

1 Covid-19 Rapid Report: Contact tracing for SARS-CoV-2: what can be
2 learned from other conditions?

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30 conditions?

31

32 **Abstract**

33

34 Contact tracing is central to the public health response to COVID-19, but the approach taken
35 has received criticism for failing to make enough of an impact on disease transmission. We
36 discuss what can be learned from contact tracing in other infections, and how the natural
37 history of COVID-19 should shape the strategies used.

38

39 **Introduction**

40

41 Effective contact tracing is now central to the strategy to enable the UK to continue
42 economic and social activities in the face of SARS-CoV-2 transmission and COVID-19
43 disease. The development and approval in the UK of effective vaccines that use different
44 approaches to generate protective immune responses raises hope for control of the
45 pandemic. However, until these vaccines are rolled-out to the country as a whole, contact
46 tracing and prompt isolation of potentially infectious individuals may be the best way to avoid
47 stringent curbs on normal life - particularly as the economic consequences of restrictions
48 bite, and if public and political support wanes. Although the development of effective
49 vaccines for SARS-CoV-2 raises hope that the pandemic can be controlled, it is unlikely that
50 immunisation will lead to disease eradication in the short-medium term and contact tracing
51 will remain a key component of infection control. Furthermore, the rapid spread of a new
52 B1.1.7 SARS CoV-2 variant in the UK, which from first detection in September 2020 has
53 circulated widely three months' later,¹ and has driven a second-wave of infection starting in
54 the South of England, demonstrates the importance of maintaining robust public health
55 systems to control viral transmission.

56

57 Contact tracing is routinely used in the management of some infections transmitted from
58 person to person where mechanisms exist to identify infected contacts and there are
59 interventions to reduce onward transmission. This has been a successful control strategy in
60 conditions as diverse as hepatitis C and tuberculosis (TB).^{2,3} Can lessons learnt from these
61 diseases apply to COVID-19? Here, using the examples of the approaches used in sexually
62 transmitted infections (STIs) and TB we highlight what may help control COVID-19.

63

64 **Sexual Health Services**

65

66 Sexual Health services utilise the skills of doctors, specialist nurses and health advisors to
67 ensure that contact tracing is undertaken for all common STIs, and HIV infection. Depending
68 on patient preference, it can be anonymous and use physical contact slips, or texting/e-mail
69 via systems such as SXT.org.uk. Clinicians have been creative with how this is provided,
70 employing social media and geo-locational dating apps as a means of contact. Given the
71 stigma around sexual infections and HIV, health care professionals ensure that clear
72 information and careful explanation are provided to the potentially infected contact to stop
73 further onward transmission with minimal distress.

74

75 Whilst Sexual Health services have had considerable success in reducing STIs generally,
76 there remain higher rates of infection in specific populations, such as Black Caribbeans,
77 which underlines the challenges in reaching those who may be at greatest risk.⁴ Conversely,
78 Hepatitis C infection has been reduced through an effective micro-elimination strategy in HIV
79 positive men who have sex with men, and in those with less access to care such as the
80 homeless and people with substance dependence problems.²

81

82 **Tuberculosis**

83

84 In TB services, contact tracing utilises a network of highly experienced specialist nurses and
85 support workers. Household contacts of cases of pulmonary or laryngeal TB are contacted,
86 asked about symptoms of TB disease, and offered testing for latent TB infection. Extended
87 testing and tracing (for instance in schools or workplaces) may be undertaken where there is
88 concern about possible transmission. This is achieved by a multidisciplinary team including
89 specialist nurses, doctors, public health officials and community support workers. The
90 identification and testing of contacts relies on the personal relationship and trust that TB
91 service users have in these individuals - an essential requirement where people may feel
92 that their medical details could be disclosed to others to benefit public health. Case
93 management and contact tracing is overseen by a system of "cohort review" (involving
94 Public Health and TB services) of all cases of TB disease and their possibly-infected
95 contacts. This allows regular, open evaluation of its effectiveness, and opportunities for
96 national improvement and uptake. Experienced health professionals work closely with a
97 specialist laboratory network to utilise mycobacterial whole-genome sequencing (WGS) to
98 help identify chains of transmission (identified by closely related TB isolates) using detailed
99 molecular epidemiology.⁵ Similar approaches have yielded important information on
100 outbreak clusters and routes of transmission for SARS-CoV-2.^{6,7}

101

102 **How does SARS-CoV-2 differ from other infections where contact tracing is used, and**
103 **why does this matter?**

104

105 Similarities and differences exist between SARS-CoV-2 and other infections (Table).
106 Disease natural history determines the speed of the response required to prevent on-going
107 transmission. For TB and some sexually transmitted infections including syphilis and blood-
108 borne viruses such as Hepatitis C, there is a relatively long timeframe (often weeks to
109 months) between infection acquisition and risk of transmission to others through disease
110 onset. This provides greater opportunity for contact tracing and intervention.⁸ However, as
111 individuals can transmit SARS-CoV-2 when asymptomatic,⁹ effective contact tracing must be
112 performed promptly to avoid a much larger network of potentially secondarily-infected
113 contacts at risk of COVID-19 needing identification and assessment. The increased
114 transmissibility of the B.1.1.7 SARS CoV-2 variant in the UK has raised the bar further for
115 contact tracing services who now encounter large numbers of individuals infected from a
116 single source – all of whom need their own management and assessment for secondary
117 cases.

118

119 It is also worth considering what constitutes a “contact”? Sexual contact is usually easily
120 defined, but a century or more of research is still trying to determine how much exposure to
121 TB disease is required to make contact tracing of value.¹⁰ For SARS-CoV-2 the length and
122 type of contact necessary for transmission is even less certain, although evidence from other
123 airborne viruses such as influenza may be informative.¹¹ What is clear is that exposure can
124 be brief, such that a general definition of a contact is someone who has spent more than 15
125 minutes at a distance of less than 2 metres from a case of COVID-19.¹²

126

127 **Contact tracing for SARS-CoV-2**

128

129 The aim of contact tracing is to identify social and household contacts exposed to, and
130 possibly infected with, SARS-CoV-2, and get them to self-isolate. The success of systematic
131 contact tracing as part of the response to SARS in 2003 encouraged its use in managing
132 COVID-19.¹³ It has been incorporated within several countries’ national public health
133 strategies who achieved prompt SARS-CoV-2 outbreak control, including Singapore, Taiwan
134 and Vietnam.¹⁴⁻¹⁶

135

136 What about the UK? After a 10 week pause when the country was in the first national
137 lockdown, contact tracing re-commenced on the 28th May 2020 to be delivered by a large,
138 new workforce, with considerable private sector input, in particular in England. This was

139 initially set up to operate separately from existing NHS and Local Authority systems.¹⁷ The
140 procedure is as follows: if someone tests positive for SARS-CoV-2, they are asked to share
141 details of their close contacts, who are then instructed to self-isolate. This is performed
142 mainly by telephone and conducted by staff not necessarily clinically-trained.

143

144 The challenges facing the NHS Test and Trace Service are significant: firstly, most cases of
145 COVID-19 are not coming to the attention of the healthcare system at all, as highlighted by
146 the discrepancy between the estimated number of cases from the population-based ONS
147 survey and reported numbers of cases from Test and Trace, for instance for the week
148 between 15-21st November,¹⁸ ONS estimated that there were 633,000 cases in England,
149 whereas only 152,660 cases were reported by Test and Trace for the similar period of 12-
150 18th November 2020.¹⁹ Once cases of COVID-19 are identified and details transferred for
151 contact tracing there are also significant losses – in the week of 12-18th November only 85%
152 of individuals with COVID-19 referred to Test and Trace were contacted, and of the contacts
153 identified 60% were then reached and instructed to self-isolate.¹⁵ This compares poorly with,
154 for instance, contact tracing for TB, where 91% assessed for contact tracing in London at
155 least one contact, 86% of whom were then evaluated for active or latent TB.³ Evidence
156 provided to the government’s SAGE committee in September described the impact of
157 contact tracing on the transmission of COVID-19 as “marginal”.²¹

158

159 The National Audit Office report that reviewed the English NHS Test and Trace Service up to
160 October 2020 concluded that the Government had achieved an admirable scale-up of tracing
161 capacity over a short time, though it had not reached its stated aim of providing results within
162 24 hours for tests carried out in person in the community (Pillar 2 tests). There was a lack of
163 a clear strategy to enable local and national tracing teams to work together effectively; and
164 the basis for its delivery model was unclear, with a risk of limited accountability and poor
165 value for money.²¹ The report is the first of two, with the second one (due in spring 2021)
166 providing a more detailed economic assessment of the service.

167

168 As, unlike TB or some Sexually Transmitted infections, there is no current treatment that can
169 prevent COVID-19 disease after exposure, effective self-isolation is essential to avoid the
170 risk of onward transmission. How likely are people to adhere to instructions to do this?
171 Particularly if they do not perceive themselves to be at risk (even when they have
172 symptoms), or feel well, or face threats to their employment if made to stop work? The
173 answer seems to be not much – a recent study by King’s College London suggests that less
174 than 11% of people asked to quarantine following being alerted as a contact of a confirmed
175 COVID-19 case complied with the request.²² Much of this is believed to result from many

176 feeling that they cannot afford to stay at home and not work. To mitigate the financial impact
177 the Government has introduced a payment scheme for people who need to self-isolate and
178 can't work from home.²³ Apart from the instruction to self-isolate, contact tracing for SARS-
179 CoV-2 does not provide practical assistance, such as ensuring that essentials such as food
180 are considered and supported.

181

182 **Issues with SARS-CoV-2 contact tracing in the UK**

183

184 To be successful the UK strategy requires both public trust and widespread acceptance.
185 This will be more easily achieved if built on existing experience. An important, early issue
186 with the Test and Trace strategy in England was the poor linkage of laboratories testing for
187 SARS-CoV-2 to local NHS services and Local Authorities. During an outbreak of cases in
188 Leicester in June 2020 it became clear that “Pillar 2” data – from commercial laboratories
189 processing drive-through tests and home testing of the general public – was not being
190 released to Local Authorities. The upsurge in numbers was only apparent some time later
191 once these data were reviewed. Earlier identification of a local increase in cases could have
192 avoided the “return to lockdown” that was then put in place. Once recognised, attempts
193 have been made to improve the communication between the Test and Trace service and
194 local health protection teams.²⁴ How this will work when mass population testing using rapid
195 antigen assays is rolled out nationally remains to be seen.²⁵

196

197 **Is technology the answer?**

198 The work involved in running a national contact tracing service is considerable. Technology,
199 seen as crucial to the success of a co-ordinated strategy, is being actively pursued by many
200 countries. In the UK a smartphone app has been introduced. This is less ambitious than that
201 originally proposed; and has been reported to have been downloaded 19 million times
202 (although this is estimated to equate to only 40% of smartphone users).²⁶ For new
203 technology to be effective high population uptake is needed – yet many individuals might
204 prefer human interaction to impersonal instructions from a computer app when it comes to
205 their healthcare decisions.

206 The reliance on technology could be problematic also as people most at risk of COVID-19 –
207 elders, those with comorbidities, ethnic minorities, and economically disadvantaged
208 communities – may be least able to access the technology. Such groups can also have
209 concerns about information held in a national database, with significant private-sector input.
210 Data protection issues that arise from contact tracing have already been raised by the

211 Information Commissioners Office. This has been a problem in other countries such as
212 Korea, where privacy concerns were highlighted, particularly for the LGBT community, by
213 tracing and testing of attendees of night clubs in Seoul following a cluster of cases.

214 Given that Black and ethnic minority populations are at greater risk from COVID-19 disease,
215 it is imperative that contact tracing also involves culturally-sensitive strategies to ensure that
216 it does not become a further barrier to care, and so exacerbate existing health inequalities.

217

218 **Conclusion**

219

220 The rapid creation of a national contact tracing system for SARS-CoV-2 is to be applauded.
221 In the UK, its performance can be expected to improve further as experience grows and
222 capacity increases. Useful lessons can be drawn from other infectious diseases: a contact
223 tracing system that is better integrated with other services, including health and social care
224 (particularly primary care), and effectively utilises established public health services and
225 Local Authorities would be more responsive to the needs of local populations. It would also
226 be able to offer the user more value from being contact traced than just being instructed to
227 self-isolate. This could include providing relevant local information, messaging and support
228 (things that appear to improve adherence to self-isolation for COVID-19). The data collected
229 needs to be rapidly available to local teams, and the capacity must exist to ensure that
230 people most at risk of COVID-19 are both suitably informed and adequately protected.

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233 **KEY POINTS**

- 234 • **Tracing contacts of cases of COVID-19 is key to on-going control**
- 235 • **Significant experience exists within healthcare services of contact tracing for**
- 236 **infectious diseases**
- 237 • **The natural history of COVID-19 requires specific approaches to contact**
- 238 **tracing**
- 239 • **The sheer scale of the problem suggests that without effective technology-**
- 240 **support the UK approach may not succeed**

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Table: COVID-19, Sexually Transmitted Infections and Tuberculosis, and the approach to UK contact tracing

	Covid-19	Sexually Transmitted Infections	Tuberculosis
Biology of disease	Short incubation, rapid spread, little latency between infection and disease. Most infected individuals get symptomatic disease, asymptomatic individuals can be infectious.	Varied biology with different infections. Most transmission by symptomatic individuals, but high infectivity may be early in disease with minimal symptoms (e.g. primary HIV infection and seroconversion)	Most exposed individuals are not infected; most infected individuals do not get symptomatic disease.
Knowledge of disease and control measures	Novel pathogen, rapidly evolving understanding of pathology and treatment options	Conditions well understood, multiple methods of prevention and treatment generally available	Long history of research into disease, transmission and treatments
Mechanism of spread	Short exposure for infection (minutes). Believed to be primarily droplet spread, although role of airborne transmission and contaminated surfaces unclear	Sexual contact	Primarily aerosol. Prolonged (>8 hours) contact required for transmission.
Interventions to prevent transmission	Contact tracing with isolation reduces onward transmission. No specific treatment available to prevent onward transmission	Identification of cases can allow preventative measures (e.g. condoms) Treatment of conditions prevents onward transmission (e.g. use of antiretroviral therapy for HIV)	Contact tracing detects incident disease, & latent (asymptomatic) infection Treatment of TB disease and latent TB cures or prevents disease, and reduces further transmission
Contact tracing approach	Contact tracing by large workforce (but mostly with less specialist skill-set) largely independent of NHS public health services	Anonymous tracing often used, national electronic system within NHS	Person-to-person, networks of skilled professionals within NHS

Infrastructure	Newly created structure with significant private sector input	Sexual health services part of health system, although with sensitive data not shared with other health systems	Built within NHS networks
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