Emerging Infectious Disease.
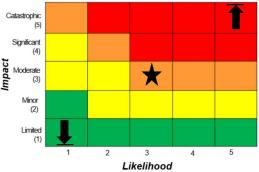## R97-DHSC

OVERVIEW INFORMATION

Risk Title
Emerging Infectious Disease
Risk Type
Hazard-related risk

Risk Assessment Owner
Department of Health

Reasonable worst case scenario
Over the past 30 years, more than 30 new or newly recognised diseases have been identified. Most of these have been zoonoses, i.e. diseases that are naturally transmissible, directly or indirectly, from animals to humans. The reasonable worst case scenario (RWCS) is an outbreak of a high consequence infectious disease (HCID) which is airborne. An airborne disease is more likely to spread rapidly from person-to-person, and can make contact tracing more difficult compared to other diseases which have a different route of transmission. Other emerging infectious diseases which are spread through different routes of transmission are explored in the three variations below.

Impact Scores		
Dimension	**Highest Score (0-5)**	**Breadth of impact**
Human Welfare	4	9/45
Behavioural	3	6/10
Essential Services	5	21/125
Security	0	0/25
International Order	0	0/30
Environment	0	0/5
Economic	4	4/5
	Overall score: 3	**Total 40/245**

Specifically, the current RWCS is based on an outbreak of an emerging respiratory coronavirus infection in the United Kingdom (UK). This may be similar to the outbreak of Middle East Respiratory Syndrome (MERS) seen in South Korea in the 2015 or could cause a global outbreak such as the outbreak of Severe Acute Respiratory Syndrome (SARS) in 2003. Currently, MERS poses the highest risk of an emerging coronavirus causing an outbreak given that it is endemic in Saudi Arabia and there is historical precedent of imported MERS cases in the UK and imported cases leading to an outbreak in Republic of Korea. However, it should be noted that due to the nature of an emerging infectious disease there is some uncertainty as to whether a different emerging pathogen, including one which was airborne, would lead to an outbreak similar to those seen previously so a range of figures are given in some cases.

The RWCS is predicated on a novel or emerging infection (i.e. one that is either globally unknown or unknown/very rare in the UK) arising in another country and then arriving in the UK before it is identified. It is possible that a novel infection could arise in the UK first but this is less likely.

Based upon the experience of recent international outbreaks of MERS, the likely impact of such an outbreak originating outside the UK would be cases occurring amongst returning travellers and their families and close contacts, with potential spread to health care workers, and other patients within a

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hospital setting. Once in the UK, the resulting cluster of individuals (particularly health care workers) with a similar, unidentified or unfamiliar illness should lead to an alert being raised and infection control within health care settings and other public health measures being instigated. This process can control the spread of the disease, although this cannot be guaranteed and a wider outbreak is possible. For MERS, sustained human to human transmission outside of close contacts and health care workers has been limited so far (Arabi et al, 2017) and therefore there is currently a low risk of this disease presenting a wider threat to the UK. However, sustained human-to-human transmission in emerging airborne diseases is possible, which is why infection control procedures are critical to the mitigation of this risk.

The RWCS described above could lead to:
 • increased demand on specialist intensive care and infectious diseases facilities;
 • short term localised disruption to routine healthcare activities if outbreaks occur in hospital settings;
 • possible disruption of several, or more, weeks to elective procedures;
 • contacts of cases being placed under health surveillance; and
 • public concern about travel, within and beyond the UK and possible international travel restriction advice.

As a novel or emerging pathogen it is unlikely that effective vaccines will be available and the effectiveness of existing antivirals/antibiotics will be unclear as will be optimal clinical management strategies.

Specific Assumptions and strategic context
The specific assumptions underlying this scenario are that:
 • the infection does not originate within the UK but spreads rapidly to UK (and globally) via travel to the UK (specifically for this scenario, a traveller with MERS travelling from the Middle East); and
 • that as an emerging infection, it would be difficult to recognise and detect rapidly.

Regarding the disease itself, the specific assumptions are that:
 • there is the possibility of spread within a hospital (or other close) setting, prior to the infection being identified in the patient;
 • there is a high case fatality rate - for MERS specifically it would be about 35%;
 • there is no effective treatment other than symptomatic management; and
 • the main control measure is the implementation of effective infection control in relation to identified cases.

For the RWCS there is an assumption that, although there will be national impacts, the spread of casualities and fatalities will be more contained within a region. Although this cannot be guaranteed, the most likely people to be infected are close contacts of the initial case and health care workers and patients within the health care setting where they are treated. This assumption would depend on transmissibility and the effectiveness of infection control procedures

Background and supporting evidence
New infections have emerged in the human population at regular intervals during recent decades. For example, this includes diseases such as HIV, SARS, MERS, Chikungunya, West Nile disease, and Ebola. Not all emerging

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diseases can be categorised as high consequence but their novelty makes them more difficult to detect and treat. The background below specifically deals with the RWCS, i.e. an airborne infectious emerging disease (including MERS and SARS). Background for emerging infectious diseases with other routes of transmission can be found in the variations described below.

MERS is caused by a coronavirus (MERS-CoV) related to same family of viruses that caused SARS. This infection emerged in the Middle East and globally in 2012, and since then World Health Organization has been notified of 2103 laboratory-confirmed cases of infection with MERS-CoV, including at least 733 related deaths (case fatality of 34.9%) as of 16 November 2017. The vast majority of these occurred in the Middle East. No specific treatment or vaccine is currently available for MERS.

In 2015, an outbreak of MERS occurred in South Korea, triggered by a single individual who had travelled in the Middle East. There were 186 cases including 38 deaths during this outbreak which was marked by multiple transmissions events within healthcare settings to other patients, their relatives and healthcare workers. (Kim KH et al, 2017), (WPRO, WHO, 2015). This outbreak feeds in to the RWCS described, although it should be noted that it is unlikely that an outbreak of MERS in the UK would mirror this scenario exactly. The principal reservoir of the infection is camels in the Middle East (Gossner et al., 2016). Human to human transmission is relatively inefficient (at present) and most human cases have arisen through exposure to camels, in healthcare settings or under conditions of close household contact (Arabi et al, 2017). Therefore, any future MERS cases are likely to be either imported to the UK through international travel, or to arise from close contact with imported cases in households or healthcare settings.

SARS is also caused by a coronavirus. An epidemic of SARS occurred in 2003, with more than 8,000 cases in 26 countries across the world. The case fatality rate for SARS, but can be as high as 50% (Donnelly et al, 2003). There were no confirmed cases of SARS in the UK and SARS is no longer prevalent across the globe so is seen as less of an ongoing threat compared to an outbreak of MERS.

The emergence of new infectious diseases is unpredictable but appears to have become more frequent. This may be linked to a number of factors such as climate change, the increase in world travel, the displacement of people because of war, the global transport of food, the encroachment of humans on the habitat of wild animals, intensive commercial animal husbandry practices and enhanced detection.

Recovery and long term implications

For the individuals infected, the outcome of any infectious disease - whether it is established or emerging - is that the infected individual recovers and may be subsequently immune to further infection with the same strain of organism (although this is not always the case), or dies as a result of the infection. However, there could well be long term consequences as a result of the disease, including becoming a chronic carrier of the disease, but this is difficult to predict in advance without knowing the specific disease involved e.g. Zika to microcephaly.

There is limited data on the long term impacts of MERS. Due to the severity of the illness, it may be expected that recovery to previous levels of activity would be longer than for other, common causes of pneumonia. Outcomes are worse

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in individuals with previous long term conditions. As the majority of cases have occurred outside of Europe, it is not known what proportion of all MERS survivors develop long-term complications of this infection, such as long-term respiratory disease.

Capability requirements

The capability requirements include:
 • Surveillance systems, particularly syndromic surveillance; covering primary and secondary care settings and HCWs
 • Staff trained in enhanced infection control practices, and adequate access to and training in the use of personalised protective equipment (PPE)
 • Public health staff for contact tracing and follow-up;
 • Excess death management, including potential infectious material (particularly for variation 2, below)
 • Decontamination services
 • Appropriate specialist healthcare services e.g. high level-isolation units, intensivists with specialised experience in infectious diseases
 • Appropriate facilities for quarantine.

Impact on vulnerable groups

Variation/Range 4

Variations

1: There is the possibility of Ebola or another highly infectious viral haemorrhagic fever emerging as a global public health threat. Based on recent examples, this would likely emerge overseas and could be brought to the UK via recent travellers.

Ebola is an example of a longer established (first identified in humans in 1976), zoonotic blood-borne infection. Ebola recently caused a major outbreak in Guinea, Sierra Leone and Liberia (WHO Ebola response team 2014; WHO Ebola response platform, 2013-2015). Almost 29,000 cases were reported in these three countries over a period of two years. Linked outbreaks occurred in Mali (8) and Nigeria (20) and a further eight cases occurred in individuals from other countries, including Europe and the United States of America. A major global response was required to bring the outbreak under control in West Africa (WHO Ebola response activities 2014-2015; WHO Ebola response platform 2013-2015; WHO Ebola Response team, 2016). The outbreak provoked a major domestic response in the UK, with the introduction of extreme public health measures such as airport screening (Moll et al, 2016; UK Government, 2016). In 2017 to date, there have been small contained outbreaks of Ebola in the Democratic Republic of Congo (WHO press release, 2017a) and Marburg (another viral haemorrhagic fever) in Uganda (WHO press release, 2017b).

Ebola is transmitted through contact with bodily fluids of the infected patient, and transmission remains possible after the patient has died. It has an average case fatality ratio of 50% (although known to range from 25%-90%) with no known treatment - only symptom management. Ebola has associated long-term musculoskeletal and ocular complications so those who recover from the infection could require further medical care. (WHO, 2017d).

For this particular variation, because of our healthcare system – which is able to practice good infection control – and our public health system it is unlikely

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person to person in household and healthcare settings but sustained person to person transmission in the wider community has not been observed. On balance, a likelihood score of 3 (<1/20 but >1/200) is therefore considered a reasonable assumption.

Likelihood – confidence assessment
There is significant uncertainty about the frequency with which an emerging infection may develop the ability to transmit from person to person.

HUMAN WELFARE

Fatalities (UK)
Total number
- 200

No notice and excess deaths
- Using the upper bounds, 3 no-notice deaths (i.e. in first two weeks) and a further 197 excess (using average from range above).

Impact on fatality management processes
- Two – Local/regional fatality management processes under significant pressure

Notes
- See explanatory notes (19e) for further details on fatalities. For fatality management process, level two has been indicated as infection control precautions may be required if post-mortem examinations need to be undertaken. For variation 2, the outbreak of a disease such as Ebola, special handling would be required for all of the deceased due to the infectiousness of the body which would likely increase the impact.

Casualties (UK)
Total number
- 2000

No notice and excess casualties
- Using the upper bounds, 20 no-notice, 1,800 excess

Casualties abroad (British Nationals)
0

Fatalities abroad (British Nationals)
0

Fatalities and Casualties abroad (non British Nationals)
8774

Crisis Hub cases
0

Shelter and evacuation
Evacuation in the UK
- 0

Temporary shelter requirements
- 0

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