INFLUENZA PANDEMIC CONTINGENCY PLAN

Version 8.0/October 2005

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Abbreviations

ACDP	Advisory Committee on Dangerous Pathogens
CCC	Civil Contingencies Committee
CDSCNI	Communicable Disease Surveillance Centre, Northern Ireland
CEO	Chief Executive Officer
CEPR	(HPA) Centre for Emergency Preparedness and Response
CMO	Chief Medical Officer
CfI	(HPA) Centre for Infections
CSG	Core Strategic Group
DEFRA	Department of Environment, Food and Rural Affairs
DH	Department of Health
ECDC	European Centre for Disease Prevention and Control
EISS	European Influenza Surveillance Scheme
GP	General Practitioner
GMP	Good Manufacturing Practice
HEPO	Health Emergency Planning Officer
HPA	Health Protection Agency
HPU	Health Protection Unit
HPS	Health Protection Scotland
HSE	Health and Safety Executive
ITU	Intensive Therapy Unit
LaRS	(HPA) Local and Regional Services
MOSA	Medical Officers of Schools Association
NAW	National Assembly of Wales
NHS	National Health Service
NIBSC	National Institute of Biological Standards and Control
NIMR	National Institute of Medical Research
NPHS	National Public Health Service (Wales)
ONS	Office for National Statistics
PCT	Primary Care Trust
PWG	Pandemic Working Group
R&D	Research and Development
RCGP	Royal College of General Practitioners
RDsPH	Regional Directors of Public Health
SARS	Severe Acute Respiratory Syndrome
SECC	Strategic Emergency Co-ordinating Centre
SECT	Strategic Emergency Co-ordinating Team
SHA	Strategic Health Authority
SitRep	Situation Report
SOP	Standard Operating Procedure
UK	United Kingdom
UKNIPC	UK National Influenza Pandemic Committee
WHO	World Health Organisation

Introduction

This document outlines the Health Protection Agency's plan for responding to aninfluenza pandemic. It replaces the Public Health Laboratory Service Pandemic Influenza Plan of July 2001, and was last updated in October 2005.

Influenza is a familiar infection in the UK, especially during winter. Almost every year new drifted strains of influenza emerge giving rise to morbidity and mortality, mainly in older persons and young children. Pandemic influenza is different.

A pandemic of influenza is the result of a new influenza A virus subtype emerging which is markedly different from its currently circulating predecessors and is able to:

- cause clinically apparent illness in humans
- spread efficiently from person to person
- spread widely, because a high proportion of the population is fully susceptible (most people will have little or no immunity to the new virus because they will not have been infected or vaccinated with it or a similar virus before).

New subtypes of influenza have emerged sporadically over the last century. In 1918 a devastating and unusual pandemic caused by influenza A, subtype H1N1 ('Spanish flu') killed between 20 and 40 million people worldwide. Other pandemics that followed had a less devastating impact but were nevertheless severe. Influenza A, subtype H2N2 ('Asian flu') emerged in 1957 and H3N2 ('Hong Kong flu') in 1968.

The circumstances still exist for a new influenza virus with pandemic potential to emerge and spread and the longest interval so far recorded between pandemics is 39 years. The unpredictability of the timing of the next pandemic is underlined by the occurrence of several large outbreaks of highly pathogenic avian influenza since the early 1980s. Large outbreaks in poultry were described in Pennsylvania in 1982 (A/H5N2), Mexico in 1993 (A/H5N2), Hong Kong in 1997 (A/H5N1), Hong Kong again in 2003 (A/H9N2) and The Netherlands in 2003 (A/H7N7). Both the Hong Kong and Netherlands outbreaks were associated with epizootic transmission to humans. However, by far the most serious has been the massive and unprecedented outbreak of highly pathogenic influenza (A/H5N1) affecting poultry in East, Central and South East Asia which began in late 2003 and has persisted to the present day. This outbreak has so far been associated with a small number of human cases and a high proportion of deaths. Whether these outbreaks presage the emergence of an A/H5N1 strain with capacity to spread efficiently between humans is unknown.

Other events and developments that inform the creation of this plan are:

- The creation of a new organisation, the Health Protection Agency from the Public Health Laboratory Service, the Centre for Applied Microbiological Research (CAMR), the National Radiological Protection Board, and Consultants in Communicable Disease Control and their Health Protection Teams formerly employed by the NHS.
- The emergence and successful control of Severe Acute Respiratory Syndrome (SARS) using aggressive infection control methods combined with standard public health interventions.
- The development and licensing of a new class of drug (neuraminidase inhibitors) active against influenza A and B.

Aims and Objectives

Aim

The aim of this publication is to provide a framework for the Health Protection Agency's response to an influenza pandemic, in the context of the overarching national arrangements laid out in the UK Health Departments' UK Influenza Pandemic Contingency Plan. Clear guidance is given in order that individual Divisions of the HPA can develop more detailed operational plans for their own parts of the response, including the development of local and regional arrangements with NHS colleagues.

Objectives

To ensure that the resources of the Health Protection Agency are effectively mobilised to support the national response to an influenza pandemic, led by the Department of Health, in the areas of detection, diagnosis, management, control and prevention. Specific HPA objectives are to:

- Recognise rapidly the emergence of a novel influenza virus and/or its introduction into England and Wales
- Produce timely and accurate information and guidance for the public and health professionals
- Produce regular, timely and accurate surveillance information for central government and other partner organisations
- Provide expert advice regarding the detection, isolation and management of cases
- Develop and validate tests for diagnosis of the new virus and provide a national diagnostic reference service
- Support clinical and laboratory diagnosis locally and regionally
- Provide expert advice and assistance to DH regarding antiviral policy
- Support the rapid development of an effective pandemic vaccine
- Provide expert advice and assistance to DH regarding pandemic vaccination policy
- Quantify the overall magnitude and burden of the pandemic and characterise its impact
- Collaborate effectively with both national and international partner organisations, and in particular with the Department of Health in respect of its overarching arrangements for dealing with an influenza pandemic in the UK

The HPA will maintain its capability and capacity to meet these responsibilities at all times. This will necessitate the implementation of programmes for service development and improvement, and for research, in order that the necessary expertise is maintained and practiced.

Scope

1. The Health Protection Agency has specific responsibilities within England and Wales (in conjunction with NPHS) and this document refers to arrangements in those administrations. However, the HPA cooperates closely with its equivalent agencies in Scotland and Northern Ireland and in the event of a pandemic would collate UK surveillance data for the purpose of providing daily updates to the Department of Health Operations Room and Civil Contingencies Committee.

2. The Department of Health is the lead government agency in England for coordinating the response to a pandemic. However it will also perform many lead agency functions for the devolved administrations of Scotland, Wales and Northern Ireland and take overarching responsibility for the UK response. The Health Protection Agency Pandemic Plan should be interpreted in the context of the Department's overall Contingency Plan, being in effect a sub-plan of the Department of Health's plan.

3. In developing this plan account has been taken of the "NHS Doctrine for Handling Major Incidents" and the wider government arrangements "Dealing with Disaster": both of which are generic approaches to a wide range of threats.

4. The overall aim of the plan is to ensure that the resources of the HPA can be brought to bear effectively in the provision of advice, specialist capabilities and supporting services to DH, the NHS and others with responsibilities in responding to an Influenza Pandemic.

5. In order to ensure clarity in the scope of the plan, the overall roles and responsibilities of HPA divisions are set out in the context of the overarching HPA Strategic Emergency Response Arrangements, and the interaction with the wider Command and Control structure that would come into play.

6. The uncertainties in the nature and scope of any pandemic are very large. To address this, the plan is based on certain Planning Assumptions and Control Principles. These in turn are underpinned by an assessment of the possible burden of illness.

7. The structure of the plan utilises the WHO phases of a pandemic and the UK Alert Levels as described in the Department of Health Contingency Plan, and provides a matrix of integrated responses at the local, regional and national levels set against these phases and levels.

8. The above matrix should be regarded as a default set of actions. The previously mentioned uncertainties in any pandemic mean that the actual characteristics of the pandemic may be different from the planning assumptions. Similarly, whilst public health issues are foremost, the plan also provides flexibility to deal with situations where the pandemic could have, or has had, a major impact on the national infrastructure. Thus in addition to specifying a set of default actions, the plan provides a framework for decision making that will enable flexibility to deal with the specific needs of the situation.

Epidemiology of pandemic influenza and possible burden of illness

Seasonal influenza

Influenza is an acute viral infection characterised by the sudden onset of fever, chills, headache, muscle pains, prostration and usually cough, with or without a sore throat or other respiratory symptoms. The acute symptoms last for about one week, although full recovery may take longer. In most years, influenza occurs predominantly in a six to eight week period during the winter. For most people, this 'seasonal' influenza is an unpleasant but self-limiting and not life-endangering illness, but in some people it may be more severe, or complicated by secondary bacterial infections such as bronchitis and pneumonia. The very young, the elderly and people with other underlying diseases such as heart or chest disease are particularly at risk of serious illness from influenza. Without interventions such as annual influenza vaccination, the elderly and those of all ages in disease-based risk groups suffer significant morbidity and mortality even in a non-pandemic year. Deaths from influenza have been estimated to be around 12,000 per year in England and Wales and occur predominantly in the elderly[1].

Pandemic influenza

In the case of an influenza pandemic a substantial proportion (possibly all) of the population is likely to be non-immune. In past pandemics, the scale and severity of illness (and hence consequences) have been variable but broadly of a higher order than even the most severe winter epidemics. Typically, there are also changes in the age-distribution of cases compared with non-pandemic years. Mortality, which in typical seasonal influenza is usually confined to older age groups, tends to be increased in younger age groups. The size of any increase in morbidity and mortality and the extent to which a shift in age distribution occurs will depend on a variety of factors including the nature of the pandemic virus and pre-existing immunity.

Excess Mortality

Excess mortality occurs as a result of most winter seasonal influenza epidemics. The average annual excess mortality attributable to influenza in recent years is around 12,000 deaths per annum in England and Wales, although there is considerable year on year variation and some years are notably much higher than the average (est. 26,000 in 1989/90)[1]. Excess mortality in England and Wales associated with the three pandemics of the 20th century has also varied widely; this was estimated at 198,000 civilians in 1918/19[2], and 37,500 in 1957/58[3]. In the 1968/69 and 1969/70 pandemic seasons associated with influenza A/H3N2 there were an estimated 31,000 and 47,000 deaths respectively[4].

It is impossible to predict with precision the level of excess mortality that will be experienced in the next pandemic. However the table below illustrates the broad range of excess mortality that needs to be considered based on various combinations of case fatality rate and clinical attack rates.

Range of possible excess deaths based on various permutations of case-fatality rates and clinical attack rate for England and Wales.

Overall case fatality rate	Clinical attack rate		
	10%	**25%**	**50%**
0.37%	19,300	**48,400****	96,700
1.00%	51,700	129,200	258,400
1.5%	77,100	192,700	385,400
2.5%	129,200	323,000	645,900

Range of possible excess deaths based on various permutations of case-fatality rates and clinical attack rate for the U.K.

Overall case fatality rate	Clinical attack rate		
	10%	**25%**	**50%**
0.37%	21,500	**53,700**	107,500
1.00%	56,700	141,800	283,700
1.5%	85,100	212,800	425,500
2.5%	141,800	354,600	709,300

A case fatality rate of 0.37% corresponds to the approximate rate observed in recent UK epidemic seasons in the 1990s and in the 1957 pandemic. The case-fatality rate in the 1918 pandemic was in the order of 1-2%. A clinical attack rate of 25% corresponds to the approximate clinical attack rate seen in all three previous pandemics. These make a figure of at least 50,000 excess deaths seem most likely. These assumptions have been used for illustrative purposes in both HPA and DH plans.

Age-specific mortality and consultations

In the 1918/19 influenza A/H1N1 pandemic there was evidence that in relative terms elderly persons were spared (almost certainly because of prior exposure to the A/H1N1 virus) whereas mortality was extremely high in young adults aged 15-44 years and children less than 5 years[2,5]. However, the 1957 A/H2N2 pandemic excess mortality occurred largely in persons aged 55 years and over[3,5]. Finally, in the A/H3N2 pandemic of 1968/9 excess mortality in the USA was observed in children under 5 years and persons aged 55 years and over[5]; but this contrasts with the fact that in the UK, GP consultations were highest in persons under 5 years and in working age adults, yet far lower in persons aged 65 years and over[4].

At the time of emergence of each previous pandemic the proportion of excess deaths occurring in persons under 65 years of age has always been higher than in subsequent seasons once the virus has become established[6]. This is illustrated in the table below.

Alterations in age-specific mortality in past pandemics

Proportion of P&I excess deaths occurring in persons <65 years (%)

	1918	**1944**	**1957**	**1967**	**1968**	**1994**
A/H1N1	**98**	**31**	**-**	**-**	**-**	
A/H2N2	**-**	**-**	**36**	**3**	**-**	**-**
A/H3N2	**-**	**-**	**-**	**-**	**47**	**4**

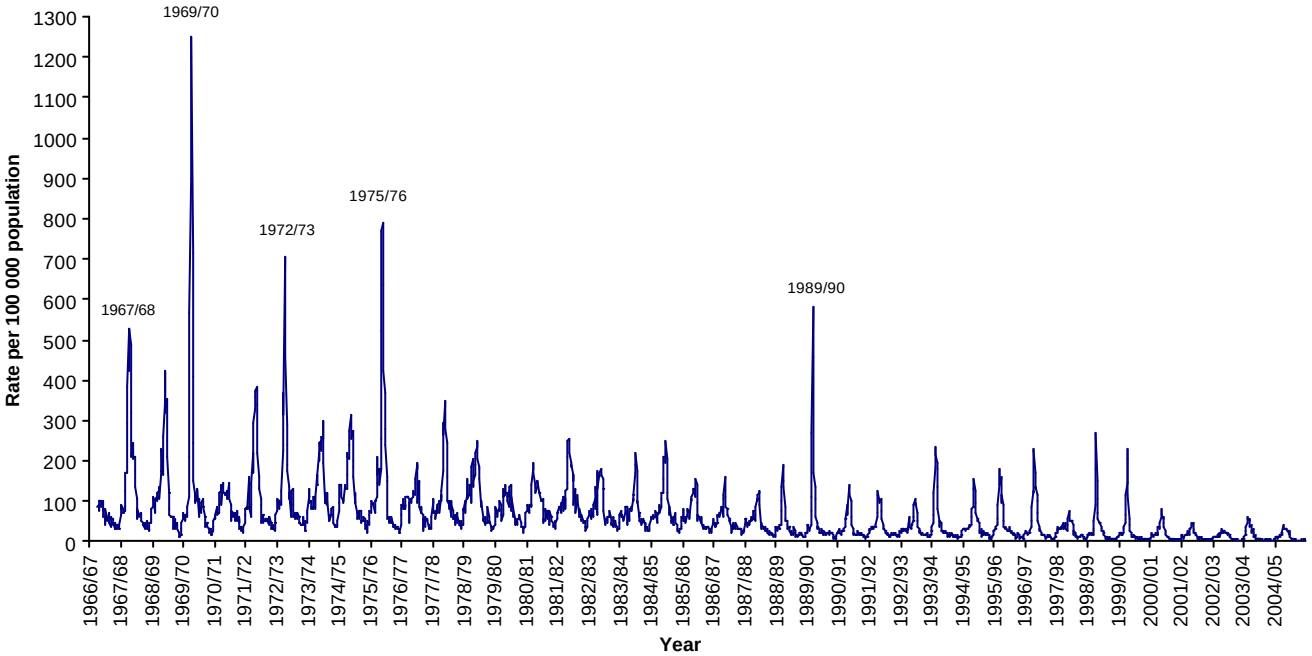
Therefore it is likely that a substantial proportion of excess deaths (at least one third) will occur in persons <65 years during the next pandemic (compared with only 5% during interpandemic periods).

Geographical and temporal spread

Virological and clinical surveillance of influenza have improved markedly since the last pandemic in 1968. However the extent of international travel has also grown. Modelling studies using transmission characteristics based on the 1968/69 pandemic and international air-traffic data from 2002 indicate that the approximate delay between a first case in Hong Kong and first introduction to UK might be in the order of one month or less. In the event of a novel influenza virus causing significant outbreaks of human illness elsewhere in the world, it is unlikely that the UK could prevent importation except by closing all borders; even a 99.9% restriction of travel into the country would only be expected to delay importation of the virus by up to two months. In terms of the spread within the UK, it will take only 2-3 weeks from the initial introduction until activity is widespread.

The temporal and spatial spread of a pandemic strain is important, particularly in terms of the demand placed on healthcare services. Pandemic activity taking the form of a brief but severe peak in cases will be more difficult for all services to cope with, compared with an identical number of cases distributed over a longer time course. Such was the observation in the 1968/9 A/H3N2 pandemic when a long first wave occurred in the winter of 1968/9 with morbidity and mortality approximately at the same level as the previous seasonal influenza; however in the following winter of 1969/70 a short and more severe epidemic occurred with a three-fold higher peak in general practice consultation rates and a four-fold higher peak in mortality attributed to influenza, bronchitis and pneumonia[4]. The high peak in consultation rates is well illustrated by the consultation data shown in the figure below.

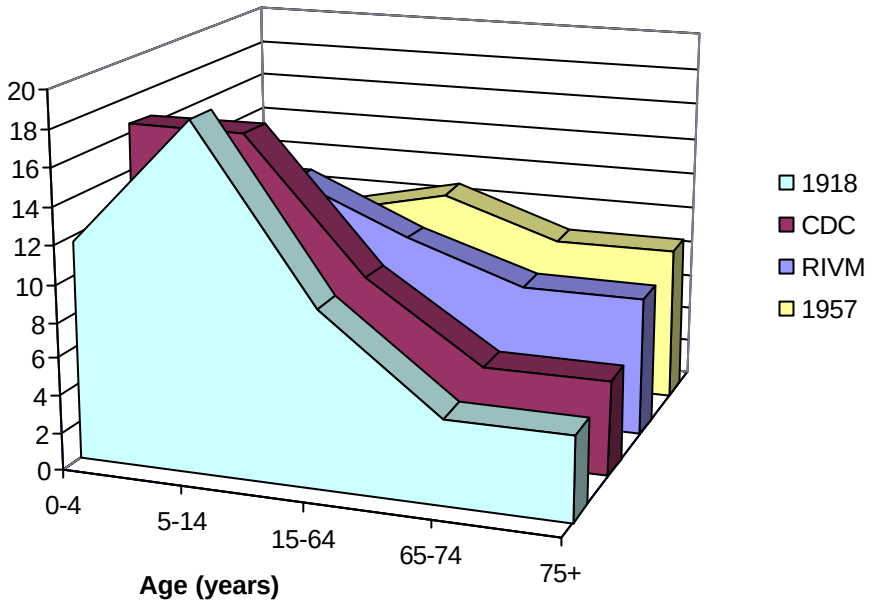
RCGP Index for Influenza & Influenza-like Illness, 1966 and 2005
(Year marked at start of season i.e. Week 40 (October))



Attack rates

In an average interpandemic year approximately 5% of adults and 20% of children develop symptomatic (clinical) influenza and similar proportions show serological evidence of infection without symptoms[7]. In past pandemics roughly 25% of the population (cumulative across all waves) has suffered a clinical illness and roughly 50% (cumulative) has shown evidence of infection on serology[8]. Both clinical and serological attack rates are typically higher in school-age groups[9]. It should be noted that age specific clinical attack rates have differed markedly between pandemics (see figure below).

Age specific attack rate profiles of past pandemic and interpandemic years



1918 & 1957: distributions in England and Wales[2,3]
CDC: average of distributions in the USA during the 1918 & 1957 pandemics and the epidemic in 1928-29[10]
RIVM: estimated from epidemic influenza in the Netherlands[11]

Pandemic waves

In 1918/19 the A/H1N1 pandemic occurred in three distinct epidemic waves: early spring 1918, autumn 1918 and late winter 1919. The second wave was by far the largest and case-fatality rates were also higher than in the first wave[12]. The A/H3N2 pandemic caused an epidemic wave in the winter of 1968/69 but a more severe one in 1969/70[4]. In contrast, the second wave of the 1957/58 pandemic in the UK was very small in comparison to the first[3]. Thus all planning should assume that more than one wave is possible (but not inevitable) and that a second wave could be worse than the first.

Summary of Epidemiology

1. The scale and severity of illness (and hence consequences) caused by pandemic influenza generally exceed those of even the most severe winter epidemics.
2. Mortality in the UK is likely to exceed 50,000 deaths, possibly appreciably higher.
3. Besides the elderly, excess mortality is also likely in younger adults and children.
4. Modelling studies suggest that after a case occurs in Hong Kong, because of international travel, it will probably take less than one month for the virus to reach the UK.
5. Once cases begin to occur in the UK it will take only a few weeks before activity is widespread
6. It is possible that there will be more than one epidemic wave (with an interval of several weeks or months) and, if a second wave occurs, it may be more severe than the first.
7. Cumulative clinical and serological attack rates across all waves together may be in the order of 25% and 50% respectively.

Modelling results (health impact)

Using the results of mathematical modelling it is possible to gain a broad understanding of the likely impact of the next pandemic. The table below summarises the number of events that might be expected.

Estimated burden of illness attributable to pandemic influenza over the entire pandemic based on a 25% clinical attack rate and illustrative case hopitalisation and case fatality rates of 0.55% and 0.37% respectively. Health Care Contacts represent the equivalent of GP consultations outside the pandemic period. It is envisaged that individuals experiencing symptoms will be diverted away from GPs in a pandemic. GP consultations represent the remaining contacts required to deal with complications and with young children. Figures are rounded and represent work additional to normal background health service activity. (Figures in parentheses illustrate the range from 10% (lower limit) to 50% (upper limit) attack rates.)

Population	**People with clinical symptoms/ Health Care contacts**	**GP consultations**	**A&E presentations**	**Minimum excess hospitalisations**	**Minimum excess deaths**
Population of 1,000	**250** (100-500)	**25** (10-50)	**13** **(5-25)**	**1** (0-3)	**1** (0-2)
Population of 100,000	**25,000** (10,000-50,000)	**2,500** (1,000-5,000)	**1,250** (500-2500)	**140** (50-300)	**90** (40-180)
Population of 1,000,000	**250,000** (100,000-500,000)	**25,000** (10,000-50,000)	**12,500** (5,000-25,000)	**1400** (500-3000)	**900** (400-1800)
England (population ~49,000,000)*	**12,250,000**	**1,225,000**	**613,000**	**67,000**	**45,000**
Scotland (population ~5,000,000)*	**1,250,000**	**125,000**	**63,000**	**6,900**	**4,600**
Wales (population ~3,000,000)*	**750,000**	**75,000**	**38,000**	**4,000**	**2,800**
Northern Ireland (population ~1,600,000)*	**400,000**	**40,000**	**20,000**	**2,200**	**1,500**
England and Wales (population ~52,000,000)*	**13,000,000**	**1,300,000**	**650,000**	**72,000**	**48,000**
UK (population ~60,000,000)*	**15,000,000**	**1,500,000**	**750,000**	**82,500**	**56,000**

approximate figures.

Using the same assumptions, the table below illustrates the number of events by week over an assumed 15-week (single wave) pandemic period in England and Wales.

Weekly totals for the number of GP consultations, A&E consultations, hospitalisations and deaths, across the UK and by health care unit. The values in the table assume that most heath care contacts are dealt with by special pandemic measures, leaving a residual 10% or 5% who will visit their GP or A&E department respectively (see text for details). The numbers for hospitalisations and deaths are based on case hospitalisation and case fatality rates of 0.55% and 0.37% respectively. They should be considered the minimum expected for pandemic flu.

Period	Cases per 100 000	% of overall total	GP consultations		A&E consultations		Hospitalisations		Deaths	
			UK-wide	per GP	UK-wide	per A&E	UK-wide	per hospital*	UK-wide	per hospital**
Week 1	36	0.1%	2,155	0	1,077	3	119	1	80	0
Week 2	51	0.2%	3,066	0	1,533	5	169	1	113	1
Week 3	205	0.8%	12,291	0	6,146	19	676	3	455	2
Week 4	780	3.1%	46,812	1	23,406	72	2,575	13	1,732	9
Week 5	2,638	10.6%	158,262	4	79,131	243	8,704	43	5,856	29
Week 6	5,388	21.6%	323,295	8	161,648	496	17,781	88	11,962	59
Week 7	5,290	21.2%	317,412	8	158,706	487	17,458	86	11,744	58
Week 8	3,568	14.3%	214,062	6	107,031	328	11,773	58	7,920	39
Week 9	2,428	9.7%	145,707	4	72,853	224	8,014	40	5,391	27
Week 10	1,886	7.5%	113,148	3	56,574	174	6,223	31	4,186	21
Week 11	1,308	5.2%	78,471	2	39,235	120	4,316	21	2,903	14
Week 12	651	2.6%	39,066	1	19,533	60	2,149	11	1,445	7
Week 13	392	1.6%	23,490	0	11,745	36	1,292	6	869	4
Week 14	216	0.9%	12,932	0	6,466	20	711	4	478	2
Week 15	164	0.7%	9,832	0	4,916	15	541	3	364	2
All weeks	**25,000**	**100%**	**1,500,000**	**39**	**750,000**	**2,302**	**82,500**	**409**	**55,500**	**275**

* Any hospital with a critical care unit ** Assuming, for illustrative purposes only, that all deaths occur in hospital

The same can also be demonstrated for a typical PCT as laid out below.

Demand for Health Care Contacts by primary care unit: The table shows weekly totals for the number of new clinical cases, and thus potential demand for Heath Care Contacts, per 100,000 population, and per PCT, community pharmacy, GP practice or GP list of various sizes (see footnote for definition of 'small', 'medium' and 'large' as they are used in the table).

Period	Clinical cases	Cases per 100,00	% of total cases	Cases per PCT			Cases per pharmacy			Cases per GP practice			Cases per GP		
				Small	Medium	Large	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
Week 1	21,367	36	0.1%	28	54	109	1	2	3	1	2	3	0	1	1
Week 2	30,400	51	0.2%	40	77	155	2	3	4	2	3	5	1	1	1
Week 3	121,886	205	0.8%	162	310	620	7	11	18	8	13	19	3	3	4
Week 4	464,219	780	3.1%	617	1,181	2,360	28	41	67	29	49	72	10	12	15
Week 5	1,569,434	2,638	10.6%	2,086	3,992	7,977	94	137	226	99	166	242	33	42	52
Week 6	3,206,013	5,388	21.6%	4,261	8,155	16,295	192	280	462	203	339	494	67	85	106
Week 7	3,147,669	5,290	21.2%	4,183	8,007	15,999	189	275	454	199	333	485	66	84	105
Week 8	2,122,779	3,568	14.3%	2,821	5,400	10,790	127	185	306	134	224	327	44	56	70
Week 9	1,444,925	2,428	9.7%	1,920	3,676	7,344	87	126	208	91	153	223	30	38	48
Week 10	1,122,055	1,886	7.5%	1,419	2,854	5,703	67	98	162	71	119	173	23	30	37
Week 11	778,167	1,308	5.2%	1,034	1,980	3,955	47	68	112	49	82	120	16	21	26
Week 12	387,404	651	2.6%	515	985	1,969	23	34	56	25	41	60	8	10	13
Week 13	232,944	392	1.6%	310	593	1,184	14	20	34	15	25	36	5	6	8
Week 14	128,240	216	0.9%	170	326	652	8	11	18	8	14	20	3	3	4
Week 15	97,498	164	0.7%	130	248	496	6	9	14	6	10	15	2	3	3
All weeks	**14,875,000**	**25,000**	**100%**	**19,770**	**37,839**	**75,606**	**891**	**1,299**	**2,145**	**942**	**1,572**	**2,292**	**311**	**396**	**494**

Note:
In the above table, ‘small’, ‘medium’ and ‘large’ refer to the 2.5th, 50th and 97.5th percentiles for the population served by a PCT, community pharmacy, GP practice or GP list, as follows:

Population	PCT	Pharmacy	GP practice	GP list
small	80,000	3,600	3,800	1,200
medium	150,000	5,200	6,300	1,600
large	300,000	8,600	9,200	2,000

Planning assumptions

Pandemic potential
There were three pandemics in the 20th century; in 1918, 1957, and 1968. The emergence of another pandemic is unpredictable but the probability is considered sufficiently high to warrant detailed planning.

Place of emergence
The most likely place of emergence for the next pandemic is China or South East Asia.

Time of onset
The pandemic may not follow the normal seasonal winter pattern of interpandemic influenza

Point of entry into the UK
This may be through multiple locations either directly from the pandemic source country or via intermediate countries in Europe or elsewhere.

Length of first wave
Between 3-5 months, depending on seasonal timing of first wave activity[13].

Mode of transmission
Droplet transmission (>5 µm) occurs[14]
Airborne or aerosol transmission (<5 µm particle size) occurs[15,16,17]
Role of transmission through contact with live virus particles on surfaces unclear.

Environmental factors
Virus survival is considerably enhanced in conditions of cold temperature and low relative humidity[18].

Incubation period
One to three days, typically two[19].

Period of communicability
Up to 6 days from exposure to the virus[19,20], but typically 3-5 days from onset of fever[19]. Virus shedding may be detectable 24 hours before onset of illness in some adults[19]. Children generally shed the virus for longer periods – up to 6 days prior to onset of symptoms and up 14 days afterwards, or 21 if immunocompromised[21,22,23].

Likely R_0 in UK setting
In the absence of vaccination and control measures the reproduction number is in the range of 1.4 - 1.8.[2425]

Clinical attack rate
25-30% cumulative[4,9,26].

Sub-clinical infectious cases
50% of all influenza infections are sub-clinical[8,9].

Case-fatality rate
In the range 0.37% -2.5% (0.37% used for illustrative purposes)

Time to availability of vaccine
The time from first virus isolation to production of large quantities of standardised monovalent vaccine will be at least four months.

Supply of vaccine
In the short term, production capacity and delivery of the vaccine in the UK may be limited.

Number of doses of vaccine required
For novel subtypes (e.g. H5N1) in completely unprimed populations a single dose of vaccine is likely to provide incomplete protection. Two standard doses may be necessary for complete clinical protection. The most likely dose regimens will be 2 x 15mcg with adjuvant or 2 x 7.5mcg with adjuvant, but development work is needed to explore this issue.

Effectiveness of neuraminidase inhibitors
Prophylaxis: Likely to be effective in preventing illness (efficacy 80%).
Treatment: Likely to be effective in shortening illness, lessening morbidity and reducing hospital admissions if given within 48 hours after onset of symptoms. Limited data from epidemic influenza suggests treatment to have an efficacy of around 50% for the prevention of severe outcomes if administered within 48 hours of symptom onset[14].

Resources
In common with many other government agencies, the Health Protection Agency is likely to exceed normal budgetary allocations during the response to a pandemic. Significant costs will need to be incurred during the early phases of preparation, before it is even clear that a pandemic is inevitable.

Control principles

- Individual control measures aimed at detecting cases (or giving sufficient information to individuals for them to diagnose themselves) and minimising their contact with other individuals may help slow the spread of the pandemic. These measures may include:

    - Information distributed at ports of entry
    - Detection of symptomatic cases on entry into the UK
    - Public education and specific guidance about self-protection
    - Voluntary home isolation of infected cases and their contacts
    - Effective infection control measures in all NHS settings
    - Intense post-exposure prophylaxis around early cases

- Measures to reduce contact between large numbers of susceptible individuals, such as school and university closures, may be considered if studies show they are likely to be effective in preventing further individual cases and slowing the evolution of the pandemic.

- Much work has been done on the most effective strategies for the use of antiviral drugs. If treatment with antiviral drugs provides benefits of the same order as those demonstrated during seasonal influenza, early treatment (within 48 hours of onset of illness) should shorten illness by around one day, reduce the severity of the symptoms, and reduce the need for hospitalisation. If, as planned, it is possible to treat all those with clinical symptoms, there should be a reduction in the number of hospitalisations needed (by around 50%), and deaths, and possibly in the size of the peak and the total numbers affected. However, the effectiveness of antivirals in a pandemic, and particularly in reducing mortality in cases of severe disease (including primary viral pneumonia), is not known. Predicting precisely how large these effects would be is impossible with current information.

- The amount of antiviral drug required if it were to be taken to *prevent* people getting the disease over the entire pandemic period is prohibitive and a treatment strategy is the only realistic option, other than in some very specific circumstances.

- Vaccination with a vaccine specifically formulated against the pandemic virus strain, ***when an appropriate vaccine becomes available,*** can be expected to achieve the greatest reduction in illness, complications and deaths, and lessening of the impact on health and other services, although the effectiveness of a pandemic vaccine will not be known until it is in use. Even in inter-pandemic years, when the virus strains predicted to be circulating the following winter, and included in the vaccine, are well matched to those which actually do occur, vaccine reduces infection by around 70-80%, hospitalisations in high risk individuals by around 60% and deaths by around 40%

Roles and responsibilities of HPA Divisions

The Health Protection Agency (HPA)

The Health Protection Agency provides specialist advice and operational support to the Department of Health (DH), Strategic Health Authorities (SHAs), the NHS, and other organisations whose formal responsibilities include responding to an influenza pandemic. Operational support at local, regional and national level will be provided for the development and implementation of interagency contingency plans for pandemic influenza.

The main roles of the divisions within the HPA in the event of a pandemic are summarised as follows:

The Centre for Infections (CfI), Colindale will provide specialist advice; coordinate the provision of clinical and epidemiological surveillance data; provide infection control advice; undertake epidemiological analyses; disseminate relevant information to the public and healthcare professionals; undertake modelling studies. Specific advice will be offered to DH regarding strategy and policy for use of antivirals and vaccine. The CfI will also obtain and characterise the new virus; conduct virological surveillance; provide advice on biological safety; develop and validate new diagnostic tests; rollout new tests as appropriate; provide antiviral susceptibility testing. In discharging its responsibilities, the CfI will be able to draw on the expertise, resources and containment facilities available at CEPR, including the Special Pathogens Reference Unit.

The Local and Regional Services Division (LaRS) will discharge the HPA's responsibilities at local and regional levels by supporting local and regional emergency planning arrangements. This will include working with PCTs, SHAs and Government Offices regarding pandemic planning; reviewing the availability of appropriate laboratory containment facilities; reviewing local diagnostic capacity; communicating with professional colleagues in primary care and acute trusts; assisting with coordination of control measures including use of antivirals and vaccine; gathering local epidemiological information.

The Centre for Emergency Preparedness and Response (CEPR) will be responsible for the integration of pandemic planning with other emergency planning measures. In particular, the HPA's Strategic Emergency Response Plan will require the establishment of a Strategic Emergency Co-ordination Centre (SECC). The primary functions of the SECC would be to take a strategic overview, provide a forward look on potential development and provide co-ordinated briefings and liaise with DH and other agencies. CEPR will work with National Institute of Biological Standards and Control (NIBSC) towards vaccine development, standardisation and production and will liaise with vaccine manufacturers. On request from DH, and supported by appropriate funding, CEPR will lay down Good Manufacturing Practice (GMP) seed stocks, to develop a manufacturing process, and manufacture small vaccine lots. CEPR will also make available its containment laboratories and expertise at the Special Pathogens Reference Unit, in support of the plan. The modelling unit of CEPR will contribute to the overall HPA modelling of pandemic influenza.

Communications Division will provide information and appropriate spokespersons for the media; draft information for informing the general public; liaise with government departments and the NHS to ensure that regular, clear, consistent and timely messages are given to both the media and the general public.

Roles and responsibilities of the Department of Health and the National Health Service

The following responsibilities have been identified in other plans with which the HPA's plan must integrate. They are recorded here in order to clarify responsibilities.

The Department of Health will be the responsible 'lead agency' for the UK government's response to pandemic influenza. It will establish a national 'Operations Room' to support SHA management of incidents and for coordination of health services, vaccine distribution and the prioritisation, purchase and distribution of antiviral drugs.

The UK Cabinet Office will provide the arrangements and framework for coordination of the pandemic response across all government departments.

Regional Public Health Groups led by Regional Directors of Public Health will maintain a 24 hour capability to support both the SHAs and the rest of the Department of Health, and where necessary to co-ordinate the work of PCTs and NHS Trusts in responding to public health emergencies. The RDsPH will provide the Department of Health link to Regional Resilience mechanisms and act as the regional nominated co-ordinator in public health emergencies.

Each Strategic Health Authority (SHA) must be able to assume strategic control of any incident that affects or seems likely to affect several hospitals. Every SHA must ensure that the NHS within its area has unequivocal command and control structures, that escalation policies are clearly described, that capacity plans are available and that links within the NHS, with neighbouring SHAs, with Regional Directors of Public Health (RDsPH), the HPA and across into others sectors - including social care - are effective and durable. As part of this, many SHAs will have 'lead' PCTs to work with.

All hospital and ambulance services trusts are responsible for deploying the right healthcare resources to care for those affected by pandemic influenza. Each service must be able to mobilise local resources flexibly and to the maximum extent consistent with maintaining essential care. Each trust must also plan to offer effective support to any neighbouring service that is substantially affected and in return should be able to rely on such mutual support if it is needed.

All Primary Care Trusts (PCTs) must be able to mobilise and direct healthcare resources to local hospitals at short notice to support them and to sustain patients in the community should these hospital services be reduced or compromised for a period. They must also plan to harness and effectively utilise primary care resources where needed to support. They must also have agreed systems in place to enable them to work as 'lead' PCT with others or, as appropriate, in support of the 'lead' PCT.

Other partner organisations

The WHO Influenza Collaborating Centre at Mill Hill has an international role as one of the four WHO international collaborating centres in the surveillance of new influenza strains, obtaining or sharing new virus isolates, properly characterising the new virus isolates and working on providing agreed diagnostic methods.

The World Health Organisation will announce the onset of the various pandemic phases, coordinate international efforts to characterise and diagnose new viruses, coordinate international efforts to develop a new vaccine, and promote uniform international surveillance through the development of guidelines.

The European Influenza Surveillance Scheme will continue to monitor influenza activity across the EU and exchange timely information between the 23 participating national centres.

The European Union will coordinate a response between the member states of Europe including where possible sharing of surveillance strategies, entry screening processes and stocks of vaccine and antiviral medications. The newly established European Centre for Disease Control (ECDC) in Stockholm will play a major role in coordination and liaison between the public health authorities in individual member states.

The Department of Environment, Food and Rural Affairs (DEFRA) is responsible for surveillance and control of influenza in animal populations in the case of a contemporaneous or initial pandemic in animal populations.

The National Institute for Biological Standards and Control (NIBSC) has a key role in the development, quality assurance and testing of influenza vaccines. It is working with the WHO in developing candidate vaccines against avian influenza viruses using reverse genetics and other technologies.

NHS Direct provides a confidential 24 hour telephone health advice service staffed by trained nurses using standard algorithms to provide advice on self-treatment and direct people to treatment services as necessary. In addition, data on calls received for relevant clinical syndromes will be supplied to CfI for the purposes of integrating into daily SitReps sent to DH and CCC.

The Royal College of General Practitioners through their Birmingham Research Unit Weekly Returns Service contributes to national surveillance by reporting new episodes of influenza and other respiratory infections.

The Medicines and Healthcare Products Regulatory Agency (MRHA) will carry out the licensing of candidate influenza vaccines in preparation for a pandemic.

The UK Vaccine Industry Group (UVIG) will collaborate with the DH and other government agencies over the supply of pandemic vaccines for the UK.

WHO International phases and implications (Revised April 2005)

Inter-pandemic period	
Phase 1	No new influenza virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human infection or disease is considered to be low.
Phase 2	No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease
Pandemic Alert Period	
Phase 3	Human infection(s) with a new subtype, but no new human-to-human spread, or at most rare instances of spread to a close contact.
Phase 4	Small cluster(s) with limited human-to human transmission but spread is highly localised, suggesting that the virus is not well adapted to humans
Phase 5	Large cluster(s) but human-to human spread still localised, suggesting that the virus is becoming increasingly better adapted to humans, but may not yet be fully transmissible (substantial pandemic risk).
Pandemic Period	
Phase 6	Pandemic phase: increased and sustained transmission in the general population Past experience suggests that a second, and possibly further, waves of illness caused by the new virus are likely 3-9 months after the first wave has subsided. The second wave may be as, or more, intense than the first
Postpandemic Period	
	Return to inter-pandemic period

Implications for the UK

The WHO Plan recognises additional national subdivisions for Phase 2 onwards according to whether a country is affected itself, has extensive travel/trade links with an affected country, or is not affected.

For UK purposes, should the UK have cases during the pre-pandemic period, the international phases apply. Once a pandemic has been declared (Phase 6), a four point UK-specific alert mechanism has been developed (see Table 1) which is consistent with the alert levels used in other UK infectious disease response plans:

Alert level 1 Cases only outside the UK (in a country or countries with or without extensive UK travel/trade links)

Alert level 2 New virus isolated in the UK

Alert level 3 Outbreak(s) in the UK

Alert level 4 Widespread activity across the UK

A move to a higher alert level may be triggered, after assessing the risk, if influenza due to a pandemic strain is affecting another country geographically close to the UK, although technically it is still 'outside the UK'.

Transition between phases

Transition between phases may be rapid and the distinction blurred. The crucial interval is between phases 5 and 6, which will determine to a large extent whether vaccine will be available in time for the first wave of illness in the UK.

The Influenza Team of the HPA Centre for Infections, which continuously monitors global influenza activity, will convene a meeting of the HPA Rapid Assessment Group for Pandemic Influenza to review changes in influenza activity that might presage a pandemic threat. The Group includes experts from the WHO UK Collaborating Centre (Mill Hill) and NIBSC and a representative of the DH. The Group advises the HPA on the need to convene the HPA Pandemic Working Group (PWG).

HPA involvement in mechanisms for changing Alert Status in the UK

On being informed by WHO of the isolation of a new influenza virus with pandemic potential (normally when person to person spread has been confirmed, i.e. Phase 5), the Secretary of State, on the advice of the Chief Medical Officer, will convene the UK National Influenza Pandemic Committee (UKNIPC). The DH will inform the Devolved Administrations and the Civil Contingencies Committee. The Civil Contingencies Secretariat will inform other Government Departments.

On receipt of confirmation from WHO of the onset of a likely pandemic (i.e. Phase 6), the DH will immediately cascade this information to the Devolved Administrations, **the HPA**, the Civil Contingencies Secretariat, other Government Departments and Agencies and the NHS.

In exceptional circumstances, the DH **may convene the UKNIPC on the strength of advice from the HPA** [or the National Expert Panel on New and Emerging Infections/NEPNEI) in the absence of, or where this differs from, advice from WHO, on the grounds of national interest. The UK may also implement its pandemic plans in the absence of a WHO declaration, on the advice of the UKNIPC, and after consultation with other European Member States through the European Communicable Diseases Network.

Should a potential pandemic subsequently fail to evolve, the NIPC will be stood down and other bodies including the HPA informed.

Relation of UK Alert levels to WHO international Phases

International Phases (WHO)		Possible UK responses/ levels
Inter-pandemic period		
Phase 1	No new influenza virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human infection or disease is considered to be low.	
Phase 2	No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease	*UK not affected* ***OR*** *UK has strong travel/trade connections with affected country* ***OR*** *UK affected*
Pandemic Alert Period		
Phase 3	Human infection(s) with a new subtype, but no new human-to-human spread, or at most rare instances of spread to a close contact.	↑
Phase 4	Small cluster(s) with limited human-to human transmission but spread is highly localised, suggesting that the virus is not well adapted to humans	*UK not affected* ***OR*** *UK has strong travel/trade connections with affected country*
Phase 5	Large cluster(s) but human-to human spread still localised, suggesting that the virus is becoming increasingly better adapted to humans, but may not yet be fully transmissible (substantial pandemic risk).	***OR*** *UK affected* ↓
Pandemic Period		
Phase 6	Pandemic phase: increased and sustained transmission in the general population Past experience suggests that a second, and possibly further, waves of illness caused by the new virus are likely 3-9 months after the first wave has subsided. The second wave may be as, or more, intense than the first	**UK. Alert Levels** 1 Virus/cases only outside the UK 2 Virus isolated in the UK 3 Outbreak(s) in the UK 4 Widespread activity across the UK
Postpandemic Period		
	Return to inter-pandemic period	

WHO PHASES 1 & 2: INTERPANDEMIC PERIOD

Definition

No new influenza virus subtypes detected in humans

Key planning assumptions for the United Kingdom

- Cases do not exceed system capacity to cope
- First cases in the new pandemic occur outside the UK and evolution of the pandemic allows an orderly escalation through WHO phases

Phase 1 and 2

Key issues: maintain and strengthen routine activity

Detect emergence of drift variants and new influenza strains
Detect onset of annual or biannual outbreak
Describe patterns of morbidity and mortality and influenza burden
Contribute to annual vaccination strategy

Responses

The following ongoing surveillance and preparedness actions will continue:

At national level	**Responsibilities**
• Royal College of General Practitioners Weekly Returns: - Every week the RCGP supplies CfI with data on new consultations for respiratory illness diagnosed by general practitioners in 74 practices, mostly in England.	**RCGP/CfI**
• NHS Direct. Weekly reports of number of calls for flu-like illness by age group and region.	**NHS Direct/CfI**
• Mortality surveillance. The Office for National Statistics provides CfI with provisional weekly mortality data for all deaths, 'influenza' and total respiratory deaths (Pneumonia, bronchitis and influenza).	**ONS/CfI**
• The Medical Officers of Schools Association (MOSA):- MOSA provides information on influenza like illness in a population of approximately 9,500 boarding school children aged 5-18 years.	**MOSA/CfI**
• Emergency Bed Service. Obtain weekly data on the number of applications for emergency admission to hospitals in London.	**CfI/EBS**
• Weekly collation of reports from NHS and HPA laboratories of numbers of serological or respiratory specimens positive for influenza by age and sex.	**CfI**
• Develop and maintain microbiology guidelines and sampling advice.	**CfI**
• Antigenic and genetic characterisation of all influenza strains received through active and passive virological surveillance.	**CfI**
• Perform antiviral susceptibility testing.	**CfI**
• Directed virological surveillance using specimens from the RCGP network and HPA network.	**CfI**
• Collect data on co-pathogens (bacteria) associated with influenza infection	**CfI**
• Draw together influenza surveillance information from devolved administrations.	**CfI**

• Contribute to WHO and EU influenza surveillance activities	**CfI**
• Assess threat to UK posed by influenza activity abroad	**CfI**
• Undertake modelling studies to support pandemic influenza contingency planning and pandemic exercise planning. Including modelling to assess possible therapeutic, public health and social interventions.	**CEPR/CfI**
• Conduct pandemic planning exercises in conjunction with other agencies.	**CEPR**
• Develop and implement programme to exercise the HPA Plan.	**CEPR**
• On an annual basis assess whether plan remains fit for purpose or needs updating.	**CEPR**

At regional level

• Regional (LaRS) and NHS clinical laboratories send isolates to the CfI Influenza Laboratory.	**LaRS**
• Operate regional sentinel surveillance schemes.	**LaRS**
• Annual serological surveillance conducted by LaRS (Preston) - age-stratified geographically representative collection of serum conducted annually.	**CfI/LaRS**
• Conduct formal annual review of influenza contingency plans and pandemic arrangements.	**LaRS (Regional Directors)**
• Regional Health Emergency Planning Officer (HEPO) undertakes an annual audit of NHS Trusts against quality assurance standards including pandemic preparedness.	**LaRS**

At local level

• Support annual PCT plans to immunise elderly and high-risk groups against influenza.	**LaRS**
• Provide local support and guidance for use of antivirals including any local decisions about thresholds and usage in outbreaks.	**LaRS**
• Outbreak detection and response in schools and nursing homes.	**LaRS**
• Review local Health Protection Team incident/outbreak plans on an annual basis including pandemic arrangements.	**LaRS**

WHO PHASE 3: PANDEMIC ALERT PERIOD

First report of new influenza subtype from a single human case outside UK*, but no human-to human spread

Definition

Human infection (s) with a new subtype, but no human-to-human spread, or at most rare instance of spread to a close contact.

Key issue
Review likely diagnostic capability

Responses

At national level	**Responsibilities**
• Monitor and disseminate international reports.	**CfI**
• In conjunction with WHO and other laboratories involved in typing influenza isolates, review reagents and prepare status report of reagents and diagnostic activity.	**CfI**
• Maintain capability for animal and laboratory containment work, and vaccine development.	**CEPR**
• Liaise with NIBSC & DH over vaccine development plans.	**CEPR**
At the regional level	**As in Phase 0.0**
At the local level	**As in Phase 0.0**

*NB: In the unlikely circumstance that the first report of a new influenza subtype were to occur in the UK, the actions above would be superseded by a full clinical, epidemiological and virological investigation and risk assessment.

WHO PHASE 4: PANDEMIC ALERT PERIOD

Small cluster(s) with limited human-to-human transmission outside the UK

Definition

Small cluster(s) with limited human-to-human transmission but spread is highly localized, suggesting that the virus is not well adapted to humans.

Key issues
Ensure enhanced surveillance activities are in place to detect imported human cases of the new virus subtype
Ensure CfI Influenza Laboratory has resources to diagnose new virus subtype

Responses

At national level	Responsibility
• The HPA CfI (Influenza Team) convenes a meeting of the HPA Rapid Assessment Group to review the current situation and advise the HPA on the need to convene the full HPA PWG.	**Rapid Assessment Group**
• CEO considers need to establish Core Strategic Group (CSG led by CEPR) to assess potential impact of pandemic on HPA business continuity and resource options to deliver plan, together with liaison with government and other agencies.	**CEO**
• Prepare website information for the general public and professionals.	**CfI**
• Prepare interim surveillance definition, guidelines and case-management algorithms.	**CfI**
• CfI Influenza Laboratory obtains new virus for antigenic analysis and reagent preparation and liaises with NIBSC/WHO.	**CfI**
• Review and update HPA Pandemic Plan	**CEPR/CfI/LaRS**
• Submit protocols for pandemic related R&D projects	**ALL**
• Activate the communications plan o Work with CfI to ensure website material is adequate o Prepare press briefing material	**Communication Division**

At regional level

• Laboratories in areas with travel-related contact with the site of initial identification of the novel virus to enhance virological sampling of patients, regardless of timing in relation to normal "influenza season"	**LaRS/CfI**
• Health Protection Units (HPUs) and laboratories to report possible clusters or outbreaks of influenza-like illness to CfI.	
• Brief RDsPH and Regional Government Offices and activate regional communications plans.	**LaRS**

At the local level

• Ensure local pandemic plans are up-to-date.	**LaRS**
• Advise port health authorities based on national entry-screening advice.	**LaRS**
• Liaise with emergency departments; Intensive Therapy Units (ITUs) and other first line services that may see imported cases.	**LaRS**

- Ensure infection control teams are fully alerted. **LaRS**

WHO PHASE 5: PANDEMIC ALERT PERIOD

Occurrence of human-to-human transmission confirmed outside the UK

Definition

Large cluster(s) but human-to-human spread still localised, suggesting that the virus is becoming increasingly better adapted to humans

Key issues

Surveillance capacity to detect as early as possible importation of cases
Distributed diagnostic capacity to detect new strain subtype
Effective communication to public and professionals

Responses

At national level	**Responsibility**
• CEO of the HPA convenes the PWG for coordination of HPA tactical response activities in providing advice, guidance and services (see appendix for membership). Optimal configuration of this group may be into two task groups – public health and virology.	**CEO**
• CEO establishes Core Strategic Group (if not already done at Phase 4) to assess potential impact of pandemic on HPA business continuity and resource options to deliver plan, together with liaison with government and other agencies.	**CEO**
• Through WHO and EISS, gather epidemiological, clinical and virological information about cases occurring in countries where transmission is already taking place.	**CfI**
• Participate in WHO/EISS-led discussions and activities	**CfI**
• Advise DH on vaccine policy, use of neuraminidase inhibitors, and other public health and social interventions.	**CfI**
• In liaison with Communication Division, web-publish surveillance case definitions for suspected cases.	**CfI/Communication Division**
• Activate enhanced clinical surveillance in hospital and primary care settings using alerting systems.	**CfI**
• Issue national guidance on Infection Control Measures.	**CfI**
• Negotiate with NHS Direct Board to ensure that protocols are in place for structured enhanced clinical and virological surveillance using agreed algorithms.	**CfI/NHS Direct**
▪ Activate case-management database.	**CfI/LaRS**
• Ensure adequate and appropriate central reference resources/literature.	**CfI**
• Liaise with DEFRA/Health and Safety Executive (HSE)/Advisory Committee for Dangerous Pathogens (ACDP) and clinical virology network with respect to guidelines for handling novel virus agent.	**CfI**
• Collaborate with DH, Industry and others to support rapid development of new vaccine(s).	**CEPR**
• Develop contingency plans for delivery of antivirals to critical staff groups within HPA.	**CEPR/ Corporate Services**
• Review existing occupational health guidelines for laboratory staff.	**CfI**
• Review strategy for diagnostic investigations in non-reference laboratories (including provision of centralised service if	**CfI**

required).	
• Begin production of diagnostic reagents for new strain.	**CfI**
• Ensure provision and distribution of diagnostic reagents.	**CfI**
• Provide guidelines and SOPs for safe-handling and identification of novel virus in non-reference laboratory setting.	**CfI**
• Evaluate commercial and non-commercial rapid tests for sensitivity and specificity against the virus.	**CfI**
• Obtain structured random sample of sera from the anonymised Residual serum collection administered by the CfI seroepidemiology unit and held at Preston, for determining age and sex specific immunity to possible pandemic strain.	
• Develop robust serological tests for assessment of Susceptibility and immunity to new virus	**CfI**
• Develop antiviral susceptibility testing for new strain.	**CfI**
• Communications	**Communication Division**
* Identify national and regional spokespeople	
* Ensure information for public and journalist inquiries is in place and daily updates are issued.	
* Ensure channels of communication are functioning	
• Identify mechanisms for re-deployment of staff from 'non-influenza' areas	**Corporate Services Executive Directors**
• Identify mechanisms for supporting staff required to work extended hours during phase 1 and 2.	**Corporate Services**
• Rehearse daily reporting to Civil Contingencies Committee and DH Operating Room	**CfI/devolved Partner Organisations**

At regional level

• Develop and rehearse standardised regional method of collating aggregate case information	**LaRS**
• Support RDsPH in the SHA and Government Office response.	

At local level

• Local HPUs to convene local Influenza Pandemic Control Committees (or equivalent body).	**LaRS**
• Work with PCTs and NHS Trusts to contact all primary care physicians and emergency departments to ensure surveillance guidance is in place.	**LaRS**
• Set up local enhanced surveillance especially in at-risk communities (e.g. communities with close links with geographic area of origin of pandemic).	**LaRS**
• Update all staff contact information to facilitate rapid communication.	**LaRS**
• Develop local methods for collating aggregate case information by residence, sex and age.	**LaRS**
• Assist NHS colleagues in developing framework for delivery of mass vaccination to target groups.	**LaRS**
• Develop local vaccine monitoring framework based on national template.	**LaRS**

PHASE 6: PANDEMIC PERIOD, UK ALERT LEVEL 1

Definition

The pandemic will be declared by WHO when the new virus subtype has been shown to cause several outbreaks in one country and spread to another country, with consistent disease patterns indicating that serious morbidity and mortality is occurring or is likely.

Key planning assumptions for the UK

- The pandemic has commenced elsewhere and sustained pandemic activity in the UK is still several weeks away

Key issues

Enhanced surveillance capacity to detect first importation of infected cases
Distributed diagnostic capacity to detect new strain subtype
Efforts to support production of a vaccine and strategy for vaccination

Responses

At national level	**Responsibility**
• CEO enhances Core Strategic Group (CSG) to co-ordinate HPA resources and liaises with government and other agencies in assessing forward projections and response options. The CSG will establish with PWG a daily 'battle rhythm' for meetings and information flows to meet HPA and government needs.	**CEO**
• PWG coordinates HPA responses and discusses progress and action through daily teleconference and situation reports.	**PWG**
• Implement enhanced surveillance and case investigation procedures.	**CfI/LaRS**
• Validate novel diagnostic tests including rapid tests.	**CfI**
• Intensify production of reagents for non-reference diagnosis, including rapid detection.	**CfI**
• Develop guidelines for use of rapid tests.	**CfI**
• Test representative sample of all influenza specimens for new virus.	**CfI**
• Develop guidelines for vaccination based on emerging epidemiology.	**CfI/DH/JCVI**
• Develop guidelines for use of antivirals based on emerging epidemiology and clinical information.	**CfI/DH/ LaRS**
• Rapidly disseminate information about emerging clinical and virological surveillance data.	**CfI**
• Communications o review staffing levels o review briefing materials o liaise closely with colleagues in the DH and the Cabinet Office o convene press conference (as appropriate).	**Corporate Services/ Communication Division**

At regional level

- Activate SHA level teams. **LaRS**
- Ensure regional laboratories are prepared. **LaRS**
- Develop aggregate activity reporting from hospitals to SHAs based on national template. **LaRS**

At local level

- Continue work with/through local Influenza Pandemic Control Committees. **LaRS**
- Support PCTs in compiling registers of at-risk or high priority groups for vaccination. **LaRS**
- Support PCTs in developing local vaccination action plan based on national guidance. **LaRS**
- Support PCTs to identify vaccination teams and delivery points. **LaRS**
- Work with PCTs to develop local distribution strategy for antiviral medication. **LaRS**
- Work with PCTs to identify secure antiviral distribution points. **LaRS**
- Work with PCTs to develop aggregate reporting methods for primary care according to national template. **LaRS**
- Work with Acute NHS Trusts to ensure local preparedness. **LaRS**
- Support PCTs in distributing antivirals to high-priority groups (as supplies are allocated by DH) **LaRS**
- Support PCTs in coordination of vaccination (if supplies are available). **LaRS**

PHASE 6: PANDEMIC PERIOD, UK ALERT LEVEL 2

First reports of virus isolates in the UK

Definition

The pandemic strain is first isolated from a person(s) in the UK. Subsequent cases are isolated; cases are sporadic and may be predominantly imported. Sustained chains of domestic transmission are not yet confirmed.

Key issues

Prompt detection of initial cases through intensive surveillance
Measures to reduce transmission
Rapid detection of any changes in the virus
Monitoring of early cases and geographical spread within UK

At national level	**Responsibilities**
• CEO activates full Strategic Emergency Response Plan, led by Strategic Emergency Co-ordinating Team (SECT). Daily 'battle rhythm' is reviewed in light of HPA and government needs.	**CEO**
• PWG coordinates HPA tactical responses and discusses progress and action through daily teleconference and situation reports.	**PWG**
• Ensure all key HPA staff are vaccinated (if vaccine available and if stipulated in national policy) and criteria for vaccination clearly explained.	**PWG/Executive/ Corporate Services**
• Ensure all key HPA staff are offered antiviral prophylaxis if stipulated in national policy.	**PWG/Executive/ Corporate Services**
• Inform WHO of first case.	**CfI**
• Activate pandemic module through NHS Direct ensuring that information collation enables assessment of vaccine efficacy (if appropriate)	**CfI/DH**
• Open case-management database.	**CfI/LaRS/CEPR (modellers)**
• Collate information from all data sources to provide daily Situation Report of overall impact and burden of pandemic on community and hospitals to support the work of other agencies and the Civil Contingencies Committee (as convened).	**CfI/HPS/NPHS Wales/CDSC NI**
• Implement data collection and review information on co-pathogens in influenza cases (community and hospital).	**CfI**
• Refine antibiotic and symptomatic treatment guidelines based on data collection above.	**CfI**
• Produce detailed antigenic and genetic characterisation for all novel UK influenza viruses for preparation of candidate vaccine strains.	**CfI**
• Develop UK specific serological and diagnostic reagents.	**CfI**
• Compare virological data from UK and international sources.	**CfI**
• Monitor antiviral susceptibility of virus isolates, including any treatment failures and compare data with other international sources.	**CfI**

At regional level

▪ Support coordination of antiviral distribution (as supplies are allocated by DH).	**LaRS**

- Support coordination of vaccination (if supplies are available). **LaRS**
- Support vaccine uptake monitoring arrangements **LaRS**
- Collate local reports of aggregate influenza activity. **LaRS**

At local level

- Continue work with/through local Influenza Pandemic Control Committees. **LaRS**
- Support PCTs in coordinating distribution of antivirals to high-priority groups. **LaRS**
- Support PCTs in coordination of vaccination (if supplies are available). **LaRS**
- Support vaccine uptake monitoring arrangements **LaRS**

PHASE 6: PANDEMIC PERIOD, UK ALERT LEVEL 3

Outbreaks in the UK

Definition

Clear evidence of sustained chains of transmission forming local and/or regional outbreaks

Responses

At the national level	Responsibilities
• SECT review experience to date in dealing with the resource demands within HPA and the profile of experience from countries that have suffered / are suffering the pandemic and refine strategy. Work with Government to ensure that appropriate data and advice is supplied and to act as the conduit for downward tasking.	**SECT**
• PWG co-ordinates HPA tactical responses through daily teleconference and Situation Reports.	**PWG**
• Consider closure of national case-management database and substitution of aggregate reporting.	**CfI**
• Monitor systematically collected and anecdotal reports of influenza activity across the country and in population subgroups.	**CfI**
• Investigate and document outbreaks including efficacy of any appropriate control measures and clinical and microbiological results.	**CfI**
• Carry out rapid vaccine efficacy studies using case control or other methods.	**CfI/LaRS**
• Review information on co-pathogens in influenza cases (community and hospital).	**CfI**
• Refine antibiotic and symptomatic treatment guidelines based on data collection above.	**CfI**
• Produce detailed antigenic and genetic characterisation for all UK influenza novel viruses for preparation of candidate vaccine strains.	**CfI**
• Develop UK specific serological and diagnostic reagents.	**CfI**
• Compare virological data from UK and international sources.	**CfI**
• Monitor antiviral susceptibility of virus isolates, including treatment failures and compare data with other international sources.	**CfI**
• Continue to collate information from all data sources to provide daily Situation Report of overall impact and burden of pandemic on community and hospitals to support the work of other agencies and the Civil Contingencies Committee (as convened).	**CfI/HPS/NPHS Wales/CDSC NI**
• Reduce virological surveillance when pandemic reaches peak to avoid overwhelming laboratories.	**CfI**
• Concentrate on identification of antigenic drift in novel strain, antiviral resistance or emergence of other variants.	**CfI**
• Continue surveillance of secondary bacterial infections to inform treatment guidelines.	**CfI**
• Liaise with the central DH Operations Room and Civil Contingencies Committee.	**Communication Division**

At regional level

- Support aggregate reporting arrangements. **LaRS**
- Support investigation and response of outbreaks and efficacy of control measures. **LaRS**
- Support coordination of antiviral and vaccine distribution. **LaRS**

At local level

- Continue work through/with local Influenza Pandemic Control Committees. **LaRS**
- Collate local aggregate reports of influenza cases in primary care. **LaRS**
- Support PCTs in distribution of antivirals and vaccine in accordance with national policy. **LaRS**

PHASE 6: PANDEMIC PERIOD, UK ALERT LEVEL 4

Widespread pandemic activity in the UK

Definition

Clear evidence of sustained chains of transmission with outbreaks now merging into confluent UK-wide activity

Responses

<u>All responses as for Alert level 3, EXCEPT:</u>

At the national level	**Responsibilities**
• Because of scale of occurrence, reduce or cease investigation and documentation of individual outbreaks.	**CfI**
• Development of UK specific serological and diagnostic reagents no longer applies: assume completed during Alert Levels 2-3.	**CfI**

PHASE 6: END OF FIRST PANDEMIC WAVE

Definition

The increase in outbreak activity in the initially affected countries or regions has stopped or reversed, but outbreaks and epidemics of the new virus are still occurring elsewhere

Key planning assumption

Circulation of virus reduces to low levels in the UK
Larger quantities of vaccine are becoming available for the first time

Key issues

Evaluation and assessment
Preparation for second wave including orderly vaccination of remaining susceptible groups

At national level	**Responsibilities**
• SECT will debrief in the light of PWG report (see below) and experiences of the interfaces with government. It will produce a Strategic Overview of the effectiveness of the HPA's plans, identify lessons to be learned and propose to the CEO revision of plans as appropriate for the possible second wave.	**SECT**
• PWG will debrief and prepare a report for the Director of the HPA.	**PWG**
• The Director of the HPA will decide if and when the PWG should stand down.	**CEO/Executive**
• Review progress of current R&D and need for further activities.	**CfI/LaRS**
• Evaluate national experience in comparison with other countries through international liaison.	**CfI**
• Prepare reports for HPA use, publication and public domain.	**CfI**
• Consider how to foster international research collaborations on pandemic influenza.	**CfI**
• Carry out a national serological survey to determine age-specific patterns of susceptibility and age-specific attack rates.	**CfI**
• Monitor uptake of vaccine as supply meets demand and mass vaccination gets underway.	**CfI**
• Manage transition of communications from DH Operations Room/CCC back to HPA.	**Communication Division**
• Consider deployment of HPA resources/expertise to support countries still in Phase 2.	
At regional level	
• Ensure restocking of laboratories.	**LaRS/CfI**
• With RDsPH and SHAs, account for regional stocks of vaccine and estimate remaining demand.	**LaRS**
At the local level	
• Support PCTs in vaccinating remaining susceptible groups.	**LaRS**

PHASE 6: SECOND OR SUBSEQUENT WAVES

Definition

Based on past experience, a second wave of outbreaks caused by the new virus may be expected to occur in many countries

Key planning assumptions

The second wave occurs within 3 to 9 months of the initial epidemic in the winter following the first wave
Majority of population are, by now, vaccinated
The virus may have evolved
Impact may be equal or worse than first phase

Key issue
Early detection of second wave

Responses

At national level	**Responsibilities**
• Continue monitoring global impact and spread of virus.	**CfI**
• Maintain national surveillance mechanisms for evidence of resurgence in activity.	**CfI/LaRS**
• Monitor any antigenic drift in the virus and assess potential significance.	**CfI**
• Reconvene the PWG and SECT as needed.	**CEO**
• **Reactivate HPA actions at UK Alert Levels 2-4 as appropriate**	**SECT/PWG**

POSTPANDEMIC PERIOD

Definition

WHO will announce when the pandemic period is over. In the UK the pandemic will be deemed to have ceased when the epidemiological indices have returned to background levels.

Planning assumptions

- This or a similar virus is likely to remain in circulation
- It may take months or even several years for some national services to recover

Key planning assumptions

Key issues

Assessment and evaluation

Responses

National, regional and local	Responsibilities
• Assessment of overall health impact of pandemic.	**CfI**
• Assessment of effectiveness of Strategic Emergency Response Plan and Influenza Pandemic Plan.	**CEPR**
• Evaluation of lessons learned.	**Whole organisation**
• Update Pandemic Plan.	**CfI/LaRS/CEPR**
• Prepare HPA report.	**CfI/LaRS/CEPR**

Appendices

Appendix 1

Proposed Pandemic Working Group membership

Chief Executive Officer or designated Director
Director of CfI or designated representative
Director of CEPR or designated representative
Head of Influenza Laboratory
Head of Respiratory Department CfI
Members of HPA Influenza Team including one who acts as Scientific Secretary
Regional Epidemiologist from Local and Regional Services
Regional Virology/Microbiology Representative from Local and Regional Services
DEFRA representative
NIMR representative
NIBSC representative
Communications / Press Office
Representatives from NPHS Wales, Scotland (HPS) and CDSC Northern Ireland
HSE representative
Representative from the Clinical Virology Network
Representative from the RCGP
Representative from clinical department of an Infectious Diseases Unit
Representative from the Department of Health

Appendix 2

Glossary of terms

Antigenic drift	Point mutations leading to changes in antigenicity of the major H and N antigen subtypes of an influenza virus
Antigenic shift	Change in circulating major antigen (H and N) determinants either through exchange and reassortment of genetic material or adaptation to human transmission
Haemagglutinin	One of the two major surface proteins. Important for virus attachment to cells of the respiratory epithelium. Subtypes include H1 to H15. H1, H2 and H3 are the only described determinants involved in sustained human to human transmission
Neuraminidase	One of the two major surface proteins of the influenza virus. Less important for attachment but probably important for propagation and virulence. Subtypes N1 to N9.
Pandemic	Worldwide spread of a new influenza virus subtype
R_0	The basic reproduction number R_0 is the number of secondary cases produced by one case in a completely susceptible population. It depends on the duration of the infectious period, the probability of infecting a susceptible individual during one contact, and the number of new susceptible individuals contacted per unit of time. It varies between populations because of different contact rates.

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