Cabinet Office

DH Department of Health

Swine Flu

UK
Planning Assumptions

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Planning Assumptions for the current A(H1N1) Influenza Pandemic

3 September 2009

Purpose

These planning assumptions relate to the current A(H1N1) pandemic and are appropriate for use until the end of the 2009/10 "seasonal flu" season – i.e. ***until Mid-May 2010****. They provide a common agreed basis for planning across all public and private sector organisations. Working to this common set of assumptions will avoid confusion and facilitate preparedness across the UK.*

These planning assumptions are based on analysis and modelling of data from both inside and outside the UK. They supersede the previous planning assumptions (dated 16 July). ***Modifications reflect the latest evidence on the severity of the current A(H1N1) strain. While considerable uncertainties remain, this evidence is sufficient to exclude some of the most severe possibilities included before.*** *The planning assumptions will be subject to further review and possible change as further new data become available on the current pandemic strain of influenza.*

The assumptions contain a number of parameters, each taken at their 'reasonable worst case' value. In some cases, it has been possible to revise these values downward given the evidence now available. Even despite these reductions, when taken together they continue to represent a relatively unlikely scenario. They should therefore not be taken as a prediction of how the pandemic will develop. Planning against the reasonable worst case will ensure plans are robust against all likely scenarios. Response arrangements must be flexible enough to deal with the range of possible scenarios up to the reasonable worst case and be capable of adjustment as they are implemented.

Because they are based on the reasonable worst case, these Planning Assumptions take no account of the possible effect of vaccination against the pandemic strain until we can be more certain about the timing of delivery and licensing of the vaccine on order. The magnitude of any such effect also depends critically on timing: a large effect on total numbers of cases would only be expected if a substantial proportion of the population could be vaccinated before the pandemic has peaked. Nevertheless, targeted vaccination of at-risk groups may be highly beneficial in preventing more serious illness amongst vulnerable groups.

As further UK and international surveillance data emerge, we will be looking to develop and extend these planning assumptions. ***It is possible that the virus may mutate, becoming more virulent, and it is important to remain prepared for the full range of possibilities.*** *Therefore, any planning for future periods beyond Spring 2010 should be based on the standard reasonable worst case assumptions promulgated in pre-pandemic planning as set out in the 'National Framework for responding to an influenza pandemic' Chapter 3*[1]*.*

[1] Located at: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_080734

General: Timing, duration and geographic spread of the pandemic

The number of cases over the summer have been relatively small (with an estimated peak of the order of 100,000 clinical cases per week according to HPA calculations),[2] as compared with the numbers that could occur during the course of a full pandemic. It remains possible that case numbers could rise to many hundreds of thousands of cases per week.

Since the last week of July the rate of new cases has slowed considerably. Nevertheless, the exponential growth seen previously may resume, for example, when schools reopen. Transmission may also increase as we enter our normal 'flu season'. It is unclear whether the pandemic would thereafter unfold as a single extended 'wave' or multiple waves separated by periods of reduced case numbers. However, early, sustained exponential growth could lead to a substantial growth in the number of cases. A substantial peak could not, however, happen until October. Such a peak could be much higher than that seen in July. By the end of the planning period (May 2010), up to 30% of the population could have experienced symptoms of pandemic Swine Flu. These are potentially in addition to those experiencing the effects of seasonal flu.

As has already been seen, variations in how the pandemic unfolds from one local area to another is possible, therefore, where appropriate, planning assumptions are shown both across the UK and for local areas where different[3].

Summary of the Planning Assumptions

The table below summarises the key planning assumptions as regards infection with the current A(H1N1) pandemic strain of influenza. As noted above, this represents a "reasonable worst case" for which to plan for the period up to mid-May 2010, not a prediction. The figures shown are explained in more detail in the supporting text below. All apply both across the UK and to local areas except where specific local assumptions are shown.[4] The figures shown can be expected to vary for different age groups within the population: this is also explained in more detail below.

[2] Estimation of the number of A (H1N1) cases in the UK is subject to significant uncertainty and bias due to problems estimating a number of key parameters (such as proportion of those with symptoms accessing the different treatment routes and swab positivity rate).

[3] Throughout this document, a "local area" refers to a population of about 100,000 to 750,000. "National" refers to the UK population of about 62,300,000.

[4] At present, the local assumptions differ from those for the UK only as regards the peak clinical attack rate. However, this may change as more evidence becomes available.

Planning assumptions to mid-May 2010: potential effects of A(H1N1) infection for the general population	
Clinical Attack Rate	up to 30% of population
Peak Clinical Attack Rate	nationally, up to 6.5% of population per week
	locally, 4.5%-8% of population per week
Case Complication Ratio	up to 15% of clinical cases
Case Hospitalisation Ratio	up to 1% of clinical cases, of whom up to 25% could require intensive care at any given time
Case Fatality Ratio	up to 0.1% of clinical cases
Peak Absence Rate	up to 12% of workforce

Clinical Attack Rate

Description: The proportion of the population who *become* ill with influenza, totalled over the period covered. (These are the *clinical cases*.)

Assumption:
In total, up to 30% of the population may experience influenza-like-illness following infection with the A(H1N1) strain within the planning period.

Commentary:
This is an average over all ages in the population. The final Clinical Attack Rate among children under 16 may reach 50% during this period, with significantly lower rates than 30% in older people (of the order of 15% in those over 65).

All the above figures refer to people experiencing symptoms. The proportion of the population infected with the A(H1N1) virus (the serological attack rate) may finally be as high as 60%. This is because in addition to those who develop clinical symptoms, a similar number may be infected but show no or insignificant symptoms.

The peak Clinical Attack Rate

Description: The proportion of the population who *become* ill in the peak week.

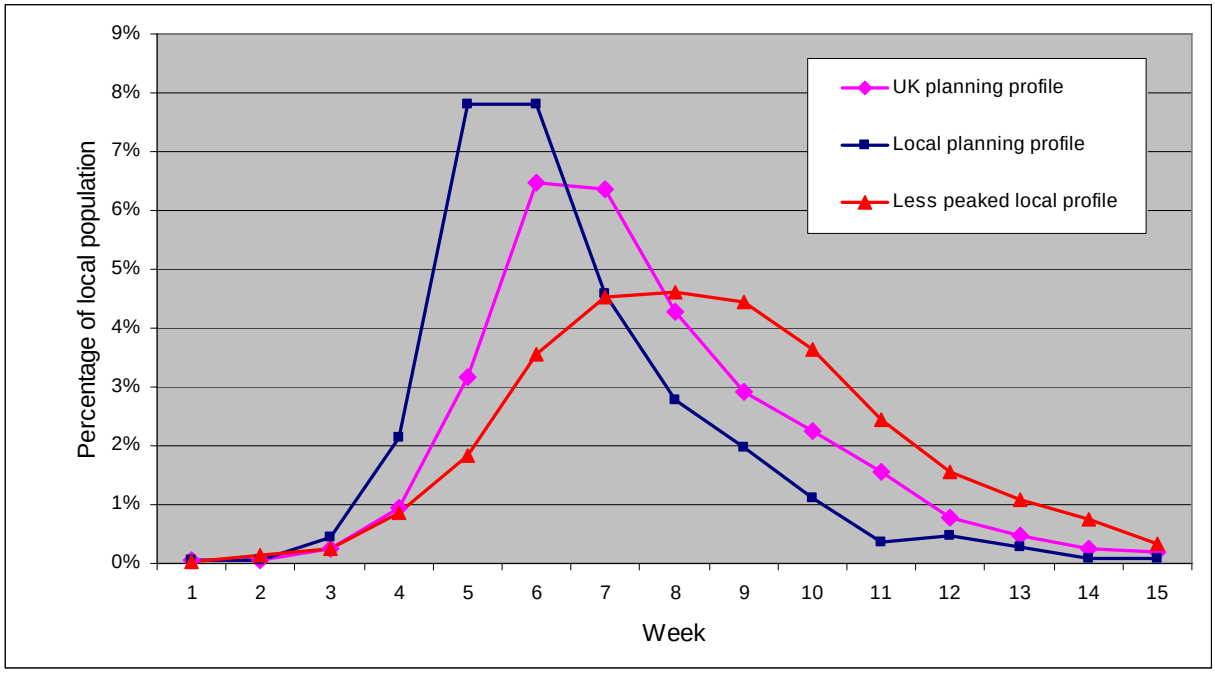
Assumptions:
- *Nationally*, up to 6.5% of the UK population may become ill with influenza in the peak week of the pandemic.
- Up to 8% of the population *in any given locality* may become ill with influenza per week in the peak week of a local epidemic.
- These peak rates might be sustained for a fortnight.

Commentary:
The maximum 8% figure for a *local area* is higher than the UK planning assumption of 6.5% because local outbreaks may not be synchronised. Indeed, if the UK epidemic is extended over a relatively long period, local epidemics may have peak Clinical Attack Rates substantially higher than the UK epidemic as a whole. This is due to the

UK epidemic curve being a composite of the local curves, which may vary in profile (see below), timing, and to some extent Clinical Attack Rate. As both highly-peaked and more lengthy epidemics pose challenges, planning should take account of the full range of possibilities.

The graph below illustrates three possible profiles for local epidemics, one following the UK planning profile exactly and the others demonstrating possible local variations. Each has a total Clinical Attack Rate of 30% (represented by the area under each curve).

Figure: Local Planning Profiles: Proportion of Local Population Becoming Ill per week



Once again, these should be regarded as illustrative curves to aid planning, not predictions. Forecasting the timing of 'Week 1' of the UK epidemic is not possible at present. Because of the low numbers in early weeks as compared to "background" levels of influenza-like-illness, it will not be possible to tell whether 'Week 1' has been reached from case data alone (except in retrospect).

However, a 'reasonable worst case' at present is that exponential growth in cases might resume when schools re-open (possibly augmented by effects of seasonality). In that case, 'Week 1' could be in early September. Based on the national profile shown, case numbers would then peak in mid to late October. It is also possible that the exponential growth could be more rapid than seen previously, leading to a peak at the start of October. However, 'Week 1' of the local epidemic curve may vary from local region to local region.

Case Complication Ratio

Description: The proportion *of those ill with influenza* who are expected to require additional treatment, such as the prescription of antibiotics (but not necessarily hospitalisation, see below).

Assumption: The complication ratio may be up to 15% of clinical cases (as defined above) during the planning period.

Commentary:
Complication rates appear to be higher, *as a proportion of those who become ill*, in the children under 5, clinical at-risk groups and older people. Conversely, older people may be less likely to become ill with this infection, but are more likely to suffer from complications if they do become ill.

Although evidence on these points is still accumulating, it is reasonable at present to suggest that with the possible exception of the very young, age differentials in Clinical Attack Rates and Complication Ratios roughly cancel each other out. Thus:

- those over 65 will be about half as likely to become ill with this infection (Clinical Attack Rate of 15% rather than 30%), but have approximately double the complication ratio (30% of clinical cases rather than 15%).
- those under 16 may have a Clinical Attack Rate of up to 50%, but a correspondingly lower complication ratio.

The resulting proportions of all age groups suffering complications from A(H1N1) infection would therefore be comparable.

Case Hospitalisation Ratio and need for Intensive Care

Description:
- the proportion of those ill with influenza who (if capacity exists) should be hospitalised, and
- the proportion of those hospitalised who would need intensive care[5] (if capacity exists).

Assumption: Up to 1% of clinical cases during the planning period may require hospitalisation. Of these, up to 25% could require intensive care at any given time.

Commentary:
Whilst hospitalisation rates for seasonal influenza are typically in the range 0.5 - 1.0% of those who become ill, current experience in the UK with the A(H1N1) virus suggests that planning should continue on the basis of the assumption given above.

[5] In this context, "Intensive Care" refers to Level 3 Critical Care, with facilities for mechanical ventilation. To date, it appears that most UK patients requiring Critical Care have required ventilation at some point. Therefore, the assumption that up to 25% of patients hospitalised may require Intensive Care at any given time (rather than only Level 2 Critical Care) is a reasonable worst case. Like all other planning assumptions, this will be reviewed as more evidence becomes available.

Similar comments apply to age groups as above for complications, *except that* there is some evidence of higher hospitalisation rates amongst children under 5. At present, it is unclear whether this reflects relative severity of symptoms, or a more precautionary approach to hospitalisation. This is a priority area for further investigation, and any further information will be incorporated into planning assumptions when available.

Case Fatality Ratio

Description: The proportion of those ill (*clinical cases*) who die due to influenza, totalled over a complete outbreak of infection.

Assumption: For A(H1N1) infections during the planning period, the eventual Case Fatality Ratio (CFR) could be up to 0.1% of clinical cases.

Commentary:
This may be regarded as precautionary in the light of what has been seen so far, but the Case Fatality Ratio may increase in the autumn (e.g. due to a higher incidence of bacterial co-infection, viral evolution or host susceptibility factors). The figure of 0.1% is therefore appropriate at present for planning purposes.

Case Fatality Ratios are particularly difficult to estimate. To do so requires knowledge of (a) the total number of cases, including those that are very mild, and (b) the number who die because of influenza but whose deaths have been recorded as due to an underlying condition made worse by influenza. Both these factors are difficult to ascertain. The delay between the onset of illness and report of death must also be taken into account when calculating this ratio. Simply comparing known cases with known fatalities at any given point in a pandemic can give a seriously misleading estimate of the CFR.

To date, the evidence suggests that similar comments with regard to age groups apply as for complication rates. That is, the effects of differing Clinical Attack Rates and Case Fatality Ratios roughly cancel each other out. There is thus no marked difference between any age groups (including the under-5s) in the overall fatality rate due to this infection.

To put the numbers in perspective, the combination of “reasonable worst case” 30% Clinical Attack Rate and 0.1% Case Fatality Ratio would result in a total number of deaths of about 20,000, or about 1/30th of the total expected each year from all causes (about 600,000).

Absence from work due to illness

Description: The proportion of the workforce who may be absent from work at the peak of the local epidemic because they are ill themselves or because they are looking after ill children.

Assumption: Absence rates for illness may reach 12% of the workforce in the peak weeks of the planning period.

Commentary:
This estimate refers to absence over and above that for "normal" holiday leave and non-Swine Flu illness.

The best current estimate[6] of the length of illness is that:

- half those people becoming ill recover within about 7 calendar days
- a further 25% need up to 10 calendar days to recover, and
- 25% have symptoms for more than 10 calendar days.

As an average (mean), the duration of illness is 9 calendar days.

Current data, and analysis of previous pandemics, suggests an average unavailability for work of approximately 10 calendar days for clinical cases without complications, and 14 calendar days for those with complications[7]. Based on analysis of previous pandemics, this includes some allowance for a short period of recuperation following recovery from clinical illness in addition to the period with flu symptoms. Also included in the assumption is an estimate for those at home caring for ill children, but *not* for any additional absence due to fear of contracting Swine Flu or the need to look after ill dependent relatives or friends other than children.

If schools are closed due to influenza during term-time (due to lack of availability of staff or planned closure), absence rates may increase as parents may need to stay at home to look after children. It has been estimated that this could cause an *additional* 15% of the workforce to be absent for the duration of the school closure. This is based on the proportion of the national workforce with dependent children at home, as evidenced by survey data. This proportion will clearly differ from case to case, and employers should take account of the characteristics of their own workforce.

[6] This is based on a limited early data set of approximately 200 cases which has a mean duration of illness of 9 days, a modal duration of 5 days and a median duration of 7 days. These figures do not include time for recovery.

[7] The Planning Assumptions issued on the 16th of July 2009 refer to working days. The estimates for average length of absence remains the same, but are now quoted in calendar rather than working days, in the interest of clarity.