INFORMATION FOR THE VACCINES AND RELATED BIOLOGICAL PRODUCTS ADVISORY COMMITTEE, CBER, FDA

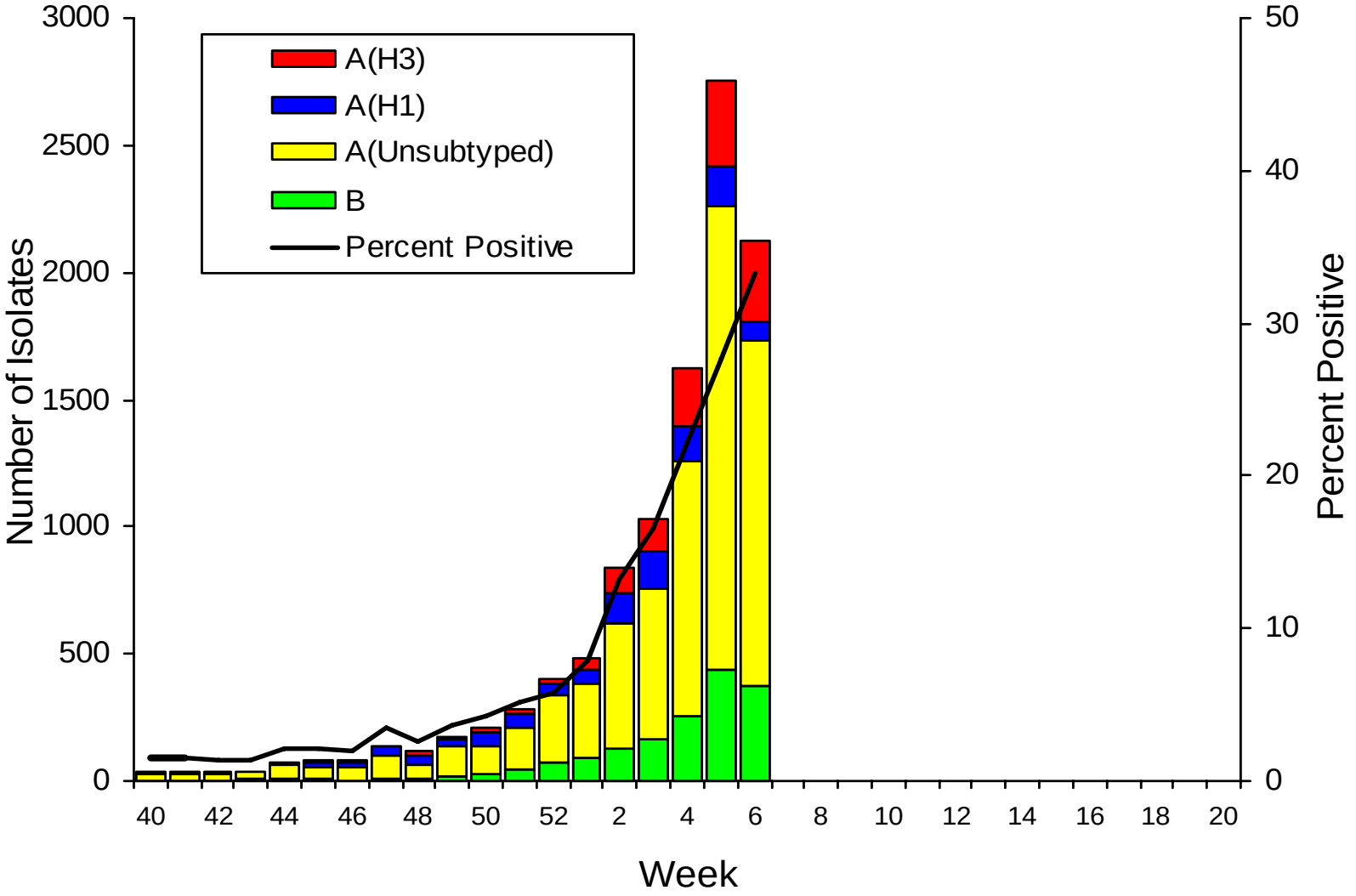
February 21, 2008

WHO COLLABORATING CENTER FOR SURVEILLANCE, EPIDEMIOLOGY AND CONTROL OF INFLUENZA

Influenza Division
National Center for Immunization and Respiratory Diseases
Coordinating Center for Infectious Diseases
Centers for Disease Control and Prevention
Atlanta, GA 30333

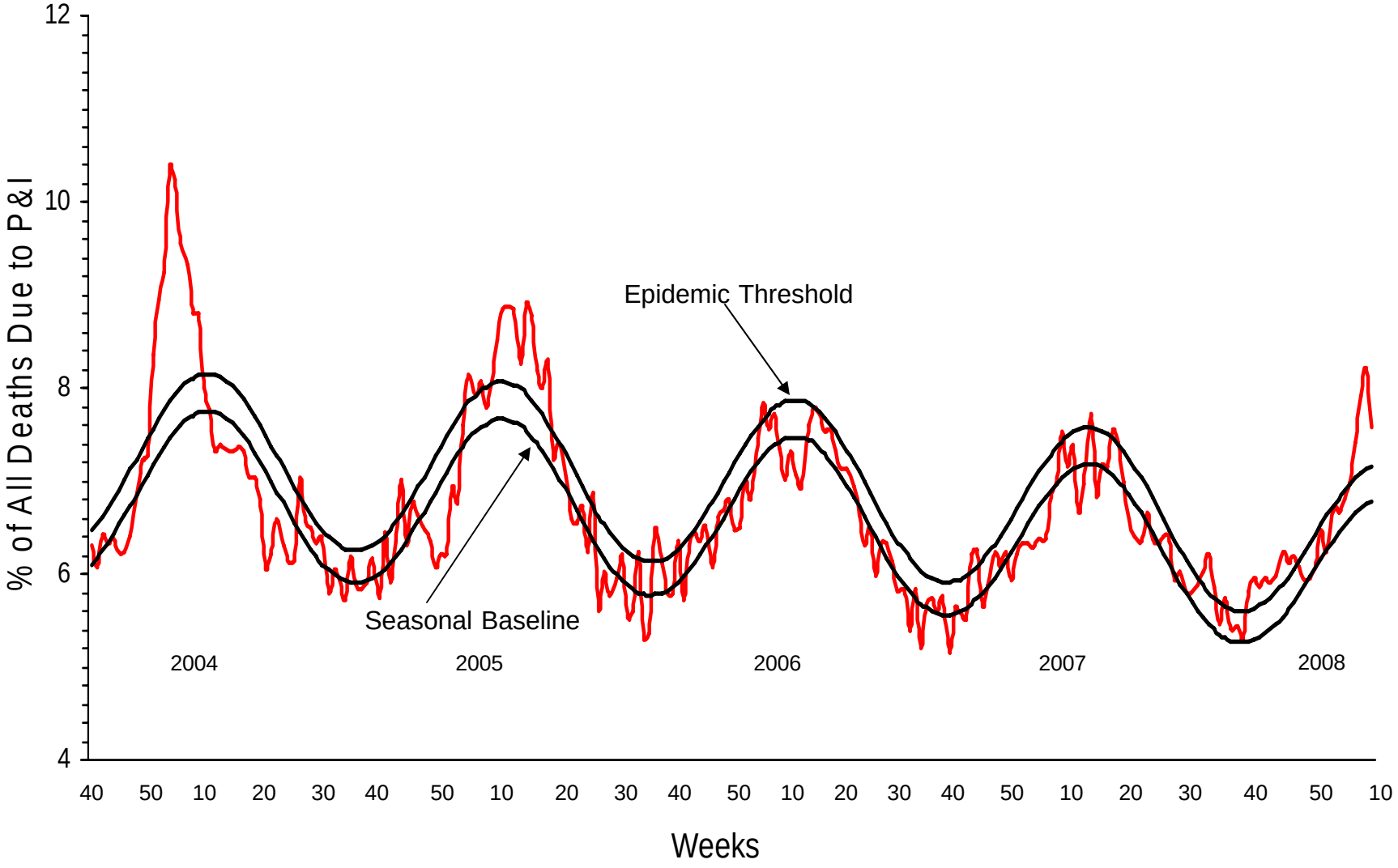
U.S. Surveillance

U.S. WHO/NREVSS Collaborating Laboratories National Summary, 2007-08



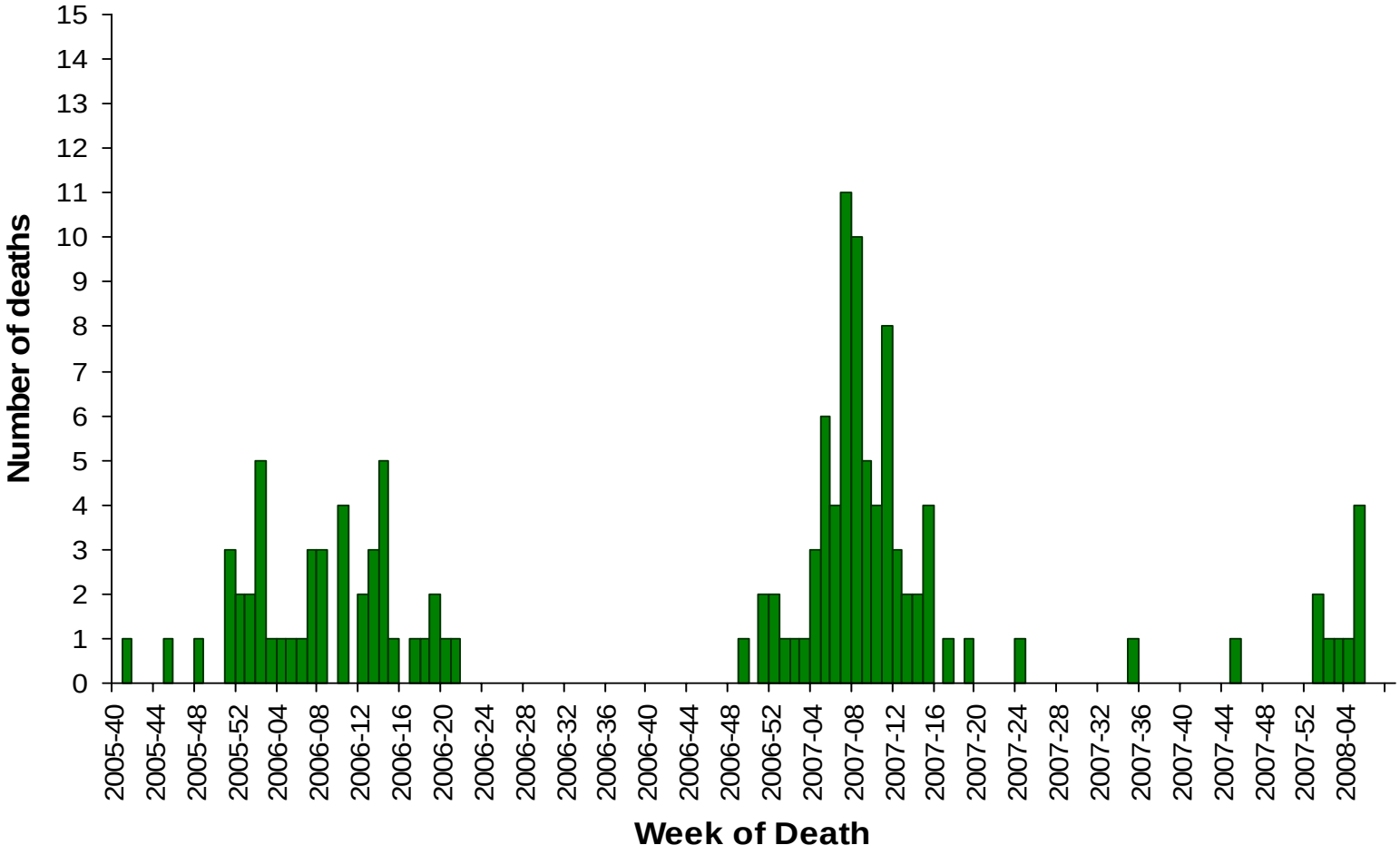
Pneumonia and Influenza Mortality for 122 U.S. Cities

Week Ending 02/02/2008

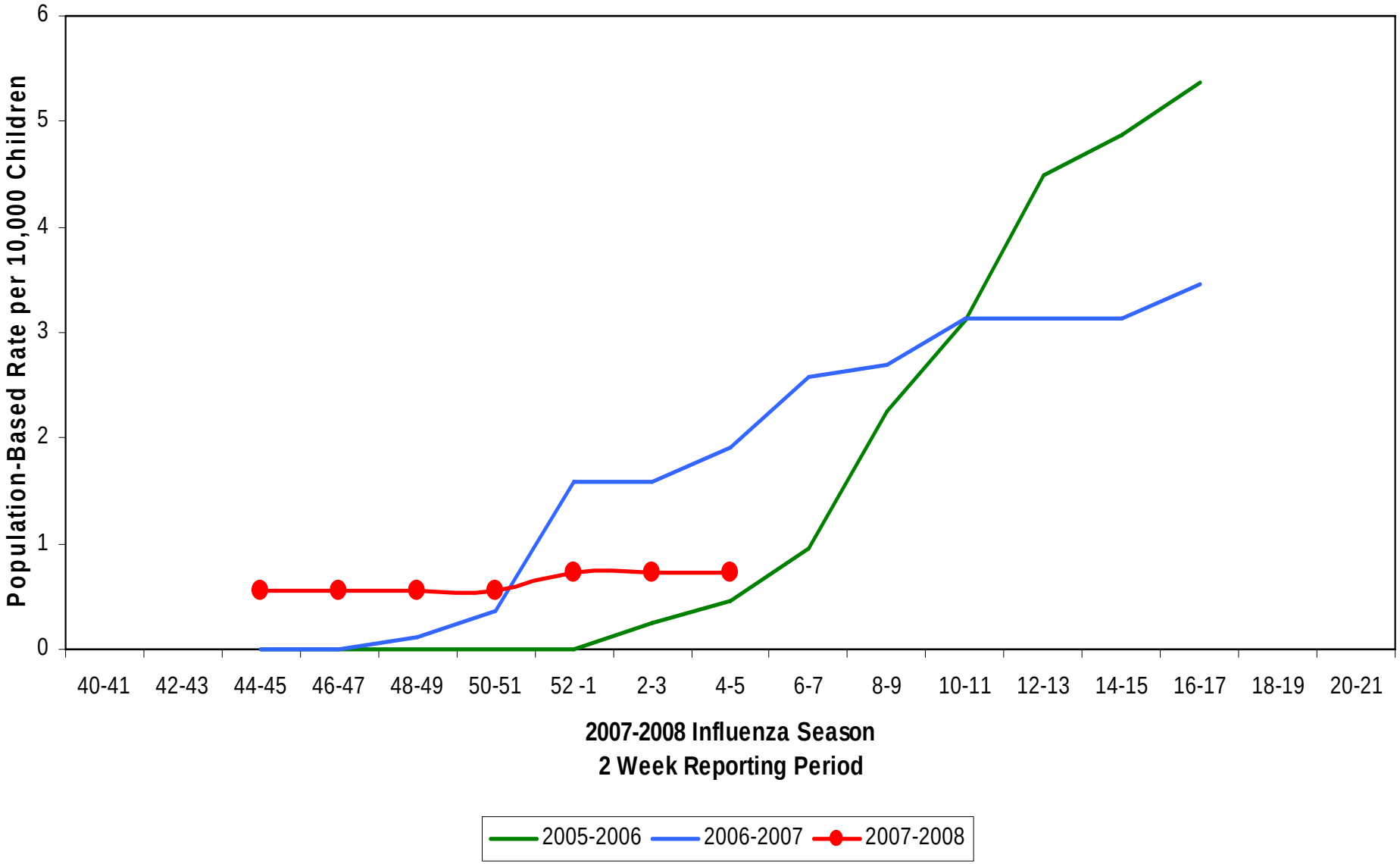


Number of Influenza-Associated Pediatric Deaths by Week of Death:

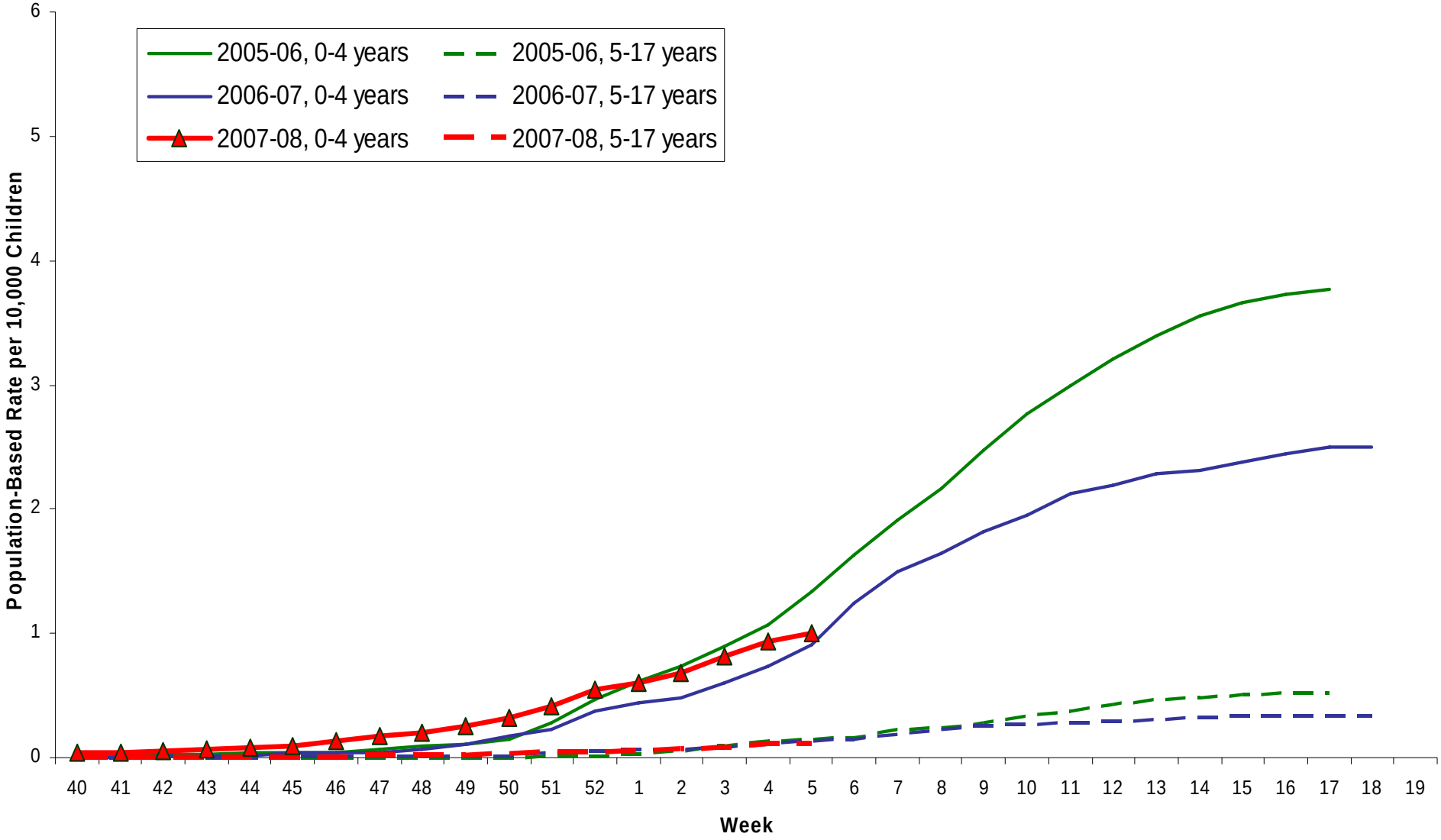
2005-06 season to present



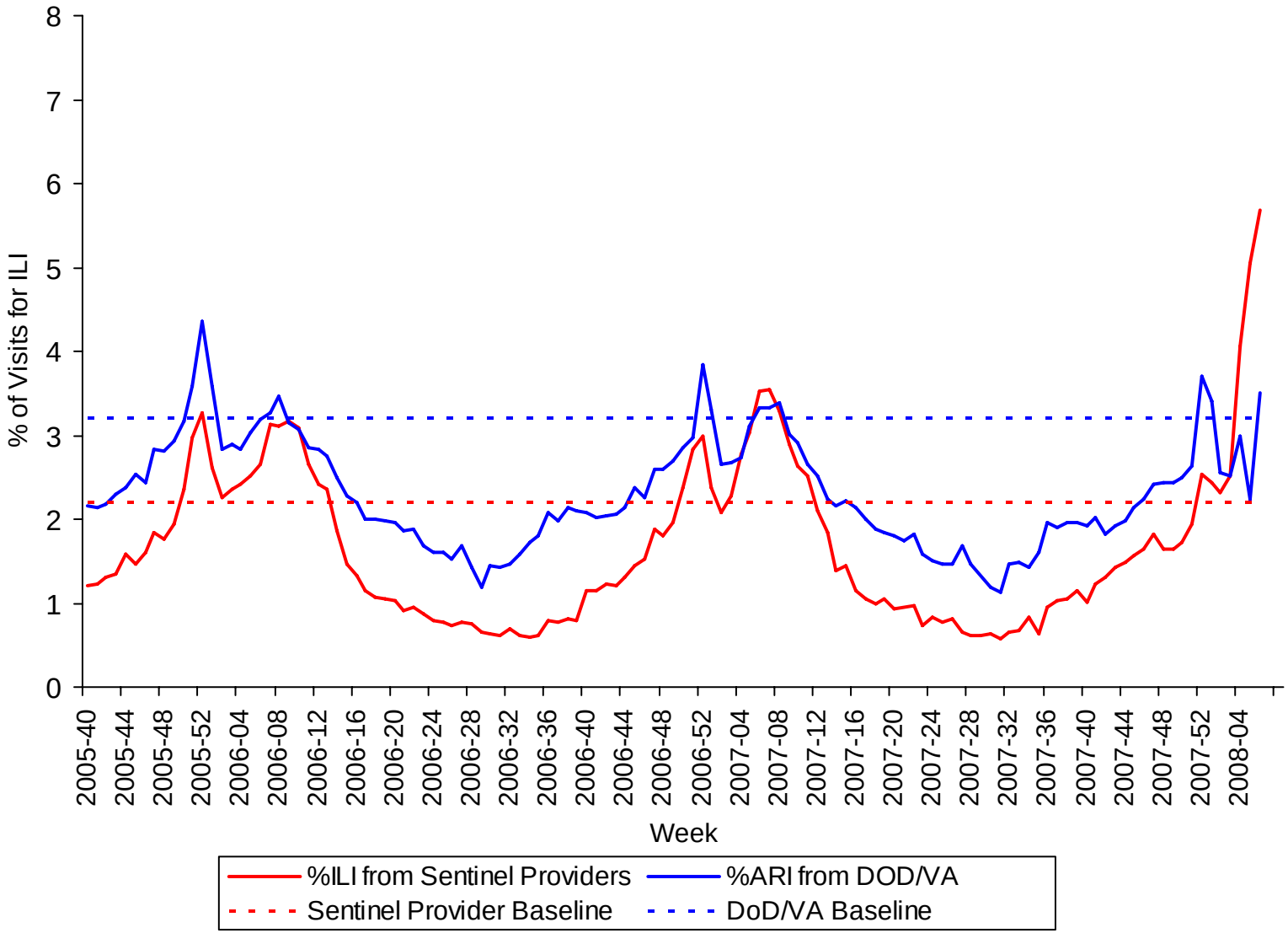
NVSN Influenza Laboratory-Confirmed Cumulative Hospitalization Rates for Children 0 - 4 Years, 2007- 08 and Previous 2 Seasons



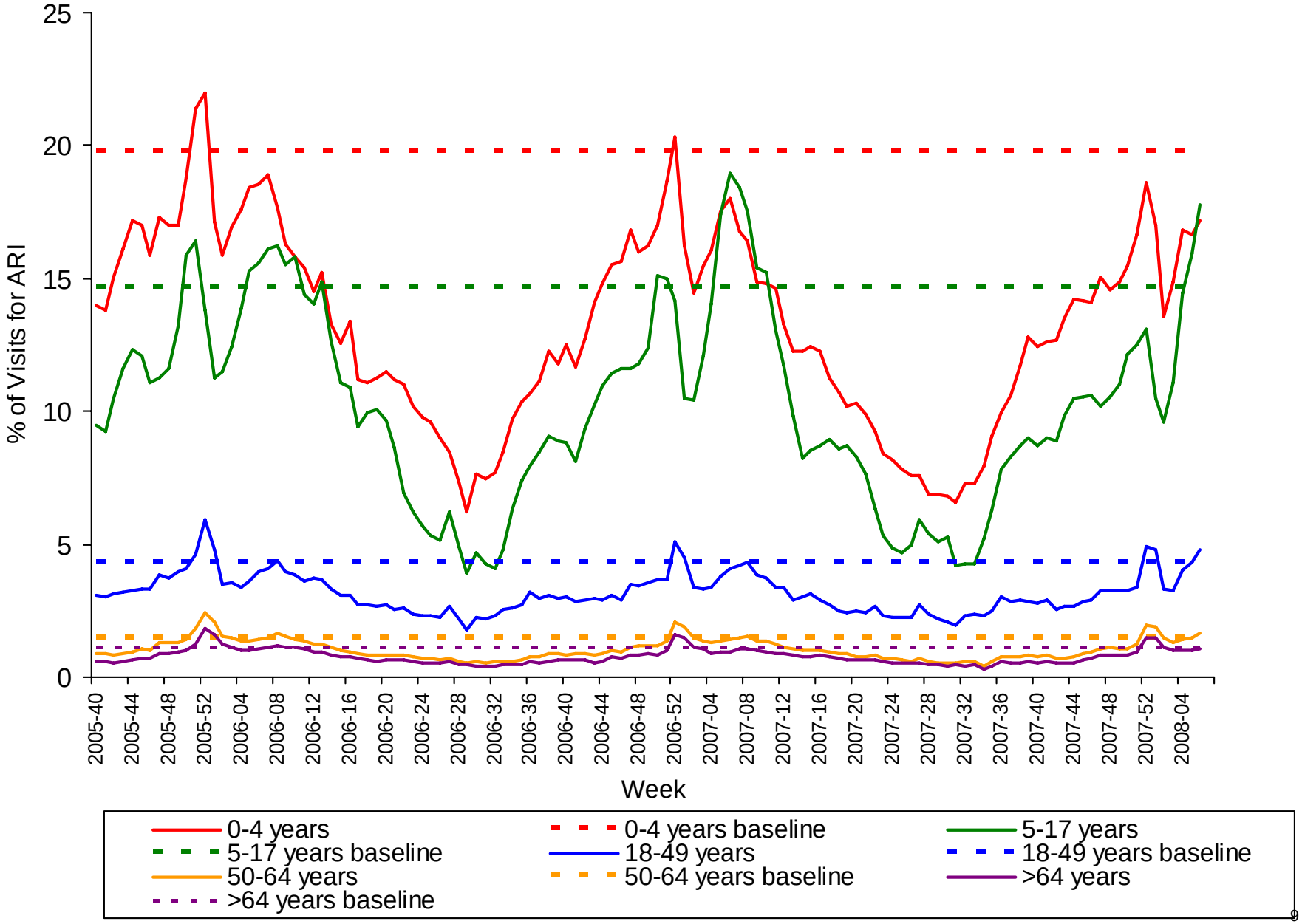
EIP Influenza Laboratory-Confirmed Cumulative Hospitalization Rates for Children Aged 0-4 and 5-17 yrs, 2007-2008 and Previous 2 Seasons



Percentage of Visits for ILI & ARI Reported by Sentinel Providers and BioSense Outpatient Facilities, National Summary

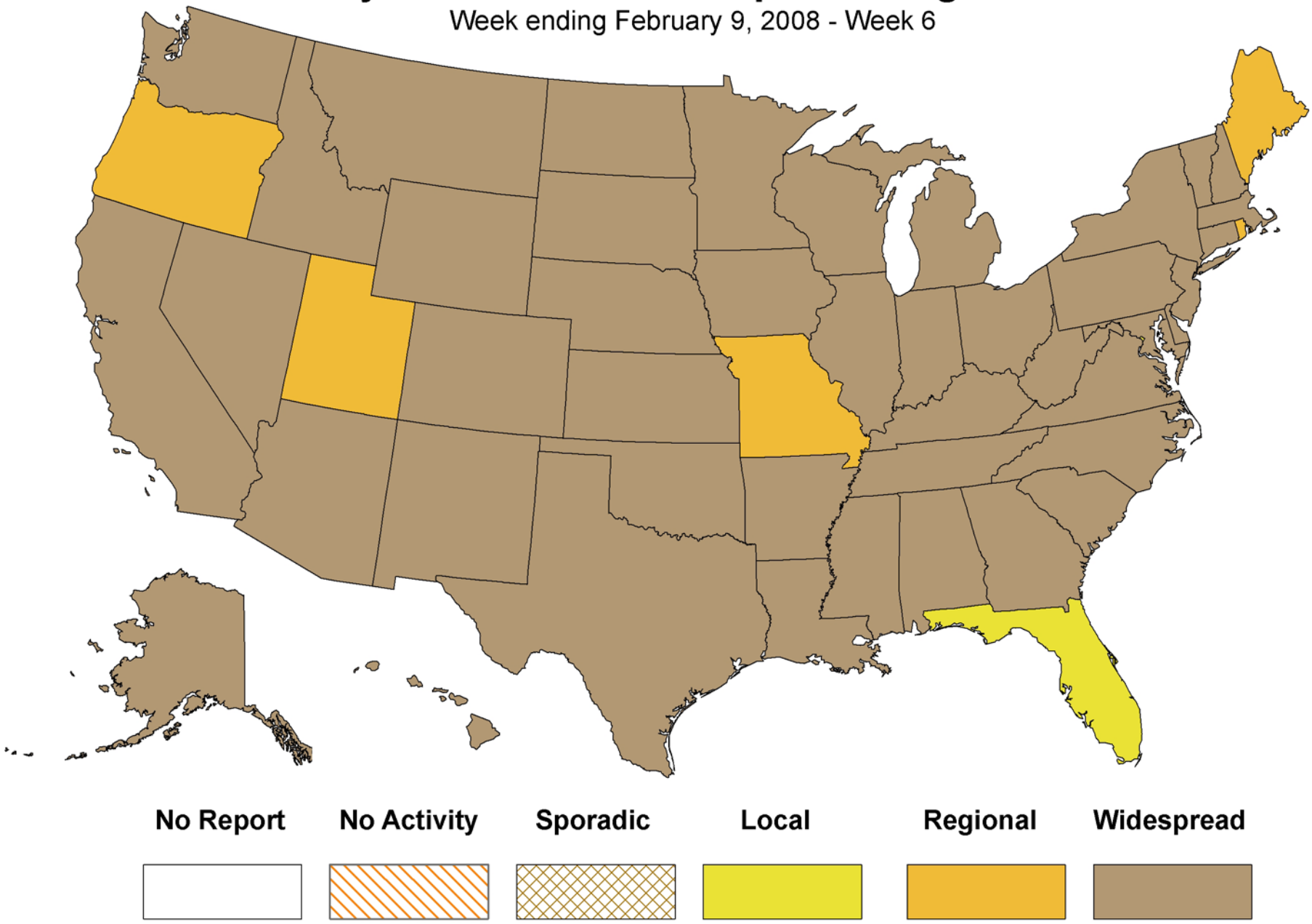


Percentage of Visits for ARI by Age Group Reported by DoD/VA Outpatient Clinics - National Summary



Weekly Influenza Activity Estimates Reported by State & Territorial Epidemiologists*

Week ending February 9, 2008 - Week 6



Influenza A(H1N1) Viruses

HEMAGGLUTINATION INHIBITION REACTIONS OF INFLUENZA H1 VIRUSES (02/08/08)

		FERERENCE FERRET ANTISERA							Date	
REFERENCE ANTIGENS		NC/20	SI/3	AS/59	SD/6	FU/141	HK/2652	CB/0371	collected	Passage
1	A/NEW CALEDONIA/20/99	**640**	160	160	160	320	160	80	06/09/99	E4/E2
2	A/SOLOMON ISLANDS/3/06 IVR-145*	160	**640**	320	160	640	320	160	REASS	E9/E1
3	A/BRISBANE/59/07*	80	160	**640**	640	640	320	320	07/01/07	E2/E1
4	A/SOUTH DAKOTA/6/07*	80	160	640	**640**	640	320	320	07/17/07	E3
5	A/FUKUSHIMA/141/06	80	160	640	1280	**1280**	640	640	UNKN	E4/E1
6	A/HONG KONG/2652/06	80	160	640	640	640	**1280**	2560	07/17/06	E3
7	A/CAMBODIA/0371/07*	40	160	320	320	640	1280	**1280**	08/09/07	E4
TEST ANTIGENS										
8	A/FLORIDA/13/2007	80	640	320	320	320	320	160	12/16/07	E2
9	A/FLORIDA/18/2007	80	320	640	320	320	320	160	12/17/07	C2
10	A/FLORIDA/19/2007-EGG	80	320	160	160	320	160	160	12/28/07	E2
11	A/NEW MWXICO/8/2007	80	320	640	320	640	640	640	12/17/07	E2
12	A/PENNSYLVANIA/14/2007-EGG	160	320	1280	1280	1280	640	1280	12/12/07	E3
13	A/PENSYLVANIA/14/2007-MDCK	80	320	320	320	320	320	160	12/12/07	C2
14	A/PENSYLVANIA/03/2008	40	160	640	640	640	320	320	01/02/08	X/C2
15	A/FLORIDA/19/2007-MDCK	80	160	320	320	320	320	160	12/28/07	C2
16	A/NEW MWXICO/01/2008	80	80	640	640	640	320	640	01/03/08	MX/C1
17	A/NEW MWXICO/07/2007	80	80	640	640	640	320	320	12/18/07	E2
18	A/COLORADO/35/2007	80	160	320	320	160	160	80	12/17/07	M2/C1
19	A/THAILAND/749/2007	80	640	320	320	320	320	160	10/08/07	C2/C1
20	A/THAILAND/589/2007	80	320	320	320	320	320	80	08/03/07	C2/C1
21	A/THAILAND/781/2007	80	320	160	160	160	160	80	10/18/07	C2/C1
22	A/THAILAND/C71644/2007	80	160	640	640	320	320	160	09/11/07	C1/C2
23	A/THAILAND/713/2007	80	160	640	1280	640	320	320	09/21/07	C3/C1
24	A/THAILAND/590/2007	40	160	640	640	1280	640	320	08/09/07	C2/C1
25	A/LYON/1323/2007	80	160	320	320	320	320	160	12/11/07	C2/C1
26	A/LYON/1412/2007	80	160	320	320	640	320	160	12/19/07	C2/C2
27	A/LYON/1375/2007	40	80	320	320	640	320	320	12/18/07	C2/C1
28	A/LYON/1321/2007	40	80	320	320	640	320	160	12/10/07	C2/C1
29	A/LYON/1362/2007	40	80	320	320	160	160	80	12/14/07	C2/C1
30	A/HIROSHIMA/93/2007	40	40	320	320	320	320	320	10/30/07	E3/E1

*Serology antigens

Influenza A(H1N1) Isolates Characterized by CDC

	U.S.A.	North America	Europe	Asia	Cent/So America	Africa, Australia, New Zealand	Total (%)
April 2007 – September 2007							
A/N.Caledonia/20/99-like	5	7	11	5	13	1	42 (25.1%)
A/Sol. Islands/03/2006-like	25	1	5	79	4	5	119 (71.3%)
A/Sol. Islands/03/2006 (low)*				4			4 (2.4%)
A/Sol. Islands/03/2006 (low)**				2			2 (1.2%)
						Total	167
October 2007- January 2007							
A/N.Caledonia/20/99-like					2		2 (1%)
A/Sol. Islands/03/2006-like	107	1	5	25			138 (75%)
A/Sol. Islands/03/2006 (low)*	12		3	6			21 (11%)
A/Sol. Islands/03/2006 (low)**	12		6	5			23 (13%)
						Total	184
Total	161	9	30	126	19	6	351

Preliminary Data 02/12/2008

* 4-fold low to A/Solomon Islands/03/2006
** 8-fold or greater low to A/Solomon Islands/03/2006

Antigenic analyses of influenza A H1N1 viruses (London)

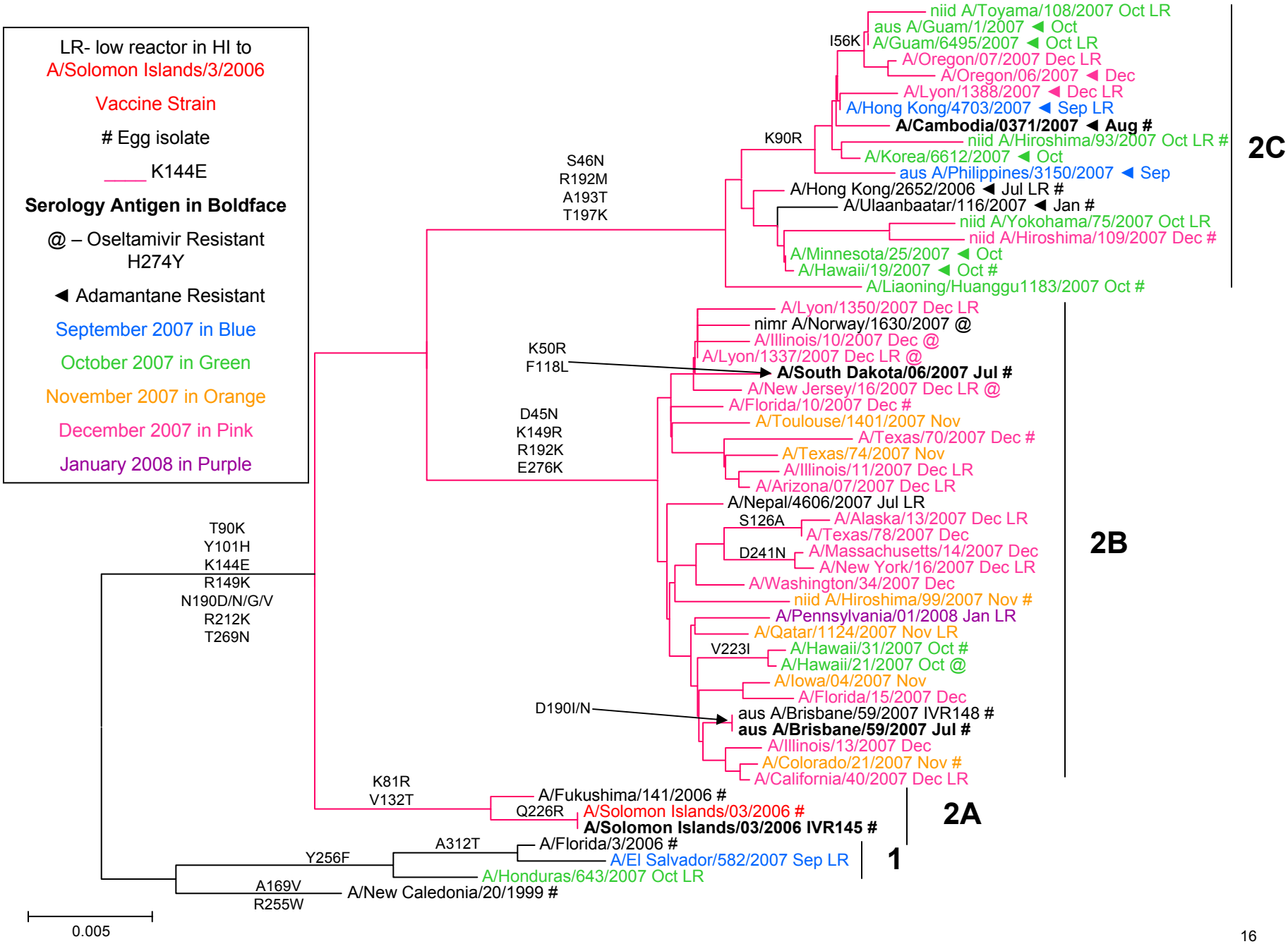
Viruses	Collection Date	Passage	Post infection ferret sera					
			A/NC 20/99	A/HK 2652/06	A/Fuk 141/06	A/SI 3/06	A/Bris 59/07 Aus	A/Bris 59/07
REFERENCE VIRUSES								
A/New Caledonia/20/99	9.6.99	Ex	**320**	40	80	40	80	160
A/Hong Kong/2652/2006	17.7.06	E2 \2	40	**320**	320	320	160	640
A/Fukushima/141/2006	7.2.06	E4 \2	80	160	**640**	640	160	1280
A/Solomon Islands/3/2006	21.8.06	E3 \2	80	320	320	**640**	320	640
A/Brisbane/59/2007	1/7/07	E2 \1	40	160	320	320	**320**	**1280**
A/Brisbane/59/2007	1/7/07	MDCKx+2	<	40	<	<	320	320
TEST VIRUSES								
A/Trieste/4/2008	8/1/08	MDCKsiat1	40	160	160	320	640	640
A/Lisbon/3/2008 #	2/01/2008	MDCK3	40	160	160	320	640	1280
A/Hungary/3/2007	25/12/07	E3 \1	<	160	160	320	80	40
A/Firenze/25/2007	20/12/07	MDCK1	40	80	160	160	160	160
A/Parma/68/07	20/12/07	II MDCK	40	80	160	160	160	160
A/Finland/4/2007	23/12/07	MDCK2	40	80	80	160	320	640
A/Algeria/G195/07	3/11/07	PO1\1	40	80	320	160	160	160
A/Barcelona/00122/2008	5/1/08	MDCK0	40	80	160	160	160	160
A/Paris/0577/07 #	Dec-08	MDCKx	40	80	80	80	320	320
A/Denmark/4/2008	4/1/08	MDCK2	40	80	80	80	320	640
A/Norway/12/2008 #	13/12/07	MDCK1	40	80	40	80	320	640
A/Algeria/G258/07	12/11/07	PO1\1	40	80	40	80	320	640
A/Barcelona/145/2008	5/1/08	MDCK1	<	80	80	80	160	640
A/Bordeaux/1314/07	04/12/07	MDCK3	40	80	40	40	160	320
A/Stockholm/16/2007	11/12/07	MDCK2	<	80	40	40	320	640
A/Stockholm/17/2007	13/12/07	MDCK2	<	80	40	40	320	1280
A/Stockholm/1/2008	Jan-08	MDCK1	<	40	40	40	80	80
A/Dakar/09/07	05/10/07	MDCK2	<	<	40	<	640	320
A/Barcelona/00083/2008	3/1/08	MDCK0	<	40	<	<	160	640
A/Baden-Wurttemberg/2/08	7/01/08	MDCKx	80	40	40	<	40	160

1. < : <40; #, oseltamivir resistant

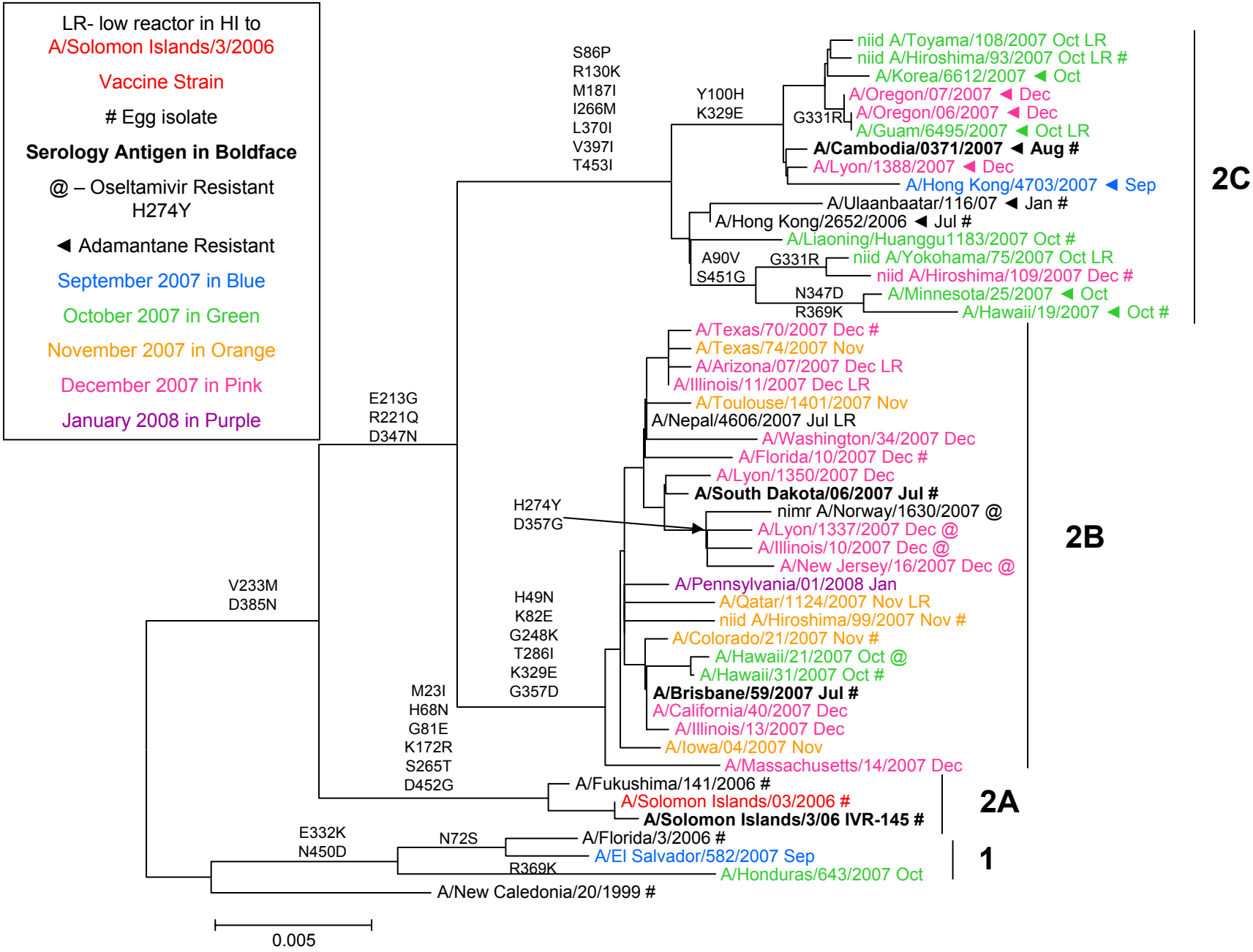
H1 low reactors in HI assays in WHOCCs

	A/SI/3/06-like	low-reactors (≥ 8-f)
• Australia (Oct-)	117 [55%]	97 [45%]
• CDC (Oct -)	137 [96%]	6 [4%]
• NIID (Sept -)	90 [88%]	12 [12%]
• NIMR (Sept -)	72 [54%]	62 [46%]
Total	416 [70%]	177 [30%]

Evolutionary Relationships Among Influenza H1N1 HA (HA1) Genes, 2007-08



Evolutionary Relationships Among Influenza H1N1 NA Genes, 2007-08



HI Antibody Responses to the H1 Component of the 2007 - 2008 Influenza Vaccine

ADULT POPULATIONS

						% with HI titer ≥ 40		% with HI titer ≥ 80		% with HI titer ≥ 160	
Population	N	Antigen	% Rise	Pre GMT	Post GMT	Pre	Post	Pre	Post	Pre	Post
Australia[1]	24	A/Solomon Islands/03/2006 IVR-145*	25	19	45	46	71	17	38	2	4
	24	A/Brisbane/59/2007	25	7	16	0	25	0	4	0	1
	24	A/South Dakota/6/2007	25	7	16	0	17	0	8	0	1
	24	A/Cambodia/0371/2007	17	6	11	0	13	8	8	0	0
Japan[2]	30	A/Solomon Islands/03/2006 IVR-145*	27	50	116	67	87	57	77	33	53
	30	A/Brisbane/59/2007	17	13	21	20	40	7	10	3	7
	30	A/South Dakota/6/2007	13	11	17	17	27	7	10	0	3
	30	A/Cambodia/0371/2007	10	8	10	7	17	3	7	3	7
USA[3]	24	A/Solomon Islands/03/2006 IVR-145*	58	71	523	67	100	50	100	33	96
	24	A/Brisbane/59/2007	46	15	64	29	71	21	67	8	33
	24	A/South Dakota/6/2007	46	14	65	29	79	13	67	8	33
	24	A/Cambodia/0371/2007	54	12	41	17	67	17	46	8	25
UK[4]	24	A/Solomon Islands/03/2006 IVR-145*	83	14	329	21	96	13	92	8	88
	24	A/Brisbane/59/2007	58	6	25	4	46	0	21	0	8
	24	A/South Dakota/6/2007	46	6	21	4	42	0	17	0	8
	24	A/Cambodia/0371/2007	54	6	19	4	33	0	17	0	8

Preliminary Data 02/01/08

1. Sera were kindly provided by Ian Barr, WHO Collaborating Center, Melbourne, Australia. The populations were vaccinated with the 2007 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/New Caledonia/20/99(H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
2. Sera were kindly provided by Dr. Takato Odagiri, WHO Collaborating Center, Tokyo, Japan. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Hiroshima/52/2005(H3N2), A/Solomon Islands/03/2006 (H1N1), and B/Malaysia/2506/2004 hemagglutinin.
3. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
4. Sera were kindly provided by Dr. John Wood, NIBSC, Hertfordshire, UK. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006(H1N1)-like, and B/Malaysia/2506/2004-like.

* H1 component of the vaccine.

HI Antibody Responses to the H1 Component of the 2007 - 2008 Influenza Vaccine

ELDERLY POPULATIONS

						% with HI titer ≥ 40		% with HI titer ≥ 80		% with HI titer ≥ 160	
Population	N	Antigen	% Rise	Pre GMT	Post GMT	Pre	Post	Pre	Post	Pre	Post
Australia[1]	24	A/Solomon Islands/03/2006 IVR-145*	21	14	27	25	46	13	25	4	8
	24	A/Brisbane/59/2007	17	7	15	0	13	0	4	0	4
	24	A/South Dakota/6/2007	17	7	15	0	17	0	4	0	4
	24	A/Cambodia/0371/2007	21	6	12	0	13	0	0	0	0
Japan[2]	30	A/Solomon Islands/03/2006 IVR-145*	67	7	38	7	50	7	33	3	23
	30	A/Brisbane/59/2007	33	7	17	3	30	0	17	0	3
	30	A/South Dakota/6/2007	27	6	15	3	27	0	7	0	3
	30	A/Cambodia/0371/2007	30	6	14	0	20	0	13	0	3
USA[3]	24	A/Solomon Islands/03/2006 IVR-145*	92	12	127	17	96	8	75	0	50
	24	A/Brisbane/59/2007	50	7	24	0	42	0	29	0	8
	24	A/South Dakota/6/2007	38	6	17	0	38	0	25	0	0
	24	A/Cambodia/0371/2007	54	6	22	0	38	0	21	0	4
UK[4]	24	A/Solomon Islands/03/2006 IVR-145*	79	8	95	8	79	8	58	4	46
	24	A/Brisbane/59/2007	42	6	20	8	38	0	25	0	13
	24	A/South Dakota/6/2007	42	6	18	8	33	0	21	0	13
	24	A/Cambodia/0371/2007	46	6	22	4	33	0	25	0	17

Preliminary Data 02/01/08

1. Sera were kindly provided by Ian Barr, WHO Collaborating Center, Melbourne, Australia. The populations were vaccinated with the 2007 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/New Caledonia/20/99(H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
2. Sera were kindly provided by Dr. Takato Odagiri, WHO Collaborating Center, Tokyo, Japan. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Hiroshima/52/2005(H3N2), A/Solomon Islands/03/2006 (H1N1), and B/Malaysia/2506/2004 hemagglutinin.
3. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
4. Sera were kindly provided by Dr. John Wood, NIBSC, Hertfordshire, UK. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006(H1N1)-like, and B/Malaysia/2506/2004-like.

* H1 component of the vaccine.

HI Antibody Responses to the H1 Component of the 2007 - 2008 Influenza Vaccine

PEDIATRIC POPULATIONS

								% with HI titer ≥ 40			% with HI titer ≥ 80			% with HI titer ≥ 160		
Population	N	Antigen	% Rise 1st	% Rise 2nd	Pre GMT	Post GMT 1st	Post GMT 2nd	Pre	Post 1st	Post 2nd	Pre	Post 1st	Post 2nd	Pre	Post 1st	Post 2nd
USA[1]	15	A/Solomon Islands/03/2006 IVR-145*	93	100	5	36	202	0	80	100	0	13	80	0	7	67
	15	A/Brisbane/59/2007	20	53	5	8	26	0	20	47	0	7	27	0	7	7
	15	A/South Dakota/6/2007	20	67	5	8	23	0	20	47	0	7	13	0	0	7
	15	A/Cambodia/0371/2007	20	47	5	8	15	0	20	40	0	7	7	0	0	7
USA[2]	29	A/Solomon Islands/03/2006 IVR-145*	N/A	96	6	N/A	129	7	N/A	93	3	N/A	90	0	N/A	48
	29	A/Brisbane/59/2007	N/A	69	6	N/A	33	0	N/A	45	0	N/A	31	0	N/A	21
	29	A/South Dakota/6/2007	N/A	52	6	N/A	29	0	N/A	45	0	N/A	31	0	N/A	21
	29	A/Cambodia/0371/2007	N/A	52	6	N/A	25	0	N/A	45	0	N/A	31	0	N/A	21

Preliminary Data 02/01/08

1. Sera were kindly provided by Virginia Commonwealth University, Medical Center, Department of Pediatrics. The populations were vaccinated with 2 doses of the 2007-2008 trivalent influenza vaccine containing 7.5ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2007(H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
2. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.

* H1 component of the vaccine.

H1N1 viruses - Summary

- H1N1 viruses predominated in most countries; caused outbreaks in some countries
- Many viruses were closely related to A/Solomon Islands/3/2006; few were A/New Caledonia/20/99-like
- Increasing proportion antigenically distinct from A/Solomon Islands/3/06 and closely related to A/Brisbane/59/2007
- Majority of HA sequences in clade 2B (represented by A/Brisbane/59/2007)
- Increasing proportion of clade 2B NAs with H274Y mutation, causing oseltamivir resistance
- Oseltamivir-sensitive and -resistant viruses antigenically similar

WHO Recommendations

- **It is recommended that vaccines for use in the 2008-2009 influenza season contain:**
  - **— an A/Brisbane/59/2007 (H1N1)-like virus.**

Influenza A(H3N2) Viruses

HEMAGGLUTINATION INHIBITION REACTIONS OF INFLUENZA H3 VIRUSES (02/06/08) GUINEA PIG RED BLOOD CELLS

		REFERENCE ANTISERA									
		BRISBANE					NEPAL	144D		Date	
	REFERENCE ANTIGENS	WI/67	BRIS/10	X-171A	UG/716	TX/37	NP/921	HE/147	BC/1287	Collected	Passage
1	A/WISCONSIN/67/2005 X PR8 X-161B*	2560	320	320	320	160	320	640	80	REASSORT	EX/E1
2	A/BRISBANE/10/2007*	320	640	1280	1280	1280	1280	5120	320	02/06/07	E2/E1
3	A/BRISBANE/10/2007 X-171A	640	2560	1280	2560	2560	2560	5120	640	REASSORT	EX/E1
4	A/URUGUAY/716/2007*	320	640	1280	640	640	640	2560	160	06/21/07	SpfCK1E4
5	A/TEXAS/37/2007*	320	640	640	640	640	640	1280	640	10/13/07	M1/C2
6	A/NEPAL/921/2006	640	320	1280	1280	640	2560	2560	320	07/11/06	SpfCK2E3
7	A/HENAN/JINSHUI147/2007	160	320	320	640	640	1280	5120	160	01/29/07	E1/E3
8	A/BRITISH/COLUMBIA/RV1287/2007	160	640	320	160	160	160	160	640	09/27/07	C1/C3
TEST ANTIGENS											
9	A/ARKANSAS/01/2008	5120	5120	5120	5120	640	640	2560	320	01/03/08	X/C2
10	A/TENNESSEE/11/2007	1280	640	1280	1280	320	320	1280	320	12/21/07	MX/C1
11	A/WISCONSIN/34/2007	1280	1280	1280	1280	5120	1280	5120	1280	11/28/07	C1
12	A/ALBERTA/RV0141/2007	640	640	640	2560	640	2560	1280	320	12/26/07	X1/C1
13	A/ARIZONA/09/2007	640	640	640	2560	640	10	1280	160	12/23/07	CX/C1
14	A/ARKANSAS/03/2008	640	640	640	1280	640	320	1280	320	01/10/08	X/C2
15	A/NORTH CAROLINA/05/2007	640	1280	2560	1280	320	320	640	160	11/26/07	MX/C1
16	A/WISCONSIN/33/2007	640	1280	640	1280	1280	640	2560	640	11/21/07	C1
17	A/ARIZONA/10/2007	320	1280	640	1280	320	640	640	80	12/14/07	CX/C1
18	A/ARKANSAS/02/2008	320	640	640	1280	640	320	640	320	01/04/08	X/C2
19	A/ARKANSAS/04/2008	320	640	1280	640	320	320	1280	160	01/14/08	X/C1
20	A/ONTARIO/RV0152/2007	160	320	320	320	80	160	320	80	12/30/07	X2/C1
21	A/MEXICO/3701/2007	320	640	1280	640	640	320	1280	160	10/18/07	C4/C1
22	A/GUATEMALA/8247/2007	320	640	640	1280	160	160	320	40	08/28/07	CX/C2
23	A/SINGAPORE/66/2007	320	640	640	1280	640	640	640	160	11/16/07	C3/C2
24	A/THAILAND/738/2007	320	640	320	1280	160	640	640	160	09/25/07	C2/C1
25	A/TOYAMA/119/2007	320	640	640	1280	160	160	640	320	UNKNOWN	C1+2/C2
26	A/GYEONGNAM/4506/2007	160	320	320	640	320	320	640	160	11/19/07	C2/C2
27	A/SINGAPORE/65/2007	160	640	320	640	320	320	640	160	10/31/07	C2/C2
28	A/THAILAND/284/2007	160	640	320	640	320	640	640	80	09/18/07	X/C2

*Serology Antigen

Influenza A(H3N2) Isolates Characterized by CDC

	U.S.A.	North America	Europe	Asia	Cent/So America	Africa, Australia, New Zealand	Total (%)
April 2007 – September 2007							
A/Wisconsin/67/2005-like	22		6	4	16	1	49 (8%)
A/Wisconsin/67/2005-like (low)*	6		5	2	5		18 (3%)
A/Wisconsin/67/2005-like (low)**	27	4	7	28	111	2	179 (30%)
A/Brisbane/10/2007-like	16	19	5	84	211	15	350 (59%)
						Total	596
October 2007 – January 2008							
A/Wisconsin/67/2005-like	8						8 (9%)
A/Brisbane/10/2007-like	54	6		10	4		74 (82%)
A/Brisbane/10/2007-like (low)	5	2			1		8 (9%)
						Total	90
Total	138	31	23	128	348	18	686

Preliminary data 02/07/2008

* 4-fold low to A/Wisconsin/67/2005
** 8-fold or greater low to A/Wisconsin/67/2005

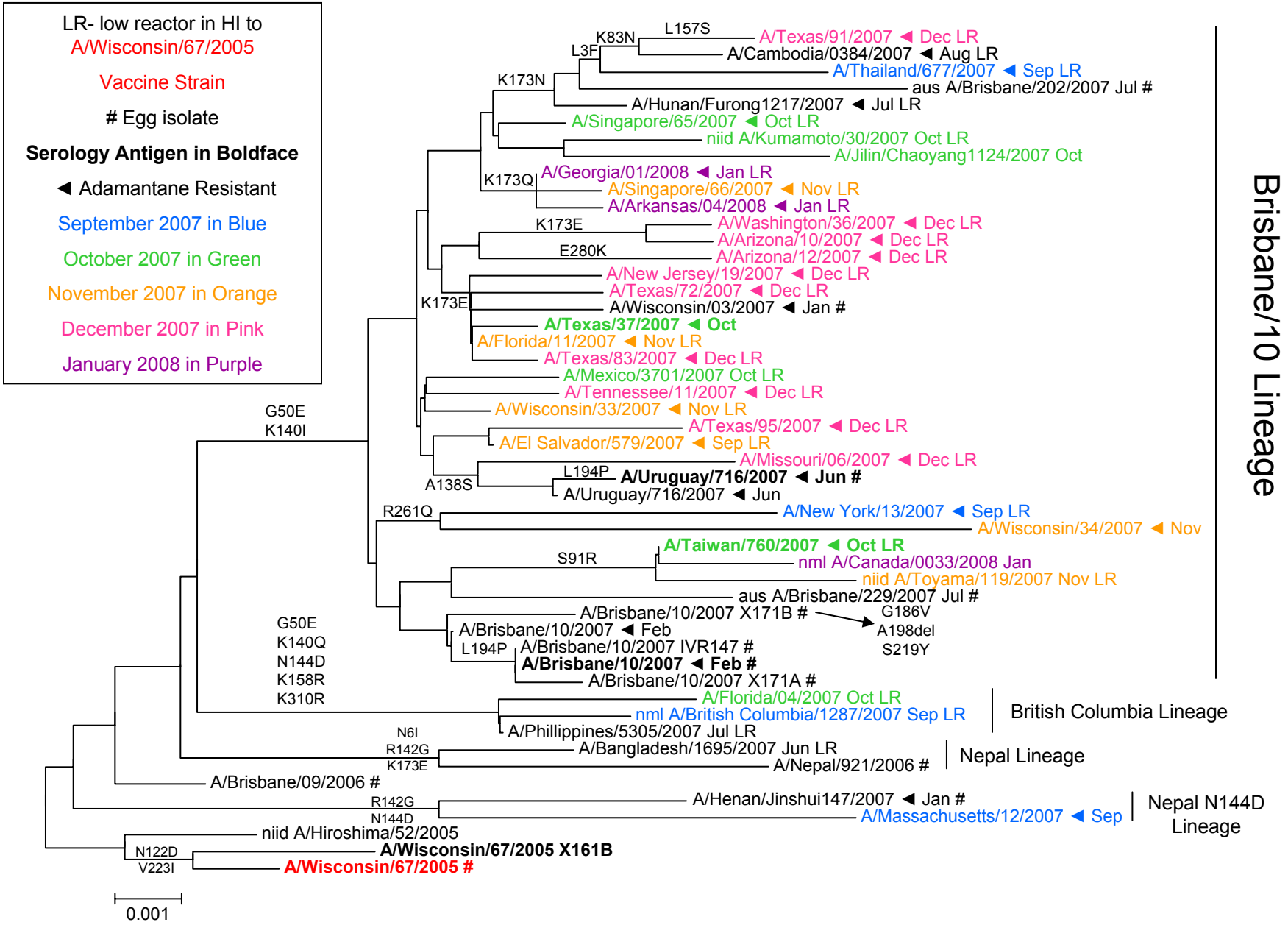
		A	B	C	D	E	F	G
		F859	F864	F897	F948	F966	F968	F998
	Reference Strains	CAL/7	WISC/67	BRIS/9	NEP/921	BRIS/4	BRIS/10	BRIS/10
A	A/CALIFORNIA/7/2004	**1280**	320	320	40	640	160	160
B	A/WISCONSIN/67/2005	1280	**640**	1280	160	1280	640	320
C	A/BRISBANE/9/2006	640	640	**1280**	160	1280	320	320
D	A/NEPAL/921/2006	320	320	640	**160**	320	320	320
E	A/BRISBANE/4/2007	640	320	1280	160	**1280**	640	640
F	A/BRISBANE/10/2007	1280	640	640	160	1280	**640**	640
G	A/BRISBANE/10/2007	80	<40	80	40	40	160	**80**
H	A/PERTH/27/2007	160	80	320	80	160	320	320
I	A/PHILIPPINES/1616/2007	80	<40	80	<40	40	80	160
J	A/WISCONSIN/3/2007	1280	640	2560	320	1280	1280	640
K	A/BRISBANE/202/2007	2560	1280	1280	640	2560	2560	2560
L	A/BRISBANE/229/2007	160	320	640	80	640	160	80
	Antigens							
1	A/SINGAPORE/206/2007	640	640	1280	320	1280	1280	1280
2	A/SINGAPORE/211/2007	320	80	640	80	320	640	320
3	A/SINGAPORE/214/2007	320	40	640	80	320	640	320
4	A/THAILAND/994/2007	160	80	640	80	320	640	320
5	A/CHRISTCHURCH/36/2007	320	160	640	80	320	640	320
6	A/SINGAPORE/67/2007	160	40	160	40	40	320	160
7	A/SINGAPORE/208/2007	320	40	640	80	160	320	320
8	A/SINGAPORE/212/2007	160	40	320	40	80	320	320
9	A/THAILAND/966/2007	160	40	320	40	160	320	320
10	A/THAILAND/981/2007	320	80	640	80	320	320	320
11	A/THAILAND/1036/2007	80	40	320	40	160	320	160
12	A/THAILAND/807/2007	160	80	320	80	160	320	160
13	A/CHRISTCHURCH/56/2007	160	40	640	80	160	320	160
14	A/SINGAPORE/56/2007	40	<40	80	<40	40	160	40
15	A/SINGAPORE/50/2007	80	<40	80	40	40	160	80
16	A/PHILIPPINES/3671/2007	80	40	160	40	80	160	160
17	A/THAILAND/829/2007	80	40	160	40	40	160	80
18	A/THAILAND/897/2007	80	<40	80	40	40	160	80
19	A/SINGAPORE/53/2007	40	<40	40	<40	<40	80	40
20	A/SINGAPORE/59/2007	40	<40	40	<40	40	80	40

H3 low reactors in HI assays in WHOCCs

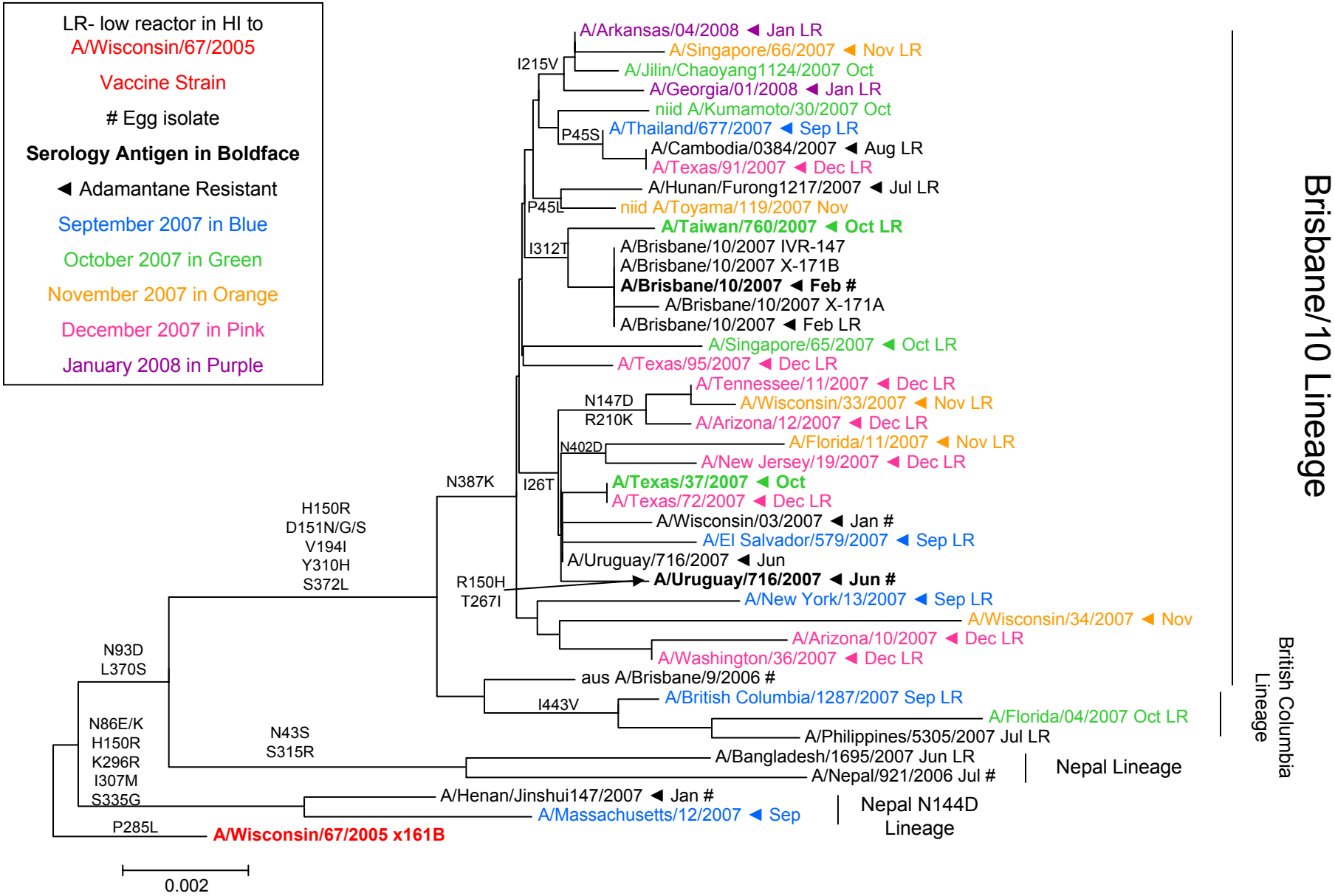
(September 2007 – present)

	A/WI/67/05-like	A/BR/10/07-like	low reactors (≥ 8-fold)
• Australia	0	139 [56%]	110 [44%]
• CDC	8 [9%]	74 [82%]	8 [9%]
• Japan	0	24 [70%]	9 [30%]
• UK	6 [35%]	12 [65%]	2 [10%]
Total	14 [3%]	247 [64%]	129 [33%]

Evolutionary Relationships Among Influenza H3N2 HA (HA1) Genes, 2007-08



Evolutionary Relationships Among Influenza H3N2 NA Genes, 2007-08



HI Antibody Responses to the H3 Component of the 2007 - 2008 Influenza Vaccine

ADULT POPULATIONS

						% with HI titer ≥ 40		% with HI titer ≥ 80		% with HI titer ≥ 160	
Population	N	Antigen	% Rise	Pre GMT	Post GMT	Pre Vaccine	Post Vaccine	Pre Vaccine	Post Vaccine	Pre Vaccine	Post Vaccine
Australia[1]	24	A/Wisconsin/67/2005 X-161B*	50	12	44	21	71	13	38	8	17
	24	A/Brisbane/10/2007	63	7	27	8	54	0	21	0	13
	24	A/Uruguay/716/2007	25	6	14	0	21	0	8	0	0
Japan[2]	30	A/Wisconsin/67/2005 X-161B*	10	14	21	20	40	3	10	0	0
	30	A/Brisbane/10/2007	17	11	17	17	37	10	13	3	7
	30	A/Uruguay/716/2007	3	8	9	7	7	3	3	0	0
USA[3]	24	A/Wisconsin/67/2005 X-161B*	50	32	155	54	92	42	88	25	71
	24	A/Brisbane/10/2007	50	21	116	38	92	33	75	21	54
	24	A/Uruguay/716/2007	58	12	52	29	63	13	50	0	29
UK[4]	24	A/Wisconsin/67/2005 X-161B*	92	12	143	13	96	13	83	8	58
	24	A/Brisbane/10/2007	58	7	37	4	50	4	42	0	25
	24	A/Uruguay/716/2007	63	6	22	4	38	0	17	0	8

Preliminary Data 02/01/08

1. Sera were kindly provided by Ian Barr, WHO Collaborating Center, Melbourne, Australia. The populations were vaccinated with the 2007 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/New Caledonia/20/99(H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
2. Sera were kindly provided by Dr. Takato Odagiri, WHO Collaborating Center, Tokyo, Japan. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Hiroshima/52/2005(H3N2), A/Solomon Islands/03/2006 (H1N1), and B/Malaysia/2506/2004 hemagglutinin.
3. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
4. Sera were kindly provided by Dr. John Wood, NIBSC, Hertfordshire, UK. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006(H1N1)-like, and B/Malaysia/2506/2004-like.

* H3 component of the vaccine.

HI Antibody Responses to the H3 Component of the 2007 - 2008 Influenza Vaccine

ELDERLY POPULATIONS

						% with HI titer ≥ 40		% with HI titer ≥ 80		% with HI titer ≥ 160	
Population	N	Antigen	% Rise	Pre GMT	Post GMT	Pre Vaccine	Post Vaccine	Pre Vaccine	Post Vaccine	Pre Vaccine	Post Vaccine
Australia[1]	24	A/Wisconsin/67/2005 X-161B*	54	16	58	38	83	13	54	4	17
	24	A/Brisbane/10/2007	54	9	28	13	46	4	17	0	8
	24	A/Uruguay/716/2007	25	7	15	4	25	0	4	0	0
Japan[2]	30	A/Wisconsin/67/2005 X-161B*	37	12	32	17	47	7	33	0	17
	30	A/Brisbane/10/2007	33	9	23	7	40	7	23	3	7
	30	A/Uruguay/716/2007	27	6	11	7	17	0	7	0	3
USA[3]	24	A/Wisconsin/67/2005 X-161B*	54	22	90	58	92	21	63	8	33
	24	A/Brisbane/10/2007	50	19	73	33	88	25	67	4	29
	24	A/Uruguay/716/2007	50	10	29	17	46	8	29	4	4
UK[4]	24	A/Wisconsin/67/2005 X-161B*	58	14	78	33	83	17	67	4	29
	24	A/Brisbane/10/2007	38	13	40	21	54	13	38	4	21
	24	A/Uruguay/716/2007	25	7	18	4	33	0	13	0	8

Preliminary Data 02/01/08

1. Sera were kindly provided by Ian Barr, WHO Collaborating Center, Melbourne, Australia. The populations were vaccinated with the 2007 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/New Caledonia/20/99(H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
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3. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
4. Sera were kindly provided by Dr. John Wood, NIBSC, Hertfordshire, UK. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006(H1N1)-like, and B/Malaysia/2506/2004-like.

* H3 component of the vaccine.

HI Antibody Responses to the H3 Component of the 2007 - 2008 Influenza Vaccine

PEDIATRIC POPULATIONS

								% with HI titer ≥ 40			% with HI titer ≥ 80			% with HI titer ≥ 160		
Population	N	Antigen	% Rise 1st	% Rise 2nd	Pre GMT	Post GMT 1st	Post GMT 2nd	Pre	Post 1st	Post 2nd	Pre	Post 1st	Post 2nd	Pre	Post 1st	Post 2nd
USA[1]	15	A/Wisconsin/67/2005 X-161B*	47	93	5	17	76	0	20	80	0	20	73	0	13	33
	15	A/Brisbane/10/2007	20	73	5	12	35	0	21	67	0	20	33	0	13	13
	15	A/Uruguay/716/2007	20	60	5	7	15	0	13	27	0	0	7	0	0	0
USA[2]	29	A/Wisconsin/67/2005 X-161B	N/A	86	8	N/A	48	17	N/A	69	10	N/A	42	3	N/A	17
	29	A/Brisbane/10/2007	N/A	48	7	N/A	20	10	N/A	28	10	N/A	10	3	N/A	10
	29	A/Uruguay/716/2007	N/A	28	7	N/A	14	10	N/A	10	7	N/A	10	3	N/A	10

Preliminary Data 02/01/08

1. Sera were kindly provided by Virginia Commonwealth University, Medical Center, Department of Pediatrics. The populations were vaccinated with 2 doses of the 2007-2008 trivalent influenza vaccine containing 7.5ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2007(H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
2. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.

* H3 component of the vaccine.

MN Antibody Responses to the H3N2 Component of the 2007-2008 Influenza Vaccine

Adult Populations

						% with MN ≥ 80		% with MN ≥ 160	
Population	**N**	**Antigen**	**% Rise**	**Pre GMT**	**Post GMT**	**Pre**	**Post**	**Pre**	**Post**
Japan[1]	30	A/Wisconsin/67/2005 (X-161B)	20	63	133	63	80	30	60
	30	A/Brisbane/10/2007	20	54	98	47	70	27	47
	30	A/Brisbane/10/2007X-171A	23	29	55	30	47	10	30
	30	A/Brisbane/10/2007X-171	17	47	84	47	70	20	40
	30	A/Uruguay/716/2007	17	32	55	37	47	13	33
USA[2]	24	A/Wisconsin/67/2005 (X-161B)*	54	123	854	58	96	54	92
	24	A/Brisbane/10/2007	46	37	226	33	83	33	75
	24	A/Brisbane/10/2007X-171A	54	46	392	38	83	33	71
	24	A/Brisbane/10/2007X-171	50	90	640	46	83	46	79
	24	A/Uruguay/716/2007	58	41	302	38	79	33	71

02/05/08

1. Sera were kindly provided by Dr. Takato Odagiri, WHO Collaborating Center, Tokyo, Japan. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Hiroshima/52/2005(H3N2), A/Solomon Islands/3/2006 (H1N1), and B/Malaysia/2506/2004 hemagglutinin.
2. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Isalnds/3/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.

* H3N2 component of the vaccine.

MN Antibody Responses to the H3N2 Component of the 2007-2008 Influenza Vaccine

Elderly Populations

						% with MN ≥ 80		% with MN ≥ 160	
Population	N	Antigen	% Rise	Pre GMT	Post GMT	Pre	Post	Pre	Post
Japan[1]	30	A/Wisconsin/67/2005 (X-161B)	37	70	237	43	83	33	63
	30	A/Brisbane/10/2007	40	26	84	7	60	7	40
	30	A/Brisbane/10/2007X-171A	47	19	57	7	50	7	27
	30	A/Brisbane/10/2007X-171	33	32	108	23	53	13	47
	30	A/Uruguay/716/2007	37	26	78	13	63	7	33
USA[2]	24	A/Wisconsin/67/2005 (X-161B)*	50	78	349	63	96	42	88
	24	A/Brisbane/10/2007	63	36	155	33	79	25	75
	24	A/Brisbane/10/2007X-171A	54	29	116	25	75	21	58
	24	A/Brisbane/10/2007X-171	54	48	202	46	79	25	75
	24	A/Uruguay/716/2007	58	26	90	29	67	17	46

02/05/08

1. Sera were kindly provided by Dr. Takato Odagiri, WHO Collaborating Center, Tokyo, Japan. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Hiroshima/52/2005(H3N2), A/Solomon Islands/3/2006 (H1N1), and B/Malaysia/2506/2004 hemagglutinin.
2. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Isalnds/3/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.

* H3N2 component of the vaccine.

MN Antibody Responses to the H3N2 Component of the 2007-2008 Influenza Vaccine

Pediatric Populations

								% with MN ≥ 80			% with MN ≥ 160	
Population	**N**	**Antigen**	**% Rise 1st**	**% Rise 2nd**	**Pre GMT**	**Post GMT 1st**	**Post GMT 2nd**	**Pre**	**Post 1st**	**Post 2nd**	**Post 1st**	**Post 2nd**
USA[1]	15	A/Wisconsin/67/2005 (X-161B)	93	100	14	243	1404	7	87	100	67	100
	15	A/Brisbane/10/2007	27	93	10	32	139	0	20	67	20	60
	15	A/Brisbane/10/2007X-171A	20	67	11	24	80	0	20	67	20	47
	15	A/Brisbane/10/2007X-171	53	100	11	70	508	0	33	87	20	80
	15	A/Uruguay/716/2007	20	73	10	23	96	0	20	67	20	47
USA[2]	29	A/Wisconsin/67/2005 (X-161B)*	N/A	90	39	N/A	704	34	N/A	100	N/A	100
	29	A/Brisbane/10/2007	N/A	66	24	N/A	117	17	N/A	76	N/A	52
	29	A/Brisbane/10/2007X-171A	N/A	72	24	N/A	117	21	N/A	72	N/A	45
	29	A/Brisbane/10/2007X-171	N/A	86	33	N/A	378	28	N/A	97	N/A	83
	29	A/Uruguay/716/2007	N/A	69	23	N/A	112	21	N/A	72	N/A	45

02/05/08

1. Sera were kindly provided by Virginia Commonwealth University, Medical Center, Department of Pediatrics. The populations were vaccinated with 2 doses of the 2007-2008 trivalent influenza vaccine containing 7.5ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/3/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
2. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/3/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.

* H3N2 component of the vaccine.

Summary - Influenza A [H3N2]

- H3N2 influenza was sporadic in many countries and outbreaks were reported in the United States.
- Some H3N2 viruses were antigenically similar to the A/Wisconsin/67/2005 vaccine virus. However, the majority was closely related to the more recently recommended vaccine virus, A/Brisbane/10/2007.
- Phylogenetically, the majority of recent H3N2 viruses fall into the HA clade represented by A/Brisbane/10/2007 virus.
- Post-infection ferret antisera against A/Brisbane/10/2007 virus reacted well with the majority of recent H3N2 viruses.

WHO Recommendations

- **It is recommended that vaccines for use in the 2008-2009 influenza season contain:**
  - **— an A/Brisbane/10/2007 (H3N2)-like virus.**

Influenza B Viruses

HEMAGGLUTINATION INHIBITION REACTIONS OF INFLUENZA TYPE B VIRUSES (02/12/08)

		REFERENCE FERRET ANTISERA									
REFERENCE ANTIGENS		FL/4	AS/3	BA/3333	JA SENDAI/114	OH/1	MY/2506	PA/5	VI/304	Date Collected	Passage
1	B/FLORIDA/04/2006 *	160	320	320	160	10	80	20	40	11/01/06	E3
2	B/BRISBANE/03/2007	160	320	320	320	10	80	20	40	03/09/07	E2/E1
3	B/BANGLADESH/3333/2007 *	80	320	320	80	5	80	20	40	08/19/07	E4
4	B/SENDAI-H/114/2007*	160	320	160	160	20	80	10	40	UNKNOWN	E1+2/E1
5	B/OHIO/01/2005	5	5	5	5	1280	640	640	2560	02/23/05	E2
6	B/MALAYSIA/2506/2004*	5	5	10	5	2560	1280	1280	2560	06/12/04	E3/E2
7	B/PENNSYLVANIA/05/2007 *	5	5	5	5	640	640	640	1280	03/01/07	E3
8	B/VICTORIA/304/2006	5	5	5	5	640	640	640	2560		E2,2/E1
TEST ANTIGENS											
9	B/NEW YORK/11/2007 TC	640	160	320	320	5	40	5	20	12/24/07	C1
10	B/NEW YORK/11/2007 EGG	640	320	320	320	5	40	10	20	12/24/07	E1
11	B/WISCONSIN/09/2007	320	640	640	640	5	160	10	80	12/27/07	C1
12	B/WISCONSIN/01/2008	320	640	640	320	5	80	10	20	01/01/08	C1
13	B/NEW MEXICO/04/2007	320	320	320	320	5	80	10	40	12/19/07	MX/C1
14	B/WISCONSIN/13/2007	160	160	320	320	5	40	10	20	12/31/07	M1/C1
15	B/WISCONSIN/03/2008	160	640	320	320	10	160	40	160	01/02/08	E3
16	B/NEW MEXICO/01/2008	160	80	320	160	5	20	5	20	01/02/08	MX/C1
17	B/COLORADO/01/2007	80	160	320	80	10	40	20	20	10/28/07	E2
18	B/NEW YORK/10/2007 EGG	80	80	160	80	10	40	10	10	12/21/07	E3
19	B/HONG KONG/1325/2007	640	320	640	640	5	40	10	20	12/05/07	C2/C1
20	B/HONG KONG/1363/2007	640	320	640	320	5	80	10	20	12/24/07	C2/C2
21	B/SINGAPORE/52/2007	640	320	640	640	5	40	10	20	06/29/07	C2/C1
22	B/THAILAND/889/2007	640	320	640	320	5	80	10	20	11/16/07	C1/C1
23	B/THAILAND/872/2007	640	320	320	320	5	40	5	10	11/19/07	C1/C1
24	B/THAILAND/873/2007	640	320	640	640	5	80	10	20	11/14/07	C1/C1
25	B/THAILAND/869/2007	320	160	640	160	5	40	5	20	11/23/07	C1/C1
26	B/HONG KONG/1303/2007	160	160	320	160	5	40	5	10	11/01/07	C2/C2
27	B/CALIFORNIA/20/2007	5	5	10	5	160	80	160	320	11/27/07	C1/C1
28	B/HONG KONG/1362/2007	5	5	10	5	5120	1280	2560	5120	12/24/07	C2/C1
29	B/THAILAND/762/2007	5	5	5	5	2560	1280	2560	5120	10/09/07	C2/C1
30	B/HONG KONG/1327/2007	5	5	20	5	160	160	320	320	12/07/07	C2/C1
31	B/THAILAND/785/2007	5	5	5	5	160	160	320	320	10/18/07	C2/C1
32	B/THAILAND/810/2007	5	5	5	5	160	80	160	320	10/25/07	C2/C1

* = Serology antigen

Influenza B Isolates Characterized by CDC

	U.S.A.	North America	Europe	Asia	Cent/So America	Africa, Australia, New Zealand	Total (%)
April 2007 – September 2007							
B/Ohio/01/2005-like	2		2	15	6	7	32 (14%)
B/Ohio/01/2005-like (low)*	1		1	10		2	14 (6%)
B/Ohio/01/2005-like (low)**	6	1	3	16	7	6	39 (17%)
B/Florida/04/2006-like	18	3	2	79	31	3	136 (60%)
B/Florida/04/2006-like (low)				6			6 (3%)
						Total	227
October 2007 – January 2008							
B/Ohio/01/2005-like	2			3			5 (5%)
B/Ohio/01/2005-like (low)*	1						1 (1%)
B/Ohio/01/2005-like (low)**	1			5			6 (6%)
B/Florida/04/2006-like	66	3		15			84 (87%)
B/Florida/04/2006-like (low)	1						1 (1%)
						Total	97
Total	98	7	8	149	44	18	324

* 4-fold down to B/Ohio/01/2005
** 8-fold or greater down to B/Ohio/01/2005

Preliminary Data 02/14/2008

TABLE 5.3

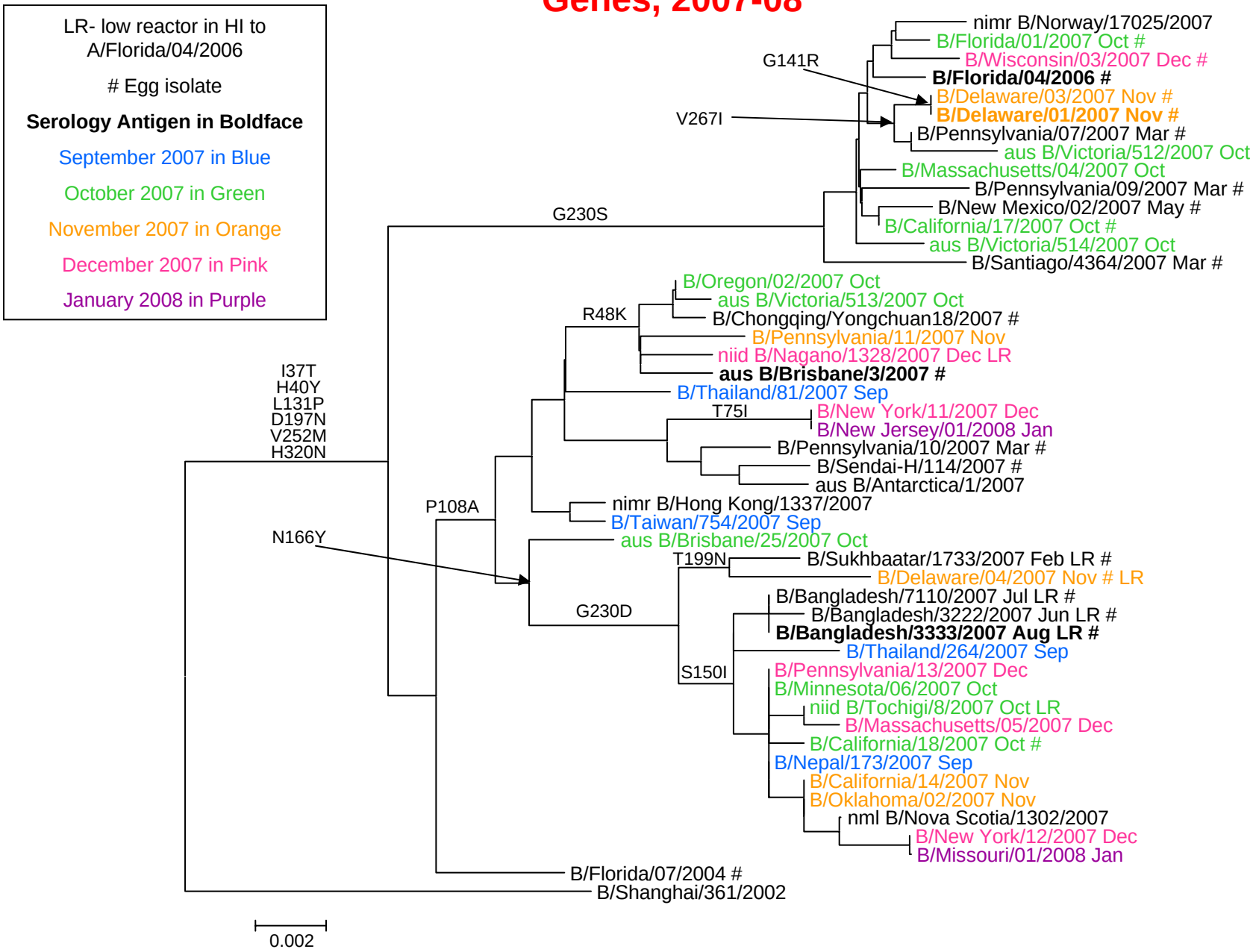
	January 31, 2008	Haemagglutination Inhibition Assay - WHO influenza Centre, Melbourne													
		Reference Antisera													
		A	B	C	D	E	F	G	H	I	J	K	L		
		F865	F884	F898	F899	CDC	F874	F875	F967	F982	CDC	F997	NIID	Passage	
	Reference Strains	MAL/2506	MAL/174	NC/5	VIC/304	PENS/5	SHAN/361	FLOR/7	THAI/369	BRIS/3	BRIS/3	FLOR/4	SENDI-H/114	History	Date
A	B/MALAYSIA/2506/2004	**1280**	640	1280	1280	1280	<20	<20	<20	<20	<20	<20	<20	E5	
B	B/MALAYSIA/174/2006	1280	**320**	1280	1280	>2560	<20	<20	<20	<20	<20	<20	<20	X,MDCK3	
C	B/NEW CALEDONIA/5/2006	640	320	**1280**	1280	1280	<20	<20	<20	<20	<20	<20	<20	E5	
D	B/VICTORIA/304/2006	640	320	320	**640**	640	<20	<20	<20	<20	<20	<20	<20	E4	
E	B/PENNSYLVANIA/5/2007	640	320	640	640	**640**	<20	<20	<20	<20	<20	<20	<20	E4	
F	B/SHANGHAI/361/2002	80	<20	80	80	40	**320**	640	20	1280	>2560	1280	640	E7	
G	B/FLORIDA/7/2004	40	<20	40	40	40	320	**640**	20	640	1280	640	640	E7	
H	B/THAILAND/369/2007	<20	<20	20	<20	<20	80	640	**320**	640	1280	640	640	MDCK8	
I	B/BRISBANE/3/2007	80	<20	40	40	40	160	640	20	**640**	1280	640	640	E3	
J	B/BRISBANE/3/2007	<20	<20	20	<20	<20	40	640	80	320	640	320	640	MDCKX,MDCK2	
K	B/FLORIDA/4/2006	40	<20	20	40	40	160	320	160	320	640	**320**	320	E4	
L	B/SENDI-H/114/2007	40	<20	40	40	20	160	640	20	640	640	320	**320**	E4	
	Antigens														
1	B/SINGAPORE/207/2007	<20	<20	<20	<20	<20	40	640	80	320	640	320	320	MDCKX,MDCK1	19/11/2007
2	B/MALAYSIA/3/2007	<20	<20	<20	<20	<20	40	320	40	320	320	320	320	MDCKX,MDCK1	6/07/2007
3	B/SINGAPORE/205/2007	<20	<20	<20	<20	<20	40	640	160	640	640	320	640	MDCKX,MDCK1	9/11/2007
4	B/MALAYSIA/1679/2007	<20	<20	<20	<20	<20	40	320	20	320	320	320	320	MDCKX,MDCK1	6/11/2007
5	B/MALAYSIA/8/2007	<20	<20	<20	<20	<20	40	320	160	320	640	320	320	MDCKX,MDCK1	20/07/2007
6	B/SINGAPORE/59/2007	<20	<20	<20	<20	<20	20	320	40	320	320	160	320	MDCK2	13/09/2007
7	B/SINGAPORE/202/2007	<20	<20	20	<20	<20	20	160	80	160	320	160	320	MDCKX,MDCK1	2/11/2007
8	B/MALAYSIA/2/2007	<20	<20	20	<20	<20	40	160	160	160	320	160	320	MDCKX,MDCK1	11/06/2007
9	B/MALAYSIA/5/2007	<20	<20	<20	<20	<20	20	320	20	320	320	160	320	MDCKX,MDCK1	13/07/2007
10	B/MALAYSIA/6/2007	<20	<20	<20	<20	<20	20	640	20	320	320	160	320	MDCKX,MDCK1	16/07/2007
11	B/MALAYSIA/7/2007	<20	<20	<20	<20	<20	40	320	40	320	320	160	320	MDCKX,MDCK1	17/07/2007
12	B/MALAYSIA/1726/2007	<20	<20	20	<20	<20	20	640	40	320	320	160	320	MDCKX,MDCK1	29/11/2007
13	B/MALAYSIA/1756/2007	<20	<20	<20	<20	<20	20	320	40	320	320	160	320	MDCKX,MDCK1	3/12/2007
14	B/MALAYSIA/1762/2007	<20	<20	<20	<20	<20	40	320	80	320	320	160	320	MDCKX,MDCK1	12/11/2007
15	B/MALAYSIA/1735/2007	<20	<20	<20	<20	<20	40	320	80	320	320	160	320	MDCKX,MDCK1	6/11/2007
16	B/MALAYSIA/1841/2007	<20	<20	20	<20	<20	20	160	40	80	320	80	320	MDCKX,MDCK1	28/12/2007
17	B/MALAYSIA/9/2007	<20	<20	<20	<20	<20	20	320	20	160	320	80	320	MDCKX,MDCK1	2/08/2007
18	B/SINGAPORE/208/2007	320	160	320	640	640	<20	<20	<20	<20	<20	<20	<20	MDCKX,MDCK1	27/11/2007
19	B/MALAYSIA/1/2007	80	320	160	640	640	<20	<20	<20	<20	<20	<20	<20	MDCKX,MDCK1	29/05/2007
20	B/MALAYSIA/10/2007	40	640	80	640	160	<20	<20	<20	<20	<20	<20	<20	MDCKX,MDCK1	17/10/2007

B viruses tested in HI assays in WHOCCs

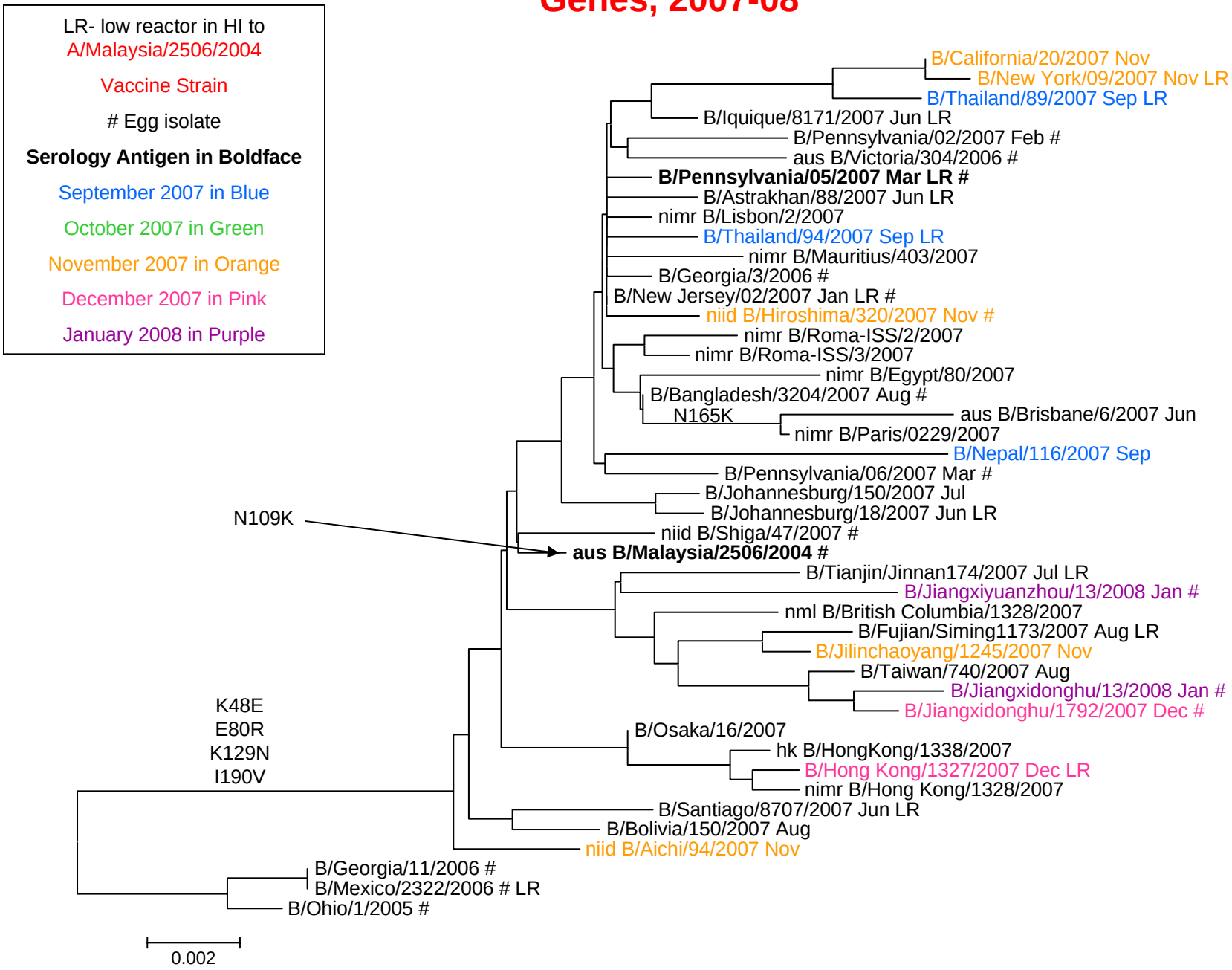
(Sep 2007 – present)

	Victoria	Yamagata
• Australia	15 [16%]	78 [84%]
Low reactors		(17%)
• CDC	12 [12%]	85 [88%]
Low reactors		(1%)
• Japan	4 [33%]	8 [67%]
Low reactors		(0%)
• UK	15 [19%]	63 [81%]
Low reactors		(27%)
Total	46 [16%]	234 [84%]
Low reactors		(16%)

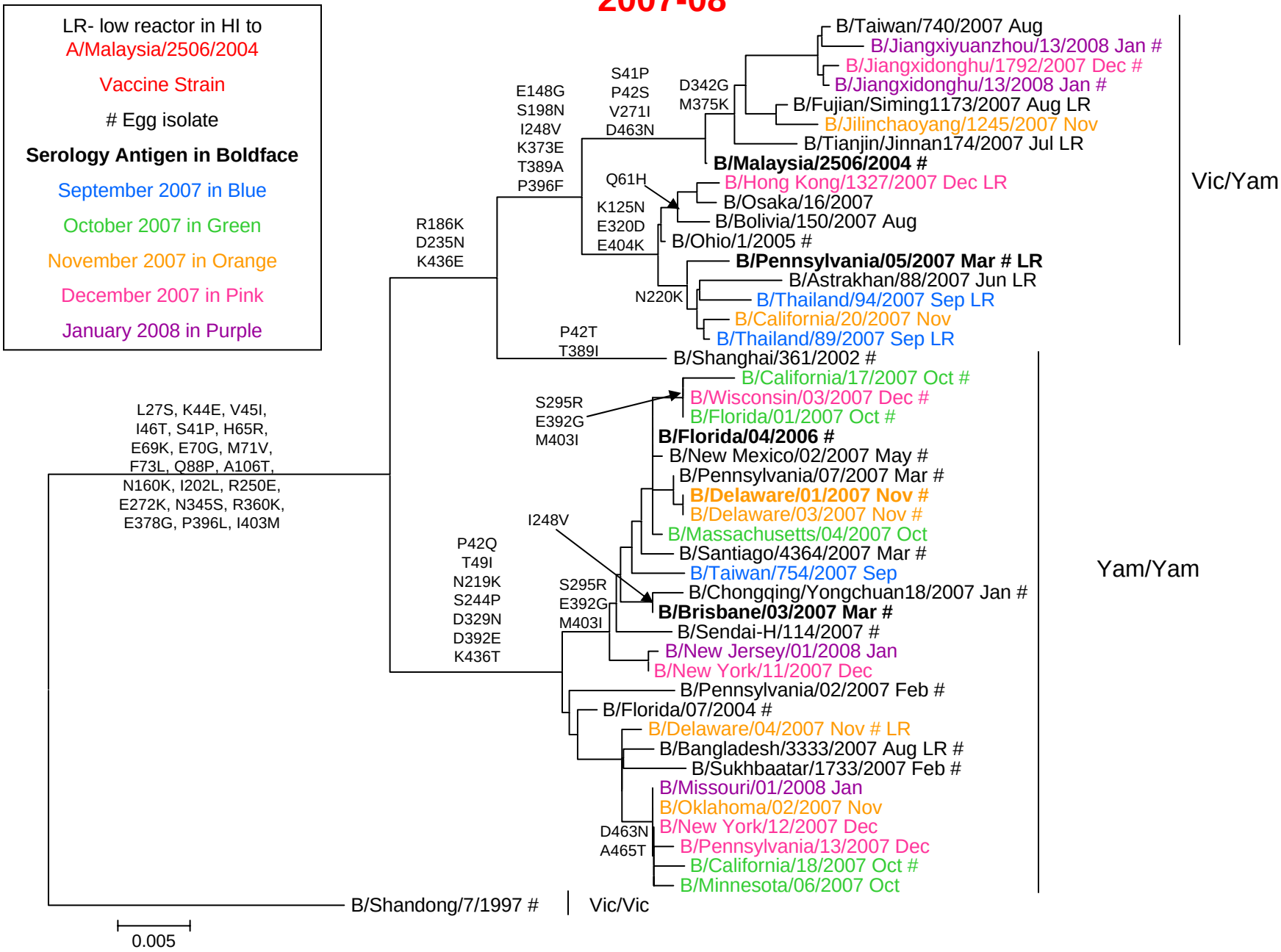
Evolutionary Relationships Among Influenza B Yamagata Lineage HA (HA1) Genes, 2007-08



Evolutionary Relationships Among Influenza B Victoria Lineage HA (HA1) Genes, 2007-08



Evolutionary Relationships Among Influenza B Neuraminidase (NA) Genes, 2007-08



HI Antibody Responses to the B Component of the 2007 - 2008 Influenza Vaccine

ADULT POPULATIONS

							% with HI titer ≥ 40		% with HI titer ≥ 160	
Population	N	Antigen		% Rise	Pre GMT	Post GMT	Pre Vaccine	Post Vaccine	Pre Vaccine	Post Vaccine
Australia[1]	24	B/Florida/4/2006	Yam	38	42	95	54	88	17	33
	24	B/Sendai-H/114/2007	Yam	8	41	69	54	79	8	38
	24	B/Bangladesh/3333/2007	Yam	17	18	30	25	54	0	8
	24	B/Malaysia/2506/2004*	Vic	25	38	87	46	83	13	42
	24	B/Pennsylvania/5/2007	Vic	33	36	92	50	88	13	17
Japan[2]	30	B/Florida/4/2006	Yam	3	116	136	93	100	57	63
	30	B/Sendai-H/114/2007	Yam	3	127	180	100	100	20	30
	30	B/Bangladesh/3333/2007	Yam	7	47	57	70	83	13	17
	30	B/Malaysia/2506/2004*	Vic	0	45	59	67	83	17	27
	30	B/Pennsylvania/5/2007	Vic	7	38	53	63	73	60	80
USA[3]	24	B/Florida/4/2006	Yam	46	65	240	79	100	25	71
	24	B/Sendai-H/114/2007	Yam	42	65	247	75	96	25	71
	24	B/Bangladesh/3333/2007	Yam	38	26	104	46	75	13	50
	24	B/Malaysia/2506/2004*	Vic	54	27	220	46	100	25	67
	24	B/Pennsylvania/5/2007	Vic	58	29	254	42	100	33	71
UK[4]	23	B/Florida/4/2006	Yam	70	14	92	30	83	9	42
	24	B/Sendai-H/114/2007	Yam	75	17	28	38	42	8	75
	20	B/Bangladesh/3333/2007	Yam	60	8	43	10	50	0	30
	24	B/Malaysia/2506/2004*	Vic	96	13	202	25	100	4	79
	24	B/Pennsylvania/5/2007	Vic	96	14	220	29	100	7	13

Preliminary Data 02/01/08

1. Sera were kindly provided by Ian Barr, WHO Collaborating Center, Melbourne, Australia. The populations were vaccinated with the 2007 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/New Caledonia/20/99(H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
2. Sera were kindly provided by Dr. Takato Odagiri, WHO Collaborating Center, Tokyo, Japan. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Hiroshima/52/2005(H3N2), A/Solomon Islands/6/2006 (H1N1), and B/Malaysia/2506/2004 hemagglutinin.
3. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
4. Sera were kindly provided by Dr. John Wood, NIBSC, Hertfordshire, UK. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006(H1N1)-like, and B/Malaysia/2506/2004-like.

* B component of the vaccine.

Note: All B serology antigens were ether-treated.

HI Antibody Responses to the B Component of the 2007 - 2008 Influenza Vaccine

ELDERLY POPULATIONS

							% with HI titer ≥ 40		% with HI titer ≥ 160	
Population	N	Antigen		% Rise	Pre GMT	Post GMT	Pre Vaccine	Post Vaccine	Pre Vaccine	Post Vaccine
Australia[1]	24	B/Florida/4/2006	Yam	21	38	92	71	92	13	29
	24	B/Sendai-H/114/2007	Yam	22	39	85	57	83	0	13
	24	B/Bangladesh/3333/2007	Yam	23	23	45	41	65	0	9
	24	B/Malaysia/2506/2004*	Vic	21	17	41	21	58	4	13
	24	B/Pennsylvania/5/2007	Vic	43	13	45	9	63	22	33
Japan[2]	30	B/Florida/4/2006	Yam	13	15	24	20	37	3	13
	30	B/Sendai-H/114/2007	Yam	23	18	33	30	53	13	24
	30	B/Bangladesh/3333/2007	Yam	17	9	13	10	14	3	11
	30	B/Malaysia/2506/2004*	Vic	40	21	54	43	63	13	30
	30	B/Pennsylvania/5/2007	Vic	27	17	38	37	52	10	17
USA[3]	24	B/Florida/4/2006	Yam	17	49	80	67	83	38	50
	24	B/Sendai-H/114/2007	Yam	21	58	107	71	83	25	50
	24	B/Bangladesh/3333/2007	Yam	8	15	24	25	50	0	4
	24	B/Malaysia/2506/2004*	Vic	42	30	82	54	88	13	38
	24	B/Pennsylvania/5/2007	Vic	42	39	116	67	92	42	54
UK[4]	23	B/Florida/4/2006	Yam	33	13	32	33	54	0	4
	24	B/Sendai-H/114/2007	Yam	31	9	19	23	42	8	25
	20	B/Bangladesh/3333/2007	Yam	4	12	17	35	39	0	4
	24	B/Malaysia/2506/2004*	Vic	46	16	57	42	75	4	29
	24	B/Pennsylvania/5/2007	Vic	42	23	67	50	92	0	0

Preliminary Data 02/01/08

1. Sera were kindly provided by Ian Barr, WHO Collaborating Center, Melbourne, Australia. The populations were vaccinated with the 2007 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/New Caledonia/20/99(H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
2. Sera were kindly provided by Dr. Takato Odagiri, WHO Collaborating Center, Tokyo, Japan. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Hiroshima/52/2005(H3N2), A/Solomon Islands/6/2006 (H1N1), and B/Malaysia/2506/2004 hemagglutinin.
3. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
4. Sera were kindly provided by Dr. John Wood, NIBSC, Hertfordshire, UK. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006(H1N1)-like, and B/Malaysia/2506/2004-like.

* B component of the vaccine.

Note: All B serology antigens were ether-treated.

HI Antibody Responses to the B Component of the 2007 - 2008 Influenza Vaccine

PEDIATRIC POPULATIONS

									% with HI titer ≥ 40			% with HI titer ≥ 160		
Population	N	Antigen		% Rise 1st	% Rise 2nd	Pre GMT	Post GMT 1st	Post GMT 2nd	Pre	Post 1st	Post 2nd	Pre	Post 1st	Post 2nd
USA[1]	15	B/Florida/4/2006	Yam	15	15	5	7	9	0	15	15	0	0	0
	14	B/Sendai-H/114/2007	Yam	7	21	5	6	10	0	7	14	0	0	0
	15	B/Bangladesh/3333/2007	Yam	15	15	5	6	6	0	8	8	0	0	0
	15	B/Malaysia/2506/2004*	Vic	23	77	5	11	55	0	23	77	0	13	33
	15	B/Pennsylvania/5/2007	Vic	15	69	5	10	58	0	23	77	0	13	33
USA[2]	29	B/Florida/4/2006	Yam	N/A	31	5	N/A	12	0	N/A	24	0	N/A	7
	29	B/Sendai-H/114/2007	Yam	N/A	34	5	N/A	13	0	N/A	28	0	N/A	7
	29	B/Bangladesh/3333/2007	Yam	N/A	14	5	N/A	7	0	N/A	7	0	N/A	0
	29	B/Malaysia/2506/2004*	Vic	N/A	72	8	N/A	65	14	N/A	72	0	N/A	28
	29	B/Pennsylvania/5/2007	Vic	N/A	66	8	N/A	63	14	N/A	69	0	N/A	28

Preliminary Data 02/01/08

1. Sera were kindly provided by Virginia Commonwealth University, Medical Center, Department of Pediatrics. The populations were vaccinated with 2 doses of the 2007-2008 trivalent influenza vaccine containing 7.5ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2007(H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.
2. Sera were kindly provided by Dr. Zhiping Ye, FDA, Bethesda, MD. The populations were vaccinated with the 2007-2008 trivalent influenza vaccine containing 15ug each of A/Wisconsin/67/2005 X161B (H3N2)-like, A/Solomon Islands/03/2006 (H1N1)-like, and B/Malaysia/2506/2004-like hemagglutinin.

* B component of the vaccine.

Note: All B serology antigens were ether treated.

Summary of influenza B

- Influenza B outbreaks were reported in several countries.
- Viruses of both B/Victoria/2/87 and B/Yamagata/16/88 lineages were reported in many countries but B/Yamagata/16/88 lineage viruses predominated.
- For the B/Victoria/2/87 lineage viruses, the majority of recent isolates were antigenically similar to B/Malaysia/2506/2004 or B/Ohio/1/2005 (B/Malaysia/2506/2004-like reference virus).
- Most of the recent B/Yamagata/16/88 lineage viruses were antigenically similar to B/Florida/4/2006.
- Northern hemisphere vaccines stimulated HA antibodies that were similar in titre to recent B/Vic lineage viruses but were lower in titre to recent B/Yam lineage viruses.

WHO Recommendations

- It is recommended that vaccines for use in the 2008-2009 influenza season contain:
  - a B/Florida/4/2006-like virus.

Antiviral Resistance Surveillance

Frequency of neuraminidase inhibitor resistance: week of 02-12-2008.
Virus collection period: Oct. 1, 2007 – Jan. 22, 2008

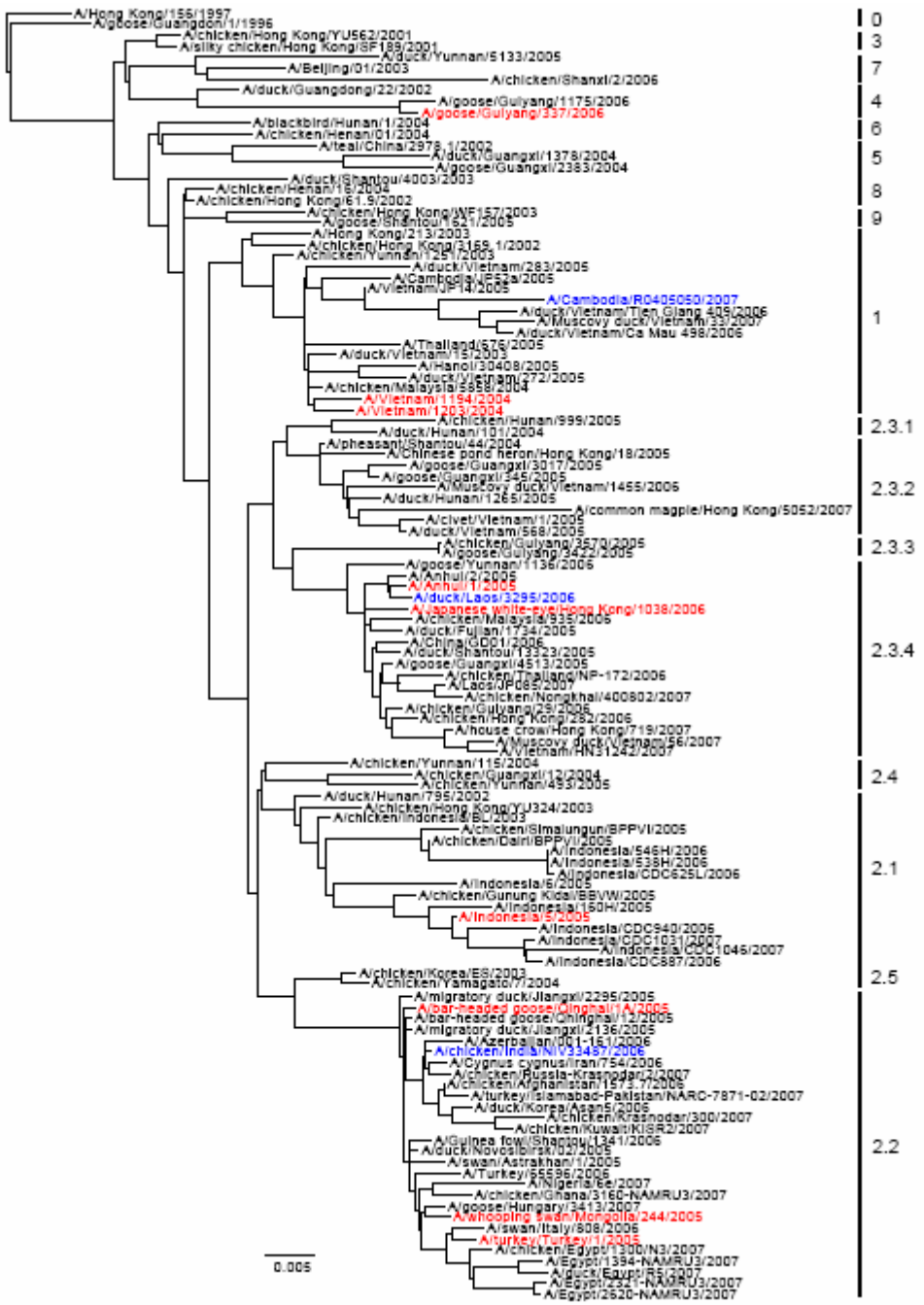
	Isolates tested (n)	Resistant (%)	
		Zanamivir	Oseltamivir
U.S. isolates:	**350**	**0 (0)**	**16 (4.6%)**
A/H1N1	198	0 (0)	16 (8.1%)
A/H3N2	72	0 (0)	0 (0)
Influenza A	270	0 (0)	16 (5.9%)
Influenza B	80	0 (0)	0 (0)
Foreign isolates:	**164**	**0 (0)**	**3 (1.8%)**
A/H1N1	89	0 (0)	3 (3.4%)
A/H3N2	40	0 (0)	0 (0)
Influenza A	129	0 (0)	3 (2.3%)
Influenza B	35	0 (0)	0 (0)
Global isolates:	**514**	**0 (0)**	**19 (3.7%)**
A/H1N1	287	0 (0)	19 (6.6%)
A/H3N2	112	0 (0)	0 (0)
Influenza A	399	**0 (0)**	19 (4.8%)
Influenza B	115	0 (0)	0 (0)

Frequency of adamantane resistance: week of 02-12-2008.

Virus collection period: Oct. 1, 2007 – Jan. 17, 2008

	Isolates tested (n)	Resistant isolates	% Resistance
US isolates:	**271**	**87**	**32.1**
A/H1N1	198	15	7.6
A/H3N2	73	72	98.6
Foreign isolates:	**96**	**59**	**61.5**
A/H1N1	71	34	47.9
A/H3N2	25	25	100
Global isolates:	**367**	**146**	**39.8**
A/H1N1	269	49	18.2
A/H3N2	98	97	99.0

Influenza A(H5N1) Viruses


A/Hong Kong/156/1997
A/goose/Guangdon/1/1996
A/chicken/Hong Kong/YU562/2001
A/silky chicken/Hong Kong/SF189/2001
A/duck/Yunnan/5133/2005
A/Beijing/01/2003
A/chicken/Shanxi/2/2006
A/duck/Guangdong/22/2002
A/goose/Guiyang/1175/2006
A/goose/Guiyang/337/2006
A/blackbird/Hunan/1/2004
A/chicken/Henan/01/2004
A/teal/China/2978.1/2002
A/duck/Guangxi/1378/2004
A/goose/Guangxi/2383/2004
A/duck/Shantou/4003/2003
A/chicken/Henan/16/2004
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A/chicken/Hong Kong/NF157/2003
A/goose/Shantou/1621/2005
A/Hong Kong/213/2003
A/chicken/Hong Kong/3168.1/2002
A/chicken/Yunnan/1251/2003
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A/Cambodia/R0405050/2007
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A/Thailand/676/2005
A/duck/Vietnam/15/2003
A/Hanoi/30408/2005
A/duck/Vietnam/272/2005
A/chicken/Malaysia/5858/2004
A/Vietnam/1194/2004
A/Vietnam/1203/2004
A/chicken/Hunan/999/2005
A/duck/Hunan/101/2004
A/pheasant/Shantou/44/2004
A/Chinese pond heron/Hong Kong/18/2005
A/goose/Guangxi/3017/2005
A/goose/Guangxi/345/2005
A/Muscovy duck/Vietnam/1455/2006
A/duck/Hunan/1265/2005
A/common magpie/Hong Kong/5052/2007
A/civet/Vietnam/1/2005
A/duck/Vietnam/568/2005
A/chicken/Guiyang/3570/2005
A/goose/Guiyang/3422/2005
A/goose/Yunnan/1136/2005
A/Anhui/2/2005
A/Anhui/1/2005
A/duck/Laos/3295/2006
A/Japanese white-eye/Hong Kong/1038/2006
A/chicken/Malaysia/935/2006
A/duck/Fujian/1734/2005
A/China/GD01/2006
A/duck/Shantou/13323/2005
A/goose/Guangxi/4513/2005
A/chicken/Thailand/NP-172/2006
A/Laos/IP085/2007
A/chicken/Nongkhai/400802/2007
A/chicken/Guiyang/29/2006
A/chicken/Hong Kong/282/2006
A/house crow/Hong Kong/719/2007
A/Muscovy duck/Vietnam/56/2007
A/Vietnam/HN31242/2007
A/chicken/Yunnan/115/2004
A/chicken/Guangxi/12/2004
A/chicken/Yunnan/493/2005
A/duck/Hunan/795/2002
A/chicken/Hong Kong/YU324/2003
A/chicken/Indonesia/BL/2003
A/chicken/Simalungun/BPPVI/2005
A/chicken/Dairi/BPPVI/2005
A/Indonesia/546H/2006
A/Indonesia/538H/2006
A/Indonesia/CDC625L/2006
A/Indonesia/6/2005
A/chicken/Gunung Kidul/BBVW/2005
A/Indonesia/150H/2005
A/Indonesia/5/2005
A/Indonesia/CDC940/2006
A/Indonesia/CDC1031/2007
A/Indonesia/CDC1046/2007
A/Indonesia/CDC887/2006
A/chicken/Korea/ES/2003
A/chicken/Yamagata/7/2004
A/migratory duck/Jiangxi/2295/2005
A/bar-headed goose/Qinghai/1/2005
A/bar-headed goose/Qinghai/12/2005
A/migratory duck/Jiangxi/2136/2005
A/Azerbaijan/001-151/2006
A/chicken/India/NIV33487/2006
A/Cygnus cygnus/Iran/754/2006
A/chicken/Russia-Krasnodar/2/2007
A/chicken/Afghanistan/1573.7/2006
A/turkey/Islamabad-Pakistan/NARC-7871-02/2007
A/duck/Korea/Asan5/2006
A/chicken/Krasnodar/300/2007
A/chicken/Kuwait/KISR2/2007
A/Guinea fowl/Shantou/1341/2006
A/duck/Novosibirsk/02/2005
A/swan/Astrakhan/1/2005
A/Turkey/55596/2006
A/Nigeria/66/2007
A/chicken/Ghana/3160-NAMRU3/2007
A/goose/Hungary/3413/2007
A/whooping swan/Mongolia/244/2005
A/swan/Italy/808/2006
A/turkey/Turkey/1/2005
A/chicken/Egypt/1300/N3/2007
A/Egypt/1394-NAMRU3/2007
A/duck/Egypt/R5/2007
A/Egypt/2341-NAMRU3/2007
A/Egypt/2520-NAMRU3/2007
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Reassortants with completed regulatory approval

Virus	Clade	Institution	Availability
A/Vietnam/1203/2004	**1**	**CDC and SJ/NIAID**	**Yes**
A/Vietnam/1194/2004	**1**	**NIBSC**	**Yes**
A/Indonesia/5/2005	**2.1**	**CDC**	**Requires Indonesia Government permission**
A/Bar-headed goose/Qinghai/1A/2005	**2.2**	**SJ/NIAID**	**Yes**
A/Whooper swan/Mongolia/244/2005	**2.2**	**SJ/NIAID**	**Yes**
A/turkey/Turkey/1/2005	**2.2**	**NIBSC**	**Yes**
A/Anhui/1/2005	**2.3.4**	**CDC**	**Yes**
A/Japanese white-eye/Hong Kong/1038/2006	**2.3.4**	**SJ/NIAID**	**Yes**

Reassortants prepared and awaiting regulatory approval

Virus	Clade	Institution	Availability
A/Chicken/India/NIV33487/2006	**2.2**	**CDC/NIV**	**Pending**
A/goose/Guiyang/337/2006	**4**	**SJ/NIAID**	**May 2008**
A/duck/Laos/3295/2006	**2.3.4**	**FDA**	**May 2008**
A/Cambodia/R0405050/2007	**1**	**NIBSC**	**May 2008**

Virus	Clade	Institution
A/duck/Hunan/795/2002	**2.1**	**SJ/NIAID**
A/egret/Egypt/1162/2007-like or A/Egypt/2321/2007-like	**2.2**	**CDC**
A/Xinjiang/1/2006	**2.2**	**CDC**
A/Common Magpie/Hong Kong/5052/2007	**2.3.2**	**SJ/NIAID**