

Current understanding of COVID-19 compared with NSRA Pandemic Influenza planning assumptions

SAGE secretariat

1 st Order Assumptions	Pan Flu reasonable worst case, based on a 2016 UK population, including confidence intervals where possible	COVID-19 key conclusions of SAGE to date, based on a 2016 UK population
Basic Reproductive Rate (R₀) (Number of secondary cases generated on average by one primary case. Suppression of an outbreak requires R to be sustained below 1)	No number included in planning assumptions	2.4 (assumed for the UK)
Doubling Time (Time required for the number of cases to double)	No number included in planning assumptions	4.6 days (assumed for the UK)
Incubation period (Time between exposure to infection and symptom onset)	Short incubation period: 1 to 3 days	Average: 5 days. Range: 1 to 11 days. (assumed for the UK)
Duration of illness	Assumes normal flu profile – most people back to normal activities in 7 to 10 days	Most cases probably resolve 7 days after symptom start. From symptom onset to hospitalisation: Average of 7 days. From onset of illness to discharge from hospital: Average of 23 days but may include avoidable delay in discharge. From onset of illness to death: Average of 22 days for severe cases, but large variation around this. Longest time so far appears to be 41 days.
Duration of infectivity	Adults are infectious for up to 5 days from the onset of symptoms. Longer periods have been found, particularly in those who are immunosuppressed. Children may be infectious for up to 7 days. Some people can be infected, develop immunity, and have minimal or no symptoms but may still be able to pass on the virus.	Duration of infectivity likely to vary depending on severity of individual cases. 14 days as upper limit. Peak infectivity is probably around the start of symptom onset, average 2 to 6 days, then falling off rapidly.

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Transmission	Sustained human-to-human transmission. Around a third of infected people are asymptomatic.	Current understanding is that the transmission route is respiratory and via contact. This means that viruses are transmitted via touching an infected person and spray of droplets such as coughing and sneezing. Human-to-human transmission outside China has occurred but there is as yet no definitive evidence of a sustained outbreak/epidemic elsewhere. Asymptomatic transmission cannot be ruled out and transmission from mildly symptomatic individuals is likely.
Case Fatality Rate (CFR) (fatality rate for identified cases of covid-19)	2.5% (previously defined as only symptomatically infected)	2-3% of identified cases only
Infection fatality rate (IFR) (cumulative % of all infected including both symptomatic and asymptomatic infections)	No number included in planning assumptions	1% of all infections (both symptomatic and asymptomatic). This increases with age with the lowest rate of 0.01% in infected under 10s and the highest rate of 8.76% in infected over 80 year olds
Origin	N/A	Current evidence suggests single point zoonotic (i.e. animal to human) outbreak, now sustained entirely by human-to-human transmission. No evidence of ongoing zoonotic transmission.
Duration of outbreak and waves	Single wave spread over 15 weeks	Single wave with 95% of cases in peak 9 weeks, half of cases in peak 3 weeks (see figure 1 below)
2nd Order Assumptions	Pan Flu reasonable worst case, based on a 2016 UK population, including confidence intervals where possible	COVID-19 key conclusions of SAGE to date, based on a 2016 UK population
Clinical attack rate (CAR) (cumulative % of population, includes symptomatic infections only)	50% (32,800,000)	50% (32,800,000)
Infection attack rate (IAR) (cumulative % of population, includes both symptomatic and asymptomatic infections)	85% (55,760,000)	80% (52,480,000)

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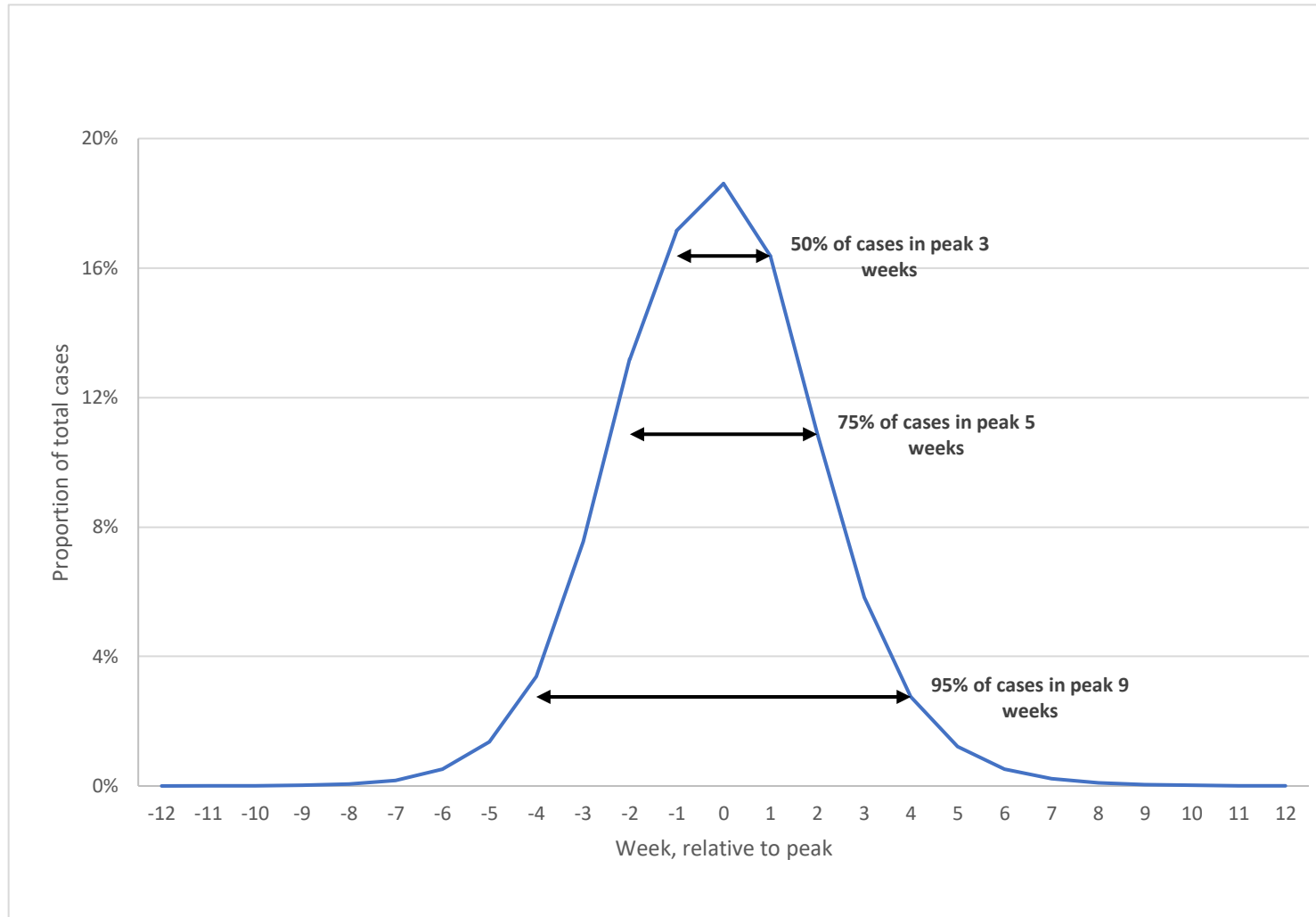
Workforce absences	17-20% nationally during peak weeks. This may vary for individual businesses. Anticipated that 50% of workforce may require time off at some stage over the entire period of a pandemic either due to illness or to care for others This would be higher were schools to be closed. An average absence duration of 7 (without complications) to 10 days (with complications).	21% nationally during peak weeks. This may vary for individual businesses. Average absence duration of 14 days based on current government advice. Most cases probably resolve 7 days after symptom start so may be lowered depending on government messaging. Includes absences due to covid-19, background rates of influenza-like illness and caring for others, but not absences due to school closures or “worried well”.
Numbers requiring assessment at health services	9,840,000 would require assessment by health services. This is 30% of all those that are symptomatic.	Unknown, use pan flu planning assumptions.
Proportion of people hospitalised (threshold for hospitalisation assumed to be “requiring oxygen”)	4% (1,312,000) of all those that are symptomatic. (Previously defined without this threshold)	8% (4,198,000) of infected people, equivalent to 13% of symptomatic people. This increases with age with the lowest rate of 0.2% in infected under 10s and the highest rate of 43.8% of infected over 80 year olds
Proportion of people requiring ventilation in hospital	25% (328,000) of all those requiring hospital care. (Previously defined as number needing critical care)	Of the people requiring oxygen in hospital, 19% (781,000) will require ventilation at some point in their care, consisting of: 9% (390,000) invasive ventilation performed in critical care; and 9% (390,000) non-invasive ventilation. The age distribution of those requiring ventilation is assumed to be the same as for IFR This is equivalent to 2% of infected people requiring ventilation at some point split between 1% requiring invasive ventilation in critical care and 1% requiring non-invasive ventilation.
Fatality rate for people requiring invasive ventilation in critical care	No number included in planning assumptions	50% (does not vary by age)
Fatality rate for hospitalised people	No number included in planning assumptions	12% of hospitalised people. This increases with age with the lowest rate of 4% in infected under 10s and the highest rate of 20% of infected over 80 year olds
Average length of stay in hospital	6 days standard. 10 days ICU.	8 days for people not requiring ventilation. 16 days for people requiring ventilation (of which 10 days are under ventilation). Based on bed usage for viral pneumonia from last 3 years.
Excess deaths (calculated using the IFR and IAR)	820,000 (to the nearest 10,000)	520,000 (to the nearest 10,000)

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Clinical Countermeasures	<ul style="list-style-type: none">• Antivirals (AV)• Antibiotics (AB)• Pandemic specific vaccine (PSV)	None
Vaccine Development	It is likely to take at least six months after a novel virus has been identified and isolated for an effective pandemic influenza vaccine to become available from manufacturers.	None likely to be available in a UK epidemic

Figure 1 Covid-19 Reasonable Worst Case planning scenario: Proportion of new cases per week in an unmitigated epidemic



Week, relative to peak	-12 to -9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9 to 12
Proportion of total cases (%)	<0.1	0.1	0.2	0.5	1.4	3.4	7.6	13.2	17.1	18.6	16.4	10.9	5.8	2.8	1.2	0.5	0.2	0.1	<0.1