenza; consulté en septembre 2015.

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.

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.

WHO web sites on infectious diseases – Sites internet de l'OMS sur les maladies infectieuses

Avian influenza	**http://www.who.int/csr/disease/avian_influenza/en/**	Grippe aviaire
Buruli ulcer	**http://www.who.int/buruli/en/**	Ulcère de Buruli
Child and adolescent health and development	**http://www.who.int/child_adolescent_health/en/**	Santé et développement des enfants et des adolescents
Cholera	**http://www.who.int/cholera/en/**	Choléra
Deliberate use of biological and chemical agents	**http://www.who.int/csr/delibepidemics/informationresources/en/**	Usage délibéré d'agents chimiques et biologiques
Dengue (DengueNet)	**http://apps.who.int/globalatlas/**	Dengue (DengueNet)
Epidemic and pandemic surveillance and response	**http://www.who.int/csr/en/**	Alerte et action en cas d'épidémie et de pandémie
Eradication/elimination programmes	**http://www.who.int/topics/infectious_diseases/en/**	Programmes d'éradication/élimination
Fact sheets on infectious diseases	**http://www.who.int/topics/infectious_diseases/factsheets/en/**	Aide-mémoires sur les maladies infectieuses
Filariasis	**http://www.filariasis.org**	Filariose
Geographical information systems (GIS)	**http://gamapserver.who.int/mapLibrary/**	Systèmes d'information géographique
Global atlas of infectious diseases	**http://apps.who.int/globalatlas/**	Atlas mondial des maladies infectieuses
Global Outbreak Alert and Response Network (GOARN)	**http://www.who.int/csr/outbreaknetwork/en/**	Réseau mondial d'alerte et d'action en cas d'épidémie (GOARN)
Health topics	**http://www.who.int/topics/en**	La santé de A à Z
Human African trypanosomiasis	**http://www.who.int/trypanosomiasis_african/en/**	Trypanosomiase humaine africaine
Influenza	**http://www.who.int/csr/disease/influenza/en/**	Grippe
Influenza network (FluNet)	**http://who.int/flunet**	Réseau grippe (FluNet)
International Health Regulations	**http://www.who.int/ihr/en/**	Règlement sanitaire international
International travel and health	**http://www.who.int/ith/en/**	Voyages internationaux et santé
Leishmaniasis	**http://www.who.int/leishmaniasis/en**	Leishmaniose
Leprosy	**http://www.who.int/lep/en**	Lèpre
Lymphatic filariasis	**http://www.who.int/lymphatic_filariasis/en/**	Filariose lymphatique
Malaria	**http://www.who.int/malaria/en**	Paludisme
Neglected tropical diseases	**http://www.who.int/neglected_diseases/en/**	Maladies tropicales négligées
Outbreak news	**http://www.who.int/csr/don/en**	Flambées d'épidémies
Poliomyelitis	**http://www.polioeradication.org/casecount.asp**	Poliomyélite
Rabies	**http://www.who.int/rabies/en**	Rage
Global Foodborne Infections Network (GFN)	**http://www.who.int/gfn/en**	Réseau mondial d'infections d'origine alimentaire
Smallpox	**http://www.who.int/csr/disease/smallpox/en**	Variole
Schistosomiasis	**http://www.who.int/schistosomiasis/en/**	Schistosomiase
Soil-transmitted helminthiases	**http://www.who.int/intestinal_worms/en/**	Géohelminthiases
Tropical disease research	**http://www.who.int/tdr/**	Recherche sur les maladies tropicales
Tuberculosis	**http://www.who.int/tb/en** and/et **http://www.stoptb.org**	Tuberculose
Immunization, Vaccines and Biologicals	**http://www.who.int/immunization/en/**	Vaccination, Vaccins et Biologiques
Weekly Epidemiological Record	**http://www.who.int/wer/**	Relevé épidémiologique hebdomadaire
WHO Lyon Office for National Epidemic Preparedness and Response	**http://www.who.int/ihr/lyon/en/index.html**	Bureau OMS de Lyon pour la préparation et la réponse des pays aux épidémies
WHO Pesticide Evaluation Scheme (WHOPES)	**http://www.who.int/whopes/en**	Schéma OMS d'évaluation des pesticides (WHOPES)
WHO Mediterranean Centre for Vulnerability Reduction, Tunis	**http://wmc.who.int/**	Centre Méditerranéen de l'OMS pour la Réduction de la Vulnérabilité à Tunis (WMC)
Yellow fever	**http://www.who.int/csr/disease/yellowfev/en/**	Fièvre jaune

Monthly report on dracunculiasis cases, January-July 2015

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-juillet 2015

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 2015 – Nombre total de rumeurs[b] de cas suspects de dracunculose en 2015	No. of new dracunculiasis cases reported in 2015[c] – Nombre de nouveaux cas de dracunculose signalés en 2015[c]								Total no. of reported cases for the same months of 2014 – Nombre total de cas signalés pour les mêmes mois en 2014	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	Total		2015	2014	
Endemic countries – Pays d'endémie														
Chad – Tchad	19 August 2015 – 19 août 2015	804	0	1	2	1	0	2	1	7	9	7	9	July 2015 – Juillet 2015
Ethiopia – Ethiopie	19 August 2015 – 19 août 2015	4196	0	0	0	0	1	0	0	1	2	1	2	May 2015 – Mai 2015
Mali	21 August 2015 – 21 août 2015	302	0	0	0	0	0	0	1	1	0	1	0	July 2015 – Juillet 2015
South Sudan – Soudan du Sud	1 September 2015 – 1er septembre 2015	2920	0	0	0	0	0	1	2	3	41	3	27	July 2015 – Juillet 2015
Precertification countries – Pays au stade de la précertification														
Kenya	18 August 2015 – 18 août 2015	4	0	0	0	0	0	0	0	0	0	0	0	October 1994 – Octobre 1994
Sudan – Soudan	NR	5	0	0	0	0	0	NR	NR	0	0	0	0	September 2013 – Septembre 2013
Total		**8231**	**0**	**1**	**2**	**1**	**1**	**3**	**4**	**12**	**52**	**12**	**38**	

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.

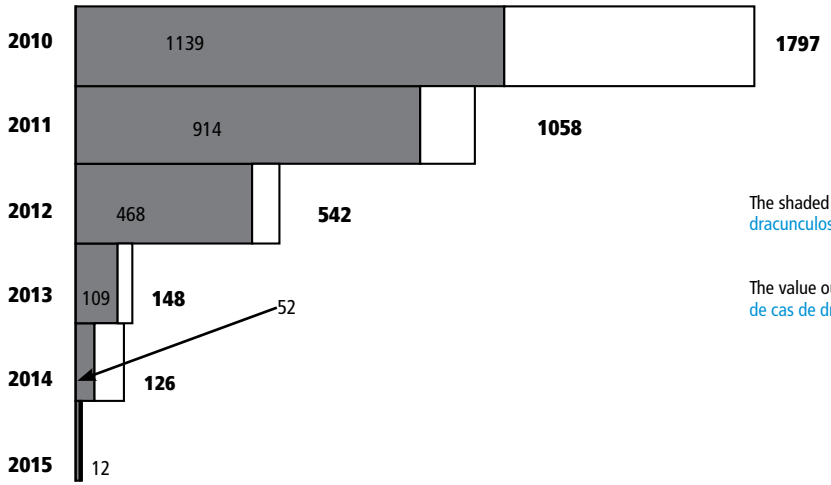
[b] Rumour of dracunculiasis. Information about an alleged case of dracunculiasis (Guinea-worm disease) obtained from any source (informants). – Rumeur de dracunculose. Information au sujet d'un cas présumé de dracunculose (maladie du ver de Guinée) obtenue à partir de n'importe quelle source (informateurs).

[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.

NR: No report received. – Aucun rapport reçu.

ND: Data not available. – Pas de données disponibles.

Number of dracunculiasis cases reported worldwide, 2010–2015 – Nombre de cas de dracunculose signalés dans le monde, 2010-2015



The shaded portion indicates the number of dracunculiasis cases reported for the same month in 2015. – La portion colorée indique le nombre de cas de dracunculose signalés pour le même mois en 2015.

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.