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**WHAT ARE YOUR MAIN RECOMMENDATIONS FOR EFFECTIVE BORDER MANAGEMENT OVER THE NEXT 12 MONTHS?**

1. The UK, and other countries with rising vaccination levels, are entering a **challenging period in relation to border management**. Increased vaccination means lower transmission and thus pressures to relax public health measures including increased travel domestically and abroad. At the same time, the volume of circulating virus globally, new variants continue to evolve, with those more transmissible and virulent, and/or vaccine-evasive VOC moving the goalposts on herd immunity.
2. Most disruptive would be if a **partial-escape variant** emerges, i.e., one able to infect a significant number of fully vaccinated people and cause severe disease. A recent study modelled different scenarios in Canada for vaccine coverage and efficacy. The most damaging, by far, was a partial-escape variant. COVID-19 cases, hospitalizations and deaths were predicted to be twice as high as the next most serious scenario.<sup>1</sup> Even with 75% full vaccination of the total population (Canada's present target for the end of the summer), a partial-escape variant could result in a fourth wave. Even at 90% full vaccination, the study showed a partial-escape variant would be disruptive.
3. **Effective management of travel-related risks will thus be critical over next 12-18 months**, particularly given slow progress on achieving **global equity in access to vaccines**. There are risks to the gains achieved from mass vaccination. Another wave of infections causing severe illness and death will mean further lockdowns, business closures and broad societal disruptions. Effective border management is therefore critical to staying the course for sustainable recovery.
4. **Key Recommendations:**
  - **Address inequities in global vaccine access.** Variants have not emerged in areas without (or with low) levels of community transmission. This tells us that the most effective and sustainable approach to eliminating illness and deaths from COVID-19 *and* preventing the emergence of new potentially more dangerous variants is to take action at the global level to strengthen responses including the rapid rollout of vaccines.
  - **Set clear objectives and targets.** It is important to set specific targets for measuring progress in protecting against travel-related risks. This will not only

provide failsafe to indicate future points at which it may be necessary to change course, but also creates a **basis for clear and transparent communication** of travel-related risk and different policy responses.

- **Testing and contact-tracing efforts should not ease up.** The importance of contact tracing rises with the decline in the quality of implementation of other travel and public health measures. To identify and respond to travel-related risks as quickly as possible, testing and contact tracing for travellers must continue to be systematically conducted. Current testing policies for vaccinated travellers from amber countries and all travellers from green countries will result in hundreds of thousands of travellers arriving to the UK, with no mechanism to systematically determine if they have been exposed to the virus between the 72-hour pre-departure test and the test 2 days after arrival.
- **Avoid describing travel as low risk given shortcomings in data.** Without ongoing efforts to trace and test all international travellers, it is problematic to communicate travel as low risk. This is a further limitation of the traffic light system where a “green light” implies little or no risk. Without universal and repeated testing (ideally on or shortly after arrival and then again at day 12-14), it will be impossible to accurately assess travel-related risk and proportion of imported cases. **Presumption of low risk based on geography does not align with a growing number of studies that find that travel is deeply implicated in the initial and repeated introduction of SARS-CoV-2 and its variants into the UK and other countries.** For instance, Han et al note:

*Although the future of COVID-19 is unknown at present, countries should plan and prepare for the worst-case scenario. It is not too late for the following lessons to be learnt and applied now. First, as described here, countries can move forward mainly on the basis of the epidemiology or on the epidemiology in combination with other considerations; however, a clear and transparent plan that describes which factors are being taken into account is essential. Ideally, these plans should explicitly state the levels or phases of easing restrictions, the criteria for moving to the next level or phase, and the containment measures that each level or phase entails. Second, countries should not ease restrictions until they have robust systems in place to closely monitor the infection situation.<sup>2</sup>*

- **Establish and apply an evidence-informed risk-based approach to border management.** The pandemic is not over and there is risk of repeating same mistakes as last summer. Given the gaps and inadequacies of the current traffic light system, it is expected that the UK along with many other countries will move towards a risk-based system, based on immunity. There is need to transition categorisation of travellers and risks they pose to a secure and reliable system based on immunization status and away from proxy of geography (i.e., traffic light system based on country from which people are travelling from). Travel during this current transition period towards higher rates of full vaccination and circulation of variants of

concern needs to be carefully managed.

- **Match any increased volume of travel with increased capacity to apply the appropriate travel-related measures rigorously** (i.e., phased easing with slow increase to match resources and systems capacity at borders)

## HOW COULD AN IMMUNIZATION OR VACCINATION-BASED APPROACH TO BORDER MANAGEMENT WORK MORE EFFECTIVELY?

5. The motivation behind an immunization or vaccine-based approach is to ensure that travel is facilitated in a manner that significantly reduces risk, while avoiding unnecessary hindrance or delay to cross-border mobility. Ideally, you want the rules applied in a way that is commensurate with the public health risk posed, as universally as possible to travellers moving across the border.
6. As many countries are seeking to move towards a vaccination-based system, it is important to have as coordinated a system as possible between countries. This is for the sake of travellers and the travel industry, but also for ensuring that the system put into place is most effective at risk assessment and mitigation.
7. Given the limitations of a traffic light system described, it **does not make sense to layer a vaccination-based system on top of the current geography-based traffic light system** which is what the UK government seems to be doing. Protocols supported by evolving science, if well implemented, should see the same risk from a fully vaccinated person, immunized with a recognized vaccine regimen, regardless of whether they are travelling from India versus the US. The key thing is the vaccine is verified and the protocols assigned are appropriate, not the specific country from which they are travelling from. This dual use of vaccination and geography creates complexity and confusion without commensurate reduction in risk, and therefore may be a transitional policy.

'Traffic Light' Requirements: A summary						
Country of Departure/ Transit	Passenger locator Form	Pre-arrival Test	Post-arrival test on Day 2	Post-arrival test of Day 8	Home Quarantine for 10 days	Hotel Quarantine for 10 days
Green	✓	✓	✓			
Amber	✓	✓	✓	✓	✓	
Red	✓	✓	✓	✓		✓

8. For a vaccination-based approach, our key recommendations would be:

- **Address inequities created by immunization-based system** by ensuring access to full vaccination, creating appropriate protocols to enable travel by unvaccinated and partially vaccinated people
  - **Allow minimal exemptions from vaccination-based system** with full vaccination of residual exempted travellers as much as possible. All workers in the transport sector (international and domestic) should be encouraged and enabled to receive full vaccination. Prior to the wide availability of vaccines, exemptions from quarantine were granted to minimize interference with “essential travel”. This is no longer a problem given that full vaccination reduces these requirements. The risk posed by exempt travellers can be largely addressed by aligning essential travellers with the immunization-based system to be applied to all other travellers. Authorities should review and minimize categories of exempt travellers to cross-border transport workers and other limited categories.
9. On specific protocols based on vaccination status, our research suggests differences in testing and quarantine protocols. The important point, however, is that these protocols need to align with the evolving science - real world data, modelling, disease surveillance etc.

	NOT VACCINATED	PARTIALLY VACCINATED	FULLY VACCINATED	TRAVELLERS WITH PROOF OF PREVIOUS INFECTION BUT NOT VACCINATED
PRE-DEPARTURE TEST	YES	YES	YES	YES
UPON ARRIVAL TEST	YES	YES	YES	YES
5/6 DAY TEST	YES	YES	YES	YES
12-14 DAY TEST	YES	YES	POSSIBLY	POSSIBLY
QUARANTINE UPON ARRIVAL AWAITING TEST RESULT	YES	YES	YES	YES
QUARANTINE REMAINING 14 DAYS IF TEST NEGATIVE	YES	YES	NO	NO
SELF-MONITOR FOR SYMPTOMS	YES	YES	YES	YES
WEAR A MASK AND OTHER PRECAUTIONS	YES	YES	DEPENDS ON SOCIAL CONTEXT	DEPENDS ON SOCIAL CONTEXT

10. The need to test after arrival is supported by two studies:
- airport screening for infection based on symptoms shown to be ineffective given one-fifth to 40%<sup>3</sup> are asymptomatic<sup>4,5,6</sup>
  - pre-departure testing helps but 1000s of passengers who arrived in Canada after January 6 still tested positive<sup>7</sup>
  - Goel et al. study of arriving passengers at Toronto Pearson Airport who consented to involvement. They found 1.5% tested positive overall, with 67% testing positive upon arrival, 27% on day 7, and 6% on day 14.<sup>8</sup> 94% of infections picked up within one week with testing and quarantine.<sup>9</sup>
  - The choice then becomes whether it is worth requiring an additional week of quarantine and then test to prevent the other 6% of infections. With a high level

of full vaccination achieved by a population, it is probably not so necessary. It also depends on the transmissibility and virulence of the VOC that we are dealing with.

## WHAT IS YOUR VIEW ON THE EFFECTIVENESS OF THE UK TRAFFIC LIGHT SYSTEM FOR MANAGING INTERNATIONAL BORDERS?

11. The traffic light style system has been used in many countries for international and domestic travel management.<sup>10</sup> These systems use geography as the basis of risk assessment and mitigation. The USA and New Zealand use a geography-based system that categorises countries from Level 1 (use normal precautions) to Level 4 (do not travel). Israel does not rank all countries but currently bans arrivals from, and strictly controls travel to, 8 countries<sup>11</sup> deemed to pose a “high risk” of COVID-19.<sup>12</sup> Many other countries have restrictions in place for travel to and from certain countries.
12. My overall question would be **whether these designations translate into appropriate policies to manage the associated risk?** How do you arrive at red, green, amber, or Levels 1-4, and how do these rankings translate into effective risk mitigation? This is where countries differ. If you are not putting into place the right measures for the right level of risk, then your ranking system is not doing what it is supposed to be doing.
13. This leads to a number of further questions. First, **whether there is methodology and data to accurately assess risk. Can you gather the right data at the right time to assess and mitigate risk based on geography to practically inform border management?** Timely access to the data needed to accurately assess risk has been an ongoing challenge.
14. More fundamentally, **is it possible to categorize risk based on national borders?** It is fair to say that it is less likely that someone travelling from New Zealand poses less of a risk of virus importation than someone from Peru at this time. But is it really possible to designate Malta as green but most of the rest of Europe as amber? The problem is that the traffic light system assumes that each country is somehow hermetically sealed when, in reality, there is substantial traffic in and out of countries by travellers worldwide. If we look at Malta, which applies its own traffic light system, there are several countries on its amber list (e.g. Turkey, UAE,) that are designated as red countries for the UK.<sup>13</sup> Thus, a holidaymaker can travel to Malta from the UK, lie on the beach beside someone from a UK red country, and then return home to the UK with some testing but not quarantining (unless positive test result).
15. This raises the problem that countries using a traffic light type system have **variation in how specific countries are classified.** There is then a mixing of those populations - at airports, holiday resorts, public venues - which undermines geography as the basis of risk assessment and mitigation. This system assumes

people simply travel from point A to point B in a bubble resembling a hamster ball. In reality, many travellers travel through multiple countries on a trip, will come into contact with many other people at their different locations, at airports and in airplanes. Airports are global crossroads. At least one variant, the Delta variant, can be transmitted with fleeting exposure (a few seconds).<sup>14</sup> Estimating the risk each traveller poses based solely on where they have travelled from (or which countries they have been in the past 14 days) ignores exposures from travel behaviours and environments.

16. A broader key question is **whether geography can be effectively used as the basis of risk assessment and mitigation at this stage of the pandemic?** Risk assessment and mitigation based on geography was used during the early stages of the pandemic because the virus was only starting to spread to jurisdictions with little or no cases. There was limited testing capacity and thus geography was used as a proxy variable to estimate relative risk of different travellers. Systematic reviews suggest that travel restrictions based on geography delayed the spread of the virus into low incidence jurisdictions.<sup>15</sup> There were also mistakes made by the US, UK and other countries regarding which geographies to target (China vs Europe). The general principle, though, is that fast action can delay or slow pathogen spread.
17. SARS-CoV-2 is now globally circulating and globally interconnected travel patterns are moving the virus about in continual and complex ways. One might argue that the emergence of new VOCs make traffic light type systems still appropriate. VOCs emerge from where the virus is being transmitted at a high level and so one might argue that there is an opportunity to reduce the UK's risk of importing that variant by restricting travel to and from that 'hot spot'.
18. Finally, **are there operational challenges with the traffic light system that undermines its usefulness as a system for risk mitigation.** Travellers categorized as red, green or amber risk mixing together and among airport staff at various points at an airport. This is simply poor infection control. This reminds me of reports about some **recycling systems**. People collect and separate their recyclables. This is collected up but the contents are then pointlessly dumped into a landfill. If people are all being bunched together at airports, the whole point of the traffic light system is undermined.
19. Overall, all of these questions cast **doubt on using geography as the main basis of your risk assessment and mitigation strategy at borders during COVID-19.** It would have been necessary when we didn't have testing and now vaccines. It makes less sense now as a defining framework. The decision to use geography seems more of a choice based on economic and political considerations than public health. It is a policy choice to optimize travel volumes at the expense of a certain degree of virus importation. Some governments (e.g., UK, USA, European countries) have been willing to accept this risk. Other countries (e.g., Canada, South Korea, Taiwan, Singapore, Australia) have not.

## WHAT IS YOUR ASSESSMENT OF THE UK'S BORDER MANAGEMENT APPROACH AMIDST VARIANTS OF CONCERN?

20. In suppression countries such as Australia and New Zealand, but also Taiwan, South Korea, Singapore, China/Hong Kong, Thailand and Vietnam, the type of border measures and how they were implemented reflects a **preventive or proactive approach**. All of these countries are following a **suppression strategy** and travel measures are used in ways that seek to **identify all cases of imported infections including VOCs and then prevent them reaching the wider population**. And what we are seeing is far less VOC cases in those countries. Of course, the outbreaks we are seeing now in some of these countries attests to the high transmissibility of these variants and their elusiveness when it comes to testing. In Australia, Singapore, Taiwan and other countries where VOC-driven outbreaks have occurred, the variants have been reported as imported by travellers and transmitted to airport staff, at quarantine hotels, or by travellers (e.g., pilots in Taiwan) not following the rules. But generally **these jurisdictions have largely controlled the importation and onward spread of VOCs more successfully than other countries**. **Travel measures are a key part of that success** as part of a package of public health measures in place.
21. By contrast, following a **mitigation strategy**, the UK has been **reactive** in its approach to VOCs. What this means is that as a variant is identified somewhere in the world, the UK government has waited until cases are identified (involving testing and genomic sequencing), and then action is taken (e.g. shifting countries to a different colour of the traffic light system, restricting travel from certain countries). The problem with this approach, when dealing with VOCs is that, by the time this all happens, if you have a lot of travel in and out of your country, a VOC is likely to have **arrived and potentially spreading within the domestic population**.
22. Other countries that have followed a mitigation strategy have experienced the same problem. **The Canadian government has taken a reactive approach and this has led the country to having the dubious claim of having most of the globally circulating VOCs causing outbreaks**. By April 2021, British Columbia had the largest outbreak of the Gamma (P1) variant outside of Brazil with 877 cases.<sup>16</sup> None of the 84 people interviewed at the beginning of the outbreak in Whistler reported travel histories which suggests the virus had entered via travellers and circulated in the province for some time before being picked up. Earlier in the year, when VOCs were becoming a serious concern, the provincial and federal governments' response at the time was that travel did not pose a substantial risk (<2% of total cases in Canada attributable to international travel) and that, if evidence emerged that travel was an issue, they would act. Gamma variant continues to account for around 50% of cases in BC.<sup>17</sup>

23. Our view of seeing the ongoing pandemic is, for each VOC that emerges somewhere in the world, a new window of opportunity opens to prevent importation. It is like the task of pandemic response is reset. It is like a **new pandemic each time a VOC comes onto the scene**. And we know that they will continue to arrive. By maintaining a certain package of travel measures at all times, rather than stopping and starting them as cases go up and down, is how you prevent the next VOC arriving and causing a surge. This was especially important in late 2020, when vaccination was just beginning to be rolled out, and remains true now as vaccination levels have increased but only for some countries. Successive VOCs appear to be becoming more transmissible, more virulent, and potentially vaccine-evasive. You can take a chance and keep allowing VOCs to enter your jurisdiction and cause surges in infection, by taking a reactive approach, and hope that your current vaccines can hold or be boosted. Evidence of “the **progressive increase in transmissibility and virulence of SARS-CoV-2 VOCs** will result in a significantly larger, and more deadly, pandemic than would have occurred in the absence of VOC emergence” suggests this is not a good strategy.<sup>18</sup> Evidence of the prevalence and problems of **long COVID** are also emerging. Or you can adopt a **preventive approach that seeks to minimize infections until the rest of the world is vaccinated and VOCs dwindle**.

#### **WHAT ELSE CAN THE UK DO TO EFFECTIVELY ADDRESS THE DELTA VARIANT?**

24. There are three aspects of the UK’s implementation of border measures that raise concerns - exempted travellers, monitoring compliance, and policy coherence.

##### **Exempted Travellers**

25. The UK (England and Wales) currently has a long list of 50 different professional categories that are “exempt from some or all COVID-19 travel and entry requirements because of their job.”<sup>19</sup> Even more complicated, these exemptions vary across common travel area jurisdictions. For travellers to Scotland and Northern Ireland, there are 10 and 38 job categories which are exempt, respectively. To the extent that testing of these exempt individuals is conducted, and whether this data is collated for ongoing risk assessment purposes, would be important to find out.

26. Prior to mass vaccination, exemptions were granted to minimize interference with what is deemed to be “essential travel”. This is understandable for some categories of travellers such as flight crews and other transport workers. However, different governments have made **economic and political choices** about who else to add to such lists. In Canada, one-third of air arrivals and up to 93% of land arrivals are exempt from testing and quarantine requirements which includes cross-border students, armed forces, government officials and parents with shared custody.<sup>20</sup>



27. It is important to note that **exempted travellers, in some cases, can be higher risk travellers**. A World Economic Forum study found transport workers at highest risk of infection among non-health workers. This is a high-risk group so their exemption must be handled carefully - balancing their ability to do their job with measures to prevent infection and onward transmission.<sup>21</sup> The public health risks of exempting travellers, for economic reasons, is also illustrated by outbreaks caused by pilots in Taiwan,<sup>22</sup> arriving passengers infecting airport staff in Singapore (now to be vaccinated),<sup>23</sup> and workers at the Mary River Mine in Nunavut, Canada.<sup>24</sup>
28. With mass vaccination, it is possible to introduce a vaccination-based system that would not unduly hinder travel but still mitigate risk. For example, quarantine can be waived for fully vaccinated travellers who test negative. This raises questions about **whether it is necessary to maintain such a long and complex list of exemption categories**. Indeed, doing so may create unnecessary risks and complexity (confusing and difficult to implement, non-compliance, alignment with evolving science).
29. Thus, the risk posed by exempt travellers can be largely addressed by aligning essential travellers with the immunization-based system applied to other travellers. Authorities should review and minimize categories of exempt travellers to cross-border transport workers and other limited categories. Any remaining exempt travellers could be required to be partially vaccinated by August 1 and fully vaccinated by September 15 in order to maintain their exempt status. Exempt travellers that cross the border occasionally should then be subject to the same tests as other fully vaccinated travellers. Exempt travellers that cross the border regularly should be tested once every two weeks.
- 30. We recommend the UK government review and minimize categories of exempt travellers, and require all remaining exempt travellers to be fully vaccinated and subject to the same tests as other travellers.**

### **Monitoring Compliance**

31. Countries have varied in how compliance with travel-related measures have been achieved. Making a policy mandatory does not necessarily mean compliance if you do not have systems in place to enable people to comply, monitor their compliance, and enforce consequences if there is non-compliance.
32. In countries deemed to have more stringent travel-related measures, high compliance is achieved through a combination of voluntary compliance using technology, effective systems of implementation and monitoring, and enforcement measures with consequences.
33. Similar to Canada, the UK relies on the penalties of fines, follow-up communication by phone, and a randomised chance of receiving an in-person

visit from NHS T&T staff. Data reports for this type of monitoring compliance often raise more questions than they answer, and make it difficult to ascertain an accurate picture of how effective isolated measures are. For example, in the UK, “police have issued 666 FPNs under international travel regulations between 8 June 2020 and 16 May 2021. Most were for failure to self-isolate after entering England or Wales from a country on the quarantine list.”<sup>25</sup> This number seems relatively low in the context of monthly air arrivals to the UK averaging between ~200,000 and 600,000 over a similar period.<sup>26</sup>

34. Similarly, in Canada, absolute number of checks conducted have been cited rather than proportion of people who are required to self-quarantine (40% of people). Problems with enforcement with private security companies hired to check but no authority to fine. Report to local law enforcement who are varying in capacity to support enforcement.
35. **We recommend that improvements to risk assessment and mitigation incorporate appropriate metrics for monitoring compliance with border health measures.**

#### **Policy Coherence**

36. Our research has identified many areas where policy coherence is needed for effective border management:
- Need to be integrated **between governments** to enable travel between different jurisdictions (e.g., coordinated and interoperable system of recognizing immunization status, assessing and mitigating risk, data sharing)
  - Need to be integrated **across different levels of government** - cannot have domestic travel rules varying by nation, county, region etc. This is particularly relevant in the UK context, given that testing and quarantine measures do not apply to travel within the Common Travel Area, yet different protocols are set for international travellers depending on whether they are arriving to England, Wales, Scotland or Northern Ireland.
  - Need to be integrated across **different stages of a journey**: a) pre border (pre departure testing, registering immunization status); b) at-the-border (upon arrival testing, mandatory quarantine for un/partially vaccinated travellers); and c) within-the-border (follow up testing, quarantine in authorized location such as home).
  - Need to be integrated for **all points/ports of entry** - cannot have inconsistencies between whether you arrive by air, land or sea
  - **Testing and quarantine protocols** need to address both in an integrated way. Need to think about the task as having two parts: a) reducing (cannot completely prevent) infections arriving in your jurisdiction; and b) preventing infections reaching the wider population.
37. When there are policy inconsistencies, implementation becomes challenging, and incentives are created to exploit loopholes and workarounds that can pose

public health risks.

38. The UK traffic light system has led to **situations of policy incoherence** so that some travellers have routed their travel to avoid certain requirements upon returning to the UK. For example:
- The first travellers arriving in the UK (from US), once new rules came into place, were allowed to leave the quarantine hotel because they stopped in Dublin on the way, a country in the Common Travel Area. Health Secretary Matt Hancock said he would be happy to discuss ways to close loophole (15 Feb 2021)
  - reports on 5<sup>th</sup> May 2021 that UK travellers from "red list" countries are flying home via Turkey, which is not on the red list, in order to avoid expensive hotel quarantine fees
39. We have also seen this happen in **Canada** where air arrivals were subject to 3-day hotel quarantine but land arrivals are not. Thousands of travellers have arranged to land just across the Canada-US border and then walk or drive across.
40. **We recommend border management policies minimize policy incoherence from a public health perspective.** Standardized treatment of travellers, that requires everyone to undergo a certain minimum standard of testing and quarantine, will reduce such incentives. As soon as you create differential treatment, some people will try to circumvent more stringent requirements due to cost or inconvenience. **Along with undermining risk mitigation, reports of such behaviours undermine public trust in the system.** If some people are seen as not complying, or trying to game the system, this lowers the incentive for others to comply.

#### **WHAT ROLE DOES VOLUME OF TRAVELLERS PLAY IN THE EFFECTIVENESS OF BORDER MANAGEMENT?**

41. It is reasonable to predict that the new measures coming into effect July 19 will result in an increased volume of traffic across the UK's national borders:
- removing the advisory against travel from UK to 'amber' countries
  - no longer requiring travellers who are arriving from amber countries and who are fully vaccinated (with NHS vaccines) to self-isolate or complete a day 8 test.
42. As the volume of travellers increases, the capacity needed to effectively test and quarantine at borders also increases. By reducing the volume of travel, governments can apply stronger measures to the remaining travellers. Governments have done this by restricting who can travel by citizenship and residency, purpose of travel, sometimes where they have travelled from and finally quotas systems. The key point is that the more travellers you have to process, the more difficult it is to apply thorough screening and quarantine measures.

43. In the case of the UK, the desire to impact travel as little as deemed necessary for economic reasons has required the government to make choices about reducing the level of border measures used for some travellers. Thus, instead of hotel quarantines for all arrivals (as Australia and New Zealand apply), you have hotel quarantine for some, self-quarantine for others, and no quarantine for still others. It thus becomes a tradeoff between travel volume and risk. But, as the UK government has chosen to follow a virus mitigation rather than suppression strategy, there is this constant tweaking to enable maximum travel.

- Mismatch between volumes and capacity to mitigate risk; evidence by Dr. Neil Ferguson stated that “part of the reason that the decision not to impose stronger measures, such as screening passengers, was ‘to do with testing capacity and PHE capacity to actually implement that on the huge numbers of travellers coming in from Heathrow and other airports...Had we had testing capacity...would have given us a much better impression of where infection was coming from.”
- need to ensure protocols can be effectively implemented and this is impacted by travel volumes (e.g. Australia quota system). UK actively encouraged travel for economic policy reasons. Need to avoid bottlenecks in processing. Compromises in risk mitigation practices in order to accommodate larger numbers. This means increased risk.

#### **ADDITIONAL QUESTIONS (NOT ASKED BY COMMITTEE MEMBERS BUT MIGHT BE USEFUL TO CONSIDER)**

#### **WHAT IS YOUR ASSESSMENT OF TRAVEL CORRIDORS?**

44. Travel corridors are essentially a variation of the traffic light system (green countries are the corridors). Our understanding is that there are **few, if any, travel corridors** (along with air bridges and travel bubbles) that have **worked over a sustained period of time**. There has been a lot of pressure to create them, driven by economic and social interests, but few have succeeded. Many have been **paused or delayed** (e.g. Singapore-Australia, Australia-New Zealand,<sup>27</sup> USA-UK<sup>28</sup>) because of domestic outbreaks or incompatibility in approaches to travel (e.g. Hong Kong-Singapore<sup>29</sup>).

45. Evidence from studies using genomic sequencing data shows that travel corridors have been **responsible for repeated importations** of SARS-CoV-2 and variants between European countries including the UK.

- Public Health England study found travel corridors, which exempted people from needing to self-isolate when returning from abroad, were linked to **higher rates of onward transmission of imported cases**. Travel from the European countries accounted for 86% of imported cases between May and September 2020. Greece was the largest source of imported infections between June and

September, making up 21% of new cases, compared with 16% for Croatia and 14% for Spain.<sup>30</sup>

- Ireland's gains through social distancing and lockdowns undermined by travel corridors.<sup>31</sup>
- WHO predicts similar effects from increased travel this summer with the reopening of travel corridors and increased travel volumes. This is especially concerning given the relaxation of public health measures domestically (social distancing, mask wearing).

46. Why don't travel corridors work specifically? **Travel corridors are not travel bubbles.** Neither partner is hermetically sealed. There will thus be a lot of travellers in and out of partner countries from other countries which can quickly impact transmission dynamics. The **viability of a corridor can change quickly**, leaving travellers scrambling or stranded. Rapidly evolving transmission dynamics amid variants makes travel corridors tenuous - open one day and closed another. More risk can be created if travellers scramble to travel to avoid quarantine.

## WHAT IS YOUR ASSESSMENT OF THE TEST AND TRACE SYSTEM?

47. Testing and contact tracing, **if done effectively, have been and can continue to be cornerstones of effective public health responses** to SARS-CoV-2 and variants. It is clear that the NHS Test and Trace system has not functioned as it was intended to:

*Since it was established in May 2020 there have been two national lockdowns and more than four million confirmed cases. In order to break chains of transmission, SAGE advises that it is desirable that no more than 48 hours should elapse between identification of an index case and their contacts self-isolating, and that 80% of these contacts would need to be reached.*<sup>32</sup>

48. The NHS Test and Trace system is used for multiple purposes, including to **ensure compliance with quarantine and testing requirements for travellers** arriving to the UK from outside the common travel area.

49. NHST&T processes test kits for travellers from lower-risk countries, required to quarantine at home, and screens test samples for variants. Staff from NHST&T call travellers who are quarantining daily. It is also responsible for tracing the contacts of international arrivals who test positive, which can involve large numbers per case.<sup>32</sup>

50. What is demonstrated through some of the challenges that NHS test and trace system has encountered, is that widely distributing tests, and collecting great volumes of test data is not sufficient - you need to also have the capacity to efficiently affect onward behavioural change based on test results, and screen for variants as quickly as possible.

51. In many ways, it **relies on public compliance** to be effective. This has been demonstrated by the poor uptake of rapid tests distributed in efforts to ramp up domestic asymptomatic testing in the Fall 2020, where only 14% (or 96 million of the 691 million distributed) have been used.<sup>33</sup>
52. Reports published on the UK test and trace programme in academic journals have highlighted the following **additional challenges**:
- In September 2020, SAGE also described the system as “having a **marginal impact on transmission**”<sup>34</sup>
  - “**delays** inevitably hamper every stage” of the test and trace process, with Allan Wilson, president of the Institute of Biomedical Science arguing that the testing would be better done locally given the existing infrastructure, instead of relying on the newly established, privately run Lighthouse Labs and supply chains involving Amazon, Boots, and Royal Mail to transport samples over long distance.<sup>35</sup> – In the first week of September 2020, only 14% received their test results within 24 hours, down from 32% the week prior (as demand increased notably due to schools reopening and people returning from holiday).<sup>36</sup>
  - UK system **relies on people to come forward for testing if they experience symptoms**, in contrast with the “case finding” focus of the “best contact tracing systems”, including amongst asymptomatic carriers - Dominic Harrison, public health director at Blackburn with Darwen Borough Council, noted in a June 2020 BMJ feature, highlighting South Korea as a successful case study.<sup>35</sup> This was confirmed in a study published in April 2021 which concluded that test and trace should be “superseded by decentralized and regular mass rapid testing and contact tracing, championed by general practitioner surgeries and low-cost community services”.<sup>37</sup>
  - A March 2021 paper found that adherence levels to test, trace, and isolate remain low e.g. with only 50.8% being able to identify the main symptoms of COVID-19, 51.8% adhering to full self-isolation, and 22.2% requesting a test for COVID-19, according to January 2021 data;<sup>38</sup>
  - 21% of people in England who tested positive in the first week of July 2020 were not reached by the test and trace programme.<sup>39</sup>
  - Government figures released in July 2020 revealed **high cost** with UK spending £10bn on the test and trace programme.<sup>40</sup>
  - Test and trace might **widen health inequalities** if not combined with support from local government, including accessing food and medicine,<sup>35</sup> with a study by Briggs and Fraser published in December 2020 indicating that “the percentage of positive cases and their contacts who have been successfully contacted was lower in the most deprived areas than in the least deprived”<sup>41,42</sup>
  - In October 2020, another paper stressed the need to “end **privatisation** of testing and to reinstate and invest in NHS primary care, public health, and NHS laboratory services, and redirect the resources from the current private testing programmes back into the local primary care, local NHS labs and local public health sector, directed by clinically led need and with clinical oversight.”<sup>43</sup>

53. According to a June 2021 report from the National Audit Office, persistent challenges include:

- Recurrent **barriers to data access** for local authorities and actors
- **Delays in actioning** positive test results
- **Delays in genomic sequencing**: I.e. in May 2021 genomic sequencing took on average 6.4 days from the point at which the test was taken to providing the result.<sup>32</sup>
- **Poor uptake** of voluntary, rapid testing for asymptomatic individuals

## HOW HAS THE UK APPLIED QUARANTINE AS A TRAVEL MEASURE COMPARED TO OTHER COUNTRIES?

54. The UK quarantine system has differed in several ways from a group of countries that have achieved relatively low cases of infection and deaths. The term mandatory is often used but it is important to dig down and define what this means in practice.

55. First, **who quarantine applies to**. These countries have required almost all international arrivals to be subject to quarantine, regardless of their purpose of travel, source country, citizenship and so on. These countries have seen all arrivals as potential carriers of SARS-CoV-2 and have acted accordingly. The UK government has applied quarantine based on the traffic light system, with many additional categories to waive quarantine depending on purpose of travel (exemptions for many jobs), citizenship/residency, and countries deemed lower risk.

56. Second, **where quarantine is served**. In countries with low cases and deaths, quarantine is often in a hotel or another government-run facility, or an approved location. This has been the default for almost all international arrivals with generally very few exemptions. For the UK, the hotel quarantine is the exception (red countries). According to official data, between 15 February 2021 (when the Managed Quarantine System began) and 26 May 2021, 556,926 people had started quarantine at home or in a managed quarantine hotel. In that period, far more people quarantined at home (491,495 or 88% of all quarantining travellers) than in a hotel (65,431 or 12%).<sup>44</sup> Unfortunately, while the UK government publishes statistics on the number of people who tested positive during quarantine, available data does not specify where those people were quarantining - for instance, between 26 March 2021 and 22 April 2021, out of 109,908 travellers arriving to England, 2,921 tested positive during quarantine (2.7%).<sup>45</sup>

57. Third, the **duration of quarantine**. The countries reviewed have required quarantine for 14 days most commonly but 21 days in some cases (e.g. Hong Kong, Vietnam). The current UK policy is 10 days. The policy seems to be to keep quarantine to a minimum to limit disincentives to travel.

58. Finally, the **methods to ensure compliance with quarantine**. The countries reviewed use designated facilities supported by government personnel (military and law enforcement in Australia, New Zealand) to ensure compliance. In some countries, digital technology (apps, bracelets) are used for tracking purposes for those quarantining at home.
59. In the UK, **self-quarantine** has largely relied on an honour system, with late revisions following reports of low compliance. In August 2020, PHE reported it would carry out spot checks through its “Isolation Assurance Service”, using random samples of around 1,000 eligible arrivals per day into England Northern Ireland, with “limited details (...) securely passed to a contractor [Sitel UK<sup>46</sup>] to make the calls”. PHE noted “a high level of compliance” with the “vast majority” of people contacted confirming that they are self-isolating for two weeks, with limited details – similar to the Canadian experience – on actual figures. National Police Chief Council figures indicated at the time that a total of three fines had been issued for failure to self-isolate in England.<sup>47</sup>
60. Home Secretary Priti Patel finally told this Committee that, for the week ending 1 March 2021, 75% of travellers due to quarantine at home were actually contacted.<sup>48</sup> In late March 2021, the Home Office announced it was looking for contractors to carry out further visits to people having to quarantine following international travel to “more than double the number of compliance checks” – with a contract expected to be in place by early April.<sup>46</sup>
61. On 15 April 2021, the Home Office announced it had hired Mitie, an outsourcing company, to carry out visits to up to 10,000 homes per day to check for quarantine compliance following international travel, which would represent a ten-fold increase from the then current number of visits.<sup>49</sup> The contract in question amounted to 90m GBP.<sup>50,51,52</sup>
62. According to the UK government website, the process is now as follows: Contact tracers from NHS Test and Trace carry out checks by text messages, emails, and phone calls. In-person visits are conducted by “staff on behalf of NHS Test and Trace”, i.e Mitie, who may then refer cases to the police, who may issue a fine if they have reasonable grounds to believe a criminal offence in breach of quarantine was committed, with fines starting at 1,000 GBP for the first offence<sup>53,54</sup> - an amount lower than in the countries we looked into (see table below)



**Table: Comparison of quarantine measures for countries with low COVID-19 cases and deaths**

\*as of 5 July 2021

Country	Mandatory / optional	Location / length	Cost	Exemptions	Penalties
<b>Australia</b>	Mandatory	Government designated facilities; 14 days	Likely at traveller's expense; depends on state/territory (e.g. New South Wales: A\$3,000 per adult but A\$1500 for seasonal workers - some waiver options)	Include "safe travel zone country" or some exemptions for some categories of workers (with reduced quarantine or possibility to do so at home); cap on weekly arrivals	Depends on state / territory (e.g. New South Wales: up to A\$11,000, 6 months in prison, or both with additional A\$5,500 for each additional day)

<b>Israel</b>	Mandatory	Government designated hotel or home if certain isolation conditions are met; 14 days (10 if two negative tests in that period)	State-funded, undisclosed amount per room (though it was reported in that the government spent NIS 498m in 2020 towards quarantine room and board or C\$185m)	Fully vaccinated or recovered Israeli citizens and residents if test negative; tight restrictions on who is allowed in the country in the first place	In case of breach, the Police can force relocation to a state-designated isolation accommodation (motel) for the remainder of the isolation period - along with a penalty of NIS 5,000 (C\$1,856)
<b>New Zealand</b>	Mandatory	Government designated facilities; 14 days	Depends on number of factors but generally NZ\$3,100 per stay and no cost if staying for 180+ days	Only for exceptional circumstances; cap on weekly arrivals	Up to six-month imprisonment or a \$4000 fine
<b>South Korea</b>	Mandatory	Government designated facilities (mostly for tourists) or private residence (mostly for residents and long-term visitors); 14 days	Ranges from approximately US\$1,400- US\$2,100 in total – at traveller's expense	People fully vaccinated in Korea, asymptomatic, and testing negative upon return; also include some people traveling for humanitarian or important business purpose	Up to a year in prison or up to 10 million won (nearly \$9,000) in fines

<b>Taiwan</b>	Mandatory	Government designated facilities or private residence (if traveller lives alone or with people they lived with abroad) ; 14 days	NT\$3,000 (C\$130) per night on average – at traveller's expense	Some exemptions for some short-term business travelers	Up to NT\$1 million (C\$43,200) for quarantine violation
<b>Thailand</b>	Mandatory	Government approved quarantine facilities or alternative state quarantine facility (hotels); 15 nights	At traveler's expense – amount unclear	Rare	Up to two years in prison and/or a fine of up to Bt40,000
<b>Vietnam</b>	Mandatory	Military-run facilities or government designated hotels; 21 days	Approximately C\$1,000 to C\$3,900 depending on hotel or \$100 at army-run facilities – at traveller's expense	Very rare – very few people let in in the first place	Unclear - One Vietnam Airlines flight attendant was handed a two-year suspended jail term in March 2021 for breaking quarantine rules

## HOW HAS THE UK APPLIED TESTING AS A TRAVEL MEASURE COMPARED TO OTHER COUNTRIES?

63. The UK testing system has differed in several ways from a group of countries we have reviewed that have achieved relatively low numbers of SARS-CoV-2 infection and deaths.

64. First, **the policy goal motivating the introduction of testing.** The **suppression countries** have applied testing to try to identify as high a

proportion of travellers with SARS-CoV-2 infection as possible. These countries recognize that one test will not do the job so there is repeated testing. There is also recognition that, even with repeated testing, you cannot identify 100% of imported infections. Quarantine is thus layered on top to prevent those cases that are missed from reaching the wider population. This is very different from **mitigation countries** like the UK where testing protocols were developed and introduced, initially under the impetus of private sector actors, with the goal of reducing quarantine and optimizing volume of travel. PM Boris Johnson actually showed reluctance to introduce testing at airports. On September 4<sup>th</sup>, 2020, he ruled out introducing COVID-19 tests at airports (after suggestions they could help reduce length of quarantine), saying they give a "false sense of security" and that testing on arrival would only identify 7% of virus cases (% based on modelling from Public Health England<sup>55</sup>). A month later (October 7<sup>th</sup>, 2020), Global Travel Taskforce established to look at introducing a testing system for travellers to the UK, giving them the chance to spend less time in self-isolation if they receive a negative test. Heathrow CEO John Holland-Kaye was urging the government to introduce airport testing since May 2020, with on-site testing facilities already set up. The policy impetus behind testing in the UK, in short, seems to have been to reduce quarantine (and not as an effective tool alongside quarantine), to enable travel rather than deter travel or reduce travel-related risk.

65. **Second when mandatory testing was introduced.** Some **suppression governments** such as South Korea and Taiwan introduced mandatory testing for travellers from as early as spring and summer 2020. In **mitigation countries**, testing was introduced much later, around the time VOCs came onto the scene. The UK, under pressure to ease quarantine restrictions for non-exempt travellers, Transport Secretary Grant Smith announced that from 15 December 2020, the UK would introduce a testing strategy from countries not included on the travel corridor list: incoming travellers could self-isolate for 14 days or take a test at day 5 for early release from quarantine. Pre-departure testing in the UK was initially introduced by airlines (presumably in part, to help travellers meet the entry requirements of other countries), on 21 December 2020. During this period, the Alpha variant began to spread and UK flight suspensions were adopted by 40 countries. The government followed on 18 January 2021 with the 72-hour pre-departure test requirement for incoming international arrivals to the UK. Travel corridors were also suspended. Post-arrival tests were not mandated for travellers entering the UK until February 2021, well after the introduction and circulation of VOCs.

66. **Third, who is required to be tested and how many times.** Countries that have been able to rely on testing and contact tracing to reduce transmission of SARS-CoV-2 and prevent or respond to the importation of variants continue to require repeated and mandatory testing of all incoming international travellers. Best practices from Hong Kong, Singapore, Taiwan and others demonstrate an ongoing commitment to tests on arrival, and then once or twice in the period following arrival (varying between day 5-8 and then again at the end of the 14 or

21 day quarantine period). In the UK, pre-departure tests within 72 hours are required for all non-exempt travellers. After arrival, only travellers arriving from red list countries (during the 10 day hotel quarantine) and amber countries (while self-isolating at home) are required to take two tests (around day 2 and day 8). Travellers arriving from 'green list' countries are only required to test once, on day 2, and there are distinct and differing protocols based on categories of exempt professions.

67. Fourth, **impact of test results on a traveller's next steps**. Many **suppression countries** continue to require a full 14 or 21 day quarantine regardless of results of intermediary test results. This is to protect against false-negatives, longer than median gestation periods, and potential exposures during travel and through airport interactions. It also gives these jurisdictions time to sequence and screen for variants, and deters non-essential travel to keep volumes within contact tracing capacities. The UK's 'test to release' program offers travellers from amber countries the opportunity to pay for a test on day 5, and if negative, end their self-isolation early. This type of policy is driven by economic and political interests, rather than public health risk.
68. Finally, **implementation**. Countries which have effectively leveraged testing to protect against the importation of variants have done so in an integrated, centralised way where testing is conducted in conjunction with quarantine requirements. In the UK, pre-departure testing requirements alone, combined with the convoluted set of traffic light restrictions, have resulted in long delays at Heathrow, with pressure from Heathrow officials to ease testing restrictions (e.g. March 10th, 2021: Emma Gilthorpe, chief operating officer at Heathrow Airport notes 3-6 hour wait at border control as a regular occurrence; April 14th, 2021: Chris Garton, Chief Solutions Officer at Heathrow Airport tells the House of Commons Transport Committee that delays caused by extensive COVID tests are becoming "untenable", with some passengers waiting up to six hours). For travellers from red list countries, two tests are included as part of the required hotel quarantine booking, whereas travellers from amber list countries need to book their tests through NHS test and trace. There is little data available to assure us of compliance with these tests.
69. As of Monday 19 July 2021, the UK government will no longer recommend against travel to amber list countries. People covered by the amber list rules, who have been fully vaccinated with a NHS vaccine, will not need to quarantine on arrival in England or take a COVID-19 test on day 8. (**Effectively, those fully vaccinated from amber, will be treated as green**). Considering the anticipated boost in volume of travel, this is concerning for a number of reasons. Full vaccination is highly effective against hospitalization or death, but not 100% protective against infection (so-called "breakthrough" infections) or transmission of SARS-CoV-2 to others.<sup>56</sup> This is especially so against the Delta and likely future variants of concern. Eliminating testing beyond the 2-day test after arrival for all travellers arriving from "green" countries and certain fully vaccinated

travellers arriving from “amber” countries creates significant gaps in surveillance. The median incubation period for the virus is 5-days and globally, asymptomatic and pre-symptomatic cases account for 20-59% of cases.<sup>57</sup> Testing policies for vaccinated travellers from amber countries and all travellers from green countries will result in hundreds of thousands of travellers arriving to the UK, with no mechanism to systematically determine if they have been exposed to the virus between the time they take the 72-hour pre-departure test and the test 2 days after arrival. Think about the reasonable steps taken on an international journey (e.g. taxi or public transit to the airport, stopping for shopping on the way, grabbing a meal at the airport) both prior to departure and again on arrival in the UK. Then multiply that by passengers sitting together on planes, in queues for immigration and at baggage claims etc, and there are any number of possible exposures that will not be caught by the current system, except in cases where travellers become symptomatic, and voluntarily get tested. This will undoubtedly result in the undetected importation of both existing, and any newly emerged variants.

**Table: UK testing policy under the Traffic Light system**

	Testing required	Risks
<b>“Green” departure country</b>	72-hour pre-departure test (nucleic acid, LAMP or antigen test)  Day 2 test pre-booked and paid for	Does not capture possible exposures between pre-departure test and Day 2 test (given 5 day median incubation period)  Risk of onward community transmission between tests, amplified by lack of self-isolation requirement while awaiting test results  Will not capture (particularly asymptomatic) cases with longer incubation periods
<b>Exempt travellers</b>	50 separate professions listed for England and Wales, with each category entailing different testing and quarantine protocols depending on red, amber or green country of departure. Scotland has 10	The premise that a traveller poses less risk if they have only been to a green list country in the past 10 days is absurd. Has everyone on their flight only been in a ‘green list country’? What about their close contacts? Have

	<p>categories of exemptions,<sup>58</sup> and Northern Ireland has 38.<sup>59</sup></p> <p>Many 'green list' exemptions for travellers to England and Wales do not include pre-departure testing. Some require a test at day 2 or may not.</p>	<p>they received one or two doses of a vaccine? Are they following public health guidelines such as social distancing and wearing masks when advised?</p> <p>Risk is not determined based on geography or profession.</p>
<p><b>"Amber" departure country, travellers fully immunized with NHS-approved vaccine**</b></p> <p><i>**As of July 19 2021</i></p>	<p>72-hour pre-departure test (nucleic acid, LAMP or antigen test)</p> <p>Day 2 test pre-booked and paid for (home self-test kits) managed through NHS Test and Trace.</p>	<p>A non-exempt traveller whose infection gestates after the day 2 test will, upon receiving a negative test, enter wider UK society. This creates a higher risk of transmitting SARS-CoV-2 and variants into the wider population at a time when many other public health protocols are being lifted</p> <p>Questions "remain open" about reinfection due to rapid waning immunity, immune-evasive VoCs and/or higher transmissibility.</p>
<p><b>"Amber" departure country</b></p>	<p>72-hour pre-departure test (nucleic acid, LAMP or antigen test)</p> <p>Day 2 and Day 8 tests (home self-test kits) managed through NHS Test and Trace.</p> <p>*travellers to England or Wales (not Scotland) can pay for 'test to release' test at day and if result is negative, end quarantine at home early</p>	<p>Repeated testing will serve well to catch infections acquired between the pre-departure test and time of travel.</p> <p>No testing beyond day 8 risks missing cases with longer gestation periods. This is the case with the 'test and release' program with the last mandatory test being day 5 as well.</p>
<p><b>Exempt travellers</b></p>	<p>50 separate professions listed for England and Wales, with each category entailing different testing and quarantine protocols depending on red, amber or green country of departure</p> <p>Examples of amber list exemptions include:</p> <p>"If you live in the UK you do not need to quarantine."</p> <p>"You need to take a COVID-19 test on day 2 and day 8 after arrival in the UK, if you are still in the country."</p> <p>"You can leave your [self-quarantine] accommodation when conducting the</p>	<p>Complex to implement, effectively or consistently</p> <p>Significant risk of importation for those professionals permitted to interact with the community so long as for the purpose of work.</p> <p>Depending on the volume of travellers in each of these categories and their frequency of travel, lower and inconsistent testing and quarantine thresholds for many of these travellers poses a significant risk of onward transmission in the communities where they are staying and working.</p>

	<p>specific exempt activity or travelling directly to and from your accommodation and a location for the purposes of this work.”</p> <p>“You do not need to quarantine – either in a quarantine hotel or in private accommodation.”</p>	
<b>“Red” list departure country</b>	<p>72-hour pre-departure test (nucleic acid, LAMP or antigen test)</p> <p>Tests at day 2 and day 8 after arrival (as part of 10-day hotel quarantine package)</p>	No testing beyond day 8 risks missing cases with longer gestation periods.
<b>Exempt travellers</b>	<p>50 separate professions listed for England and Wales, with each category entailing different testing and quarantine protocols depending on red, amber or green country of departure</p> <p>Examples of protocols for exempt travellers arriving from red list countries:</p> <p>“You do not need to quarantine – either in a quarantine hotel or in private accommodation.”</p> <p>“You must quarantine in the place you are staying. You can leave your accommodation when conducting the specific exempt activity or travelling directly to and from your accommodation and a location for the purposes of this work. You must quarantine at all other times during your stay.”</p> <p>“Senior executives are only exempt if the business activity requires their physical presence and cannot be done remotely or by anyone who would not need to quarantine.”</p>	<p>Complex to implement, effectively or consistently</p> <p>Significant risk of importation for those professionals permitted to interact with the community so long as for the purpose of work.</p> <p>Depending on the volume of travellers in each of these categories and their frequency of travel, lower and inconsistent testing and quarantine thresholds for many of these travellers poses a significant risk of onward transmission in the communities where they are staying and working</p>

**Table: Comparison of testing measures for countries with low COVID-19 cases and deaths**

Country	Frequency	Process/cost	Exemptions	Penalties
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<b>Australia</b>	Proof of negative PCR test result 72 hours pre-departure	At cost to traveller	Children aged under 5 years (4 years and younger) People with a medical condition w/ certificate International air crew (undergo testing every 7 days) Travellers on a designated green safe travel zone flight People travelling from countries where COVID-19 PCR testing is not reasonably available	Prevented from boarding
	Test on arrival or within 48 hours at quarantine hotel  Test again between days 10 to 12 of quarantine.	Part of mandatory hotel quarantine, at cost to traveller, administered under state authority exact testing arrangements depend on states and territories.  Includes flight crew	Exemptions vary by state, testing on arrival or at hotel quarantine: exemptions include in-transit travellers, 'safe zone' travellers, and some categories of workers with adjusted requirements	If you refuse testing, you may have to quarantine for a longer period  Fines for breaching vary by state
<b>Israel</b>	All passengers must present a negative COVID-19 PCR test result, taken within 72 hours prior to the scheduled time of departure to Israel,	At cost to traveller  Includes vaccinated travellers, those with a certificate of recovery and transit passengers	Passengers arriving in Israel who cannot take a pre-departure PCR test of humanitarian grounds, or special personal needs, or if it is physically impossible to access PCR testing need to apply to the Exceptions Committee.	Entry to Israel depends on complying with this requirement.
	PCR tests on arrival for all foreign nationals and again at Day 9  PCR tests for Israeli passport holders	At airport, through contracted private company, at travellers' expense	All travellers are required to test on arrival.  Travellers who have been vaccinated or have recovered in Israel if not travelling from a high risk destination do not need to enter mandatory isolation and have day 9 test	Those who do not comply will face a NIS 3,500 fine. Those who breach a restriction are fined and required to enter isolation in a motel.

<b>New Zealand</b>	Travellers are required to have COVID-19 test (PCR tests (including RT-PCR) LAMP tests or Antigen tests unless travelling from a 'very high-risk country' which requires PCR only) no more than 72 hours before departure	Arranged by and at cost to traveller	Limited exceptions for travellers from Australia, Antarctica and most Pacific Islands Exemptions for humanitarian reasons may be granted by the Director General of Health. children who are under two years of age (up to 24 months) asymptomatic individuals with medical certificate within 72 hours, and unable to undertake a test for medical reasons but do not exhibit symptoms of COVID-19 individuals with past (recovered) cases of COVID-19 who have a positive 72 hour or less test result with a medical certificate	Denied boarding
	Most travellers tested within 24 hours of arrival (day 0/1).  Tested again around day 3 and day 12  You'll be tested again around day 3 and around day 12.	Travellers may be asked to remain in room until negative test results are received.  If the result of day 0/1 test is positive, traveller transferred to a quarantine facility.  If arrival test is negative, 14 day 14 days managed isolation stay at your facility as normal	Children are treated the same as adults for testing, except infants under six months of age are not required to undergo nasopharyngeal testing, unless they are symptomatic or close contacts of a confirmed or probable case.  Air crew and airport workers are required to be tested every 7 or 14 days depending on circumstances/risk Maritime crew required to be tested every 7 or 14 days depending on their circumstances/risk level  In very exceptional circumstances, you may be eligible for an exemption from managed isolation. For most cases, if you're granted an exemption, you must still:  complete 7 days in managed isolation have a negative COVID-19 test on or around day 3	6 months prison or \$4000 NZD fine
<b>South Korea</b>	All travellers (Koreans and foreigners) required to submit negative COVID-19 PCR test result issued within 72 hours of departure for all foreigners	At cost to traveller A proof of a negative COVID-19 test (PCR) must be presented to the airline personnel The test result should be submitted to the quarantine	Infants and children under the age of 6 (as of entry date)  Airline crew (may be subjected to change in the future)  Korean nationals with quarantine exemption certificate issued for a humanitarian reason (i.e attend a funeral)	Boarding will not be permitted for foreign passengers without a negative COVID-19 test result issued within 72 hours.

		authorities upon their arrival in the ROK.		
	All arrivals – regardless of nationality and length of stay – are also required to be tested for coronavirus (COVID-19) after entering South Korea.  Required tests with 3 and 14 days of arrival.	Depending on country of departure, test on arrival administered at the airport or temporary living facility	Those exempted from quarantine are required to undergo diagnostic tests.  Authorities allow "fast track" entry for essential business trips and official travel from certain countries. In addition to pre-departure testing, fast-track travelers must take another COVID-19 test upon arrival, await the result before entering South Korea, and abide by health surveillance procedures	Up to a year in prison or up to 10 million won (nearly \$9,000) in fines
<b>Taiwan</b>	Before boarding the flight to Taiwan, all travelers must provide a COVID-19 RT-PCR test report issued within three days prior to the flight, including business and transit passengers	At travellers' expense	Emergency situations, arriving from a country where self-paid COVID-19 tests are not available, Programs managed by relevant ministries and agencies and approved by the CECC  Travelers who arrive without test results must sit in a designated area on the flight and undergo testing at their own expense on arrival	Subject to a fine between NT\$10,000 to NT\$150,000 If such travelers test positive, criminal liability will be imposed
	Repeated testing required on arrival for all travellers, schedule and process varies depending on risk of country of departure/recent travel history	All travelers whether symptomatic or asymptomatic, are required to undergo a government-funded PCR either at the airport or upon arrival at quarantine facilities test one day before their isolation or quarantine period ends	No listed exemptions	Fines between NT\$10,000 to NT\$150,000.
<b>Thailand</b>	Pre-departure PCR test taken within 72 hours	At travellers' expense	Thai nationals: no COVID-19 test required, though it is recommended	Unclear – prison time and fines

	RT-PCR test on arrival, and again on days 6-7, and 12-13	At travellers' expense	No listed exemptions	Unclear – prison time and fines
<b>Vietnam</b>	Vietnam is only allowing entry to those foreign experts, and those travelling for official or diplomatic purposes	must undergo medical checks at their own cost on arrival	Unclear	Unclear

**Table: Comparative analysis of methods for achieving compliance with public health measures during the COVID-19 pandemic**

<b>Country</b>	<b>Responsible authority for implementation</b>	<b>Process from flight to quarantine location</b>	<b>Compliance checks</b>
UK	Airlines and channel shuttle services, the Civil Aviation Authority, Border Force, Public Health England's Isolation Assurance Service (IAS), NHS Test and Trace and the police share responsibility for enforcing international travel quarantine requirements.	<p>For travellers arriving from <b>Red list</b> countries: Need to book, and pay for, a quarantine package before you complete your passenger locator form and board your return journey to the UK. You will only be able to book this within the two weeks prior to arriving in the UK</p> <p>Travellers from red list countries guided through baggage reclaim and customs to the dedicated hotel transport (no private transport permitted)</p> <p>For travellers from <b>amber lists</b>: When you arrive in England, go straight to the place you are staying to quarantine. Only use public transport if you have no other option, and make sure you follow safer travel guidance for passengers.</p>	<p>New government department created: Isolation Assurance Service (IAS) to contact everyone returning from non-red list countries that are staying in England and Northern Ireland.</p> <p>NHS Test and Trace staff carry out up to 1000 visits per day to people who are required to quarantine</p> <p>Police officers have been deployed to airports and ports to support the enforcement of international travel quarantine requirements. Officers at ports check the reasons for passengers' journeys and help ensure passengers arriving from "red list countries" comply with the requirement to quarantine in designated hotels.</p>

Australia	Managed and enforced by state and territory governments with Australian Government support	Depends on state/territory but generally transport from airport to government-arranged accommodation provided with escort from police or military personnel. Taxi, rideshare or public transport not allowed. The hotel traveller stays at is decided upon on the day of arrival (no possibility to pick or need to book in advance)	Depends on state/authority (e.g., New South Wales Police stationed at quarantine hotel and in charge of approving any accommodation changes; someone in corridor at all times in most hotels; mix of CCTV, private security guards, police, and robots for surveillance)
Canada	Public Health Agency of Canada, local law enforcement	Transport from airport to hotel provided by hotel and may include taxi, shuttle, limousine, ride-sharing service or traveller can drive their personal car if can walk to pick it up; Private vehicle from hotel to home	Government of Canada and security companies conduct live or automated calls, in-person visits at private residence but concerns over low proportion of compliance checks, reports of travellers skipping hotel quarantine and not fined, lack of training/authority of private companies conducting checks
Israel	Ministry of Health, Ministry of the Interior, and Ministry of Defence	All travellers must submit an entry statement including personal information, address of accommodation where they will isolate, and a health declaration (digital or printout)	Close monitoring by Israel Police - in case of breach, the Police can force relocation to a state-designated isolation accommodation (motel) for the remainder of the isolation period - along with a penalty of NIS 5,000 (C\$1,856); Israeli Defense Forces also on site at quarantine motels; Legislation on the use of monitoring technology has yet to be passed - current bill proposes electronic bracelets upon arrival (to be worn on wrist or ankle and monitor location via Bluetooth and GPS connected to a provided cellphone). Those who refuse would be required to stay at a government-run quarantine hotel. Program piloted in March 2021 with 100 people. System alerts authorities if bracelet is removed or person ventures too far from home monitor. Controversy over use of domestic spy agency to track cases - top court that the government had to curb its use by 14 March 2021.

New Zealand	Managed Isolation and Quarantine (MIQ) officers	Traveller needs to secure a Managed Isolation Allocation Voucher (very few available spots), held for 48 hours while traveller organizes flights; allocated to facility upon arrival (no choice); transferred to facility in provided transport; traveller does not pick up luggage - delivered directly to hotel room	Managed Isolation and Quarantine unit, part of the COVID-19 All-of-Government Response Group, on site for support – alongside police, military, Aviation Security Service (civil aviation authority); some private security guards (despite government saying in August 2020 only government employees would be providing security following privacy breach)
South Korea	South Korean Ministry of Health and Welfare	Quarantine facility randomly assigned; transport to quarantine facility pre-arranged; travel to Seoul for self-isolation in government-certified taxi or shuttle bus - or family but need to provide more information (home address, phone number); married couples split up into different rooms	For those not quarantine in hotels, system of self-diagnosis app and phone calls from health authorities ("A-1, A-2 and A-3 visa holders with negative test results from COVID-19 diagnostic testing will be subjected to "Active Monitoring" (instead of 14 days quarantine), which includes daily submission of health status information via the 'Self Diagnosis App' and phone calls from health authorities throughout their stay in Korea."); those who violate quarantine guidelines "will be required to wear a safety wrist band. Those who refuse to wear the safety wrist band will be transferred to a designated quarantine facility and may be required to pay for the use of the facility."

Taiwan	Taiwan Centers for Disease Control; Central Epidemic Command Center (CECC)	Travellers need to book their own hotel room in advance; other elements unclear	Central Epidemic Command Center (CECC) officer checks in daily via phone calls/text messages and in-person visits if no answers; some differences across hotels; Quarantine System for Entry - travellers log into app when checking in prior to boarding; electronic tracking "inbound passengers please act in concert with using our country's telecom number (SIM card can be bought in airport after arriving) and personal cellphone (1 cell per person) for declaration. Nevertheless, special occasions, including, but not limited to children under 12 years old also having the same home quarantine location, is permitted to share the same cellphone for declaration."; daily phone calls (visit in person if traveller does not pick up)
Thailand	Center for Covid-19 Situation Administration (CCSA) in partnership with Department of Disease Control	Transport provided	Unclear
Vietnam	National task force headed by Deputy Prime Minister (set up in January 2020)	Transport run by government; hazmat suit provided at airport and to be worn on the way to hotel room	Health officials, police on site

### HOW WOULD YOU ASSESS THE CRITERIA AND METHODOLOGY USED BY THE JOINT BIOSECURITY CENTRE TO CATEGORIZE COUNTRIES UNDER THE TRAFFIC LIGHT SYSTEM?

70. Given the emerging science on SARS-CoV-2 and variants, the effectiveness of vaccines, and the unprecedented use of travel measures by all countries, the methodology for risk assessment is also still evolving.
71. We have reviewed the Joint Biosecurity Centre methodology<sup>60</sup> and data.<sup>61</sup> It is, for the most part, aligned with the WHO risk assessment methodology guidance released in December 2020.<sup>62</sup> The WHO risk assessment methodology treats

travellers as a **homogenous group** (i.e., **risk is independent of purpose for travel**).

72. Two additional considerations which WHO includes which are not highlighted by UK methodology are, first, **volume of travel** between jurisdictions under consideration (though 'travel connections to the UK is mentioned') and, second, **destination country's (UK) capacity to detect and cope with additional COVID-19 cases predicted to result from travel**.
73. While the described JBC methodology accounts for many of the key contextual factors, when you drill down to the data being used, **access to and quality of data** remains a big question mark. For example, it relies on "incidence per 100,000" as a key epidemiological indicator but consistency, availability and reliability of this data differs depending on, for example, testing capacities and strategies employed. How are adjustments made in the assessment of cases where departure countries have unstable incidence trends or unreliable surveillance?
74. As is the case with WHO methodology, the UK approach focuses on **mitigating rather than eliminating risk**. The underpinning policy goal of reducing travel-related risk across jurisdictions with high levels of ongoing community transmission relies on staying within **health system capacity thresholds to manage additional COVID-19 cases introduced by travel**.
75. There is no accounting for presumed **under detection of asymptomatic transmission**. In its risk assessment guidelines, WHO acknowledges that incidence of COVID-19 is assumed to be consistently higher than what is captured by surveillance (since measured incidence excludes asymptomatic cases and cases which are not confirmed through testing). For travel between countries that both have community transmission, undetected or asymptomatic cases are presumed to have a similar influence so would not dramatically affect relative risk. However, **"this assumption does not hold where unrestricted travel of asymptomatic individuals will lead to re-seeding in locations with no cases, imported/sporadic cases or a small number of cluster cases."** Considering the disparate and dynamic situations of different regions of the UK, this factor needs to be accounted for in risk assessments conducted to guide travel policies at national and sub-national levels. As case numbers decrease and vaccination uptake continues, testing and tracing will become even more important to protect the gains made through public health measures, including vaccination.
76. Finally, the UK risk assessment approach has been **developed in the context of known variants of SARS-CoV 2 and their characteristics**. However, as WHO acknowledges "the **emergence of any virus variant with confirmed changes to epidemiologic or clinical characteristics** (e.g., higher transmissibility or virulence) requires a dedicated risk assessment."<sup>63</sup> Variant cases are identified through genomic sequencing or targeted PCR testing and



not the total number of cases. Testing protocols and genomic sequencing capacity are very important because sampling travellers and their contacts can be used to identify VOCs before they spread to the community.<sup>64</sup>

77. Overall, these issues point to challenges in applying the JCB methodology and criteria.

### **HAVE COUNTRIES APPLYING A VIRUS SUPPRESSION (ELIMINATION) STRATEGY FOR BORDER MANAGEMENT BEEN MORE EFFECTIVE?**

78. This is a **complicated question** because we need to be clear what measures we are talking about when we talk about border management. There is a lot of **imprecision and misleading terminology** like “border closures” and “travel bans.” **How a country fared**, in terms of total infections and deaths, will have been influenced by geographical and economic factors such as location, number and nature of points of entry, pre-COVID travel volumes and so on. How a country fared is also dependent on a wide range of interrelated factors including the timing and effectiveness of accompanying domestic public health measures such as testing and social distancing, availability of critical supplies, health care capacity and so on. We have also seen **wide variation in policies adopted** and change over time in each of the countries that have followed a suppression strategy. Finally, of course, we can assess the public health impacts of these policies but **wider economic and social impacts** also need to be considered when assessing effectiveness. So all of this means that it would be too simplistic to conclude that countries that adopted more stringent travel-related measures have somehow been more effective during the COVID-19 pandemic.
79. What we can provisionally conclude is that, for this pathogen, when border management aligns with the **evolving science** (rather than economic or political goals), governments more effectively identify imported infections and preventing them reaching the wider population in a jurisdiction. Countries put into place more comprehensive (applying to almost all travellers) and stringent border health measures that aim for suppression are associated with having lower levels of virus importation and overall lower numbers of cases and deaths. These countries tend to also put into place measures domestically that have contributed to these low numbers. Our overall conclusion might be that border management is a **necessary, but not sufficient**, policy area to get right in a government’s overall pandemic response strategy.
80. This is supported by a study by Haug et al. that, among the many non-pharmaceutical interventions (NPIs) applied during the COVID-19 pandemic, **“social distancing and travel restrictions<sup>65</sup> are top ranked” as the two most effective interventions for mitigating the spread of the virus.**<sup>66</sup> Their analysis of 63 categories of NPIs applied in 79 jurisdictions (including the UK),<sup>67</sup> “found strong support for the effectiveness of border restrictions.” While the countries that have most successfully controlled the spread of SARS-CoV-2 have applied a

**package of measures**, evidence suggests the **two interventions you need to do effectively are social distancing and travel restrictions**. The question then becomes, what does effective mean? There has been so much variation in how countries have applied travel restrictions. **What can we learn from how different countries have applied different border health measures specifically?**

## **81. WHAT IS PROBLEMATIC ABOUT ARGUMENTS USED TO SUPPORT A MITIGATION APPROACH TO BORDER MANAGEMENT?**

82. Governments that have adopted a mitigation approach often attribute relatively low risks to international travel. For example, in Canada, the figure of <2% of total cases of COVID-19 was used, and continues to be used, to downplay risks from international travel. Many studies published over the past year or so, based on genomic sequencing data, shows that travel imported virus into Canada, the UK and other jurisdictions repeatedly and seeded onward community transmission.<sup>68, 69</sup> There is also a certain circularity about the lack of evidence of risk. Weak border measures means not collecting the data needed that allows for accurate assessment of real risk. For example, not testing all travellers coming into your country (one-third of air arrivals and up to 93% of land arrivals are exempt in Canada from testing and quarantine)<sup>20</sup> simply means you cannot calculate the proportion of arrivals who are infected, nor develop any evidence-based understanding of the onward transmission they may cause. I can say more about an effective risk-based approach but let me say at this point that it has been a case of garbage in, garbage out when it comes to estimating travel-related risk. Yet this figure has been used in Canada to argue that stronger border measures are not needed.<sup>70</sup>

83. On the argument that resources should be put to curbing **domestic transmission rather than international borders**, this might arguably have been the case before variants came onto the scene. The modelling study by Timothy Russell and colleagues, of travel measures during the early stages of the pandemic, calculated that travel measures are effective at delaying importation if a jurisdiction has low incidence of the virus, large numbers of arrivals from other countries, or where “epidemics are close to tipping points for exponential growth.”<sup>69</sup> Another study by du Plessis and colleagues, concluded that high volumes of international arrivals to the UK contributed to >1000 identifiable UK transmission lineages.<sup>68</sup> Today, of course, that window of opportunity to prevent or slow importation of wild-type SARS-CoV-2 (which many countries missed by the way) has been long closed.

84. Finally, on the argument that it is **not possible to prevent virus importation**, this is partly true. The outbreaks we have seen recently in Taiwan,<sup>71</sup> Singapore and Vietnam,<sup>72</sup> despite relatively strong border measures compared to the UK, all driven by variants, shows how challenging the situation is. The robust border management regimes in these contexts are nevertheless a critical component of

COVID-19 response strategies, contributing to these governments' capacity to identify, trace and respond to these travel-related outbreaks.

85. Importantly, we need to see the task of border management as comprising **two main tasks**: a) identifying international arrivals who are infected; and b) preventing those who are infected from transmitting their infection to the wider population. So yes, it is not possible to prevent virus importation, even with pre-departure testing. This is because the virus is elusive, you can become infected in the interim and enroute, and there can be false negatives. People will arrive infected into your jurisdiction and you have to recognize this. The question is how well do you identify them and ensure they do not reach the wider population. This can be achieved through appropriate testing and quarantine protocols for all international arrivals. The challenges are to continuously and appropriately match the protocols with the evolving science, and to ensure that these protocols are adhered to by all travellers. When you are dealing with variants, slip ups can lead to major consequences.

#### 86. WHAT ROLE DOES PUBLIC MESSAGING PLAY IN EFFECTIVE BORDER MANAGEMENT?

- Need to be more precise by what we mean by border management and travel measures; **terminology** is inconsistent and misleading at times in government, research and media
- One limitation of the UK approach to border measures currently is that it is incredibly **complex, dynamic and not always intuitive**. Border measures changed depending on where a traveller is arriving from, whether they are a resident of the UK, by what means they arrived, what their purpose of travel is, and where within the UK they are flying too. And then within those categories, the rules differ depending on individual vaccination status, whether the traveller opts in for the test and release scheme and other personal circumstances such as whether they are travelling with children, where their final destination is in the UK etc. While there is extensive publicly available information and clear efforts towards decision-making transparency compared to many other countries, the sheer complexity and diversity of measures undermines their effective communication.
- **Mixed messaging** is problematic. Airlines advertising and travel agents touting package holidays at the same time as government advisories against travel is confusing.
- Promises of restarting travel by a certain date creates **false hopes** and unrealistic timelines. It erodes public trust and thus compliance with public health measures.
- Perceived **fairness** of policies very important for compliance. Reports of MPs and senior business executives travelling against government advisories rankled.
- Framing stronger measures as “draconian” reduced policy flexibility and reduced their acceptance by the public.

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