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

September 2013

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

Seasonal Influenza activity, February – September 2013

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

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

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

Influenza A(H3N2) activity was variable in Africa, the Americas, Asia, Europe and Oceania. In Africa, sporadic activity was reported between February and August. In

[1] http://www.who.int/influenza/vaccines/virus/en/, accessed 26 September 2013
[2] Description of the process of influenza vaccine virus selection and development available at: http://www.who.int/gb/pip/pdf_files/Fluvaccvirusselection.pdf, accessed 26 September 2013

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

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

The extent and type of seasonal influenza activity worldwide are summarized in Annex 2.

Zoonotic influenza infections

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

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

[3] http://www.who.int/entity/influenza/human_animal_interface/EN_GIP_20130829CumulativeNumberH5N1cases.pdf, accessed 26 September 2013

[4] http://www.who.int/influenza/human_animal_interface/influenza_h7n9/Data_Reports/en/index.html , accessed 26 September 2013

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

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

Antigenic and genetic characteristics of recent seasonal influenza viruses

Influenza A(H1N1)pdm09 viruses

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

Influenza A(H3N2) viruses

Antigenic characteristics of A(H3N2) viruses collected from February to August 2013 were assessed with panels of post-infection ferret antisera in HI and virus neutralization assays. The majority of recent A(H3N2) viruses were well inhibited by ferret antisera raised against cell-propagated reference viruses such as A/Victoria/361/2011 and A/Texas/50/2012. Post-infection ferret antisera raised against egg-propagated A/Texas/50/2012 inhibited many recent viruses, while ferret antisera raised against egg-propagated A/Victoria/361/2011 poorly inhibited most of the recent viruses. The HA genes of most recent A(H3N2) viruses fell into phylogenetic clade 3C, with small numbers in phylogenetic clades 3A, 3B, 5 and 6. Viruses in these genetic clades, including those clade 3C viruses with amino acid substitutions T128A, R142G and N145S, were antigenically indistinguishable in HI and neutralization assays.

Influenza B viruses

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

[5] http://www.cdc.gov/flu/swineflu/h3n2v-situation.htm , accessed 26 September 2013

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

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

Resistance to influenza antiviral drugs

Neuraminidase inhibitors

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

M2 inhibitors

M gene sequencing of A(H1N1)pdm09 and A(H3N2) viruses revealed that all those analysed had the serine to asparagine substitution at amino acid 31 (S31N) of the M2 protein which is known to confer resistance to the M2 inhibitors, amantadine and rimantadine.

Human serology studies with inactivated influenza virus vaccines

HI assays were used to measure the presence of antibodies to recent virus isolates in panels of sera from children, adults and older adults who had received seasonal trivalent inactivated vaccines. For A(H3N2) viruses, virus neutralization assays were used for a subset of sera. One panel of sera from adults and older adults was obtained

[6] http://www.who.int/wer/2012/wer8739/en/index.html, accessed 26 September 2013

from recipients of the vaccine for the northern hemisphere 2013-2014 season (A/California/7/2009 (H1N1)pdm09-like, cell-propagated A/Victoria/361/2011 (H3N2)-like and B/Massachusetts/2/2010-like viruses); three panels of sera from adults and older adults as well as one panel from children were from trials of vaccine with the composition recommended for the southern hemisphere 2013 season (A/California/7/2009 (H1N1)pdm09-like, A/Victoria/361/2011 (H3N2)-like and B/Wisconsin/1/2010-like viruses).

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

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

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

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

A(H1N1)pdm09 viruses co-circulated in varying proportions with A(H3N2) and B viruses during the period of February-September 2013, with outbreaks in several countries. The majority of A(H1N1)pdm09 viruses were antigenically similar to A/California/7/2009. Vaccines containing A/California/7/2009 antigens elicited anti-HA antibodies in humans of similar titres against the vaccine virus and recent A(H1N1)pdm09 viruses.

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

Influenza B activity was reported in many countries. The proportion of B/Yamagata/16/88 lineage viruses increased in many parts of the world. The majority

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

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

– an A/California/7/2009 (H1N1)pdm09-like virus[a];
– an A/Texas/50/2012 (H3N2)-like virus[b];
– a B/Massachusetts/2/2012-like virus.

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

[a] A/Christchurch/16/2010 is an A/California/7/2009-like virus.
[b] A/Texas/50/2012 is an A(H3N2) virus that following adaptation to growth in eggs has maintained antigenic properties similar to the majority of recently circulating cell-propagated A(H3N2) viruses including A/Victoria/361/2011.

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

As in previous years, national or regional authorities approve the composition and formulation of vaccines used in each country. National public health authorities are responsible for making recommendations regarding the use of the vaccine. WHO has published recommendations on the prevention of influenza[8].

Candidate vaccine viruses (including reassortants) and reagents for use in the laboratory standardization of inactivated vaccine may be obtained from: Immunobiology, Office of Laboratory and Scientific Services, Monitoring and Compliance Group, Therapeutic Goods Administration, P.O. Box 100, Woden, ACT, 2606, Australia (fax: +61262328564, email: influenza.standards@tga.gov.au; web site: http://www.tga.gov.au); Division of Virology, National Institute for Biological Standards and Control, a centre of the Medicines and Healthcare products Regulatory Agency (MHRA), Blanche Lane, South Mimms, Potters Bar, Hertfordshire, EN6 3QG UK (fax: +441707641050, e-mail: enquiries@nibsc.org, web site: http://www.nibsc.ac.uk/spotlight/influenza_resource_centre/reagents.aspx); Division of Biological Standards and Quality Control, Center for Biologics Evaluation and Research, Food and Drug Administration, 1401 Rockville Pike, Rockville, MD

[7] http://www.who.int/influenza/vaccines/virus/candidates_reagents/home, accessed 26 September 2013
[8] http://www.who.int/wer/2012/wer8747.pdf, accessed 26 September 2013

20892, United States (fax: +1 301 480 9748); Center for Influenza Virus Research, National Institute of Infectious Diseases, Gakuen 4-7-1, Musashi-Murayama, Tokyo 208-0011, Japan (fax: +81425616156, email: flu-vaccine@nih.go.jp).

Requests for reference viruses should be addressed to the WHO Collaborating Centre for Reference and Research on Influenza, VIDRL, 10 Wreckyn Street, North Melbourne, Victoria 3051, Australia (fax: +61393423939, web site: http://www.influenzacentre.org, email: whoflu@influenzacentre.org); the WHO Collaborating Centre for Reference and Research on Influenza, National Institute of Infectious Diseases, Gakuen 4-7-1, Musashi-Murayama, Tokyo 208-0011, Japan (fax: +81425616149 or +81425652498, email: todagiri@nih.go.jp; 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, United States (fax: +14046390080, web site: http://www.cdc.gov/flu/, email: influenzavirussurveillance@cdc.gov); the WHO Collaborating Centre for Reference and Research on Influenza, MRC National Institute for Medical Research, The Ridgeway, Mill Hill, London NW7 1AA, UK (fax: +442089064477, web site: http://www.nimr.mrc.ac.uk/wic/, email: whocc@nimr.mrc.ac.uk) 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: +86 10 5890 0851, fax: +86 10 5890 0851, email: whocc-china@cnic.org.cn, website: http://www.cnic.org.cn/eng/).

Influenza surveillance information is updated on the WHO web site[9].

[9] http://www.who.int/influenza, accessed 26 September 2013

Annex 1

Declarations of interest

The WHO recommendation on composition of influenza vaccines for the southern hemisphere 2014 was made through a technical consultation with relevant WHO Collaborating Centres on Influenza (CCs) and Essential Regulatory Laboratories (ERLs).

In accordance with WHO policy, Directors of the relevant WHO CCs and ERLs, in their capacity as representatives of their respective institutions ("Advisers") completed the WHO form for Declaration of Interests for WHO experts before being invited to the consultation. At the start of the consultation, the interests declared by the Advisers were disclosed to all consultation participants.

The Advisers declared the following personal current or recent (within the past 4 years) financial or other interests relevant to the subject of work:

Institution	Representative	Personal interest
WHO CC Atlanta	Dr Nancy Cox	None
WHO CC Beijing	Dr Yuelong Shu	None
WHO CC London	Dr John McCauley	None
WHO CC Melbourne	Dr Anne Kelso	Shareholdings (significant) in the company CSL
WHO CC Memphis	Dr Richard Webby	None
WHO CC and ERL NIID Tokyo	Dr Masato Tashiro	None
ERL CBER Bethesda	Dr Zhiping Ye	None
ERL NIBSC London	Dr Othmar Engelhardt	Travel cost (flights and hotel) to a conference related to influenza vaccine development under GAP[10] program as invited speaker by the vaccine manufacturer BIRMEX
ERL TGA Canberra	Dr Gary Grohmann	None

Based on the WHO assessment of the interest declared by Dr Kelso, it was concluded that Dr Kelso should continue to serve as an Adviser, considering that the interest was disclosed at the beginning of the consultation, and that, in accordance with the conditions required of all WHO CC Melbourne staff, Dr Kelso has agreed to refrain from acquiring additional shares in companies involved in influenza vaccine manufacture.

The interest declared by Dr Engelhardt was reviewed by WHO and determined not to present a conflict of interest with the objectives of the technical consultation.

In view of the foregoing, Dr Kelso and Dr Engelhardt participated in the consultation as Advisers.

[10] http://www.who.int/influenza_vaccines_plan/objectives/en/, accessed 26 September 2013

Annex 2. Extent and type of influenza activity worldwide, from end of January to early September 2013

Geographical region / Country, area or territory	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20	Weeks 21-24	Weeks 25-28	Weeks 29-32	Weeks 33-36
Africa								
Algeria	****H1(pdm09), *H3, ****B	***H1(pdm09), *H3, ***B	*H1(pdm09), *B	0	0	0	0	*B
Burkina Faso	*H1(pdm09), *B	*H1(pdm09), *H3, *B	*H3	*B	*B		*B	
Cameroon	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *B	**H1(pdm09), *B	**H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *B	
Central African Republic	*H1(pdm09)	*H1(pdm09)	*H1(pdm09)	*H1(pdm09)	*H1(pdm09), *B	*B	*H1(pdm09), *B	*H1(pdm09), **B
Côte d'Ivoire	*H1(pdm09)	*H1(pdm09), *H3, *B	*H1(pdm09), *H3	*H1(pdm09), *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
Democratic Republic of the Congo	0	0	0	*B	*B	*B	*B	
Egypt	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, **B	*H1(pdm09), **B	*H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
Ethiopia	*H1(pdm09), *H3							
Ghana	*H1(pdm09), *H3	*H1(pdm09), *H3	*H3	*H1(pdm09), *H3	*H3	**H1(pdm09), *H3, *B	*H3	*H3
Kenya	*H1(pdm09), *H3, *B	*H1(pdm09), *H3	*H1(pdm09), *H3, *B	*H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B		
Madagascar	*H3, *B	*H1(pdm09), *H3, *B	**H1(pdm09), **B	***H1(pdm09), **B	***H1(pdm09), **B	*H1(pdm09), **B	*H1(pdm09), *B	*H1(pdm09)
Mauritius	0	*H1(pdm09), *H3	*H1(pdm09)			*H3	*H3, *B	*H3
Morocco	***H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09)	0	0	0	0	0
Niger	*H1(pdm09)	*H1(pdm09)	*H1(pdm09)					
Nigeria	*H1(pdm09), *B	*H1(pdm09), *B	*B	*B	*B	*B		
Rwanda	*H3	*H1(pdm09), **H3, *B	*H1(pdm09), **H3, *B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, *B	*B		

Geographical region / Country, area or territory	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20	Weeks 21-24	Weeks 25-28	Weeks 29-32	Weeks 33-36
Senegal	*B	**B	*B	*B	*B	*B	*B	
Sierra Leone								
South Africa	*H1(pdm09), *B	*H1(pdm09), *H3	*H1(pdm09), *H3	**H1(pdm09), *H3, *B	**H1(pdm09), *H3, *B	****H1(pdm09), *H3, *B	**H1(pdm09), **H3, *B	*H1(pdm09), *H3, **B
Togo	*B	*H3, *B	0	*H1(pdm09)	*H1(pdm09), *H3	*H1(pdm09), *H3	*H3, *B	
Tunisia	****H1(pdm09), *H3, ****B	***H1(pdm09), *H3, **B	*H1(pdm09)	*H1(pdm09), *B				
Uganda	*H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *B	*H1(pdm09),**B	*H1(pdm09),**B	
United Republic of Tanzania	**H1(pdm09), *H3, *B	*B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*B	*H3	*A
Zambia	*H1(pdm09), *B	*H1(pdm09), *B	*B	0	0	0	0	0
America								
Argentina	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H3, *B	**H1(pdm09), **H3, *B	***H1(pdm09), **H3, *B	**H1(pdm09), ***H3, *B	***H1(pdm09), **H3, *B	*H1(pdm09), *H3, *B
Barbados	*H3							
Bermuda	*H3							
Bolivia (Plurinational State of)	*H1(pdm09), *H3, *B	*B	*H3, *B	*H3, *B	*H1(pdm09), ***H3, ***B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
Brazil	*H1(pdm09), **H3, *B	*H1(pdm09), **H3, **B	*H1(pdm09), **H3, **B	***H1(pdm09), ***H3, ***B	***H1(pdm09), ***H3, ***B	***H1(pdm09), ***H3, ***B	***H1(pdm09), **H3, ***B	**H1(pdm09), *H3, **B
Canada	*H1(pdm09), **H3, **B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
Chile	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	**H1(pdm09), *H3, *B	**H1(pdm09), *H3, *B	**H1(pdm09), *H3, *B	***H1(pdm09), **H3, **B	*H1(pdm09), **H3, *B
Colombia	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	**H1(pdm09), *H3, *B	*H1(pdm09), *H3	**H1(pdm09), *H3	*H1(pdm09), *H3, *B
Costa Rica	**H1(pdm09), **H3, **B	***H1(pdm09), ***H3	****H1(pdm09), ****H3	**H1(pdm09), *H3, **B	****H1(pdm09), *H3, *B	**H1(pdm09), **H3, **B	****H1(pdm09), ****H3, ****B	0
Cuba	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	**H1(pdm09), *H3, *B	**H1(pdm09), *H3	**H1(pdm09), *H3	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B

Geographical region / Country, area or territory	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20	Weeks 21-24	Weeks 25-28	Weeks 29-32	Weeks 33-36
Dominica	*H3	*B						
Dominican Republic	*H1(pdm09), *H3, *B	*H1(pdm09), *B	*H1(pdm09)	*H1(pdm09), *H3	*H1(pdm09)	*H1(pdm09), *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3
Ecuador	*H3, ***B	*H1(pdm09), *H3, *B	*H1(pdm09), ***H3, *B	***H1(pdm09), ***H3, *B	***H1(pdm09), *H3, *B	***H1(pdm09), *H3, *B	***H1(pdm09), *H3, ***B	***H1(pdm09), *B
El Salvador	**H3	**H3	**H3	***H3, *B	***H3	*H1(pdm09), ***H3	*H1(pdm09), ***H3	*H1(pdm09), **H3, *B
France, French Guiana	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	0	0
France, Martinique	*B		*H3					
Guatemala	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H3, *B	*H1(pdm09), *B	0
Haiti					*H1(pdm09)	*H1(pdm09)		
Honduras	*H3, *B	*H3, *B	0	*B	0	*H3, *B	0	*B
Jamaica	*H1(pdm09), *H3, *B	*H1(pdm09)	*H1(pdm09)	*H1(pdm09), *H3	*H1(pdm09), *H3	*H1(pdm09)	*H1(pdm09)	0
Mexico	*H1(pdm09), **H3, *B	*H1(pdm09), **H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	**H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3
Nicaragua	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3	*H1(pdm09), *H3	*H1(pdm09), **H3, *B	**H1(pdm09), ***H3	**H1(pdm09), **H3
Panama	***H1(pdm09), ***H3	0	*H3	*H3	***H3	***H1(pdm09), ***H3	*H1(pdm09), ***H3	*H1
Paraguay	*H3, *B	*H3, *B	*H1(pdm09), *H3, *B	*H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), **H3, *B	*H1(pdm09), **H3, *B	*H1
Peru	*H1(pdm09), *H3, *B	*H3	*H1(pdm09), *H3	*H1(pdm09), *H3, *B	*H1(pdm09), *H3	*H1(pdm09), **H3, **B	***H1(pdm09), **H3, **B	***H1(pdm09), *H3, *B
Trinidad and Tobago	*H3	*H1(pdm09), *H3						
United Kingdom of Great Britain and Northern Ireland, Cayman Islands	*B							
United States of America	**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

Geographical region / Country, area or territory	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20	Weeks 21-24	Weeks 25-28	Weeks 29-32	Weeks 33-36
Uruguay	0	0	0	0	***H1(pdm09), ***H3, ***B	***H1(pdm09), ***H3	***H1(pdm09)	*H1(pdm09), *H3
Venezuela (Bolivarian Republic of)	***H1(pdm09)				****H1(pdm09), ***H3	**H1(pdm09), **H3		
Asia								
Armenia	*H1(pdm09), *B	**H1(pdm09), **B	*H1(pdm09), *B	*B	0	0	0	0
Afghanistan	0							
Azerbaijan	*B	*H3, *B	*H3, *B	*H3, *B	0	0	0	0
Bahrain	*H1(pdm09), *B	*H1(pdm09), *B	**H1(pdm09)					
Bangladesh	*H1(pdm09), *H3, *B	*H1(pdm09)	*H1(pdm09), *H3	*H1(pdm09), *H3	*H1(pdm09), **H3	*H1(pdm09), **H3		
Bhutan	*H3	*H3	*H3	0	*H1(pdm09), *H3	*H3	*H3	*H3
Cambodia	*B	*B	*B	*H1(pdm09), *B	*H1(pdm09), *B	**H1(pdm09), *H3	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
China	**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	*H1(pdm09), **H3, *B	**H1(pdm09), **H3, **B	***H1(pdm09), **H3, ***B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
India	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3	*H1(pdm09), *H3	*H1(pdm09), **H3, *B	*H1(pdm09), **H3, *B
Indonesia	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
Iran (Islamic Republic of)	*H1(pdm09), *H3, **B	*H1(pdm09), **B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H3	*H1(pdm09), *H3, *B	*H1(pdm09), *B	
Iraq	*H1(pdm09)	**H1(pdm09)	0	0	0	0	0	0
Israel	****H1(pdm09), *H3, *B	***H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B					
Japan	*H1(pdm09), ****H3, **B	*H1(pdm09), ***H3, ***B	*H1(pdm09), **H3, ***B	*H1(pdm09), *H3, ***B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, *B	*H1, *H3	*H3

Geographical region / Country, area or territory	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20	Weeks 21-24	Weeks 25-28	Weeks 29-32	Weeks 33-36
Jordan	*H1(pdm09), *H3, *B	*H1(pdm09), *B	*H1(pdm09), *H3, *B	*B	*H3, *B	*H1(pdm09), *B	0	
Kazakhstan	*H1(pdm09), **H3, **B	*H1(pdm09), **H3, **B	*H1(pdm09), *H3, *B	*H1(pdm09)	0	0	0	
Kyrgyzstan	*H1(pdm09), *B	*B	0	0	0	0	0	
Lao People's Democratic Republic	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H3, *B	*H1(pdm09), *H3, **B	*H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09)	*H1(pdm09)
Malaysia	0							
Mongolia	*H1(pdm09), **H3	*H1(pdm09), *H3	*H1(pdm09), *H3	*H1(pdm09), *B	0	0	0	
Nepal	*H1(pdm09), *H3	*H1(pdm09), *H3, *B	*H1(pdm09), *H3	*H1(pdm09), *H3	*H1(pdm09), **H3	*H1(pdm09), **H3	*H1(pdm09), *H3, *B	*H3, *B
Oman	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *B					
Pakistan	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *H3, *B	*B				
Philippines	*H1(pdm09), *B	*H1(pdm09), *H3, *B	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
Qatar	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09), *B				
Republic of Korea	*H1(pdm09), **H3, *B	*H1(pdm09), **H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	0	*H3	0
Singapore	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), **H3, **B	*H1(pdm09), **H3, *B	**H3, *B	*H1(pdm09), *H3, *B
Sri Lanka	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	**H1(pdm09), *H3, **B	**H1(pdm09), *H3, **B	*H1(pdm09), *B	*H1(pdm09), *B	*H3, *B
Suriname	*H1(pdm09)		*H1(pdm09)	*H1(pdm09)				
Thailand	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H3, *B	*H3	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
Uzbekistan	*H1(pdm09), *H3, *B	*H3, *B	*H3, *B	0				
Viet Nam	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B

Geographical region / Country, area or territory	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20	Weeks 21-24	Weeks 25-28	Weeks 29-32	Weeks 33-36
Europe								
Albania	*H1(pdm09), *B	*H1(pdm09), **B						
Austria	****H1(pdm09), *H3, ****B	***H1(pdm09), *H3, ****B	*H1(pdm09), *H3, **B	*B	*H1(pdm09)	0	0	0
Belarus	**H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H3, *B				
Belgium	****H1(pdm09), *H3, ****B	*H1(pdm09), *H3, ****B	*H1(pdm09), *H3, *B	0	0	0	0	0
Bosnia and Herzegovina	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	0	0	0	0	0
Bulgaria	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, **B	*H1(pdm09), *B	*B	*B	0	0	0
Croatia	****H1(pdm09), ****H3, *B	0	*H1(pdm09), *H3, *B	*B				
Czech Republic	****H1(pdm09), ****H3, **B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, **B			*H1(pdm09)		
Denmark	**H1(pdm09), **H3, ****B	*H1(pdm09), *H3, ****B	*H1(pdm09), *H3, **B	*B	0	*H3, *B	0	0
Estonia	*H1(pdm09), *H3, ****B	*H1(pdm09), *H3, ****B	*H1(pdm09), *H3, ****B	*B	0	0	0	0
Finland	****H1(pdm09), *H3, *B	****H1(pdm09), **H3, *B	***H1(pdm09), ***H3, ***B	*H1(pdm09)	0			
France	****H1(pdm09), **H3, ****B	***H1(pdm09), **H3, ****B	*H1(pdm09), *H3, **B	*H3, *B	*B	0	0	0
Georgia	****H1(pdm09), **B	****H1(pdm09), **B	*H1(pdm09), **B	*H1(pdm09), **B	*B	0	0	0
Germany	****H1(pdm09), ***H3, ****B	**H1(pdm09), ***H3, ****B	*H1(pdm09), ***H3, ****B	*H3, *B	*H1(pdm09), *H3	*H1(pdm09), *H3, *B	0	0
Greece	**H1(pdm09), **H3, *B	**H1(pdm09), **H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *B	*H1(pdm09), *H3	0		
Hungary	***H1(pdm09), ***H3, *B	***H1(pdm09), **H3, ***B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B				

Geographical region / Country, area or territory	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20	Weeks 21-24	Weeks 25-28	Weeks 29-32	Weeks 33-36
Iceland	***H1(pdm09), *H3, **B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*B			
Ireland	***H1(pdm09), ***H3, ****B	**H1(pdm09), ***H3, ***B	**H1(pdm09), **H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H3	0	0
Italy	***H1(pdm09), *H3, ****B	***H1(pdm09), *H3, ****B	*H1(pdm09), *H3, *B					
Latvia	**H1(pdm09), *H3, ****B	*H1(pdm09), *H3, ****B	*H1(pdm09), *H3, ****B	***B	*B			
Lithuania	***H1(pdm09), *H3, *B	*H1(pdm09), *H3, ***B	*A, **B	*B	0	0	0	0
Luxembourg	****H1(pdm09), *H3, ****B	**H1(pdm09), *H3, ****B	*H3, *B	*B				
Netherlands	****H1(pdm09), ****H3, ****B	*H1(pdm09), **H3, ****B	*H1(pdm09), *H3, ****B	*B	*B	0	0	0
Norway	***H1(pdm09), *H3, ****B	***H1(pdm09), *H3, ****B	*H1(pdm09), *H3, ***B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, *B	*B	*H1(pdm09)	*H1(pdm09), *B
Poland	**H1(pdm09), *H3, **B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, *B	*B	0	0	0	*H3, *B
Portugal	****H1(pdm09), *H3, ****B	****H1(pdm09), *H3, ****B	*H1(pdm09), *H3, *B	*B	*B	0	0	0
Republic of Moldova	****H1(pdm09), *H3, ****B	***H1(pdm09), *H3, ***B	*H1(pdm09), *H3, *B	*H3, *B	0	0	0	0
Romania	***H1(pdm09), *H3, ***B	****H1(pdm09), *H3, ****B	**H1(pdm09), *H3, **B	*H1(pdm09), *H3, *B	0	0	0	0
Russian Federation	***H1(pdm09), ***H3, **B	****H1(pdm09), ****H3, ****B	****H1(pdm09), ****H3, ****B	*H1(pdm09), *H3, *B	*H3, *B	0	0	0
Serbia	***H1(pdm09), *H3, ***B	*H1(pdm09), *H3, ***B	*H3, *B	0				
Slovakia	**H1(pdm09), *H3, **B	*H1(pdm09), *H3, **B	*H1(pdm09), *B	*H3, *B	0	0	0	0
Slovenia	****H1(pdm09), *H3, ****B	*H1(pdm09), *H3, ****B	*H1(pdm09), *H3, **B	*B	0	0	0	0
Spain	**H1(pdm09), *H3, ****B	**H1(pdm09), *H3, ***B	*H1(pdm09), *H3, *B	*H1(pdm09), *B	*H1(pdm09), *B	*H1(pdm09)	*H1(pdm09), *H3	0

Geographical region / Country, area or territory	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20	Weeks 21-24	Weeks 25-28	Weeks 29-32	Weeks 33-36
Sweden	****H1(pdm09), *H3, ****B	**H1(pdm09), *H3, ****B	*H1(pdm09), *H3, ***B	*H1(pdm09), *H3, **B	*H1(pdm09), *B	*H1(pdm09)	*H1(pdm09)	0
Switzerland	*H1(pdm09), *H3, ****B	*H1(pdm09), *H3, ****B	*H1(pdm09), *H3, **B					
The former Yugoslav Republic of Macedonia	**H1(pdm09), **B							
Turkey	**H1(pdm09), *H3, *B	**H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	0	0	0	0
Ukraine	***H1(pdm09), *H3, *B	***H1(pdm09), *H3, *B	**H1(pdm09), **H3, ***B	*H1(pdm09), *B	*H3, *B	0		
United Kingdom of Great Britain and Northern Ireland	*H1(pdm09), **H3, ***B	*H1(pdm09), **H3, ***B	*H1(pdm09), **H3, **B	*H1(pdm09), *H3, **B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B
Oceania								
Australia	*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	0	*H3, *B	0					
France, New Caledonia	*H1(pdm09), *H3	*H1(pdm09), *B	*H3	0	*H1(pdm09)	0	**H1(pdm09), *H3	**H1(pdm09), *H3
Micronesia (Federated States of)						*H1(pdm09)		
New Zealand				*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), *H3, *B	*H1(pdm09), **H3, **B	*H1(pdm09), **H3, **B
United States of America, American Samoa	*H3	*H3		*H3				
United States of America, Guam			*H3					
United States of America, Northern Mariana Islands, Saipan	*H1(pdm09)			*H1(pdm09)				

Data in Annex 2 were provided by the Global Influenza Surveillance and Response System and other partners.

* = Sporadic activity	A = Influenza A (not subtyped)
** = Local activity	B = Influenza B
*** = Regional outbreaks	H1(pdm09) = Influenza A(H1N1)pdm09
****= Widespread outbreaks	H1 = Former seasonal influenza A(H1N1)
	H3 = Influenza A(H3N2)
	0 = All negative