

# Influenza surveillance in the United Kingdom: October 2001 to May 2002

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## Summary

Low levels of influenza activity were observed in the United Kingdom in the season 2001/02. Consultation rates with general practitioners for influenza-like illness remained within the range of 'baseline activity' throughout the season for the first time. The highest consultation rates were in children aged 0 to 4 years followed by children aged 5 to 14 years. Rates remained lowest in adults aged 65 years and over. In England, general practitioner (GP) consultation rates for total respiratory disease and acute bronchitis remained within the range expected. Over the New Year period rates remained low for respiratory infections, especially in the elderly with limited disruption to health services.

The 2001/02 winter season was marked by the identification of a new influenza A subtype, H1N2, which co-circulated over the same period with influenza A (H3N2). Similar numbers of H3N2 and H1N2 viruses were isolated with very few A (H1N1) or influenza B, viruses detected. All circulating virus strains were antigenically similar to vaccine strains for the 2001/2 winter season. Sporadic outbreaks of influenza occurred throughout the season. The outbreaks involving the new H1N2 subtype occurred among school children. Laboratory reports of respiratory syncytial virus followed the usual seasonal pattern, peaking in January while *Mycoplasma pneumoniae* reports remained unexpectedly low.

**Keywords:** *influenza, epidemiology, outbreak, surveillance*

## Introduction

Surveillance of influenza activity is conducted by the PHLS throughout the year, but with a particular focus on the winter season from October (week 40) to May (week 20). The PHLS uses a variety of sources for its surveillance of influenza. A primary objective of influenza surveillance is to provide information on circulating strains of influenza for early detection of novel subtypes or strains of epidemic potential, for comparison with previous strains and to contribute to the decision about the vaccine composition for the following year. A second objective is to provide timely and up to date information for informing health

professionals, and also for the public and the media. At the end of the season, the impact of influenza on morbidity and mortality is assessed and compared with previous years.

## Methods

Influenza surveillance is broadly split into two categories of information: laboratory and clinical. A network of laboratories provides diagnosis on samples from both hospital and community settings throughout the United Kingdom (UK) while the Central Public Health Laboratory (CPHL) acts as a reference laboratory that subtypes specimens referred from this network and also community surveillance schemes. Clinical consultation rates from Wales, Scotland, and Northern Ireland are briefly summarised to present a UK overview. The main source of clinical data for England is that of the Royal College of General Practitioners (RCGP) which has a sentinel network of general practitioners (GPs) which reports a range of diagnoses from patient consultations. Wales, Scotland, and Northern Ireland have similar sentinel schemes. A boarding school surveillance scheme operated by the Medical Officers of Schools Association (MOSA) is also maintained in England to detect early outbreaks. The Office for National Statistics (ONS) provides weekly figures on deaths by age and cause for assessing the impact of influenza from year to year. Calls to NHS Direct, a telephone service run by nurses to provide medical advice to the public, are being monitored to assess their potential for surveillance of influenza activity within the community. The PHLS also contributes to and receives surveillance information from organizations such as the European Influenza Surveillance Scheme (EISS), the World Health

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Organization (WHO), and the Centers for Disease Control and Prevention (CDC) in Atlanta, United States.

Previous reports have described in detail the format and type of different data sources used for influenza surveillance in England Wales, and Scotland<sup>1,2,3</sup>. The concept behind NHS Direct has also been previously described<sup>4</sup>. The use and principle of thresholds for describing levels of influenza activity based on consultation rates with general practitioners in different sentinel schemes in England, Wales, and Scotland has also been well documented<sup>5</sup>. The methods used for influenza surveillance are summarized briefly below.

**Clinical**

**Royal College of General Practitioners (RCGP) Weekly Returns Service.** A weekly reporting service from sentinel GP practices distributed throughout England which record morbidity data from every consultation as the working diagnosis made by the general practitioner. Unpublished diagnostic guidelines for acute respiratory infections have been circulated to participants in the RCGP scheme. Similar schemes are run in Northern Ireland, Scotland, and Wales. All rates are reported per 100 000 of the general population.  
**Medical Officers of Schools Association (MOSA).** Weekly rates per 1000 boarding school pupils from sentinel schools, for influenza and influenza-like illness.

**Virological**

**Respiratory Virus Unit (RVU), Enteric, Respiratory and Neurological Virus Laboratory (ERNVL), Central Public Health Laboratory (CPHL).** The reference laboratory for subtyping, antigenic and genetic characterization of influenza and other respiratory viruses.

**RCGP/ERNVL virological surveillance scheme.** Community based sampling for influenza by GPs from the RCGP scheme.

**PHLS virological surveillance of influenza scheme.** Community based sampling for influenza by GPs outside the RCGP scheme and in collaboration with PHLS Group laboratories.

**PHLS/NHS laboratory reports.** A voluntary reporting system to CDSC from laboratories in England and Wales of influenza A or B positive specimens. Clinical specimens that yield positive results for influenza either by single

elevated serological titre, seroconversion antigen detection, or culture are reported.

**Deaths**

**Office for National Statistics (ONS).** Weekly registration of deaths by age and cause.

**Outbreaks**

Information on outbreaks of influenza and other respiratory illness in England and Wales reported to CDSC or ERNVL are collated.

Influenza activity outside the UK is received using information from the following organizations and websites: World Health Organization (WHO) <<http://oms2.b3e.jussieu.fr/flunet/news.html>>, Centers for Disease Control and Prevention (CDC Atlanta) <<http://www.cdc.gov/ncidod/diseases/flu/fluvirus.htm>>, European Influenza Surveillance Scheme (EISS) <<http://www.eiss.org>>.

Unless otherwise stated the data in this report covers the period October 2001 to May 2002 (weeks 40/01 to 22/02)

**Results**

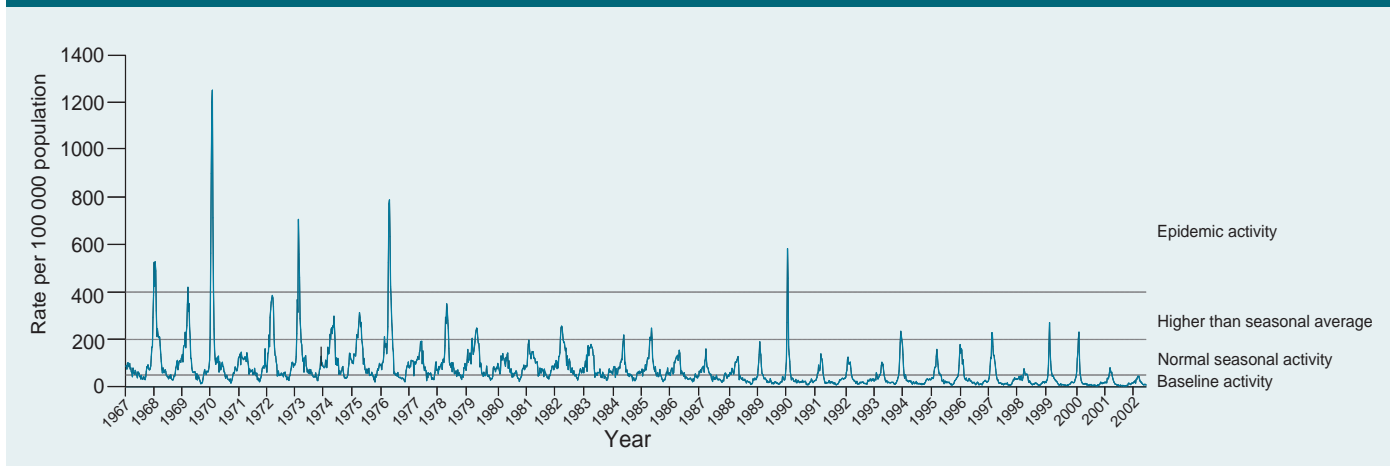
**Clinical**

**Royal College of General Practitioners Weekly Returns Service.** In the RCGP sentinel surveillance scheme, the weekly GP consultation rate for influenza and ‘influenza-like illness’ for England remained below baseline (less than 50 new episodes per 100 000 population) throughout the influenza season. Influenza levels began to rise consistently from week 01/01 reaching a peak of 45/100 000 by week 06/02 and there after steadily declined to a level of 10/100 000 by week 13/02. This is the first reported influenza season since 1966 where the baseline level has not been breached (figure 1).

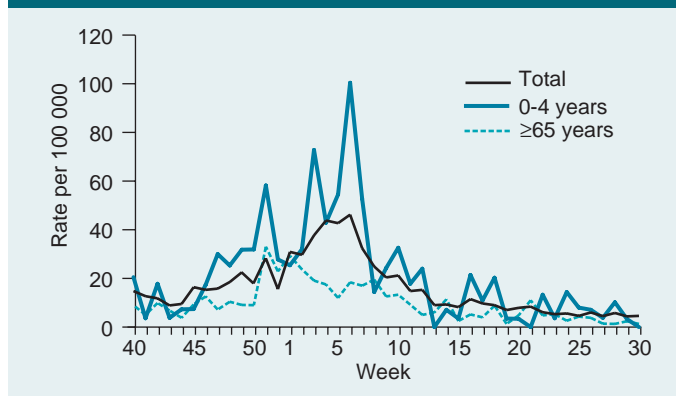
The highest consultation rates were for children aged 0 to 4 years (100/100 000 in week 06/02) followed by children aged 5 to 14 years (97/100 000 in week 04/02) (figure 2). When rates were examined by region they were highest in the RCGP northern region (59 per 100 000) while the lowest peak was in the RCGP southern region (36/100 000).

GP consultation rates for acute bronchitis peaked in 02/02 with a rate of 236/100 000 population (figure 3). This rate was similar to the peak seen during the 2000/01 season

**Figure 1** Weekly consultation rates for influenza and influenza like illness: RCGP Weekly Returns Service, 1967-2001



**Figure 2** RCGP consultation rate for influenza and influenza-like illness, 2001-02



(213 per 100 000). Consultation rates were highest among children aged 0 to 4 years (643/100 000 in week 49/01), followed by people aged 65 years or above (573/100 000 in 02/02). These rates were slightly lower than for the previous season for the 0 to 4 year age category (773/100 000) and slightly higher for over 65s (430/100 000). GP consultation rates for the combined total of respiratory disease definitions were lower than seen during the 2000/01 season with a peak rate of 788 /100 000, compared with 899/100 000 during the 2000/01 season.

**Wales**

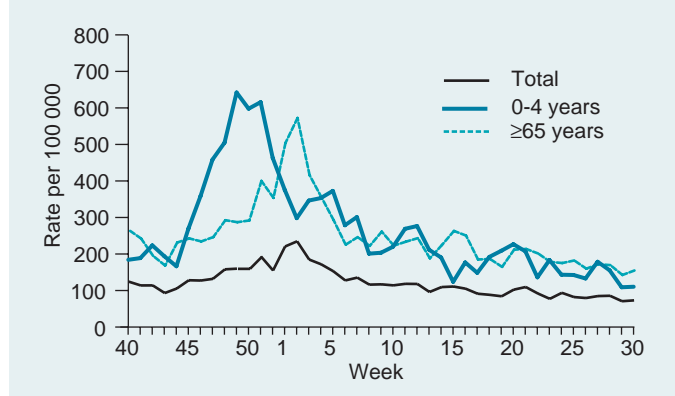
Consultation rates in the sentinel GP scheme co-ordinated by CDSC Wales remained within the range for ‘baseline activity’ of less than 25/100 000 population for the duration of the 2001/02 season. Rates peaked at 10/100 000 in 06/02.

**Table 1** Excess mortality due to influenza in England and Wales

Season	Number of excess deaths
1988/89	2223
1989/90	27590
1990/91	7170
1991/92	4938
1992/93	1113
1993/94	13131
1994/95	1549
1995/96	15215
1996/97	21292
1997/98	–
1998/99	17558
1999/00	21290
2000/01	402
2001/02	5870
<b>Total</b>	<b>139341</b>

NB Every year the model is revised to incorporate the current season’s data. The fitted model then not only creates a figure for the most recent season, but also readjusts the previous years’ figures.

**Figure 3** RCGP consultation rates for acute bronchitis: 2001-02



**Scotland**

In the sentinel GP scheme co-ordinated by the Scottish Centre for Infection and Environmental Health (SCIEH), GP consultation rates for influenza and flu-like illness remained within the range for ‘baseline activity’ of less than 50/100 000 population for the duration of the 2001/02 season. Rates peaked at 41/100 000 in week 05/02.

**Northern Ireland**

This was the second year of enhanced surveillance of influenza in Northern Ireland, coordinated by the Communicable Disease Surveillance Centre (Northern Ireland)<sup>6</sup> and no baseline values can yet be determined. A peak rate of 2.8/100 000 for influenza was seen in week 12/02 and 42.3/100 000 in week 45/01 for ‘flu-like illness’. In general, in comparison to the previous years data, levels of rates for influenza and ‘flu-like illness’ remained low, as seen elsewhere in the UK.

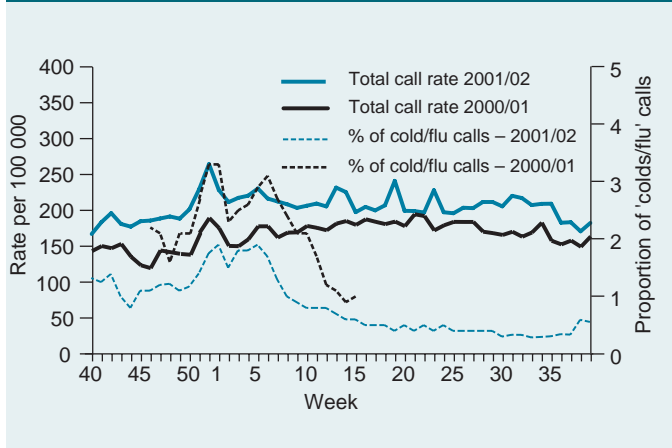
**Outbreaks**

During the 2001/02 influenza season, 15 outbreaks of influenza-like illness were reported to CDSC covering the period from 01/02 to 13/02 which coincided with the period of increased influenza activity as reported by the RCGP. Eleven of the outbreaks occurred in schools, one in a nursing home, two in hospitals and one in a religious community. The duration of the outbreaks ranging from one to five weeks, with the number of individuals affected in each outbreak ranging from less than ten to approximately 450. Specimens were taken from individuals in 13 of the outbreaks, and influenza virus was isolated from all but one of these outbreaks. Seven of the outbreaks were associated with the new circulating subtype, H1N2, all of which were among school children. Four of the remaining outbreaks were associated with influenza A H3N2 and one was due to co-circulation of both influenza A H3N2, and H1N2.

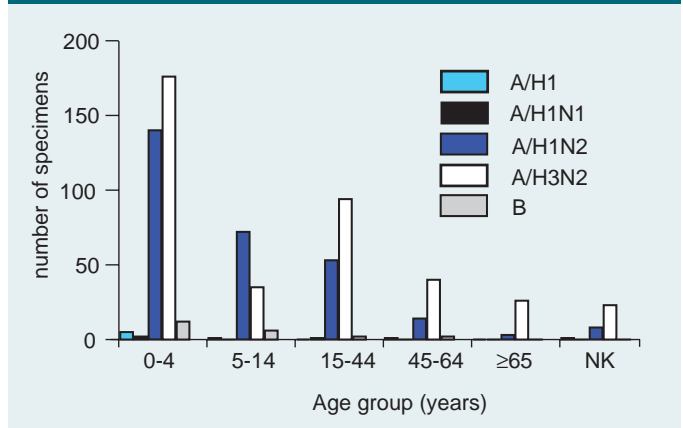
**Mortality**

The weekly total number of deaths due to all causes peaked at 15 958 in week 02/02, compared to 12 345 in 02/01. Between weeks 40/01 and week 22/02, 32 deaths were directly attributed to influenza. This figure is similar to the 40 deaths covering the same period during the 2000-01 season. The total estimated number of excess deaths

**Figure 4** NHS Direct total call rate and proportion of 'cold/flu' calls



**Figure 5** Age distribution and subtyping for influenza specimens detected by ERNVL 2001/02



attributed to influenza between week 40/01 and week 26/02, using a time series method based on the method of Serfling<sup>7</sup>, was 5870 (*Unpublished PHLS data*) (table 1). The mortality data for the 2001/02 season has been added to the database used to derive the model. This leads to some revision to the model and as a result, some small changes in the estimates for excess mortality in previous years.

**NHS Direct total call rate activity**

During the winter of 2001/02 the pattern for the total call rate was similar to that of 2000/01 but with an overall increase of 20% in the number of calls. There were two main peaks in the NHS Direct total call rate for England and Wales: one at week 52/01 (265/100 000), and a smaller peak at week 05/02 (232/100 000) (figure 4). 'Cold/flu' calls and 'fever' calls, as proportions of total calls, peaked in week 05/02 at 1.9% (981 calls) and 8.3% (3989 calls) respectively. The highest age specific proportion of 'cold/flu' calls was the 5 to 14 year olds, which peaked at 3.9% in week 05/02. A breakdown of the proportion of daily 'cold/flu' calls by regions (three day rolling average) showed southern sites peaked at 2.3% on the 2 January 2002. Higher and later peaks were observed for the northern (2.8% on the 1 February 2002) and central sites (2.6% on the 2 February 2002).

**Virological**

Between 1 October 2001 and 29 May 2002 (weeks 40-22) the PHLS Enteric, Respiratory, and Neurological Virus Laboratory (ERNVL) received 717 virus samples from both community and hospital sources (table 2). Of these, 695 (97%) were influenza A and 22 (3%) were influenza B (figure 5). Of the influenza A samples, ten (1.4%) were A (H1N untyped), three A (H1N1) (0.4%), 288 (41%)A (H1N2), and 394 A (H3N2) (56.7%). The influenza A (H3N2) and A (H1N1) viruses were antigenically similar to the vaccine strains A/Panama/2007/99 (H3N2) and to A/New Caledonia/20/99 (H1N1) viruses respectively. For the new H1N2 subtype the haemagglutinin and neuraminidase proteins were also antigenically similar to their respective components in the vaccine strains. The influenza B viruses were antigenically similar to the influenza B vaccine strain B/Sichuan/379/99. No influenza B viruses of the B/Victoria/

2/87 lineage were found to be circulating in the UK during the 2001/02 season.

Community derived isolates were predominantly from children aged 5 to 14 years and adults aged 15 to 44 years. Hospital derived isolates were mainly from children aged less than 5 years.

**RCGP/ERNVL Influenza and RSV detection from RCGP community based surveillance**

Between 1 October 2001 and 29 May 2002, 399 samples from community-based surveillance were tested for influenza and RSV by the polymerase chain reaction (PCR)<sup>8</sup>. Eighty-two (20.6%) tested positive for influenza A (42 H3N2, 38 H1N2 and two H1 untyped). There were no influenza B positive samples diagnosed. Twenty-six (6.5%) tested positive for RSV. The highest positivity rate for influenza detection was in samples derived from children aged 5 to 14 years (34%) and adults aged 15 to 44 (35%) and the highest rate for RSV detection was in samples derived from children aged 0 to 4 years (50% positive).

**PHLS virological surveillance of influenza<sup>9</sup>**

Seventeen laboratories contributed to the scheme during 2001/02 receiving specimens from 40 GPs. Forty out of 539 (7%) specimens tested positive for influenza (39 influenza A and one influenza B) by DIF and/or culture. Sixteen (50%) of the influenza A virus isolates were H1N2. The highest positivity rate was among children aged 5 to 14

**Table 2** Virological typing of positive specimens received by ERNVL/RVU during the 2001/02 influenza season: PCR or virus isolation

Source	Influenza type/subtype				A total	B	Total
	A/H1	A/H1N1	A/H1N2	A/H3N2			
Hospital	6	1	217	248	472	22	494
Community	2	2	73	146	223	0	223
<b>Total</b>	<b>8</b>	<b>3</b>	<b>290</b>	<b>394</b>	<b>695</b>	<b>22</b>	<b>717</b>

years (12%). Nine specimens (1.7%) tested positive for respiratory syncytial virus (RSV), and 22 specimens were positive for other respiratory viruses.

### Laboratory reports

Laboratory reports for England and Wales by week of specimen showed that 857 confirmed influenza A infections were identified between weeks 40/01 and 22/02, with the peak in week 06/02 (100 reports). Ninety-one influenza B infections were reported during the weeks 40/01 and 22/02, with the peak in week 15/02 (7 reports). This is in contrast to the previous season where influenza B was the dominant circulating strain reported to CDSC.

Between weeks 40/01 and 22/02, 7868 laboratory reports of RSV were made to CDSC, with the peak in week 01/02 (709 reports). Of these, 7165 (91%) were specimens taken from infants aged from 0 to 4 years.

### Influenza activity elsewhere

Levels of influenza activity have ranged from none to widespread among countries participating in the European Influenza Surveillance Scheme (EISS). Widespread geographical activity was reported in Belgium, France, Germany, Italy, Norway, Portugal, Romania, Spain, and Switzerland. In all cases the intensity of the influenza activity was described as 'medium' rather than 'high' or 'very high'. Influenza A (H3N2) was the predominant circulating virus during 2001/02 although influenza B circulated in Belgium, France, Italy, Slovenia, Spain, and Switzerland. Influenza activity began to decline across most participating countries at the beginning of March, except in Germany, Norway, and Romania where activity remained at higher levels until the beginning of April. Sporadic reports of the new influenza subtype H1N2 were made from Belgium, France, Germany, The Netherlands, Republic of Ireland, Sweden, Switzerland, and Romania. Influenza B viruses of the B/Victoria/2/87 lineage were reported in low numbers from France, Italy, the Netherlands, and Norway, and in larger numbers from Germany.

The 2001-02 season in the US was described as mild to moderate. Influenza A (H3N2) viruses predominated, whilst influenza B virus occurred more frequently towards the end of the season. The new influenza A subtype (H1N2) was also detected in low numbers across the US. The majority of influenza B isolates characterized in the US during 2001/02 belonged to the B/Victoria/2/87 lineage.

### Antigenic characterization of influenza virus isolates worldwide and vaccine recommendations

In general the majority of isolates characterised worldwide in the 2001/02 season were influenza A (H3N2). Influenza A H1N1 and the new subtype (H1N2) have also been reported worldwide. The haemagglutinin and neuraminidase components of the new (H1N2) subtype have a close antigenic match to those of the Caledonian and Moscow vaccine components respectively. Therefore the vaccine should provide a good level of protection. Following the increased circulation of influenza B viruses of the B/Victoria 2/87 lineage world wide in 2001/02 WHO have recommended that the influenza B component be updated to a B/Hong Kong/330/01-like virus. The

2001/02 vaccine component B/Sichuan/379/99 induced antibodies that reacted suboptimally with those related to B/Hong Kong/330/01<sup>10</sup>.

### Match between vaccine and circulating strains

In the UK the match between influenza vaccine components and circulating strains in 2001/02 was good and the vaccine is likely to have provided substantial protection.

### Discussion

Influenza activity during the 2001/02 season was very low with clinical levels remaining within the range of baseline activity of 0 to 50 consultations per 100 000 population. The season was characterized by the identification of a new subtype of influenza A (H1N2) that co-circulated with A (H3N2) throughout the season<sup>11</sup>. Few detections of the A(H1N1) subtype were made. Levels of influenza B remained low and were much lower than the previous season, with only sporadic isolates detected. The threat of a new subtype of influenza A was limited by the fact that it consisted of neuraminidase and haemagglutinin components which closely matched those of the recent circulating virus subtypes and the current vaccine strains. This is supported by the absence of high levels of influenza activity this season and no direct evidence of enhanced clinical severity associated with this new subtype. The choice of the influenza A (H1N1) vaccine strain for the 2002/03 season, A/New Caledonia/20/99(H1N1)-like virus, reflects the fact that few antigenic drift variants were isolated, as this component remains unchanged from 2001/02. The recommendation of the influenza A (H3N2) vaccine strain, A/Moscow/10/99(H3N2)-like virus, also remains unchanged. It will be interesting to see which subtype predominates next winter (2002/03) and whether H1N2 continues to co-circulate with H3N2 and H1N1. The emergence of this new influenza subtype illustrates the high mutability of the influenza virus and emphasises the continued need for virological surveillance.

The number of outbreaks of influenza, which were reported throughout the season fell by approximately 50% compared to the 2000/01 season, with the majority reported from schools. Many of the outbreaks were investigated through typing and H1N2 accounted for half the recorded outbreaks, all of which came from schools.

Consultation rates for acute bronchitis peaked during week 02/02, with rates highest in children aged 0 to 4 years and adults aged 65 and over. The peak in RSV laboratory diagnoses reported to CDSC, 91% of which were for children under the age of four years, coincided with this during weeks 48/01 to 04/02 and would be likely to have contributed to levels of acute bronchitis and influenza-like illness in young children. RSV infections in older adults are infrequently reported but this infection would also have contributed to bronchitis rates in adults aged 65 years and over. *Mycoplasma pneumoniae* infections also remained at low levels during 2001/02. Increased levels were expected during 2001/02 in line with the previously observed four-yearly epidemic cycle of this infection but this did not occur.

Influenza activity levels across Europe were similar with that seen in the United Kingdom, with levels reported

as 'sporadic' or 'low' in the majority of the eighteen countries contributing to the European Influenza Surveillance Scheme (EISS) throughout the 2001/02 season. In the United States the majority of influenza B isolates were of the B/Victoria/2/87 lineage. The vaccine component for influenza B (from the B/Yamagata lineage) was reported to induce antibodies that reacted poorly with B/Hong Kong/330/01 viruses (of the B/Victoria/2/87 lineage)<sup>10</sup>. This contributed to the recommended change in the influenza B strain for the 2002/03 northern hemisphere vaccine.

### Surveillance

Surveillance data has traditionally focused on clinical consultations with GPs and virological confirmation through laboratory reports. The emergence of new data sources when available should, however, be utilized to improve the timeliness relevance and usefulness of surveillance information. Since November 1999 the additional source of data from NHS Direct has been introduced with a view to enhance surveillance. For the 2001/02 season, daily counts of callers with 'cold/flu' or 'fever' were collected from 22 NHS Direct sites (population approximately 50 million). The overall call rate was up 20% from the previous year but this is more likely due to an increased awareness of this service by the general public rather than a real rise in health related issues. In general the use of this system needs to settle before baselines can be calculated. It is currently best used as a component in helping to interpret trends as well as an early warning indicator for new influenza activity

Other new initiatives currently being developed include collaboration with the Met Office (the UK national weather forecasting service) on a project called *Forecasting the nations health* <<http://www.metoffice.com/health/nationhealth>> and also to look at hospital derived data on emergency admissions and situation reports for the effect of respiratory illnesses on winter bed pressures.

### National influenza vaccination campaign

Influenza vaccine has been recommended since autumn 2000 for all people aged 65 years and over and in addition, to those at high risk in younger age groups. For the second time vaccine uptake was monitored during the season by the PHLS on behalf of the Department of Health (DH). Monitoring of vaccination uptake among patients aged 65 years and over and among healthcare workers will continue to be undertaken by the PHLS for the 2002/03 season. This will take place within the newly reorganized structure of the NHS<sup>12</sup> with the previous responsibilities of the 95 health authorities transferred to the smaller and more numerous primary care trusts (PCTs).

### Excess deaths

There is currently debate about the extent of the contribution of influenza infection to excess mortality in the UK<sup>(13,14)</sup>. The PHLS estimates for the annual excess deaths (table 1) suggests that the number of excess deaths in the 2001/02 season was higher than in the previous season, though considerably lower than that estimated for the seasons before (1998/99 and 1999/00). If these estimates of excess mortality are broadly correct it suggests that even in a winter when consultations for influenza with general

practitioners did not exceed traditional baseline levels, an appreciable excess of deaths due to influenza still occurred in the population. The thresholds used to define 'baseline' levels of influenza activity<sup>(5)</sup> are currently being reviewed.

### Respiratory mortality

The above model uses the Office for National Statistics (ONS) all cause mortality figures for calculating excess deaths due to influenza. In January 2001, ONS replaced the ICD-9 coding system for cause of death with ICD-10. As a result, figures for some causes of death, including respiratory deaths, are no longer directly comparable between data from 2000 and 2001/2002. Consequently it is not possible to make a direct comparison between the figures for respiratory deaths recorded for last season (2000/01) and the current season (2001/02).

### Vaccine recommendations

The recommended components for the 2002/03 vaccine for the northern hemisphere are<sup>15</sup>:

A/New Caledonia/20/99 (H1N1)-like virus

A/Moscow/10/99 (H3N2)-like virus (the widely used vaccine strain is A/Panama/2007/99)

B/Hong Kong/330/2001 – a B Victoria-like virus

The H1N1 and H3N2 components are unchanged from the current vaccine and are considered to provide good protection against the new influenza A H1N2 subtype.

### Acknowledgments

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