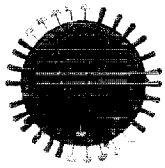
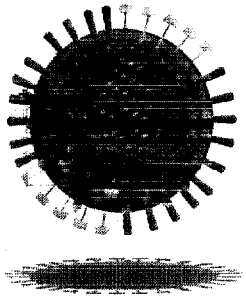
Influenza Section
Enteric and Respiratory Virus Laboratory
PHLS Central Public Health Laboratory
61 Colindale Avenue, London NW9 5HT
United Kingdom

UK INFLUENZA SURVEILLANCE 2000-2001





Data prepared for FDA Influenza Vaccine Meeting
Washington - January 2001

PUBLIC HEALTH LABORATORY SERVICE

PROTECTING THE POPULATION FROM INFECTION

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Summary

Influenza surveillance in England, Wales and Scotland is based on clinical and virological information. Clinical activity in England is monitored by the network of general practitioners which is co-ordinated by the Royal College of General Practitioners (RCGP). A subset of these GPs participate in virological surveillance. Virus strains are obtained by isolation from respiratory specimens provided by the sentinel GPs, or submitted by PHLS and NHS diagnostic laboratories. Virological data are obtained by analysing influenza strains using antigenic and molecular methods.

During the 2000/2001 season, clinical morbidity indices in England and Wales have not risen above baseline (<50 per 100,000 pop England. <25 Wales) and indicate low influenza activity. GP consultation rates in Scotland remain at the lower end of the threshold for 'normal seasonal activity' (50-600 per 100,000 pop). These are the lowest levels of clinical activity seen in the United Kingdom in the last 10 years. The RCGP consultation index for influenza usually averages 15-20 per 100,000 population in the summer months, and in December 2000 rose above 30 per 100,000 for the first time in week 1/01 and has remained at approximately 35 per 100,000 for the last few weeks. Analysis of the regional influenza activity suggests that higher rates of respiratory infection have been seen in the north and central regions of England, with similar consultation rates in all age groups, and the highest consultation rates being seen in the 15-44 age groups and the <5years olds

Greater than 80% of the strains received and analysed have been influenza A H1N1 isolates, with few influenza B isolates associated with sporadic cases and a few outbreaks. No influenza A H3N2 isolates have been detected so far this season

Influenza A H1N1

The first H1N1 strain to be characterised in the 2000/2001 season was obtained in week 43 from a hospitalised 4 year old. This was followed closely by strains obtained from community based surveillance. The majority of 120 H1N1 isolates characterised so far, have been obtained from community sources. Haemagglutination Inhibition (HI) testing using panels of antisera indicates that all but three strains have shown good reactivity to A/New /Caledonia/20/99. The three strains which do not show good reactivity to A/New /Caledonia/20/99 show good reactivity to A/Bayern/7/95 and related viruses, indicating that there are two separate antigenic lineages circulating. However, it should be noted that all the A/Bayern/7/95 like viruses have originated in Swansea, Wales and are associated with a cluster of illness. These observations are confirmed in the genetic analyses of H1N1 viruses. This is the first year since 1996/97 that H1N1 viruses have circulated widely in the United Kingdom.

Influenza B

The first influenza B viruses were isolated in week 49/2000 from a hospitalised infant under 1 year. Since then approximately 30 influenza B viruses have been characterised. Analysis of these viruses indicates that generally they have a good reactivity to B/Yamanashi/166/98 virus and better reactivity to B/Sichuan/379/99. The limited molecular analyses performed so far on influenza B viruses supports the conclusion that influenza B viruses are more closely related to B/Yamanashi/166/98 and B/Sichuan/379/99 than to B/Beijing/184/93, a previous vaccine strain.

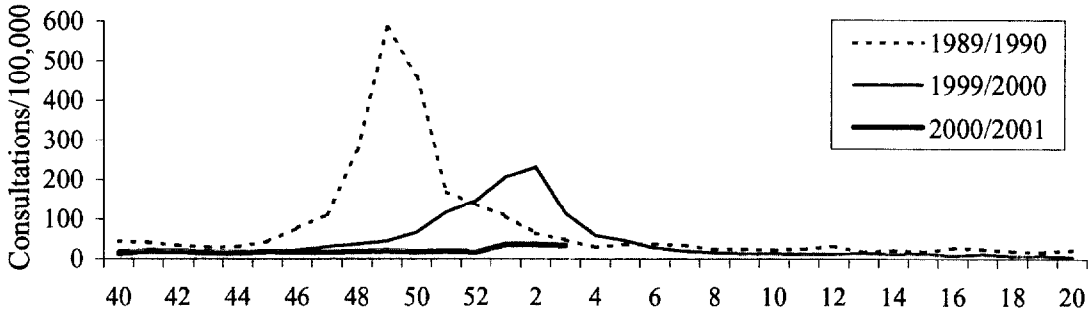
Conclusions

The 2000/2001 winter influenza season has been one of minimal activity, mainly attributable to influenza H1N1 circulation. Influenza A New Caledonia/20/99 H1N1 viruses have been the predominant circulating strain in the season so far. There is limited antigenic heterogeneity of the influenza A H1N1 isolates with a small cluster of older A/Bayern/7/95 like strains. There has also been sporadic isolation of influenza B viruses, which are antigenically similar to the vaccine strain B/Yamanshi/166/98 and more recent prototype strain B/Sichuan/379/99.

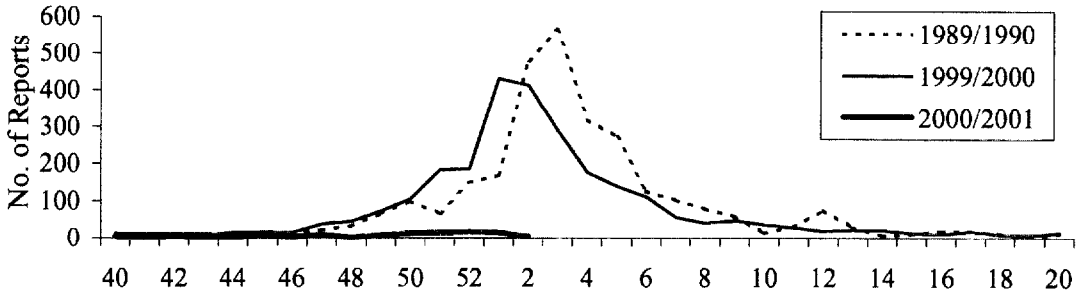
Maria Zambon
Head Respiratory Virus Unit
January 2001

EPIDEMIOLOGICAL DATA

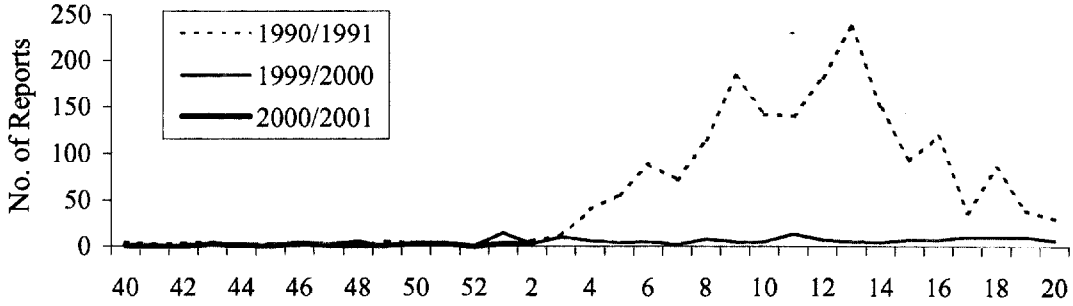
RCGP* Consultation Index for Influenza-Like Illness



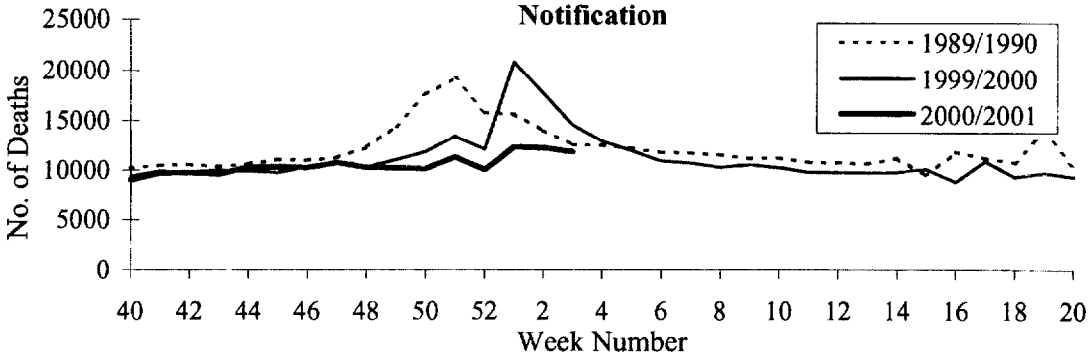
Laboratory Reports** of Influenza A



Laboratory Reports** of Influenza B

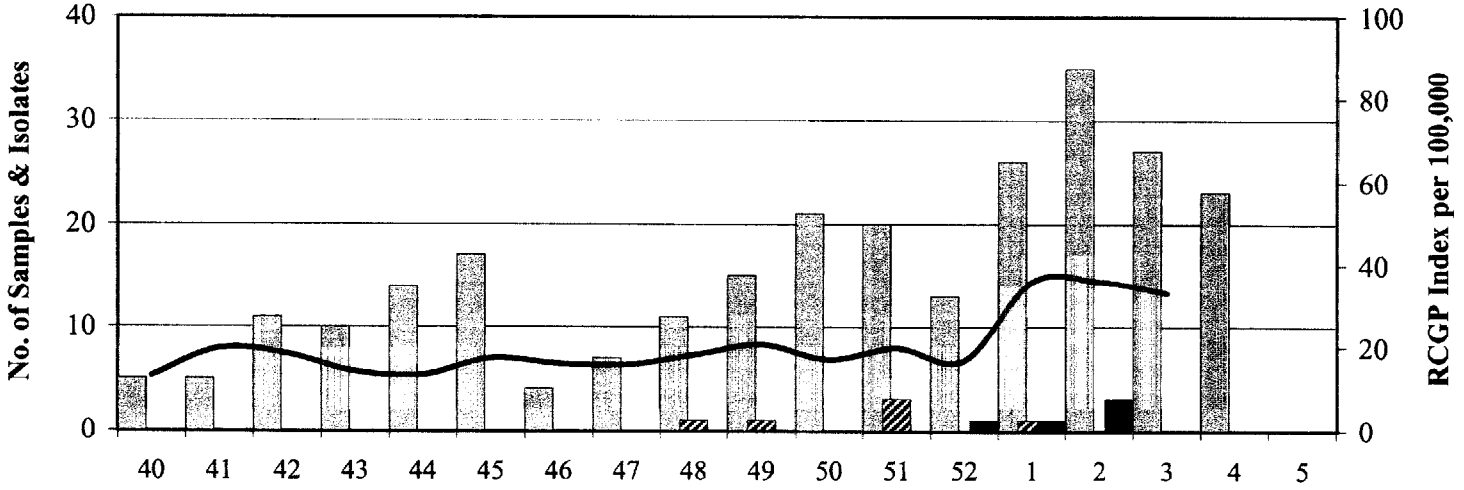


Deaths Due to All Causes Notified to ONS*** by Week of Notification

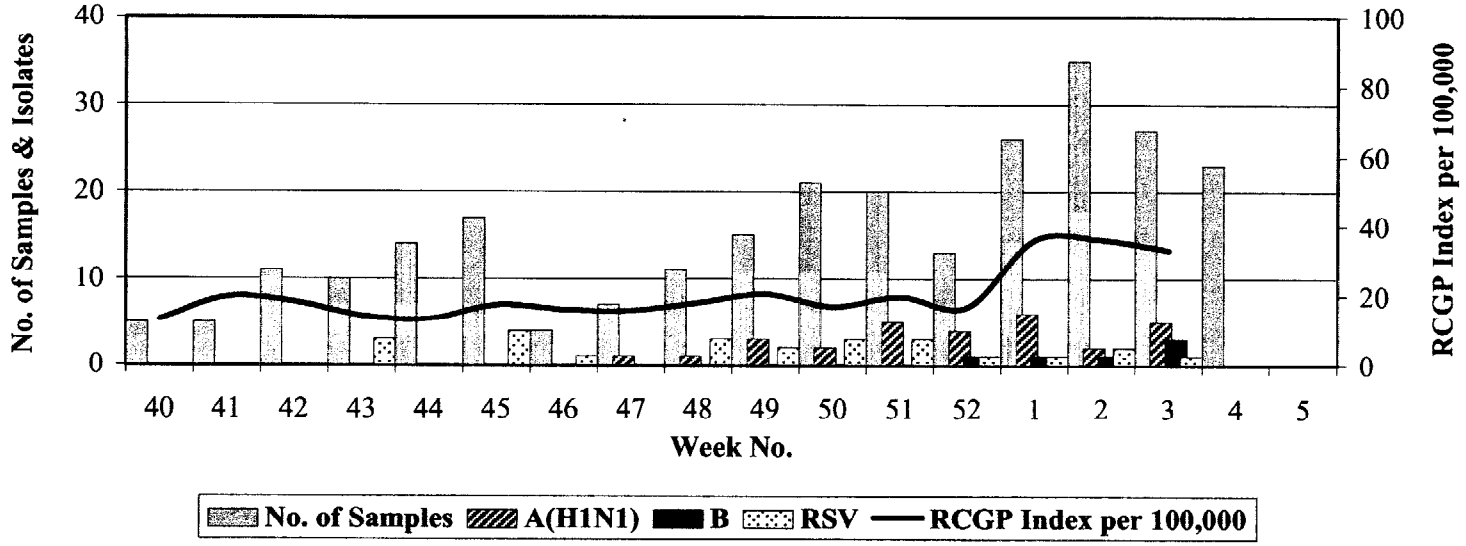


* Royal College of General Practitioners
**Reports to Communicable Disease Surveillance Centre
***Office of National Statistics

RCGP/PHLS Samples & Isolates by Week of Sample Date (2000/2001)

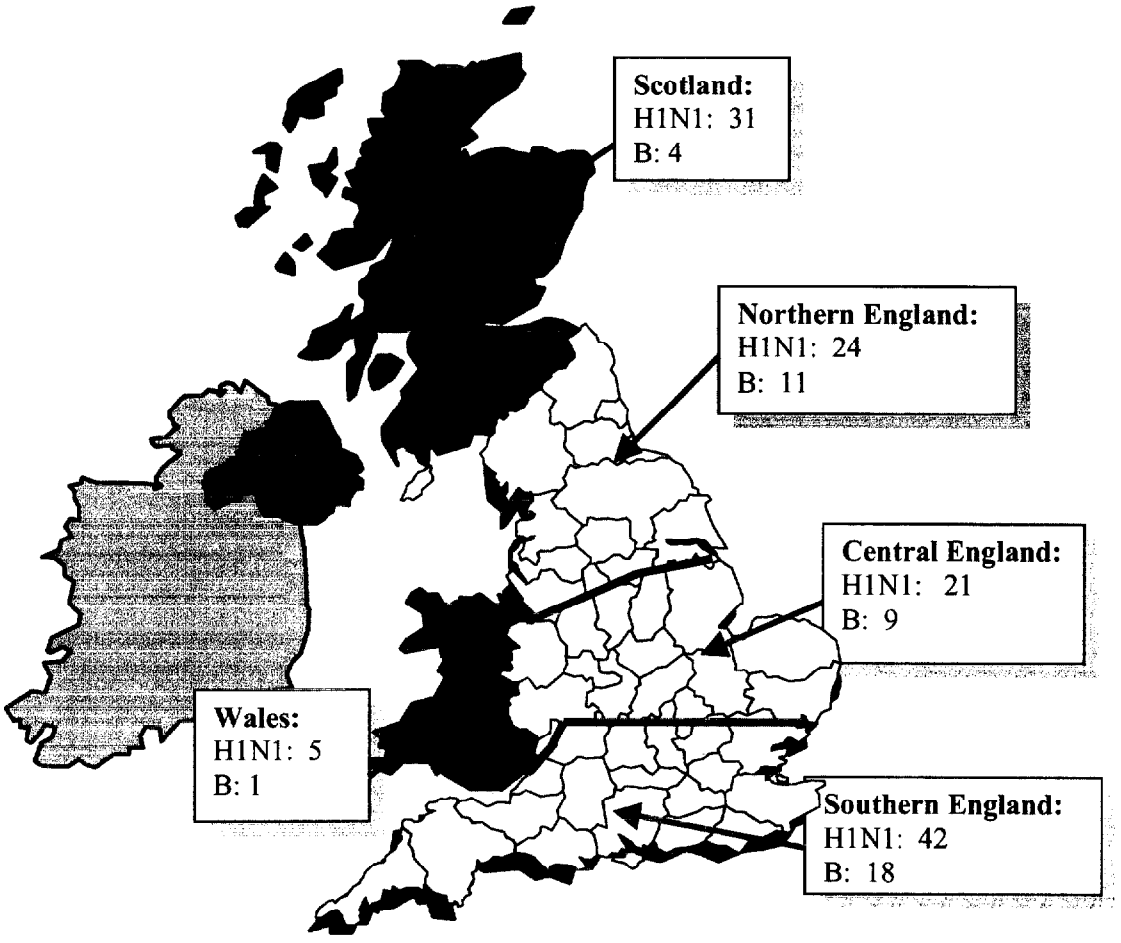


RCGP/PHLS Samples & PCR +ve by Week of Sample Date (2000/2001)



REGIONAL DISTRIBUTION OF INFLUENZA ISOLATES, 2000/2001

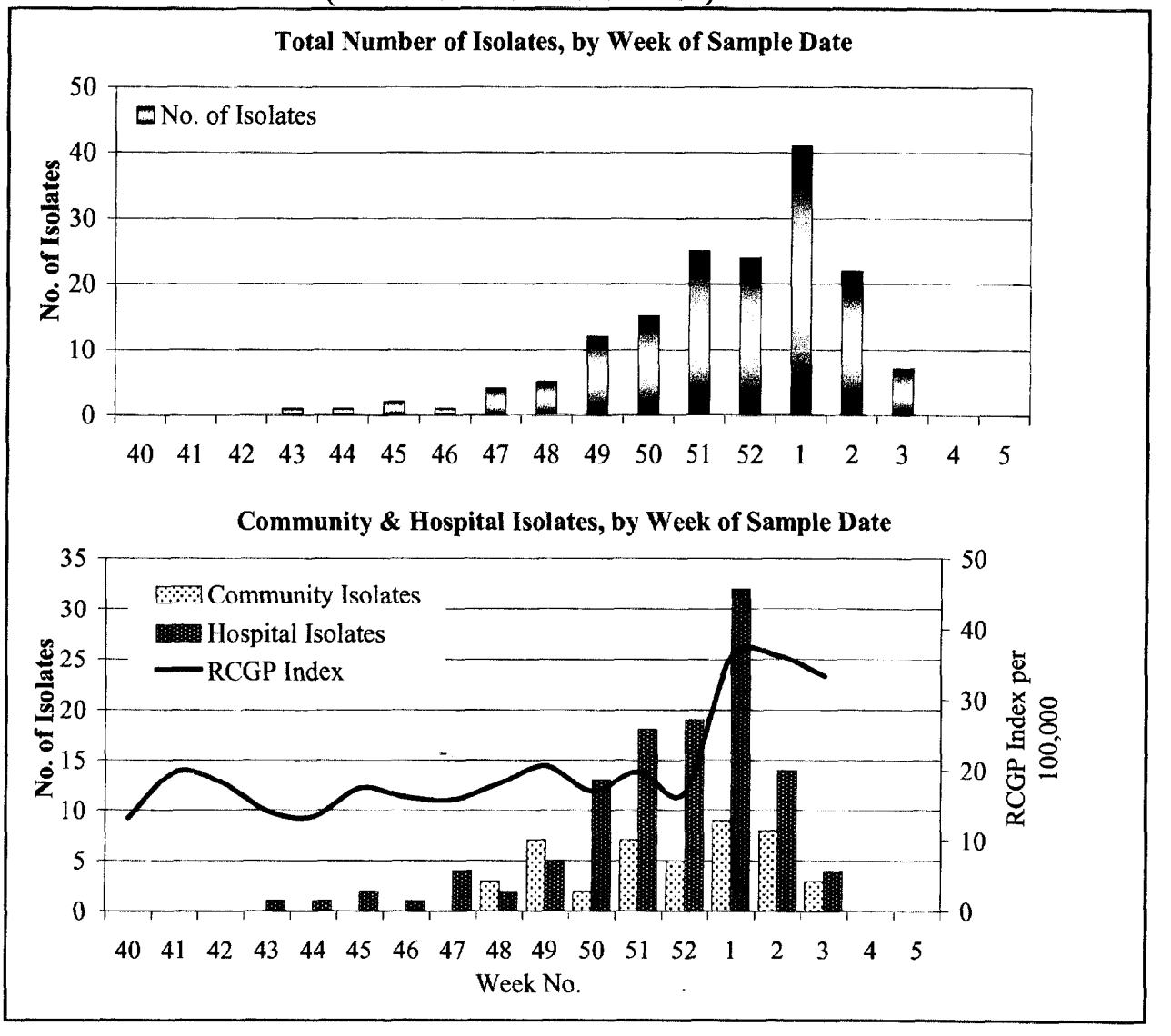
Cumulative Total from Week 40/2000 (2nd October 2000) to Week 3/2001 (21st January 2001).

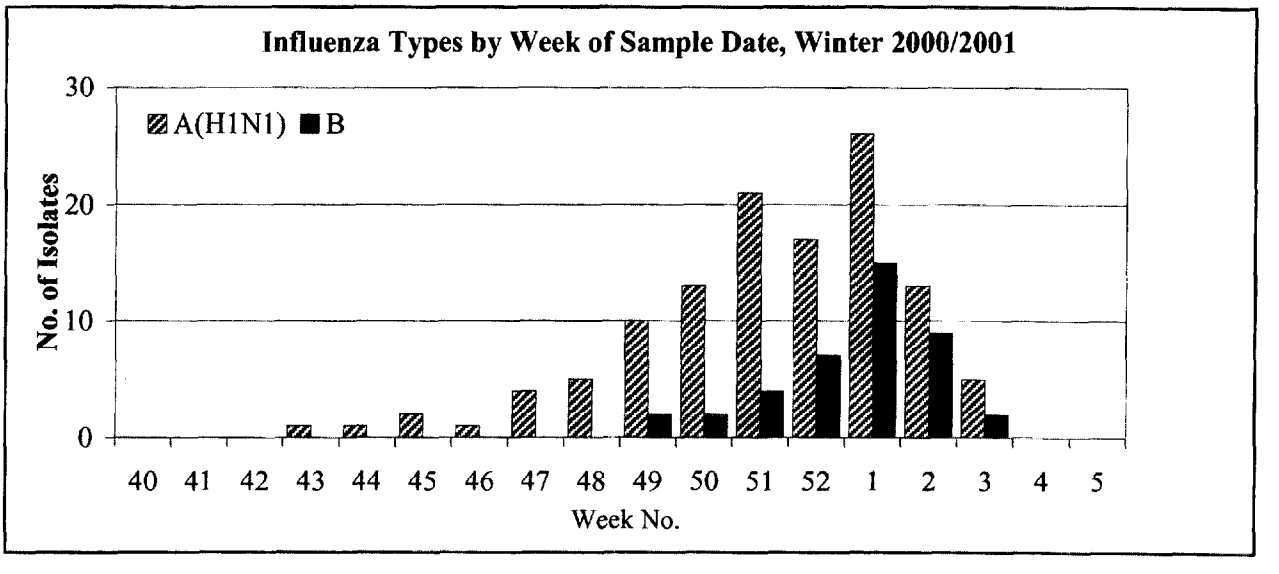


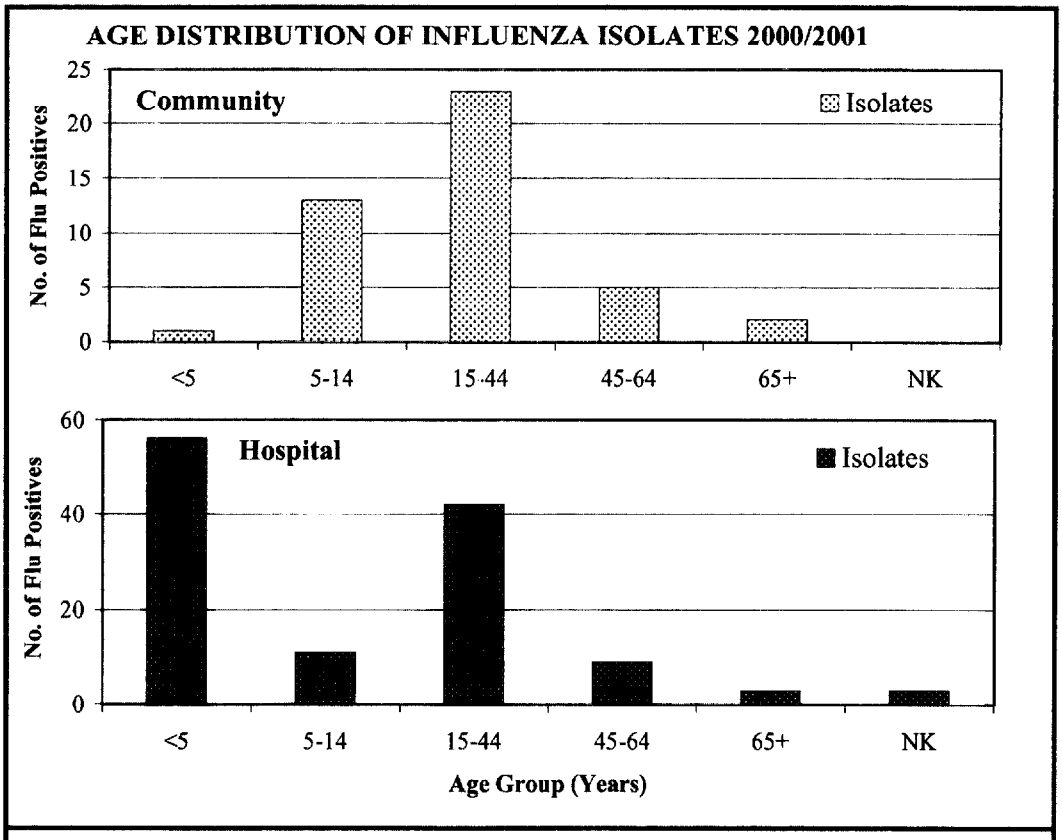
A(H1N1)	B	Total Positive
125	43	168

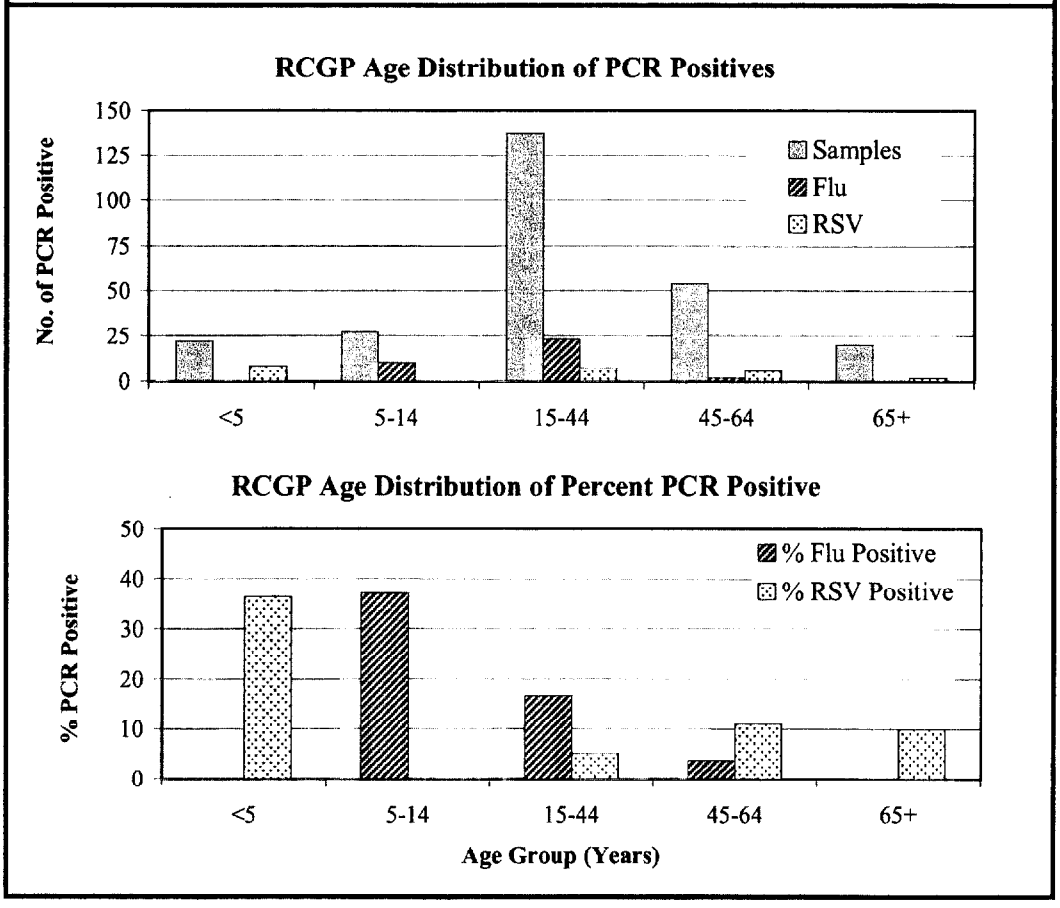
	North	Central	South	Scotland	Wales	NK
Community Samples	197	161	218	5	58	1
Community Isolates	13	12	17	1	1	
% Positive	6.6%	7.5%	7.8%	20.0%	1.7%	
Hospital Isolates	22	18	43	34	5	2
All Isolates	35	30	60	35	6	2

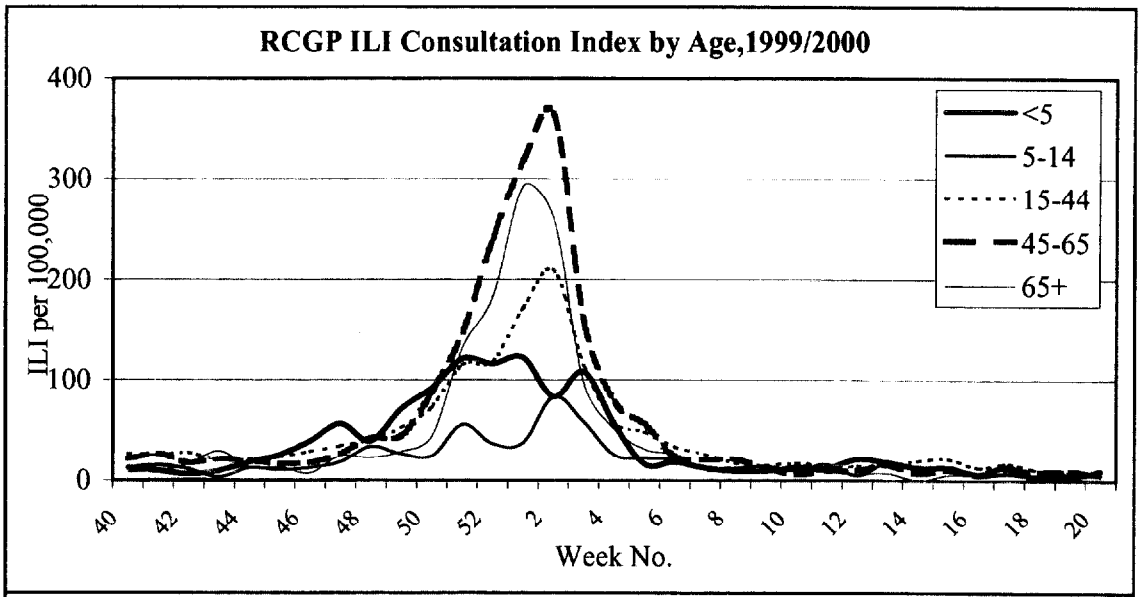
SOURCES OF ALL INFLUENZA ISOLATES 2000/2001
(Week 40/2000 to 3/2001 inc.)

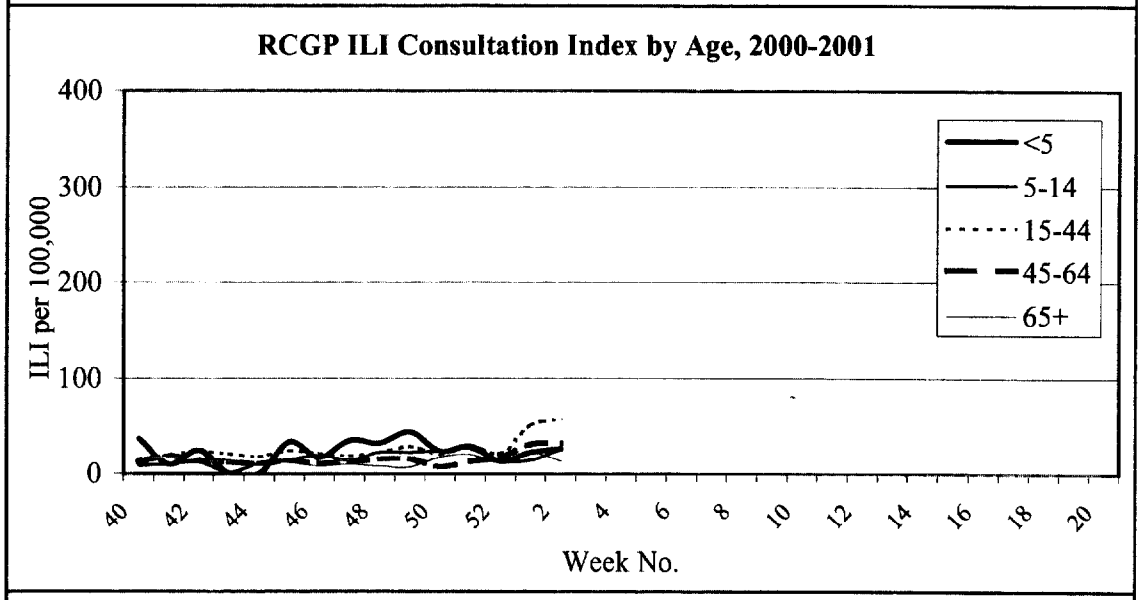


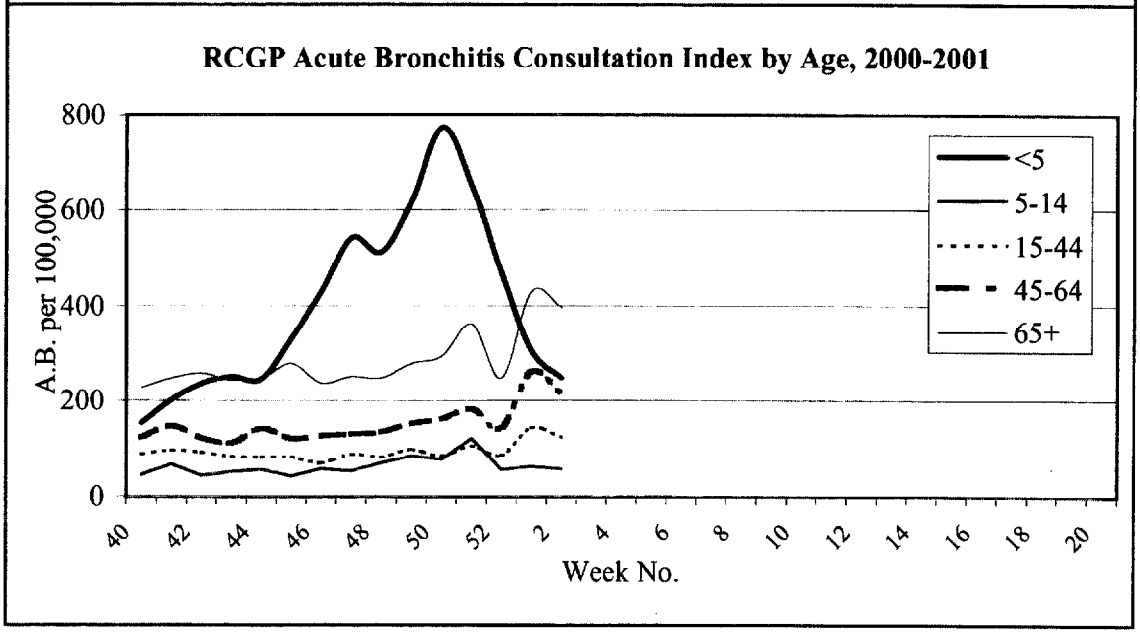



AGE DISTRIBUTION OF INFLUENZA ISOLATES 2000/2001
Community
Isolates
No. of Flu Positives
25
20
15
10
5
0
<5
5-14
15-44
45-64
65+
NK
Hospital
Isolates
No. of Flu Positives
60
40
20
0
<5
5-14
15-44
45-64
65+
NK
Age Group (Years)


RCGP Age Distribution of PCR Positives
No. of PCR Positive
150
125
100
75
50
25
0
Samples
Flu
RSV
<5
5-14
15-44
45-64
65+
RCGP Age Distribution of Percent PCR Positive
% PCR Positive
50
40
30
20
10
0
% Flu Positive
% RSV Positive
<5
5-14
15-44
45-64
65+
Age Group (Years)


RCGP ILI Consultation Index by Age,1999/2000
ILI per 100,000
400
300
200
100
0
40
42
44
46
48
50
52
2
4
6
8
10
12
14
16
18
20
Week No.
<5
5-14
15-44
45-65
65+


RCGP ILI Consultation Index by Age, 2000-2001
ILI per 100,000
400
300
200
100
0
40
42
44
46
48
50
52
2
4
6
8
10
12
14
16
18
20
Week No.
<5
5-14
15-44
45-64
65+


RCGP Acute Bronchitis Consultation Index by Age, 2000-2001
A.B. per 100,000
800
600
400
200
0
40
42
44
46
48
50
52
2
4
6
8
10
12
14
16
18
20
Week No.
<5
5-14
15-44
45-64
65+

CROSS REACTIVITY OF ENGLAND H1N1 STRAINS

Haemagglutination Inhibition
Post infection ferret sera
< = <40

January 2001

8AD VIRUS	A/Wuhan/ 371/95	A/Bayern /7/95	A/JHB/ 82/95	A/New Cal/ 20/99	Hosp/ Comm	Date of Specimen	Geography (Source)	Age
A/Wuhan/371/95	**1280**	320	80	80				
A/Bayern/7/95	80	**5120**	640	1280				
A/JHB/82/95	80	640	**2560**	2560				
A/New Cal/20/99	160	5120	5120	**5120**				
A/England/190/00	80	<	<	640	**H**	**27/10/00**	**Manchester**	**4.3**
A/England/192/00	80	5120	5120	1280	**H**	**7/11/00**	**Swansea**	**2.5**
A/England/201/00	1280	40	40	5120	**C**	**6/12/00**	**Liverpool**	**40**
A/England/229/00*	2560	160	160	5120	**C**	**19/12/00**	**Birmingham**	**42**
A/England/19/01	80	2560	2560	80	**H**	**2/01/01**	**Swansea**	**0.5**

***vaccinated**

CROSS REACTIVITY OF ENGLAND B EPIDEMIC STRAINS

January 2001

Haemagglutination Inhibition
8AD virus
<=<20

8AD Virus	B/Beij/ 184/93	B/Yam/ 166/98	B/Sichuan/ 379/99	Source	Date of Specimen	Geography	Age
B/Beijing/184/93	**640**	640	320				
B/Yamanashi/166/98	160	**640**	640				
B Sichuan/379/99	320	320	**1280**				
B/Eng/197/2000	320	640	2560	**Hospital**	**8/12/00**	**Epsom**	**0.25**
B/Eng/224/2000	80	320	2560	**Hospital**	**11/12/00**	**London**	**30**
B/Eng/6/2001							

Amino acid sequences of the HA1 subunit of influenza AH1N1 viruses

```
Majority                DTICIGYHANNSTDTVDTVLEKNVTVTHSVNLLEDSHNGKLCLLKGIAPLQLGNCSVAGWILGNPECESLISKESWSYIVETPNPENGTCYPGYFADYEELREQLSSVSSFERFEIFPKE
                                10        20        30        40        50        60        70        80        90       100       110       12
A/TEXAS/36/91           ..........................................R......................K....F........A.......................................
A/HK/52/95              ..........................................................................................................................
A/WUHAN/371/95          ..........................................................................................................................
A/BEIJING/262/95        ..........................................................................................................................
A/PERTH/15/95           ..........................................R...T......................F........A.......................................
A/BAYERN/7/95           ..........................................R...T......................F........A.......................................
A/NEWCALEDONIA/20/99    ..........................................................................L.........................................
A/ENG/190/00            ..........................................................................L.........................................
A/ENG/192/00            ..........................................R...T.........I.............F........A.....K...............................D
A/ENG/194/00            ..........................................................................L.........................................
A/ENG/200/00            ..........................................................................L.........................................
A/ENG/205/00            ..........................................................................L.........................................
A/ENG/220/00            ......................G...................................................L...R.......................................G
A/ENG/221/00            ..........................................R...T.........I.............F........A.....K...............................D

Majority                SSWPNHTVT-GVSASCSHNGKSSFYRNLLWLTEKNGLYPNLSKSYVNNKEKEVLVLWGVHHPSNIGDQRAIYHTENAYVSVVSSHYSRRFTPEIAKRPKVRDQEGRINYYWTLLEPGDTI
                                130       140       150       160       170       180       190       200       210       220       230       24
A/TEXAS/36/91           .........K..TT...........I......K.......................................................................................
A/HK/52/95              .........-..........................................................................................................
A/WUHAN/371/95          .........-..T.............................N.................P...N.......................................................
A/BEIJING/262/95        .........-..T.............................N.......................V.................................G.................
A/PERTH/15/95           .........K..T........C...K.......................................................................................
A/BAYERN/7/95           .........K..T............K.......................................................................................
A/NEWCALEDONIA/20/99    .........-.......................G...........................P.......L.......................................
A/ENG/190/00            .........-.......................G............A...............P...N...L....D.......................................
A/ENG/192/00            .........K..T............K.....................K.G.............M........K.......L.......................................
A/ENG/194/00            .........-.......................G............A...............P.......L.......................................
A/ENG/200/00            ....Y....-.......................G............A...............P.......L.......................................
A/ENG/205/00            .........-.......................G............A...............P.......L.......................................
A/ENG/220/00            .........-.......................G.........M.................P.......L.......................................R...
A/ENG/221/00            .........K..T............K.....................K.G.............M........K.......L.......................................

Majority                IFEANGNLIAPWYAFALSRGFGSGIITSNAPMDECDAKCQTPQGAINSSLPFQNVHPVTIGECPKYVRSTKLRMVTGLRNIPSIQSR
                                250       260       270       280       290       300       310       320
A/TEXAS/36/91           ..............................S.........................................................
A/HK/52/95              ..............................N.........................................................
A/WUHAN/371/95          ..............................N.........................................................
A/BEIJING/262/95        ..............................N.........................................................
A/PERTH/15/95           ..............................SLG.......................................................
A/BAYERN/7/95           ..............................S.G.......................................................
A/NEWCALEDONIA/20/99    ..........................................................................A........
A/ENG/190/00            ..............................A.........................................A.................
A/ENG/192/00            ........................I...S.G.........................................V......
A/ENG/194/00            ...........R..........................................................A.................
A/ENG/200/00            ...........R..........................................................A.................
A/ENG/205/00            ...........R..........................................................A.................
A/ENG/220/00            ....................L.........................................................A.................
A/ENG/221/00            ........................I...S.G.........................................V......
```

Amino acid sequences of the HA1 subunit of influenza B viruses

```
Majority                 DRICTGITSSNSPHVVKTATQGEVNVTGAIPLTTTPTKSHFANLKGTKTRGKLCPTCLNCTDLDVALGRPMCVGITPSAKASILHEVRPV
                                 10        20        30        40        50        60        70        80        90
B/BEIJ/184/93            ........................V........................N..................T...............
B/HARBIN/7/94            ........................V........................N..................T...............
B/HK/46/94               ........................V........................K..............K.T.NI....V.........
B/ENG/615/98             ....................................................................................
B/ENG/671/98             ....................................................................................
B/ENG/889/99             ....................................................................................
B/ENG/63/00              ....................................................................................
B/YAMANASHI/166/98       ........................V.......................................V...............
B/SICHUAN/379/99         ...................................................................................IK..
B/ENG/197/00 (2000-01)   ....................................................................................
B/ENG/224/00 (2000-01)   ...................................................F.................................

Majority                 TSGCFPIMHDRTKIRQLPNLLRGYEKIRLSTQNVINAEKAPGGPYRLGTSGSCPNATSKSGFFATMAWAVPR-DNNKTATNPLTVEVPHI
                                 100       110       120       130       140       150       160       170       18
B/BEIJ/184/93            ......................N.............................R............-...............Y.
B/HARBIN/7/94            ......................N.............................R............-.D............YV
B/HK/46/94               ......................H.....H.............I........V.NGN...........KN........S..I...Y.
B/ENG/615/98             ...................................................................-................
B/ENG/671/98             ...................................................................-................
B/ENG/889/99             ............Q.......................................................-........A........
B/ENG/63/00              ...................................................................-................
B/YAMANASHI/166/98       ...................................................R............K-................
B/SICHUAN/379/99         ...................................................................-................
B/ENG/197/00 (2000-01)   ...........................................................E........-................
B/ENG/224/00 (2000-01)   ................................D..................................-................

Majority                 CTKEEDQITVWGFHSDNKTQMKNLYGDSNPQKFTSSANGITTHYVSQIGGFPDQTEDGGLPQSGRIVVDYMVQKPGKTGTIVYQRGILLF
                                 190       200       210       220       230       240       250       260       27
B/BEIJ/184/93            ...G.............I...................V.......................................V...
B/HARBIN/7/94            ..EG.............A...................V.......................................V...
B/HK/46/94               ..EG............EI..AK.....K.........V...........N....................S......T........
B/ENG/615/98             ....................................................................................
B/ENG/671/98             ....................................................................................
B/ENG/889/99             ....................................................................................
B/ENG/63/00              ....................................................................................
B/YAMANASHI/166/98       ....................................V...............................................
B/SICHUAN/379/99         ....................................................................................
B/ENG/197/00 (2000-01)   ................D....................D...............................................
B/ENG/224/00 (2000-01)   ....................................................................................

Majority                 QKVWCASGRSKVIKGSLPLIGEADCLHEKYGGLNKSKPYYTGEHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKER
                                 280       290       300       310       320       330       340
B/BEIJ/184/93            ....................................................................
B/HARBIN/7/94            ....................................................................
B/HK/46/94               ....................................................................
B/ENG/615/98             ....................................................................
B/ENG/671/98             ....................................................................
B/ENG/889/99             ....................................................................
B/ENG/63/00              ....................................................................
B/YAMANASHI/166/98       ....................................................................
B/SICHUAN/379/99         ....................................................................
B/ENG/197/00 (2000-01)   ....................................................................
B/ENG/224/00 (2000-01)   ....................................................................
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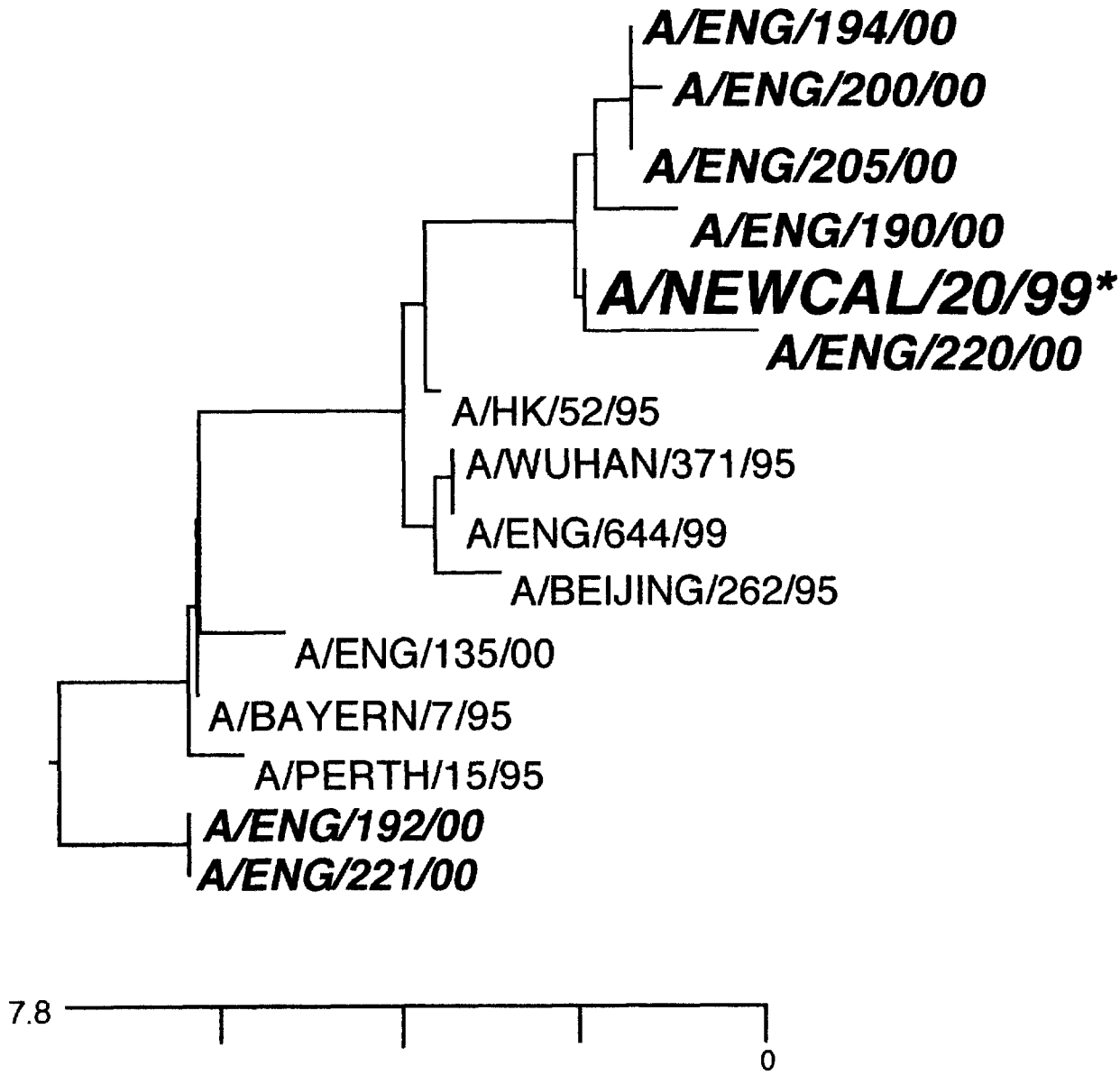
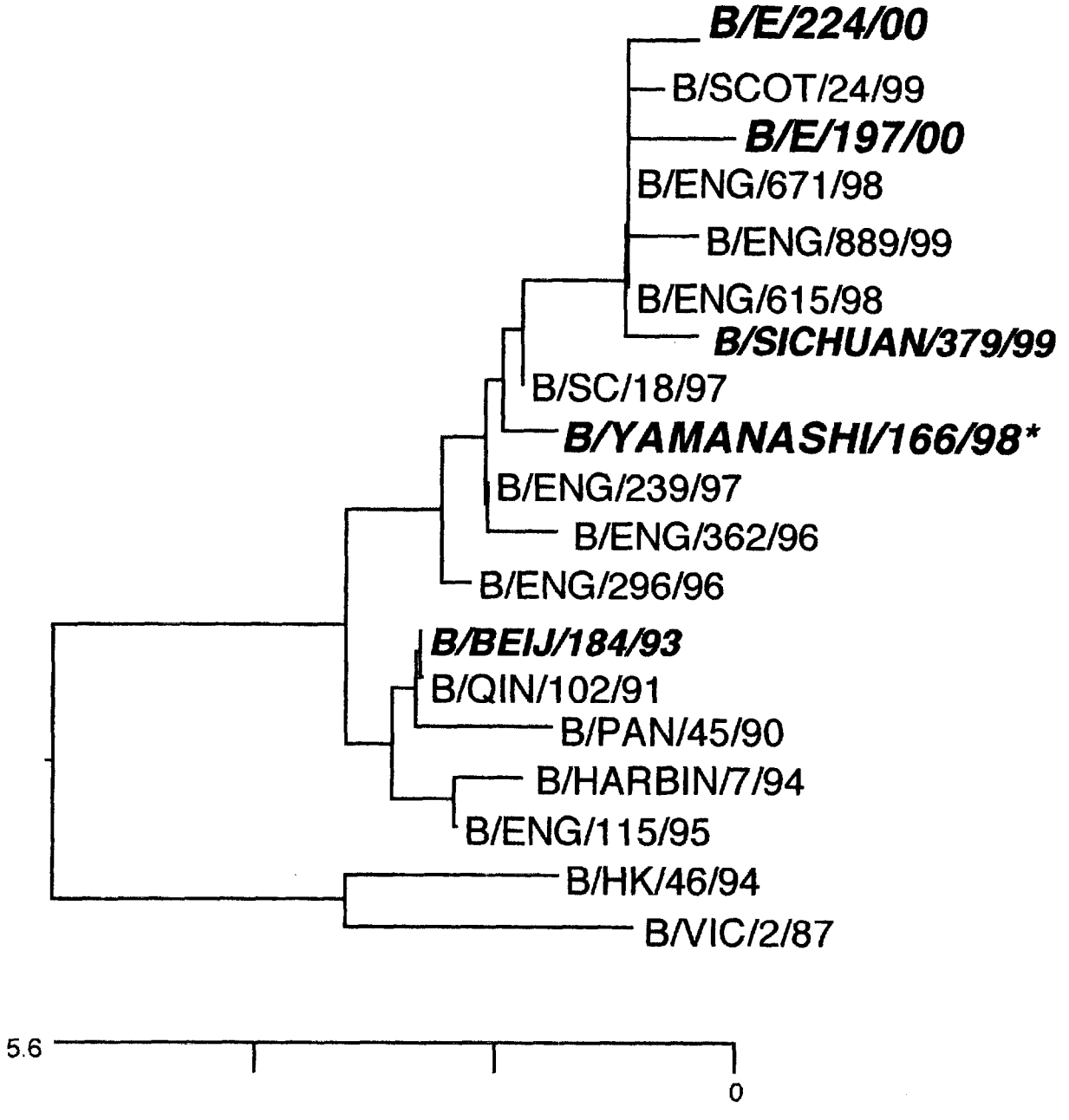
Phylogenetic Tree - Influenza AH1N1 Viruses



(% distance between sequences * denotes current vaccine strain)

Phylogenetic Tree - Influenza B Viruses



(% distance between sequences * denotes current vaccine strain)