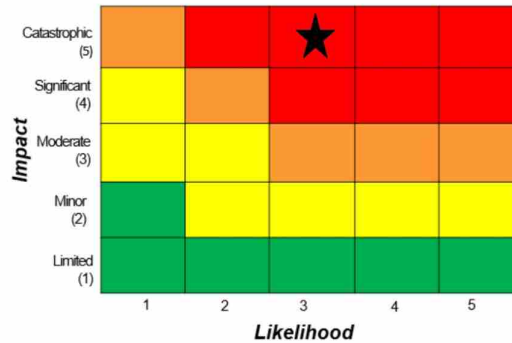# Influenza-type Disease Pandemic.
R95-DHSC

OVERVIEW INFORMATION

Risk Title
Influenza-type Disease Pandemic

Risk Type
Hazard-related risk

Risk Assessment Owner
Department of Health and Social Care

Reasonable worst case scenario
An influenza pandemic is a worldwide outbreak of influenza, which occurs when a novel influenza A virus emerges that is different from current or recently circulating seasonal influenza strains. There is sustained human-to-human transmission. The novelty of the strain would mean that there was little or no immunity in the population which would allow the virus to spread rapidly among humans and in general terms makes the virus likely to be more virulent than seasonal influenza. Modern mass global transit also affords opportunities for the virus to be rapidly spread across the world, even before it

Impact Scores		
Dimension	Highest Score (0-5)	Breadth of impact
Human Welfare	5	20/45
Behavioural	5	9/10
Essential Services	5	56/125
Security	5	19/25
International Order	3	4/30
Environment	0	0/5
Economic	5	5/5
	Overall score: 5	Total 113/245

has been fully identified. The short incubation period of influenza (one to three days), means that within a relatively short period of time a significant number of cases will appear across the globe as in the last pandemic of 2009-10. Each pandemic is different and the nature of the virus, where and the time of year it will emerge, and its impacts cannot be known in advance.

The reasonable worst case scenario (RWCS) assumes that the pandemic will come in multiple waves (up to three), each approximately 15 weeks long. Over the course of this period, up to 50% of the UK population may fall ill (i.e. are symptomatic) with up to 20% of people off work during the peak weeks. This would lead to a huge surge in demand for health and social care services which would have a knock on effect on the current provision. For example, in the RWCS 9,840,000 people would require assessment by health services (30% of those that are symptomatic), of which 1,312,000 people would require hospital treatment and 328,000 require the highest level of critical care. Using the estimated UK population for 2016, this RWCS could result in 820,000 fatalities.

Besides very severe levels of stress on the NHS, the level of excess deaths would stretch capacity within organisations involved in the management of deaths, including the coronial system and burial services. This would be felt on a national scale, with local capacity likely to be overwhelmed during the peak of the pandemic.

Given the high levels of ill health, it is anticipated that 50% of the workforce may require time off at some stage over the entire period of a pandemic, either because they are ill or caring for someone who is ill, or both, causing significant impact on business continuity in the UK. This high level of staff absence would also impact upon

587

the health and social care systems and the management of death, compounding the impact felt by the surge in demand. Critical national infrastructures may also be affected during peak periods.

Note: The reasonable worst case scenario does not take into account the response measures we put in place as the impact of the countermeasures in any given pandemic is difficult to predict as it will depend on the nature of the virus.

Specific Assumptions and strategic context

The RWCS is based upon the experience and mathematical analysis of influenza pandemics in the 20th and 21st century. The specific assumptions of this scenario are listed below.

• The pandemic would present in one or more waves. Each wave is expected to lasting 15 weeks, with the peak weeks occurring at weeks 6 and 7 in each wave.

• 50% of the population would be infected and experience symptoms of pandemic influenza during the one or more waves. The actual number of people infected would be higher than this as there would be a number of asymptomatic cases.

• A case fatality ratio of 2.5%, meaning 2.5% of those with symptoms could die as a result of the influenza virus.

• 4% of symptomatic patients requiring hospital care, 25% of whom are expected to require the highest level of critical care (level 3).

• Peak illness rates of around 10-12% (measured in new clinical cases per week as a proportion of the population) are expected in each of the weeks in the peak fortnight (weeks 6 and 7).

• Workplace absence rates for illness will be reaching 17-20% in the peak weeks.

The RWCS assumes that antivirals will not have an effect on the characteristics of the pandemic described above. See Variation 3 for further exploration of the potential impact of antivirals.

The time of year when the novel strain will appear cannot be predicted and therefore is not taken into account in this scenario. This scenario does assume that the novel strain emerges outside of the UK, although it is possible that this would not be the case, however no specific region or country has been assumed as the origin of the novel strain.

Further detail of the modelling which underpins the reasonable worst case scenario assumptions can be found in the SPI-M modelling summary (Scientific Pandemic Influenza Advisory Committee Modelling subgroup, SPI-M Modelling Summary, https://www.gov.uk/government/publications/spi-m-publish-updated-modelling-summary)

Background and supporting evidence

Influenza pandemics appear to have occurred rarely and randomly throughout human history. Historical evidence indicates that the timing, severity and duration of each episode is variable and unpredictable. There have been four recorded pandemics of influenza during the past 100 years: in 1918, 1957, 1968 and 2009 and three in the last century, giving a best estimate of annualised risk of 3-4%.

The 1918/19 Spanish flu (H1N1 strain) was by far the most serious event. It had a high case fatality ratio (2-3%) and is estimated to have caused 200,000-250,000 deaths in the UK. Despite the name, it is unclear where the strain emerged. Other pandemic strains, for example Asian Flu in 1957/58 (H2N2 strain) and Hong Kong Flu in 1968/69

underpinning-the-uk-influenza-pandemic-preparedness-strategy. More information on the modelling assumptions can also be found here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/624155/SPI-M_influenza_modelling.pdf

Recovery and long term implications

As mentioned above, it is predicted that an influenza pandemic would come in multiple waves. This means that recovery from one wave could be hampered by the arrival of a subsequent wave. However, a vaccine should be available for the later stages of the pandemic, potentially from the early or mid-point in a second wave. The UK has an Advanced Purchase Agreement for pandemic vaccine which can be triggered in response to a pandemic threat.

Even after the end of the pandemic it is likely that it would take months, or even years, for the health and social care services to recover although an exact timescale cannot be predicted. Elective surgical procedures and other business-as-usual procedures will have been postponed during the pandemic, which would mean that demand for health and social care services could still be high even once the levels of influenza have decreased to normal levels.

There are no confirmed common long term health effects from influenza, however a small proportion of people recovering from acute influenza may develop Guillain-Barré syndrome. Guillain-Barré syndrome is a rare and serious condition of the peripheral nervous system. It occurs when the body's immune system attacks part of the nervous system. Most cases (60%) are thought to result from an aberrant immune response triggered by a recent infectious disease, including respiratory diseases such as influenza, or gastrointestinal infection caused by Campylobacter bacteria.

It is likely that the economic impact of the reasonable worst case scenario would be felt for years following the pandemic. However, this is very difficult to predict accurately given the potential worldwide consequences of this scenario.

Capability requirements

Capability requirements include:
 • Disease surveillance and early detection
 • Robust and tested arrangements for rapid scientific and clinical advice
 • Local and national plans for management of excess deaths
 • Local and national plans to deal with a surge in demand for health and social care services. This includes how to triage patients within the NHS.
 • Stockpiles of countermeasures and advanced purchase arrangements for those which cannot be acquired in advance
 • Communication plans to encourage social distancing and good hygiene
 • National communications plans
 • Sector resilience plans including planning for absence of key workers.
 • Robust command and control arrangements

Impact on vulnerable groups

Mortality and morbidity patterns for pandemic influenza are complex to understand. In general attack rates are highest in children and decrease with age. At the same time the likelihood of death, if infected, generally increases with age (although there is also an increased risk of death in the very young). Taken together these phenomena can combine to increase the proportion of influenza deaths overall which occur in younger adults of working age, as was clearly observed in 1918 (a severe pandemic) and 2009 (a mild one). The precise pattern of morbidity and mortality will vary according to the

pandemic strain and cannot be predicted in advance, emphasising that high quality real-time surveillance is a critical capability.

Whether the influenza virus particularly affects one sub-set of the population or not, it is very likely that there will be an impact on vulnerable populations due to the wider impacts of the pandemic on public services and critical national infrastructure. In the RWCS, those with existing health and social care needs may not be able to access their usual services either because of increased demand, fewer staff or planned cancellations to divert resources to dealing with the pandemic.

There could also be further impacts upon other vulnerable populations, due to the higher rate of staff absence due to ill-health. This may make some safeguarding procedures more difficult.

Variations

1: There is no known firmly established evidence of inverse association (or trade-off) between the rate of transmissibility and severity of infection, although many virologists instinctively believe this to be so. Therefore it cannot be excluded that a novel pandemic virus could be both highly transmissible and highly virulent. Therefore, pandemics significantly more serious than the reasonable worst case described above are possible.

There is currently a potential threat from the influenza A virus subtype H7N9. This virus has encroached into humans in China, from infected poultry since 2013 causing over 1,500 cases to date (Dec 2017). As of the same date the case fatality ratio (CFR) in humans is 39%; however, this is considered to be an overestimation due to incomplete reporting of all cases of human infection with H7N9. There is no evidence that a pandemic has previously occurred which had a CFR as high as 39%, so a scenario with a CFR four times higher than the RWCS is described below.

The specific assumptions of this variation are broadly similar to the RWCS but has a CFR of 10% instead of 2.5%. This would result in 3.28m excess deaths across the whole pandemic. If this were to occur, it would overwhelm death management systems very quickly, as well as likely completely overwhelm health and social care services and other aspects of critical national infrastructure. This scenario would lead to great public anxiety and outrage, which would likely compound the number of absences from work. It would be more likely to lead to transport restrictions, school closures, and restrictions on mass gatherings. The economic impact would likely be trillions of pounds.

2: This variation models a moderate pandemic, based on the 1957 and 1968 pandemics. The annual likelihood of a pandemic with the characteristics described below is 2%.

The specific assumptions of this scenario are listed below.
 • 32.5% (21,320,000) of the population would be infected and experience symptoms of pandemic influenza.
 • A case fatality ratio of 0.2%, resulting in 65,600 deaths.
 • 0.55% (117,260) of symptomatic patients requiring hospital care, 25% (29,315) of whom are expected to require the highest level of critical care (level 3).
 • Peak illness rates of around 6.5-8% (measured in new clinical cases per week as a proportion of the population) are expected in each of the weeks in the peak fortnight (weeks 6 and 7).

This scenario would still have a significant impact on health and social care systems as well as death management systems. There would also be higher than usual absence from work.

3: The RWCS assumes that antivirals do not have an impact upon the case fatality ratio (CFR). This variation assumes that the impact of mass treatment of clinical cases with antivirals would lower the CFR to 1% due to the ability of antivirals to lower the severity of the disease. According to SPI-M (Scientific Pandemic Influenza Advisory Committee Modelling subgroup, SPI-M Modelling Summary, https://www.gov.uk/government/publications/spi-m-publish-updated-modelling-summary) there would likely also be an impact upon the attack rate but this has not been taken into account for this variation due to the need for antivirals to be taken within 24 hours to see this effect – an ambitious target.

The main impact of effective antiviral delivery would be to reduce the number of deaths, using 2016 population figures, to 328,000. This number of deaths would still have a very significant impact of death management systems, but would be less likely to overwhelm national systems.

Confidence – likelihood/plausibility
High

Confidence –impact
High

LIKELIHOOD

Likelihood
2%

Likelihood score
3

Explanatory notes
The average annual probability of a RWCS occurring within the next two years is estimated as 1-2%.There have been four pandemics over the last 100 years – one with a similarly high case fatality ratio to the assumptions in the RWCS. Therefore, it is judged that the annual likelihood of this risk is approximately 1 - 2%. This is a lower likelihood than previously stated in the National Risk Assessment, only due to the reduction in the time period rather than an actual reduction in the risk.

Likelihood – confidence assessment
In theory, it is possible that a pandemic worse than the RWCS has occurred prior to this without a record of the event being available. However, it is felt that this is highly unlikely given the magnitude of such an event.
It should also be noted that the likelihood quoted above is based on a 1918-like scenario, however milder pandemics are more likely than the figure quoted.

HUMAN WELFARE

Fatalities (UK)
Total number

- 820,000

No notice and excess deaths

- 820,000 excess (0% no-notice using definition provided)

Impact on fatality management processes

- Five – National fatality management processes completely overwhelmed

Notes

- It is likely that the fatality management processes will become overwhelmed locally and there may be a level of national coordination required to help overcome this. Legislative easements may be put in place to streamline this process.

Casualties (UK)

Total number

- 3,280,0000

No notice and excess casualties

- 32,800,000 (0% no notice using definition provided)

Casualties abroad (British Nationals)

2,450,000

Fatalities abroad (British Nationals)

61,250

Fatalities and Casualties abroad (non British Nationals)

47,088,9500

Crisis Hub cases

0

Shelter and evacuation

Evacuation in the UK

- 0

Temporary shelter requirements

- 0

Long term shelter requirements

- 0

British Nationals requiring evacuation abroad or repatriation

- 0 (see explanatory notes)

Human welfare - confidence assessment

The number of casualties and fatalities are based on the specific assumptions given in the previous tab, applied to the 2016 ONS mid-year estimate for the UK population which was 65.6m (https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates). For mental health casualties, the number of people requiring assessment by health services (i.e. 30% of those symptomatic) has been used in the formula provided. It is noted that the true figure could be far higher.

The number of British Nationals overseas affected by the pandemic is based on the RWCS assumptions applied to UN migration data from 2015 (United Nations, International Migrant Stock 215, http://www.un.org/en/development/desa/population/migration/data/estimates2/estimate

593