Covid-19 Modelling Summary Addendum (HMPPS) ***Accurate as of: 27.04.2020***

This paper has been drafted by HMPPS in collaboration with PHE.

Please be aware that our understanding of the virus is continuing to evolve. Therefore, the modelling and guidance are **subject to change** based on developing evidence base.

Our contingency planning is based upon the best scientific evidence available, which is growing every day. We know that:

- Covid-19 is caused by a previously unknown virus (SARS-2-Cov), which means the global population has little to no immunity to infection
- The latest understanding is that the main transmission route is respiratory via contact and that evidence suggests transmission is both horizontal and vertical in a closed institution
- There are currently no clinical counter measures available to treat Covid-19 and a vaccine is not available. Current treatment focuses on relieving the symptoms of infection and supportive care while the patient's body fights against the infection.

Prisons are a distinct social environment from that of the community, with people interacting in close proximity, high population vulnerability and unique pressures. Modelling the potential impact of Covid-19 on prisons is a dynamic and complex task, with each prison and function having its own challenges, and some establishments being more vulnerable to outbreaks than others. We are constantly revising and improving our modelling as we learn more about the virus.

PHE and HMPPS have made the reasonable assumption that compartmentalisation and regime changes have reduced contacts across HMPPS by up to 50% compared to the pre-pandemic regime. Further work to understand the true extent of the reduction is required and, whilst this is a best-case scenario estimate where compartmentalisation is implemented across the whole estate, individual prisons may have more or fewer levels of contact.

The modelling is based on the following assumptions, using evidence from SAGE, PHE and NHS:

- Fatality rate of infected cases is affected by access/ provision of local healthcare and SAGE assumptions.
- Hospitalisation rate of infected uses assumes average physiological age of prisoners. This was updated from previous RWCS modelling due to amended NHS/PHE assumptions.
- Incubation period of 5-7 days and infectivity 2-6 days
- Average duration of illness 7 days.
- Current R_o in the community: 1-1.5. Unmitigated R_o of 3.
- Time from onset of symptoms to detection/ implementation of protective measures for individuals: 24 hours
- 7 days from detection to recovery with mild illness

- 22 days from detection to recovery with severe illness
- 1 day to detection for those who are clinically attacked

HMPPS and PHE have incorporated parameters on the prison population due to modelling constraints:

- We have assumed that the modelled interventions are operationally delivered and sustained over time. We are not able to comment on the deliverability, nor on the potential wider impacts of restrictive interventions over time.
- Prison population is static and homogeneously mixed. Prison staff have not been considered.
- Frequency dependent mixing - contact rates do not change when individuals if removed.
- Transition times follow Erlang distribution (two E and two I compartments)
- The probability of seeding should be drawn from to the prevalence outside the prison.
- We would expect all prisons to be subject to a risk of infection, but we would not necessarily expect all prisons to enter an outbreak state. These numbers are generated assuming outbreaks of more than 5 cases are seen.
- Once there is transmission within a prison, this will outweigh any risk of importing an infection until the epidemic has been brought under control or reached its natural end.