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Evidence considering quarantining and test arrangements

This paper has been informed by a conversation with Nick Gent, from PHE. This paper does not make recommendations for policy. It provides evidence available and positives and negatives of options. Risk appetite will dictate policy options and recommendations.

COVID-19 risks assessment is based on four major factors:

1. Increased risk of transmission of the infection
2. Increased risk of infection leading to severe infection;
3. Increased risk of death from severe illness
4. Increased complications amongst those who survive the pandemic

This paper is concerned with the risk of transmission from incoming arrivals to St Helena. This follows on from the existing 'St Helena Covid 19 Suppression Strategy – Principles, Practice, And Resourcing' paper dated May 2020 and the 'St Helena – First steps in returning to normality and new arrival arrangements' paper and 'Annex A: Long-term options for discussion paper' dated June 2020.

For other components of the risk picture, the COVID-19 Strategy should be referred to. This Strategy is concerned with risk reduction should the virus present itself in St Helena; therefore risk of transmission in the community, risk of infection, risk of death and increased complications amongst those who survive the pandemic.

This paper assesses risk and options related to quarantine and test arrangements. Already there has been published a statistics bulletin which outlines the case prevalence of countries worldwide, which can be used to assess the risk of passengers on a case by case basis. Gold Standard Countries are ones in which there are no COVID-19 cases (as of the last 14 days), and green, amber and red category countries are considered low, medium and high risk respectively.

Once persons arrive on St Helena, it is important to reduce the risk of any transmission if they are a COVID-19 carrier. We can categorise objectives related to quarantine and test arrangements throughout this document:

1. Reassurance
   An activity may provide assurance that a person who has a negligible chance of being COVID-19 free, is indeed COVID-19 free.
2. Risk Reduction
   An activity which reduces the risk of someone who has a chance of having COVID-19 from infecting other persons.

Reassurance Options for passengers from Gold Standard Countries

It is important that before designating any 'air bridges' between St Helena and COVID-19 free countries, the health directorate is comfortable with the data and procedures undertaken by the country so that when they report no cases, there is certainty that that report is robust. And that if there is a reported case, there are procedures in place so that it doesn't become an outbreak.

Persons from a COVID-19 free country (Gold Standard) could ultimately be seen as having 'quarantined before entry' for the period of time that the country has been COVID-19 free and the person has been present in the country. For example, a person having spent more than 14 days in a jurisdiction which has no cases of COVID-19 and a robust risk mitigation policy (quarantine/testing requirements), is seen to be of negligible risk of being infectious of COVID-19.

Persons arriving from what appears to be a zero risk country could ultimately enter St Helena without a testing requirement, as scientifically there is no requirement to reduce risk of infection if a person has negligible chance of being infectious.

However, it may be more comfortable for the public and politicians to include an additional measure to reassure them that the person is indeed at no risk of being infectious.

Potential options include:

1. No test on arrival
2. Test 3 days before departure.
3. Test on arrival.
4. Quarantine at home is necessary for 5 days followed by a clear test.
5. Quarantine at home is necessary for 5 days followed by a clear test, then the person must wear a mask and social distance for the next 9 days.

Note that a longer quarantine requirement or quarantine at Bradley's requirement was not shortlisted due to the obvious outweighing weaknesses including:

- Taking spaces in Bradley's Camp from persons who may be contagious (the facility is limited to 39 rooms on the quarantine side or up to 47 residents).
- Waste of SHG resources quarantining, monitoring and providing for persons who are not at risk of having COVID-19. For example, if Bradley's has 40 people therein for 14 nights this costs around £28,000 or £700 per person.
- Potential reputational, health and liability risk of mixing persons who are not at risk of having COVID-19 and persons who are at risk of having COVID-19 where people within the camp do not follow procedure.
- Mental health implications from persons quarantining for long periods.
- SHG significantly restricting tourism, particularly during the Christmas period.
- PR issues of risk free arrivals not following the rules.
- Negative opinion of SHG by residents from Gold Standard countries.

Also note that if a country is no longer designated as a Gold Standard country, a change in risk reduction process is likely to follow. Please see further below in this note for Risk Reduction Options for passengers from red, amber and green category countries.

The strength and weaknesses of the options are perceived as follows.

Option	Strengths	Weaknesses	Opportunity	Threats
1. No test on arrival	This option allows maximum flexibility for travellers to re-establish family ties, business activities and the tourist industry Least use of resources Least inconvenience and cost to passenger	Whilst scientifically robust approach, public might want 'just in case' assurance. Health team must be satisfied with country risk reduction methodologies. Would apply to persons having spent at least 14 days in COVID-19 free country.	Potential of tourism between COVID-19 free destinations.	Arrangement must be changed immediately if cases confirmed in departure country. Risk of transference from crew on transport, unless crew are assured COVID-19 free
2. Test 3 days before departure.	Gives public 'just in case' reassurance. Pre-empts announcement of outbreak in departure country during or shortly after passenger arrival.	Scientifically there is no requirement to reduce risk of infection if a person has negligible chance of being infectious: Resources in country used on persons with no suspected infection (i.e. tests, staff time)	Potential of tourism between COVID-19 free destinations.	Arrangement must be changed immediately if cases confirmed in departure country. Risk of transference from crew on transport, unless crew are assured COVID-19 free
3. Test on arrival.	Gives public 'just in case' reassurance.	Scientifically there is no requirement to reduce risk of infection if a person has negligible chance of being infectious: Resources in St Helena used on persons with no suspected infection (i.e. tests, staff time). Arrivals must wait until tests are processed or returned – long wait in airport.	Potential of tourism between COVID-19 free destinations.	Arrangement must be changed immediately if cases confirmed in departure country. Risk of transference from crew on transport, unless crew are assured COVID-19 free
4. Quarantine at home is necessary for 5 days followed by a clear test.	Gives public 'just in case' reassurance. Allows for time frame to ensure that no outbreak had occurred in country at the time of departure.	Scientifically there is no requirement to reduce risk of infection if a person has negligible chance of being infectious: Waste of SHG resources transporting and monitoring persons who are not at risk of having COVID-19. Resources to sign off properties for quarantine.	Rental properties could be in demand as an alternative to Bradley's Camp.	Hope of tourism between COVID-19 free destinations unlikely – requiring ongoing subsidy to businesses currently costing £30k per quarter with the potential of some tourism businesses closing. Non-compliance by tourists creating a PR issue
5. Quarantine at home is necessary for 5 days followed by a clear test, then the person must wear a mask and social distance for the next 9 days.	Gives public 'just in case' reassurance. Allows for time frame to ensure that no outbreak had occurred in country at the time of departure.	Scientifically there is no requirement to reduce risk of infection if a person has negligible chance of being infectious: Waste of SHG resources transporting and monitoring persons who are not at risk of having COVID-19. Resources to sign off properties for quarantine.	Rental properties could be in demand as an alternative to Bradley's Camp.	Hope of tourism between COVID-19 free destinations unlikely – requiring ongoing subsidy to businesses currently costing £30k per quarter with the potential of some tourism businesses closing. Non-compliance by tourists creating a PR issue

Risk Reduction Options for passengers from red, amber and green category countries

Quarantine and testing methods can be used for passengers arriving who have a risk of being infectious with COVID-19.

Information was provided from PHE regarding different testing strategies including spacing of tests and number of days quarantine. This information is provided later within this document.

Potential options considered in this paper include:

1. No quarantine.
2. Agree that person is tested 3 days before departure, on arrival and quarantine at home is necessary until a test after 48 hours of arrival.
3. Agree that person quarantines for 7 days with a test at day 5-6.
4. Agree that person quarantines for 10 days with a test at day 8-9.
5. Agree that quarantine at Bradley's Camp is necessary for 14 days.
6. Agree that quarantine at home is necessary for 14 days.
7. Agree that persons should not be allowed entry.

The no quarantine option would present too high of a risk for St Helena, and should only be considered for passengers from red, amber and green category countries once worldwide prevalence rates have dropped lower. This is because this option does not contribute to reducing risk of infection on St Helena. In addition, while other nations are 6 months into the pandemic, St Helena is currently Covid-19 free, so infection would be the start of the local epidemic with no underlying immunity.

The studies currently show that:

- the quarantine of 7 days with a second test at day 5-6 is estimated to provide 85% accuracy rate[1].
- the quarantine of 10 days with a second test at day 8-9 is estimated to provide 96% accuracy rate[2].
- The strategy of testing 3 days in advance, and test after 48 hours of arrival is estimated to provide 90% accuracy rate[3].
- There is no evidence that there is 'live virus' after 14 days - even if PCR tests are positive. So a 14-day PCR test impact on risk reduction is minimal - if used it is only a reassurance measure[4].

These risk reduction rates should be considered in tandem with the risk of a person being infectious with COVID-19. For example, someone arriving from the UK, if the UK had a per capita infection probability of 0.02% would mean that:

- Quarantine of 7 days with a test after 48 hours of arrival and again at day 5-6 is estimated to reduce the probability of infection to 0.005% in this example
- Quarantine of 3 days with testing 3 days in advance, on arrival and again after 48 hours of arrival is estimated to reduce the probability of infection to 0.002% in this example.
- Quarantine of 10 days with a test after 48 hours of arrival and again at day 8-9 is estimated to reduce the probability of infection to 0.0008% in this example.

Nick Gent seemed to favour shortened time in quarantine if coupled with testing.

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/909382/s0544-phe-double-testing-travellers-170620-sage-42.pdf
[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/909382/s0544-phe-double-testing-travellers-170620-sage-42.pdf
[3] Information provided by Nick Gent.
[4] Information provided by Nick Gent, PHE.

Option	Strengths	Weaknesses	Opportunity	Threats
1. No quarantine. No test.	This option allows maximum flexibility for travellers to re-establish family ties, business activities and the tourist industry Least use of resources Least inconvenience and cost to passenger.	Does not reduce risk. Politically not acceptable at this stage. 'Not an option'.	Could be used for passengers from 'Green Countries' when prevalence reduces significantly. Health Directorate is now equipped to deal with an outbreak of COVID-19 and has separate quarantine and medical facilities already established, which would help to mitigate the risk. Significant cost reductions at Bradley's – up to £32k per rotation. Better possibility of not losing out on 2021-22 cruise ship season if implemented by then. (2020-21 already cancelled).	Highest risk of COVID-19 arriving in St Helena and becoming infectious in the community.
2. Allow visitors to enter St Helena following a negative COVID-19 test result on arrival.	7% risk reduction. [Should be considered against risk of arrival being contagious] This option allows maximum flexibility for travellers to re-establish family ties, business activities and the tourist industry Low use of resources Least inconvenience and cost to passenger. Significant cost reductions at Bradley's – up to £32k per rotation. Furthermore, ability to reduce cost of UK – St Helena charter flight due to ability to increase to up around 100 passengers – up to £70,000 saving per flight rotation.	Doubt in the minds of some people that COVID-19 could still develop following a negative test result.	Health Directorate is now equipped to deal with an outbreak of COVID-19 and has separate quarantine and medical facilities already established, which should help to mitigate the risk. Contact tracing, lockdown and hygiene measures will mitigate transmission in the community. St Helena would be able to promote itself as a COVID-19 free destination, which will be highly attractive to the international travel market coming out of COVID-19. Better possibility of not losing out on 2020-22 Scuba Diving season if implemented by then. Better possibility of not losing out on 2021-22 yacht season if implemented by then. (2020-21 already cancelled).	Some risk of COVID-19 arriving in St Helena and becoming infectious in the community.
3. Agree that person is tested 3 days before departure, and quarantine at	90% risk reduction. [Should be considered against risk of arrival being contagious]	Resources in country used (i.e. tests, staff time) Resources in St Helena used for 2 days per	Could have weekly planes if necessary.	No option except '8.Agree that persons should not be allowed entry' will remove all risk of infection. Infections would need to be contained as per contact tracing strategy.

Option	Strengths	Weaknesses	Opportunity	Threats
home is necessary until a clear test after 48 hours of arrival.	Increases the amount of time travellers are able to spend out of self-isolation. Reduces negative media coverage of those visiting family and friends.	transport arriving (i.e. tests, staff time, monitoring, provisions)	Tourism could be possible under this scenario, although small numbers expected. If quarantining is undertaken at home, there would be less demand on Bradley's (Significant cost reductions at Bradley's – up to £32k per rotation – planes can increase capacity – provides assurance to persons going off island that return is not limited by capacity at Bradley's (which is 39 rooms)– allows flight to break even, and save up to £70,000 per flight rotation. St Helena would be able to promote itself as a COVID-19 free destination, which will be highly attractive to the international travel market coming out of COVID-19.	If someone tests positive 72 hours before the flight they would be unable to travel until the next flight - the cost of changing flights or getting refunds for pre-booked activities/accommodation is problematic, since some travel insurance isn't covering COVID-19 presently.
4. Agree that person quarantines for 7 days with a test after 48 hours of arrival and again at day 5-6.	85% risk reduction. [Should be considered against risk of arrival being contagious] This option allows visitors to spend time with family whilst quarantining (if home quarantine).	Resources in St Helena used for 7 days per transport arriving (i.e. tests, staff time, monitoring, provisions). If quarantine is undertaken in Bradley's, there are significant costs, estimated at £16,000 for 7 days for 47 people. Contributions from residents are £30 per day or £60 per day Quarantine will discourage tourists, as they often come only for 7-14 days	Could have planes every 2 weeks if necessary. If quarantining is undertaken at home, there would be less demand on Bradley's (which is 39 rooms or 47 residents)– planes can increase capacity – provides assurance to persons going off island they can return – allows flight to break even and save up to £70,000 per flight rotation.	No option except '8.Agree that persons should not be allowed entry' will remove all risk of infection. Infections would need to be contained as per contact tracing strategy. Return of the weekly Airlink flight is not possible – potential contractual costs. Hope of tourism unlikely – requiring ongoing subsidy to businesses currently costing £30k per month. SHG will not be able to financially support local businesses for a long period of time. Likely losses in the island's tourism industry. If at Bradley's it will be difficult to restart SA Airlink route to South Africa at the same time as flights to UK due to limitations of space at Bradleys – this could have contractual implications.
5. Agree that person quarantines for 10 days with a test after 48 hours of arrival and again at day 8-9.	96% risk reduction. [Should be considered against risk of arrival being contagious] This option allows visitors to spend time	Resources in St Helena used for 10 days per transport arriving (i.e. tests, staff time, monitoring, provisions).	Could have planes every 2 weeks if necessary. If quarantining is undertaken at home, there would be less demand on Bradley's (which is 39 rooms or 47 residents)– planes can increase	No option except '8.Agree that persons should not be allowed entry' will remove all risk of infection. Infections would need to be contained as per contact tracing strategy. Return of the weekly Airlink flight is not possible – potential contractual costs.

Option	Strengths	Weaknesses	Opportunity	Threats
	with family whilst quarantining (if home quarantine).	If quarantine is undertaken in Bradley's, there are significant costs, estimated at £23,000 for 10 days for 47 people. Contributions from residents are £10-£40 per day. Quarantine will discourage tourists, as they often come only for 7-14 days	capacity – provides assurance to persons going off island they can return – allows flight to break even and save up to £70,000 per flight rotation.	Hope of tourism unlikely – requiring ongoing subsidy to businesses currently costing £30k per month. SHG will not be able to financially support local businesses for a long period of time. Likely losses in the island's tourism industry. If at Bradley's it will be difficult to restart SA Airlink route to South Africa at the same time as flights to UK due to limitations of space at Bradleys – this could have contractual implications.
6. Agree that quarantine at Bradley's Camp is necessary for 7 days, followed by a further 7 days quarantine from home.	98% risk reduction. [Should be considered against risk of arrival being contagious] This option allows visitors to spend time with family for the second week whilst quarantining. If a case presents itself up to day 7, no travel needed to move to hospital facility in Bradleys.	Resources in St Helena used per transport arriving (i.e. tests, staff time, monitoring, provisions). Quarantine in Bradley's, has significant costs, estimated at £16,000 for 7 days for 47 people. Contributions from residents are £10-£40 per day. Still restricts numbers of arrivals to island to 47 adults– e.g. when Bradley's is used for plane arrivals it cannot be used for MV Helena. Plane does not break even and therefore costs SHG every 6 weeks. Resources for daily calls. Resources for proper officer to check quarantine location. Risk to children – mixing, unsafe play areas. Dissatisfaction of standards at Bradley's. Mental Health effects of quarantining in a small area at Bradley's.	Could have planes every 2 weeks if necessary. Continued employment of Bradley's Staff. Purchase of food from hospitality sector.	Transport between Bradley's and Home would need to be undergone as per the standard operating procedures regarding safe travel. No option except '8.Agree that persons should not be allowed entry' will remove all risk of infection. Infections would need to be contained as per contact tracing strategy. Return of the weekly Airlink flight is not possible – potential contractual costs. Hope of tourism unlikely – requiring ongoing subsidy to businesses currently costing £30k per month. SHG will not be able to financially support local businesses for a long period of time. The island's tourism industry will fold whilst waiting for the borders to open. Potential litigation risk from Bradley's Camp operations. If there were breaches, potential mixing with family during the second week, while they go about the island doing their daily business negates the point of second week of quarantine and could unleash the virus into the community. New arrivals would not be able to join households with other family members for the second week. Difficult to restart SA Airlink route to South Africa at the same time as flights to UK due to limitations of space at Bradleys – this could have contractual implications.

Option	Strengths	Weaknesses	Opportunity	Threats
		Risk of many employees choosing to leave the island and not returning because they are unable or choose not to. Quarantine will discourage tourists, as they often come only for 7-14 days		
7. Agree that quarantine at Bradley's Camp is necessary for 14 days.	98% risk reduction. [Should be considered against risk of arrival being contagious] Public like this option as it keeps risk away from conurbations. If a case presents itself, no travel needed to move to hospital facility in Bradleys. Policed and isolated quarantine station	Will continue to degrade more seriously the economy and tourism industry. Significant cost to SHG and to resident for provisions whilst in the Camp (utilities, food, staffing). For example, at maximum capacity, 47, cost is around £32,000 per rotation. Contributions from residents are £10-£40 per day. Restricts numbers of arrivals to island to 47 adults– e.g. when Bradley's is used for plane arrivals it cannot be used for MV Helena. Plane does not break even and therefore costs SHG around £70,000 per rotation every 6 weeks. Resources for daily calls. Risk to children – mixing, unsafe play areas. Dissatisfaction of standards. Mental Health effects of quarantining in a small area. Risk of many employees choosing to leave the island	Continued employment of Bradley's Staff. Purchase of food from hospitality sector. Online and phone ordering and delivery of groceries is commercial opportunity.	No option except '8.Agree that persons should not be allowed entry' will remove all risk of infection. Infections would need to be contained as per contact tracing strategy. No hope of tourism– requiring ongoing subsidy to businesses currently costing £30k per month. SHG will not be able to financially support local businesses for a long period of time. The island's tourism industry will fold whilst waiting for the borders to open. Potential litigation risk from Bradley's Camp operations. Infection of staff. Infection amongst residents of Bradley's leading to risk of overwhelming of health facilities. Potential persons skipping of quarantine. Limiting the number of potential arrivals without limiting departures exacerbates existing issues around shrinking populations. Should there be a case in the community, there would be limited space at Bradley's to accommodate them should a vessel have arrived within the last 2 weeks. Difficult to restart SA Airlink route to South Africa at the same time as flights to UK due to limitations of space at Bradleys – this could have contractual implications.

Option	Strengths	Weaknesses	Opportunity	Threats
		and not returning because they are unable or choose not to. Quarantine will discourage tourists, as they often come only for 7-14 days		
8. Agree that quarantine at home is necessary for 14 days.	98% risk reduction. [Should be considered against risk of arrival being contagous] Reduction in significant cost to SHG and to resident for provisions whilst in the Camp (utilities, food, staffing).	Some public fear or rumour of skipping quarantine. Requirement of resources of proper officer to assess properties in advance. Resources for daily calls. Bradley's would need to be used for persons who do not have appropriate alternative location. For example, Bradley's costs for 8 persons including food and security not including staff costs is around £270. Quarantine will discourage tourists, as they often come only for 7-14 days	Online and phone ordering and delivery of groceries is commercial opportunity. Significant cost reductions at Bradley's – up to £32k per rotation.	No option except '8.Agree that persons should not be allowed entry' will remove all risk of infection. Infections would need to be contained as per contact tracing strategy. No hope of tourism– requiring ongoing subsidy to businesses currently costing £30k per month. SHG will not be able to financially support local businesses for a long period of time. The island's tourism industry will fold whilst waiting for the borders to open. Potential persons skipping of quarantine. In which case the integrity of the 98% risk reduction factor would be compromised.
9. Agree that persons should not be allowed entry.	100% risk reduction	Significant impacts to business continuity. Significant impacts to travel of medical referrals. Significant impacts to movement of residents.	Only way to remove risk completely. Subsidy for the airplane round trip is less or eliminated. No requirement to keep additional medical staff.	No hope of tourism– requiring ongoing subsidy to businesses currently costing £30k per month. SHG will not be able to financially support local businesses for a long period of time. The island's tourism industry will fold whilst waiting for the borders to open. No progression of major projects. No progression of investment and business projects. Risk of not being enabling – how would UK tax payers feel about subsidising this decision. Risk of many residents and employees choosing to leave the island.

A note on testing procedures

A UK derived 'Note on application of double testing to border controls for UKOTs' (July, 2020) states that 'Testing is additive to isolation and can effectively reduce the isolation time needed quite significantly to achieve good levels of protection. However, it must be noted that the performance of a single test is poor of its own. PHE modelling suggests that, provided travellers are fit when they begin their journey, then the following proportion of cases would be identified by 1 or 2 tests, with differing spacings of the two tests:'

Number Of Tests	Spacing Of Tests	% Capture Of Cases
1	n/a	7%
2	3 days	52%
2	4 days	66%
2	5 days	76%
2	8 days	93%
2	10 days	97%

A paper entitled 'Investigation into the effectiveness of "double testing" travellers incoming to the UK for signs of COVID-19 infection'[5] considers the effectiveness of requiring all incoming travellers to undergo two rounds of PCR type testing. One test at arrival at UK border and again some period (the time required to take, run and report a test) before ending of that person's quarantine.

The findings of the study were as follows:

- Requiring incoming travellers to self-isolate on arrival to the UK increases the detection rate of infected travellers compared to the base case.
- The longer incoming travellers are required to self-isolate, the higher the expected detection rate of infected travellers.
- There is a natural correlation between longer flight time and detection rate, however, this correlation becomes less pronounced as the period spent self-isolating increases.

Double testing success rates (averaged across flight times considered):

Double testing scenario	**Double testing success rate**
Base case (testing only on arrival)	0.07
Second test administered after 5 days isolation, before being isolated for a further 2 days (isolated for a total of 7 days)	0.85
Second test administered after 8 days isolation, before being isolated for a further 2 days (isolated for a total of 10 days)	0.96
Second test administered after 10 days isolation, before being isolated for a further 4 days (isolated for a total of 14 days)	0.98

A paper entitled 'Optimising the swab test regimen of contacts to minimise the risk of releasing falsely negative SARS-CoV-2 individuals from traveller quarantine or isolation following tracing' by Jewell et al[6] stated that a testing regimen requiring 3 successive negative tests on days 5, 6 and 7 following exposure (day 0) is necessary to reduce the risk of releasing an infected individual from isolation to below 5%. Should any test prove positive, or the individual develop symptoms, they should be considered infected, and isolation continued for the prescribed duration.

[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/909382/s0544-phe-double-testing-travellers-170620-sage-42.pdf

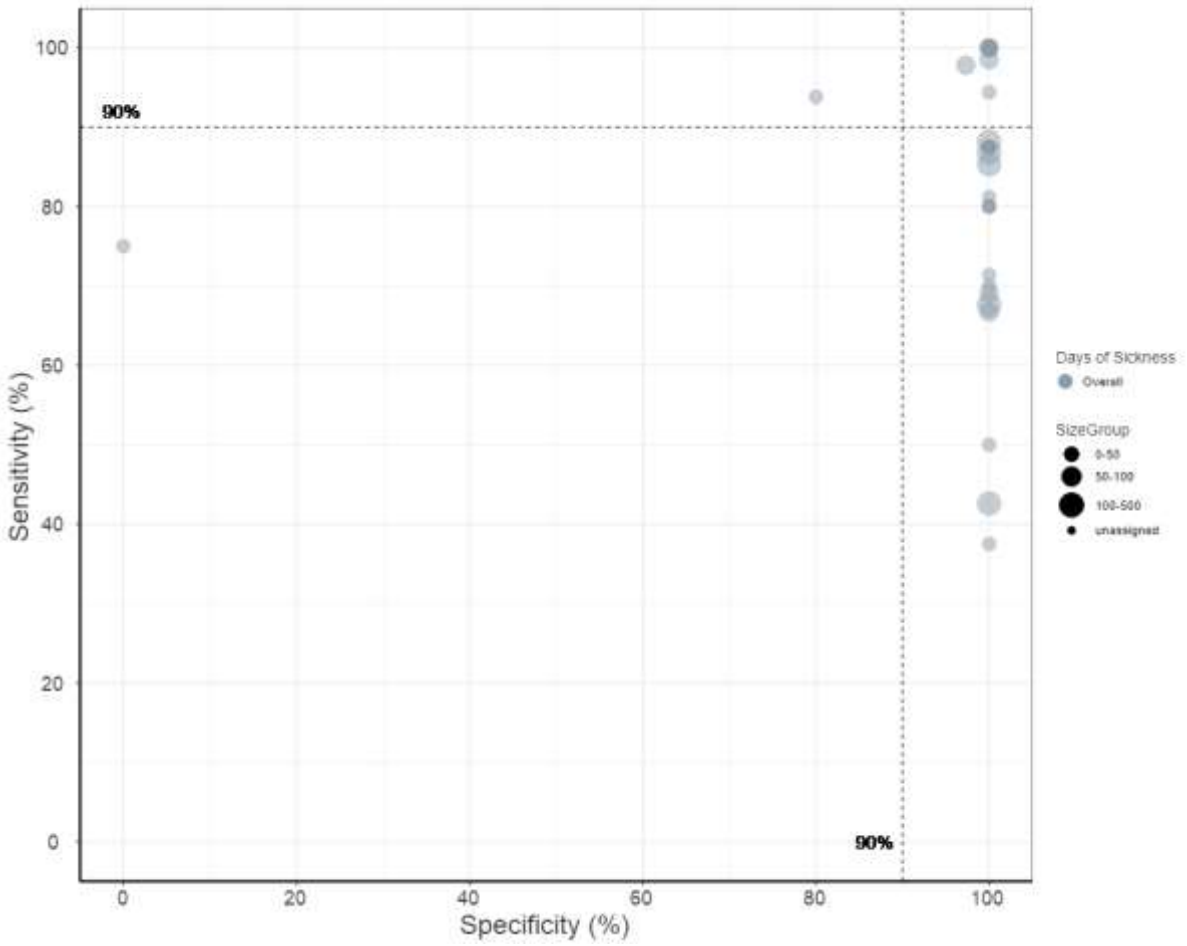
[6] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/901608/S0545_3c._Lancaster_-_Serial_testing_to_minimise_false_negatives__2_.pdf

For arriving infected passengers, it may be beneficial to delay testing by 1 or 2 days with the aim of optimising the delay to ensure testing begins on day 5 following exposure for the majority of infected passengers. Practically this may be difficult to achieve.

SHG Statistics has also created an excel spreadsheet 'C19_Probability_Calculator_Multi_Strategies' which allows the user to estimate the risk of COVID-19 transmission to the community based on the country of origin of arrivals and also the quarantine and test procedures used. This, however, is not publically available due to it containing data from a source which has requested such.

Currently SHG uses PCR tests using a nasopharyngeal swab.

Data is published from laboratories outlining the specificity and sensitivity of tests[7].



The chart shows results from all PCR tests using a nasopharyngeal swab.

SHG's microbiologist noted that as long as the technique is the same and sample collection is the same as used in St Helena, the should be comparable. The outliers do not correlate with the genesig primers that SHG uses. Filtering the data down there are two other labs using the genesig primers, however SHG use the QIAamp RNA for extraction. These two test results show a 100% Specificity and 100% Sensitivity. This means there were no false negatives or false positives tested. However, sample sizes for these tests are small and therefore on a larger scale we would expect errors.

[7] https://www.finddx.org/covid-19/dx-data/

Laboratory	Country	Reference Sample Type	Test	Manufacturer	RNA Extraction Kit	Sample Size	Total Positive	Total Negative	True Positive	True Negative	Sensitivity	Specificity
Microbiology Department, Basingstoke & North Hampshire Hospital	Great Britain	Nasopharyngeal swabs; Oropharyngeal swabs	genesig Real-Time PCR COVID-19	Novacyt/ primerdesign	PerkinElmer chemagic Prepito-D (NA Body Fluid kit; plasma protocol)	57	4	53	4	53	100	100
Institut Pasteur	France	Nasopharyngeal swabs	genesig Real-Time PCR COVID-19	Novacyt/ primerdesign	Extraction NucleoSpin Dx Virus (Réf. Macherey Nagel 740895.50)	9	8	1	8	1	100	100

Testing possibilities evolve. For example, rapid response tests allow for quick (e.g. 40 minute) results[8] which can be utilised at airports. However, the effectiveness of the test must be considered or double testing used where possible to ensure risk reduction is meaningful.

A note on options appraisal

This paper is an evidence paper and not an options analysis which provides a recommendation. Further options appraisal can be undertaken for this purpose.

Any preferred option should preserve the integrity of the Island's need to have external travel links, maintain family ties, encourage inward investment opportunities and assist the generation of income such as from tourism.

Attempts to maintain overly restrictive arrangements have been seen elsewhere to be undermined by fatigue in the society and impossible to maintain if an economy was so degraded that it was unable to support its essential public services or leads to a break down in public security.

As Christmas approaches, there may well be more calls from residents, on island and in the UK, to open up the island to allow visitors to spend time with their families and friends. There will be a need to find a workable solution that balances access to the island, the protection of the economy and public health considerations to allow people to make appropriate travel and personal arrangements.

With all of the options outlined above, there is an element of risk involved. Risks should be balanced against, on the one hand, the public health mitigation measures that could be implemented in the event of an outbreak to minimise its impact and, on the other hand, the financial and social implications of not re-opening the island (including mounting loss of revenue, loss of jobs, fewer businesses, inflationary impacts, and reduced ability to fund basic services).

A note on quarantine location

On quarantine camp vs home quarantine, there are risks present in both strategies and difference in terms of use of resources and risk of mixing.

Staff and residents need to be vigilant and follow procedure. The obvious risk to group quarantine is that it cannot be assured that the group will not mix, without enforcing to the extent that SHG risks complaints about human rights conditions, and mental health risk significantly increases. Therefore if one case did present itself in group quarantine (i.e. Bradley's Camp) there is a greater risk of infection amongst persons including those residing in the camp than there would be if isolation occurred in separate locations.

The obvious risk of home quarantine is that persons could not follow quarantine procedure e.g. leave the property. When home quarantine was trialled in March, there were rumours that people had skipped quarantine or had inappropriate contact with others. Reports from past Bradley's Camp residents was that it is also possible to leave Bradley's Camp, but the overriding reasons for not breaching quarantine requirements is to ensure that you don't put the population at risk, to avoid putting your own reputation at risk and also to avoid the fine. These motivations will exist at home as they would within the Camp. Law breaking is always possible and hard to fully mitigate against. Bradleys is not intended to be a prison and requires responsible compliance.

There is benefit to families quarantining alone with each other, due to the risk of children mixing.

Home-based quarantine needs same standards as centres i.e. if someone joined the household, then they also would need to quarantine. In both situations it is critical for food preparation, and hygiene facilities to be separate from other households.

There is concern about need for additional resources to monitor home-based quarantine. Whilst the daily phone calls would be required to monitor both groups – there would certainly be greater requirements on the proper officers to approve locations as suitable for quarantine.

[8] Example of a test being marketed to the air services industry https://travelsafeblog.com/

The WHO guidance should be used by the proper officer when assessing a location – risk assessment would be undertaken of the location to ensure contact between the quarantining party and others is not a cause for concern. Landline are required for monitoring.

There are also logistic/perception difficulties when trying to implement different strategies (i.e. centres vs home) for different risk groups which need to be overcome.

There are other issues which should be considered, such as mental health and wellbeing, productivity,

A note on transport / flights

Nick Gent, epidemiologist from Public Health England stated that risk of transmission from transport/flights as a potential point of weakness, but 'low risk as anything', especially for transport from other zero prevalence countries with appropriate protocols. Therefore reviewing protocols is important.

IATA states that the quality of air in modern aircraft is far better than most other enclosed environments. It is exchanged with fresh air every 2-3 minutes, whereas the air in most office buildings is exchanged 2-3 times per hour. Moreover, High Efficiency Particulate Air (HEPA) filters capture well over 99.999% of germs, including the Coronavirus. The cabin air flow is from ceiling to floor. This limits the potential spread of viruses or germs backwards or forwards in the cabin. There are several other natural barriers to the transmission of the virus on board, including the forward orientation of passengers (limiting face-to-face interaction), seatbacks that limit transmission from row-to-row, and the limited movement of passengers in the cabin. [9]

The IATA Guidance for Cabin Operations during and Post Pandemic[10] includes guidance on Health Precautions[11]. This for example, requires use of face coverings, gloves and other PPE as per a risk assessment for cabin crew. Titan, who is the company providing St Helena's charter flights from the UK, and between St Helena and Ascension, has processes for handling crew and passengers (e.g. crew are tested).

Furthermore, for airports, the ACI[12] provides information and guidance for airport operations, for example the ACI Aviation Business Restart and Recovery guidelines. These have been used to inform Standard Operating Procedures at St Helena Airport.

Prior to the IATA Guidance being issued, there were a number of studies undertaken to understand the risk of transmission in the airplane. These studies were undertaken when no one on board were taking precautions through use of PPE, and it is estimated that following correct procedures regarding cleanliness, use of PPE and social distancing assists in risk reduction significantly.

In the study 'Lack of COVID-19 transmission on an international flight' by Schwartz et al[13], the first Canadian cases of coronavirus disease 2019 was tracked when patients travelled from Wuhan to Guangzhou, then Guangzhou to Toronto, Canada, arriving on Jan. 22, 2020. The index patient was symptomatic with dry cough during the flight. His wife developed cough on Jan. 23. Both sets of throat and nasopharyngeal swabs collected were positive for COVID-19. There were approximately 350 passengers on board the airplane. The public was notified through the media that the index case was symptomatic during the 15-hour flight. Close contacts included 25 individuals sitting within 2m of the index case during the flight, flight crew members, and 1 close contact on arrival in Toronto. Close contacts received active daily contact monitoring by local public health officials for 14 days from the flight's arrival in Toronto. Passengers and crew members who were not from Ontario were referred to their home jurisdictions for follow-up. On Jan. 29, 1 close contact developed symptoms of cough; however, nasopharyngeal and throat

[9] https://www.iata.org/en/pressroom/pr/2020-07-07-01/
[10] https://www.iata.org/contentassets/df216feeb8bb4d52a3e16befe9671033/iata-guidance-cabin-operations-during-post-pandemic.pdf
[11] https://www.iata.org/contentassets/df216feeb8bb4d52a3e16befe9671033/iata-guidance-crew-health-precautions-during-post-pandemic.pdf
[12] https://aci.aero/about-aci/priorities/health/covid-19/
[13] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7162437/

swabs were negative for COVID-19. Non-close-contact passengers were advised to self-monitor and contact public health if they became symptomatic; 5 of these passengers became symptomatic, were tested and found by nasopharyngeal and throat swabs to be negative for COVID-19.

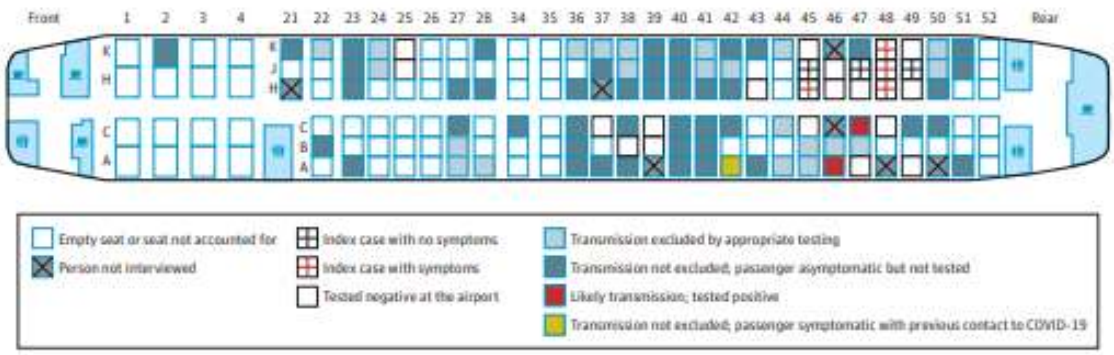
This study showed no transmission of cases of COVID-19 from the two positive cases on the flight, and that the lack of secondary cases after prolonged air travel exposure supports droplet transmission, not airborne, as the likely route of spread of the COVID-19.

Another study also took place prior to PPE being required on airplanes. 'Assessment of SARS-CoV-2 Transmission on an International Flight and Among a Tourist Group' by Hoehl et al[14] assessed a commercial airline flight from Tel Aviv, Israel, to Frankfurt, Germany, that occurred on March 9th, 2020. Among 102 passengers on a Boeing 737-900 aircraft were 24 members of a tourist group. Starting 7 days earlier, the group had contact with a hotel manager who later received a diagnosis of coronavirus disease 2019 (COVID-19). No member of the group had received a diagnosis of COVID-19 before the flight, and no measures to prevent transmission (e.g., wearing of masks) had been applied. The flight duration was 4 hours 40 minutes. Of the passengers not within the tourist group ("index case") two passengers tested positive for Covid-19.

It is not clear whether transmission occurred during the boarding process, on the flight, or through other means. The study states that the risk of transmission of droplet mediated infections on an aircraft depends on proximity to an index case and on other factors, such as movement of passengers and crew, fomites, and contact among passengers in the departure gate. In the study, both passengers with likely on board transmission were seated within 2 rows of an index case. The airflow in the cabin from the ceiling to the floor and from the front to the rear may have been positively associated with a reduced transmission rate. It could be speculated that the rate may have been reduced further had the passengers worn masks.

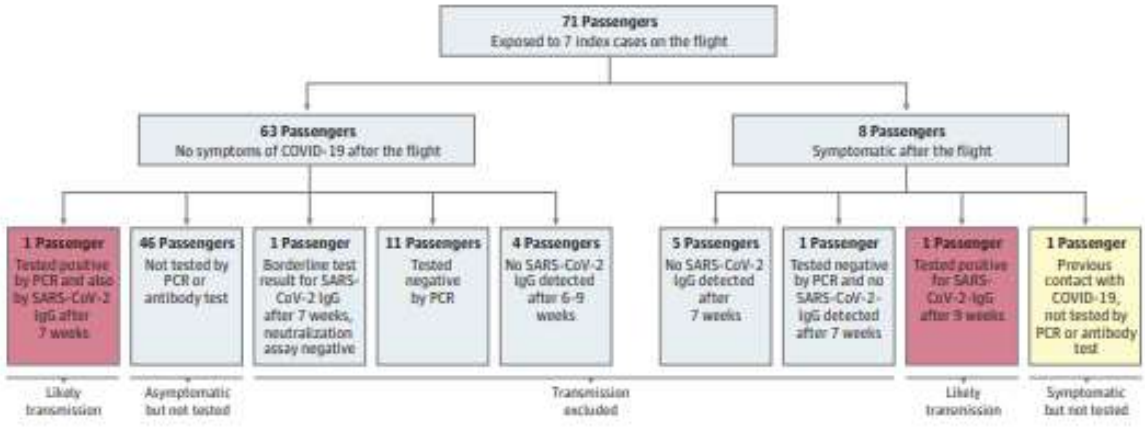
14 https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2769383?utm_source=For_The_Media&utm_medium=referral&utm_campaign=ftm_links&utm_term=081820

Figure 1. Seating of the Index Cases and Other Passengers on the Aircraft (Boeing 737-900)



COVID-19 indicates coronavirus disease 2019.

Figure 2. Flowchart of the Tests for Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) and of Symptoms of the 71 Passengers Who Were Interviewed



A further study 'Covid-19 Risk Among Airline Passengers: Should the Middle Seat Stay Empty?' by Barnett et al[15] estimated the probability that an air traveller in coach will contract Covid-19 on a US domestic flight two hours long, both when all coach seats are full and when all but middle seats are full. The point estimates based on data from late June 2020 are 1 in 4,300 for full flights and 1 in 7,700 when middle seats are kept empty. Under "middle seat empty," the risk is approximately a factor of 1.8 lower. These estimates are subject to both quantifiable and non-quantifiable sources of uncertainty, and sustain known margins of error of a factor about 2.5.

The CDC[16] summarises that air travel requires spending time in security lines and airport terminals, which can bring you in close contact with other people and frequently touched surfaces. Most viruses and other germs do not spread easily on flights because of how air circulates and is filtered on airplanes.

A note on Island Readiness for the Private Sector

WTTC issues a number of Global Protocols to support health and safety with regards to COVID-19 in business settings[17].

This includes 'Global Protocols for the New Normal' for Hospitality, Aviation, Airports, Tour Operators, Short Term Rental, Car Rental.

WTTC also provide certification through a Global Safety Stamp to Recognise Safe Travels Protocols.

A note on risk reduction through face coverings

The WHO states that droplet transmission occurs when a person is in close contact (within 1 metre) with an infected person and exposure to potentially infective respiratory droplets occurs, for example, through

[15] https://www.medrxiv.org/content/10.1101/2020.07.02.20143826v3.full.pdf
[16] https://www.cdc.gov/coronavirus/2019-ncov/travelers/travel-during-covid19.html
[17] https://wttc.org/COVID-19/Safe-Travels-Global-Protocols-Stamp

coughing, sneezing or very close personal contact resulting in the inoculation of entry portals such as the mouth, nose or eyes. Transmission of the COVID-19 virus can occur directly by contact with infected people, or indirectly by contact with surfaces in the immediate environment or with objects used on or by the infected person (e.g., stethoscope or thermometer).

According to the CDC, consistent and correct use of cloth face coverings will reduce the spread of SARS-CoV-2. For example, in a study, among 139 clients exposed to two symptomatic hair stylists with confirmed COVID-19 while both the stylists and the clients wore face masks, no symptomatic secondary cases were reported and all test results were negative.[18]

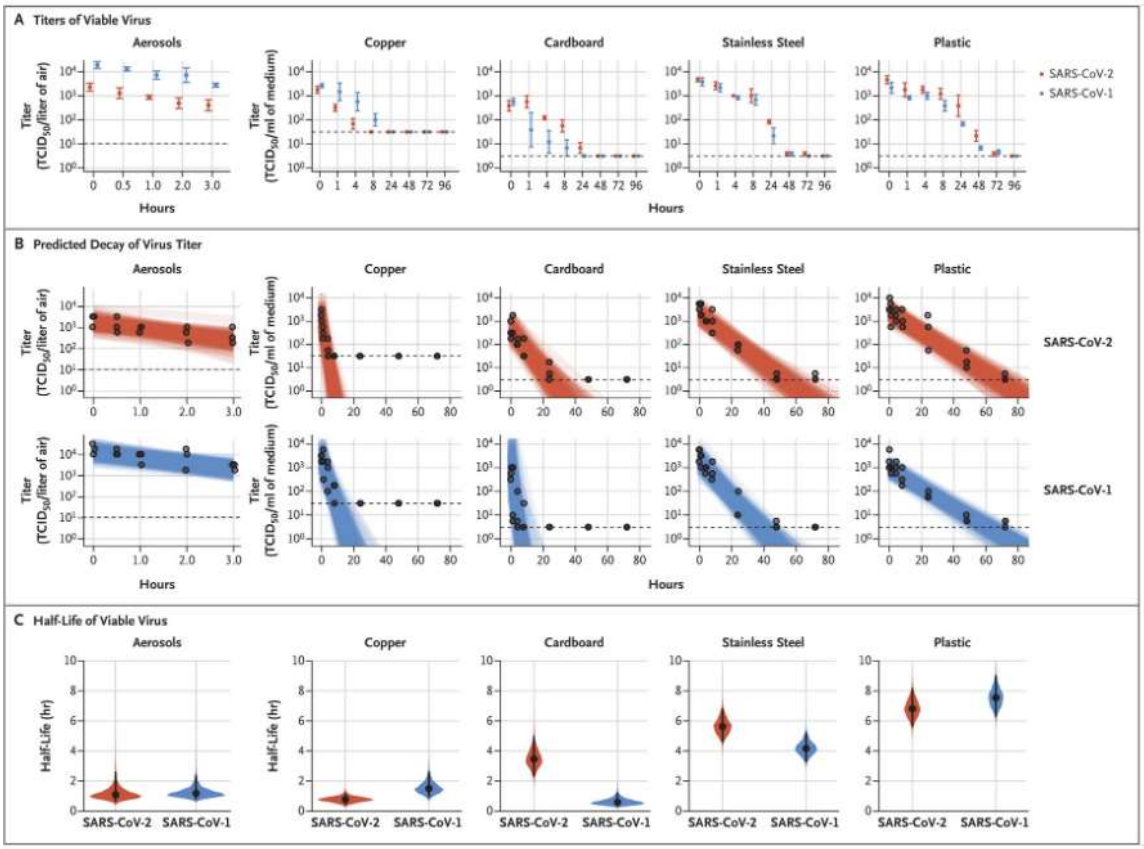
A note on transmission through surfaces

As published in the New England Journal of Medicine, the 'Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1' study by Munster et al[19] evaluated the stability of SARS-CoV-2 and SARS-CoV-1 in aerosols and on various surfaces (plastic, stainless steel, copper, and cardboard) and estimated their decay rates using a Bayesian regression model.

SARS-CoV-2 remained viable in aerosols throughout the duration of the experiment (3 hours), with a reduction in infectious titer from 103.5 to 102.7 TCID50 per litre of air. This reduction was similar to that observed with SARS-CoV-1, from 104.3 to 103.5 TCID50 per millilitre.

SARS-CoV-2 was more stable on plastic and stainless steel than on copper and cardboard, and viable virus was detected up to 72 hours after application to these surfaces, although the virus titer was greatly reduced (from 103.7 to 100.6 TCID50 per millilitre of medium after 72 hours on plastic and from 103.7 to 100.6 TCID50 per millilitre after 48 hours on stainless steel). The stability kinetics of SARS-CoV-1 were similar (from 103.4 to 100.7 TCID50 per millilitre after 72 hours on plastic and from 103.6 to 100.6 TCID50 per millilitre after 48 hours on stainless steel). On copper, no viable SARS-CoV-2 was measured after 4 hours and no viable SARS-CoV-1 was measured after 8 hours. On cardboard, no viable SARS-CoV-2 was measured after 24 hours and no viable SARS-CoV-1 was measured after 8 hours.

[18] https://www.cdc.gov/mmwr/volumes/69/wr/mm6928e2.htm
[19] https://www.nejm.org/doi/full/10.1056/nejmc2004973



'Evidence of Wider Environmental Transmission of SARS-CoV-2'[20] for SAGE is another study which outlines known risk of transmission through outdoor air, water and outdoor surfaces.

The study concludes the following:

- The highest risk of outdoor transmission is through aerosols and droplets when people are in prolonged close, **face-to-face contact within 2m**. This is likely to be lower than indoor settings but remains a risk especially in crowded areas, e.g.at major sporting events, festivals and public gatherings.
- **Beyond 2m**, risk is likely to progressively decrease.
- **By 10m**, risk of outdoor aerosol or droplet person-to-person transmission is Very Low with medium uncertainty.
- Based on current epidemiological evidence, the risk of **long-range (>10m) aerosol or droplet person-to-person transmission** outdoors is Negligible with low uncertainty, due largely to dispersion effects.
- The risk of acquiring virus from **infrequently touched outdoor surfaces** is Very Low to Negligible with medium uncertainty, particularly if surfaces are exposed to sunshine on a daily basis.
- **Surfaces that are frequent touch points** such as outer shop door handles, cash machines, outside shutters, door knockers and door bells are likely to be slightly higher risk, i.e. Low with medium uncertainty.
- Recent modelling of the **solar inactivation of SARS-CoV-2 on surfaces** indicates that the virus could remain infectious for long time periods when light levels are low. Modelling survival time in direct midday sunlight at the latitude of London showed that the time for 90% infectivity reduction is likely to be around 30 minutes in mid-summer but extended to 300 minutes in mid-winter (Sagripanti and Lytle 2020). The virucidal effect of UV may be halved on a cloudy day or in the shade (Ben-David and Sagripanti 2010; 2013).
- **Public toilets** represent a potential SARS-CoV-2 exposure point for a number of reasons. Thorough and frequent cleaning is likely to reduce risk, although this can be challenging in some

[20] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/899611/s0546-tweg-evidence-wider-environmental-transmission-200612.pdf

remote public toilets. Toilet users, cleaning staff and plumbers may also be exposed to contaminated surfaces or sewage. The level of risk is Medium with high uncertainty.

- Once **wastewater** is treated, effluent discharged to receiving waters will contain very little coronavirus (few studies have detected virus in wastewater treatment effluents), and the risk of this being a route of infection is Negligible with medium uncertainty.
- **Recreational use of waters**, particularly fresh waters many of which are not designated bathing waters (e.g. rivers, lakes and canals) presents a theoretical risk, but there is no evidence of coronavirus transmission by this route. The level of risk is Very Low to Negligible with medium uncertainty.
- Airborne droplet transmission between **bathers** in close proximity (<2m) is likely to be a more significant risk than from waste water sources. Waterborne transmission between bathers beyond 2m is Negligible Risk with medium uncertainty.
- Risk of infection from mains-supplied drinking water is Negligible with low uncertainty.
- Risks from private water supplies may locally be very low to low with high uncertainty, due primarily to contamination from septic tanks.
- The probability of exposure of UK consumers to SARS-CoV-2 via food is Very Low with high uncertainty. The uncertainty associated with this estimate is high as there is still no evidence to confirm or refute the hypothesis that people can be infected by ingesting SARS-CoV-2 in food.

The diagram below summarises the risk of transmission and its significance.