

Paper for SAGE small group: COVID-19 Alert level change criteria
25 May 2020

Background

The Joint Biosecurity Centre, which will begin to be operational from 1st June 2020, will be responsible for setting the COVID-19 Alert Level. In advice to the CMO and JBC SRO Tom Hurd on 24 May 2020, the JBC team outlined the intention for the JBC to be the single authoritative advice on the COVID-19 Alert Level from end August 2020, but that in the intervening period the JBC would issue an Alert Level Assessment to the CMOs who would then determine the Alert Level.

The five Alert Levels were set out by the Prime Minister as part of the Recovery Strategy on 10th May. JBC has been tasked with identifying the initial criteria for moving between those five levels. In developing these criteria, the JBC has sought input from a number of experts, and is now seeking views from SAGE on the process for changing the Alert Level, the indicators and data sources proposed and the threshold levels for those indicators. These are laid out in detail in the attached paper, along with the rationale, uncertainties and notes for each.

These proposed criteria are based on data and information sources which are currently available or, in the case of data from contact tracing, are expected to be available in the coming days.

Questions for consideration

The JBC team is seeking expert views on the following questions:

- a) Top level:
Do you support our proposed approach of a principal indicator with a number of ancillary considerations?
- b) Detail:
 - a. Are the proposed principal indicators for each alert level change appropriate?
 - b. What are the pros and cons of using estimated or observed new infection counts?
 - c. Should we stick to estimated counts for all principal indicators?
 - i. If so, how can we draw best on the inputs to SPI-M for this?
 - d. If we use estimated counts of new infections, we will need these at regional level and for all nations of the UK. What models can we use to obtain comparable estimates that will allow us to achieve this?
 - e. For each alert level change, what evidence can we draw on to improve the proposed threshold for each indicator?
 - f. How long should a national test and contact tracing system be in operational mode before a move to level three should be considered?
 - i. What indicators would give sufficient confidence that it is working well enough to support such a move?

Annex A: DRAFT criteria for moving between COVID-19 Alert Levels

Introduction

1. The Joint Biosecurity Centre (JBC) forms a central part of the government's COVID-19 recovery strategy, which seeks to return life to as close to normal as possible, for as many people as possible, in a way that is safe and protects our NHS and social care.
2. A key initial objective of the JBC is to establish and maintain a COVID-19 Alert Level system that clearly and transparently communicates to the public the alert level and criteria for action. The alert levels were defined in the UK Government's COVID-19 recovery strategy *Our Plan to Rebuild* in May 2020.
3. This document proposes a draft set of criteria for moving between the alert levels, with data sources and the rationale for selecting these criteria.
4. The actions (including NPIs and advice to the public on behaviour change) to be taken by local and national government at each alert level are not considered here. It is an assumption that the scope of these can be increased or reduced within a given alert level and will be defined by JBC implementation and response in consultation with SAGE.

Approach

5. The approach is focussed on the criteria to move between levels, rather than criteria that define an individual level. This is because the relative importance of different attributes of the COVID-19 Alert Scale (CAS) will have different weight when the alert level is escalated than when it is de-escalated. For example, it will be necessary to review and escalate the alert level as rapidly as possible, to prevent and contain an escalating public health crisis which may emerge over hours or days. This reflects disease transmission dynamics, particularly the importance of the doubling time of cases and the reproductive number at any point in time. Conversely, as the threat of disease slowly drops and public restrictions are eased, it will be important to ensure changes to alert level are undertaken in a stable fashion and that a long-term downward trend in new infections has been established. This stability will be important for public and commercial confidence in any change to alert levels.
6. For each alert level change we have proposed a primary indicator, based on an actual or estimated measure of new infections, with a number of ancillary

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considerations to ensure the fullest possible picture of the situation is considered by decision makers.

7. When an increase in the alert level is being considered, meeting the principal indicator will be taken as sufficient grounds for such an increase, but will not be mandatory. The ancillary considerations may be used as the rationale to increase the alert level even if the threshold for the principal indicator has not been met. Conversely, when considering a decrease in the alert level the principal indicator threshold must be met. The ancillary considerations alone will not be sufficient, but may warrant remaining at a higher level despite the principal indicator threshold having been crossed.

Timeliness of review of alert levels

8. We propose minimum times between changes of alert levels. When considering an increase in the alert level, this interval is daily although an observable change in the epidemic profile is unlikely before one serial interval. When considering a reduction, it is important that any non pharmaceutical interventions (NPIs) are given sufficient time for their full effect to be demonstrated and control gained of the outbreak before any further reductions in alert level as the scale of effect of any change is unlikely before 2-3 serial intervals.
9. The proposed interval for reduction is thus variable for downward changes between levels and in general a longer period than for upward changes, in keeping with the public health precautionary principle. This will also avoid rapid oscillation between alert levels when specific metrics are at, or close to, a chosen threshold. Extending the period of restrictions at higher alert levels will give greater assurance of and confidence in prolonged disease control at lower alert levels, once restrictions are relaxed.

Review and revision

10. This document outlines a set of criteria for JBC Initial Operating Capacity (IOC) on 1st June. It is thus based on information, analyses and data which will be immediately available to the JBC. JBC will constantly review the available information and add or amend criteria where appropriate. A key early example will be NHS Test and Trace, which will provide vital information on efforts to isolate contacts, control the spread of the virus and save lives.
11. The health service indicators to support transition between alert levels 4 and 5 must be identified in agreement with the NHS. This is awaited.
12. Criteria for reducing the alert level will not mirror criteria for going up. Upwards alerts need to be acute responses to rein in an escalating situation. Downward

alerts must be more measured, to avoid relaxing restrictions too quickly and risking an upswing in numbers.

Alert level one - COVID-19 is not known to be present in the UK

Escalating from alert level one to level two

Principal indicator:

Are there any confirmed infections that cannot be traced to importation to the UK?

Public Health rationale: A single case or cluster confirmed in the UK but known to have been acquired abroad does not represent a UK outbreak. Rapid public health action to isolate the case(s) and their contacts will be key here, followed by active follow up of all contacts.

Data sources: New infections notified to health protection teams and central surveillance teams in each nation; laboratory surveillance; RCGP and other sentinel surveillance systems

Uncertainties and notes: It is very unlikely we will reach this decision point in the foreseeable future. Potential additional data sources include point of care (POC) testing.

Deescalating from level two to level one

Principal indicator:

Is there reliable evidence and consensus that COVID-19 is no longer endemic in the UK?

Public Health rationale: This change in alert level is dependent on greater understanding than at present of antibody protection, duration of natural or acquired immunity, the success of any vaccine candidate and subsequent immunisation programme and then validation of methods to confirm the absence of circulating disease.

Data sources: Identification by SAGE that disease is no longer endemic, drawing on a range of routine and bespoke data and information sources.

Uncertainty/notes: Active surveillance, rapid testing of all/any suspected new infections and - potentially - isolation of contacts may be necessary at this very late stage of the outbreak.

Alert level two - COVID-19 is present in the UK but the number of cases and transmission is low

Escalating from alert level two to level three

Principal indicator:

Are there >2,000 confirmed new infections in the UK per day?

Public Health rationale

2,000 new infections per day remains within the expected capacity of the contact tracing service and thus it is reasonable to consider such a threshold to be within the ability of Public Health England and NHS Test and Trace to control.

Data sources

Laboratory test results through all pillars of the testing strategy, currently compiled by DHSC on a daily basis; notification of institution outbreaks to Health Protection Teams.

Uncertainties/notes

At this level of identified new infections (likely to be symptomatic) in the UK outbreak to date, modelling estimates would suggest there may have been 5,000 -10,000 total infections nationally once asymptomatic and mildly symptomatic individuals are considered. In the context of a five day doubling time, it is foreseeable that there would be 20,000 new infections per day by the time any NPIs or other control measures introduced have any demonstrable effect. It may be preferable to rely instead on modelled estimates of new infections per day or a much lower confirmed new infection count, which would allow more rapid disease control and reduce the probability of moving to level four within days.

If there is good access to rapid POC testing across the country, this threshold should be reviewed.

The contact tracing system has not yet been established nationally and thus the capacity is not yet tested.

An incidence-based indicator (cases per 100,000 population) may be helpful once there is confidence that all people with suspected infection are being tested. This will be particularly relevant for a sub-national alerting system to allow comparison of disease frequency between areas.

Secondary indicators:

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- **Is the national R reliably estimated to be ≥ 1 and/or doubling time < 7 days?**
- **Has the number of COVID-19 outbreaks notified in care homes, prisons or schools in any Upper tier LA (UTLA) increased by 50% or more over the previous seven days?**
- **Are any cases or clusters detected through sentinel surveillance NOT linked to a known transmission chain?**

Data sources

PHE Health Protection team daily reporting of respiratory outbreaks in high risk institutions; RCGP, USISS and other PHE sentinel surveillance systems; University of Cambridge PHE Joint Modelling Team nowcasts and forecasts

Public Health rationale

At level two, there will be so few new infections that these can be suppressed by local / regional testing and tracing. In practice this probably means fewer than 1-2,000 new infections per day. At this level many statistical measures such as R are not reliable without confirmed infection counts and (when available) contact tracing process information. A short doubling time suggests the contact tracing and isolation programme is not sufficiently containing outbreaks.

Escalating outbreaks are a rapid indicator of uncontrolled transmission and community spread. This is a secondary indicator as a 50% increase in outbreaks in a setting may represent an increase from 2 to 3 and thus should be considered an early warning for action rather than an absolute indicator.

Sentinel surveillance systems will identify infections separately from contact tracing mechanisms; if new infections are picked up by this route and are not able to be linked to existing transmission chains, this may be a signal for undetected community transmission and thus an indicator that COVID-19 is in general circulation at a higher rate than is being detected.

Uncertainties and notes

Contact tracing process metrics and outbreak metrics are likely to be highly relevant here once available, such as time taken to identify and manage the contact networks and count/proportion of total contacts identified per case.

An incidence based indicator (cases per 100,000 population) may be helpful once there is confidence that all people with suspected infection are being tested. This will be particularly relevant for a sub-national alerting system to allow comparison of disease frequency between areas.

Deescalating from level three to level two

Timeliness

A move from level three to level two should not be considered until at least two-three serial intervals have elapsed since the move from level four. If any relaxation in NPIs accompanied the change from level 4 to level 3, these should be given time for any potential rebound in infection numbers to be observed before further changes are introduced.

Principal indicator:

Are there less than 2,000 estimated new infections per day?

Public Health rationale

The total estimated number of new infections need to be low enough to be sure that sporadic community transmission is effectively suppressed to a level which is well within the capacity of the contact tracing programme and gives public confidence that the rate of transmission in the community is very low.

Data source

University of Cambridge / PHE Joint Modelling Team nowcasts and forecasts

Uncertainties/notes

Estimated new infections may be unstable at such low levels, or have very wide confidence intervals which will reduce certainty in this measure to +/- 700-800 new infections.

Secondary indicators:

- **Is the estimated R lower than at the same point in each of the last four weeks?**
- **Has the total count of defined outbreaks been in decline in all regions for at least four weeks?**
- **Have the number of new daily Covid-19 infections, hospital admissions, ICU admissions and deaths been on a downward trend for the last 4 weeks?**

Public Health rationale

A four week declining trend gives confidence that transmission is declining, in addition to the falling new infection count. The PHE/MRC modelling is subject to a number of lags including death data so by the time this threshold is reached there is some confidence that the decline in transmission has been true for a number of weeks.

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A known decline in the total number of active clusters/outbreaks as well as healthcare activity indicators will provide public reassurance that the impact of the outbreak is in decline.

A demonstrable reduction in the number of people becoming severely unwell and/or dying will give public confidence in the proposed reduction in alert level and accompanying actions.

Data sources

Contact tracing performance and cluster data, University of Cambridge PHE Joint Modelling Team nowcasts and forecasts, PHE Health Protection Team daily collated reports of outbreaks in high risk settings.

Uncertainties

Contact tracing metrics are not yet available as there is no national contact tracing at present. It is unlikely that a move down between levels will be possible without high certainty that contacts will be traced and isolated. Singapore has achieved a level of 99% of community transmission cases in the general population linked to a known case or cluster.

R is likely to be an unreliable measure when considered in isolation at low infection counts. Modelled data will not necessarily provide a forecast of a continued downward trend in the event of any planned changes to NPIs to coincide with the change in alert level, which will need additional modelling to identify any potential negative impact.

Healthcare activity indicators represent a small section of total COVID-19 infections and are subject to variable lags.

Alert levels three and four - A COVID-19 epidemic is in general circulation / A COVID-19 epidemic is in general circulation; transmission is high or rising exponentially

Escalating from level three to level four

Principal indicator:

Are there >20,000 confirmed new infections in the UK per day?

Public Health rationale

Estimates of the number of contacts per new infections vary and are likely to be lower than before the introduction of restrictions in the UK. Beyond 20,000 new confirmed infections per day, the contact tracing service will be required to identify

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and contact over 100,000 new individuals per day and ensure that enter self-isolation. This is a principal control measure and without this key intervention, the epidemic cannot be said to be under control. This is akin to the 'circuit breaker' approach taken in other countries such as Singapore.

Data source

Laboratory test results, all pillars (DHSC and PH agency data)

Uncertainties

Confirmed infections did not reach this level during the March-April peak, however there is considerably more testing capacity available and contact tracing capacity planned. If contact tracing is likely to be overwhelmed at a lower level or is not rolled out at national level by June 1st, this daily confirmed new infection count must be revised down. This has not been tested as the contact tracing service is still in pilot.

Secondary indicators:

- **Is $R > 1$ and/or doubling time less than seven days?**
- **Are Covid-19 related hospital and/or HDU/ICU admissions and/or total deaths increasing at $\geq 50\%$ over the same period?**

Public Health rationale

Estimated transmission dynamics of $R > 1$ or a doubling time less than seven days at alert level three would warrant consideration of the instigation of the national NPIs otherwise reserved for level 4, even before 20,000 new infections per day are detected. If R stabilises at less than 1 before the limiting new infection count is reached, it may be possible to contain such an outbreak with thorough contact tracing and less restrictive NPIs.

Data sources

University of Cambridge PHE Joint Modelling Team nowcasts and forecasts; NHSE daily data (via DHSC); PHE death data

Uncertainties

Nowcasts/forecasts of transmission dynamics are updated twice per week and so will not offer immediate evidence of a change in R /doubling time. Hospital activity is subject to a lag from the point of infection and so will give an indication of infection events which occurred 7-14 days previously. They give insight to only the most severe infections.

Deescalating from level four to level three

Timeliness

A move to level four is expected to be accompanied by the introduction of a range of national interventions which will require a significant lead time to reduce community transmission to a manageable level, in order to avoid a further escalation to level five. A move from level four to level three should not be considered until at least six weeks have elapsed (although this may be shorter for subsequent spikes of disease after the first wave). A longer period may be required, to be governed by the success of NPIs and whether a national contact tracing service has been resumed.

Principal indicator:

Are there estimated to be less than 10,000 new infections per day?

Public Health rationale:

The total estimated new infection count will be essential in understanding the impact on contact tracing capacity. The public perception of the meaning of a change in alert levels is to be explored in consultation with SPI-B, however it is plausible that behaviour will alter after a change from level four to three in a way that might be expected to lead to an increase in infections in at least the short term. The threshold has thus been set lower than the opposite threshold (to move from level three to level four) to allow for some stability in alerts and avoid rapid oscillation between levels.

Data source:

University of Cambridge PHE Joint Modelling Team nowcasts and forecasts

Uncertainties

It is not yet known what the initial operating capacity of contact tracing will be and thus this threshold may have to be set at a lower level if this indicator is set above the level at which the contact tracing service is resourced.

Secondary criteria:

- **Does the national contact tracing system have the capacity to perform contact tracing for all new confirmed infections? *[There may be no data against which to assess this on 1st June]***
- **Has the community estimate of R been consistently <1 for at least 2-3 serial intervals?**
- **Have the observed number of new daily COVID-19 confirmed infections, hospital admissions, ICU admissions and deaths been on a downward trend for the last 4 weeks?**

Public Health rationale

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Estimated transmission dynamics of $R < 1$ for a sustained period would give confidence that the NPIs put in place at the move to level four have been effective.

It is not expected to be practical to further reduce NPIs without adding in the vital transmission control function of a contact tracing system.

A demonstrable reduction in the number of people becoming severely unwell and/or dying will give public confidence in the proposed reduction in alert level and accompanying actions.

Data sources

University of Cambridge PHE Joint Modelling Team nowcasts and forecasts; NHSE daily data (via DHSC); PHE death data

Uncertainties

Nowcasts/forecasts of transmission dynamics are updated twice per week and so will not offer immediate evidence of a change in R /doubling time.

Hospital activity is subject to a lag from the point of infection and so will give an indication of infection events which occurred 7-14 days previously. They give insight to only the most severe infections.

We do not yet know what the initial operating capacity of the contact tracing system will be and will not have metrics against which to consider the effectiveness and completeness of contact tracing until it has been established for a number of days.