PROTECTING HIGH RISK INDIVIDUALS AS AN APPROACH TO CONTROLLING COVID-19 OUTBREAKS – IMPORTANCE OF TRANSMISSION NETWORKS AND THE CHAIN OF TRUST

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Rationale

- The need to protect those most at highest risk of adverse consequences of COVID-19 infection should be self-evident (though a collective failure to do so has been cited as a major dereliction during the UK's first wave).
- The highest risk segments of the population have now been defined through the NERVTAG commissioned QCOVID risk algorithm.
- One strategy for better protection is to ensure that those in regular contact with at high risk individuals – 'shielders' – are free from infection. This concept is firmly embedded in the routine screening of hospital staff and care home staff to protect hospital patients and care home residents, respectively. A broader protection strategy extends the same logic to all high risk individuals.
- There is evidence (see Supporting Documents) that by partially decoupling hospitalisations/ deaths from community spread large-scale segmentation and protection (S&P) could allow lighter interventions in the general population while still limiting the public health burden of COVID-19.
- Possible advantages to this risk-based approach include:
  - o The role of shielder is already being taken up informally (probably on a large scale) but without formal support.
  - o S&P is a natural extension of current ideas about managing transmission networks (e.g. bubbles).
  - o The investment required is scalable with resources (once the shielders are identified, then the extent of the intervention - testing, PPE etc. - can be changed easily).

High risk individuals

- The new NERVTAG QCOVID algorithm is the most appropriate tool for identifying individuals at highest risk of hospitalisation and dying from COVID-19.
- Studies such as EAVE II provide both i) estimates of risk factors for adverse outcomes (hospitalisations, ICU stay, death) and ii) the prevalence of these risk factors in the population.
- Risk factors include age, sex, ethnicity, deprivation and a wide range of clinical conditions/markers.
- Age is by far the most important risk factor: based on age alone, at least 20% of the population can be considered at high risk.
- High risk individuals are safest if all their contacts are uninfected.

Shielders

- Shielders are those in contact with high risk individuals and would therefore, if infected, pose a high risk to those individuals. Obvious examples include members of the same household, care in the home workers and informal carers.

- Shielding status may be essentially fixed (e.g. informal carers in the same household) or dynamic (e.g. social care staff, care relievers).
- The most practical method of identifying shielders may be to ask them to self-identify. As a starting point a minimum of one shielder per high risk individual might be assumed.
- Shielders therefore need to protect themselves in order to protect their high risk contacts. This leads to the concept of the chain of trust.

Chain of trust

- There should be no contact with a high risk individual by any person who i) has symptoms and should be self-isolating; ii) should be self-quarantining; iii) has been in contact with anyone with symptoms, anyone who should be self-isolating or anyone who should be self-quarantining.
- Shielders therefore need to pay close attention to their own contacts and particularly should not have contact with persons in any of the above categories.
- Any individual who has had high risk contacts or been in a high risk setting within the past 2 weeks should suspend contact with high risk individuals. Possible examples of high risk contacts/settings are: has attended hospital, has been to a large indoor social gathering, or has travelled to a high incidence area.
- This may be difficult where the shielder is a member of the same household, necessitating both alternative accommodation and, possibly, alternative care arrangements for the high risk individual.

Modelling issues

- The population-level impact of S&P is all about altering the transmission matrix post-intervention.
- The intention of S&P is to target links in potential transmission chains that lead to high risk individuals.
- It is important to distinguish the transmission matrix from the contact matrix: not all contacts (however defined) will have the same associated risk of transmission; and risk per contact can be modified (by PPE, physical distancing etc.)
- High risk individuals may have different contact patterns and the impact of previous advice to shield has yet to be formally assessed (to our knowledge).
- Shielders, by definition, have contact with high risk individuals, and may or may not have contact patterns that are otherwise representative of the general population.
- For all realistic efficacies of protection levels of infection within the general population will remain very important. It is important to understand the role of shielders in weakening the linkage between infection in the general population and risk to the high risk segment.
- During different phases of the epidemic there is likely to be different degrees of spontaneous behavioural change (in all three segments: high risk, shielder and general population) that may be heterogeneous and hard to capture (particularly if it affects the nature as well as the number of contacts).
- Given the above, parameterising the post-S&P transmission matrix may be very challenging.

Practical issues

- Language. The term "shielding" appears now to be irrevocably linked to extreme self-isolation. For the great majority of high risk people this will be highly undesirable and not sustainable. We prefer the term "protecting".

- Ethics. S&P raises ethical questions as some measures are targeted at subsets of the population. However, lockdown also raises ethical questions as the benefits are felt mainly by those same subsets of the population. It needs to be understood that here are no easy options available.
- Clear guidance needs to be provided on how that protection is delivered. Though reducing contacts will play a key role, just as much emphasis is needed on making contacts safer.
- Elements of making contacts safer include appropriate NPIs, with hygiene, face coverings, and distancing (where possible) as key components, plus environmental considerations (indoor/outdoor, ventilation etc.).
- Messaging needs to emphasize who is a shielder, what their role is and how to perform it effectively. And also the importance of the 'chain of trust' in protecting high risk individuals.
- Contacts could also be made safer by regular testing of shielders. This could be a key element of a S&P strategy but would require very large testing volumes (at least locally). False positives (currently estimated at ~1/1000) would be an issue. [Strategies to deal with false positives include temporary self-isolation until a confirmatory test has been conducted]. Large-scale, rapid testing could be greatly facilitated by new rapid testing technologies (LAMP) currently under development.

Integrated responses

- S&P can be used in conjunction with other COVID-19 control strategies.
- Mass social distancing measures (elements of lockdown) can be targeted at activities/locations where high risk individuals are over-represented.
- Mass testing can prioritise shielders.
- Test, Trace and Isolate may be able to prioritise contacts who are shielders.

Supporting documents

- Edinburgh S&P briefing to SPI-M 160720
- Edinburgh S&P briefing to SPI-M supporting figure [submitted to Scottish C19AG on 27/04/20]
- Pre-print: 'Segmentation and shielding of the most at risk members of the population as elements of an exit strategy from COVID-19 lockdown'
- Note on peer history review of pre-print