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# Adapting to the 'New Normal': Implications for post-COVID-19 Health Communication and Education

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# 1.0 Adapting to the New Normal

## 1.1 Introduction and overview

We are two years into the COVID-19 pandemic while many countries are eager to move on to resume life as 'normal', others are still facing upheavals due to unyielding trends in infections, hospitalisations, and deaths. COVID-19 has become firmly embedded in everyone's daily life, irrespective of where they live. It is almost impossible to have not heard of a friend, colleague or family member who has been infected, or read some new clinical development in the fight against the virus or find yourself in the position of having to take a test. Nevertheless, many governments are holding out hope that we will soon see a light at the end of the tunnel and reach a state of equilibrium where we 'learn to live' with the virus.

## 1.2 Do we still need to talk about COVID-19?

If COVID-19 is so inextricably tied to our daily lives, but we can relegate it to the background, then why is it so important to keep talking about it? The answer is that while many hold out hope for it to attain an endemic status, where it is cyclical but its public health effects are relatively predictable, we still need a transition phase to get there. There is still much that is not understood about the emergence, transmissibility, and virulence of future variants, and about the general population's immunity profile with the current range of vaccines. This uncertainty is worse in developing countries where access to vaccines is unreliable, and COVID-19 cannot be thought of as a 'third-world problem'.

Even as some countries begin to phase into an endemic status, it is unlikely that they can do so consistently, even within their own jurisdictions. This is especially true for federal nations, which can adopt different stances to public health measures internally. And in centralised administrations 'soft' measures like the need to have temperature checks before entering private premises can be applied, without the need for legislative backing.

Finally, the risks from COVID-19 are long-tailed, meaning that it may take some time for some of them to be fully exposed. While a great deal of work has already been done in trying to anticipate the long-term socioeconomic impacts of the pandemic, dealing with the tail risk requires constant vigilance and stakeholder engagement.

In these respects, the only 'new normal' we can project is the transitional pathway towards endemic status, and ongoing COVID-19 policy discussions should be oriented to this cause.

## 1.3 What do policymakers need to consider now?

Key to effective policymaking in this transitory 'new normal' is a robust planning framework that recognises we are no longer simply 'rolling with the punches' of the pandemic. Some basic elements of such a framework are outlined below.

### a. Pay close attention to the science

The momentum of the medical and scientific community in unlocking the mechanisms of infection and immunity to COVID-19 has been unprecedented so far. While they have charted the frontier for hope, it is also important to temper this with the accepted limitations to progress.

In a recent report issued by the World Health Organization (WHO) on 28 January 2022, Chair of WHO COVID Vaccines Research Expert Group Phil Krause expressed that while there is a possibility for an endemic COVID-19, we cannot discount the risks which are posed along this journey. The chief concerns are that future variants (beyond Omicron) may be more transmissible, virulent, and evasive of current immunity (World Health Organization, 2022).

### b. Monitor the repertoire of contagion controls

Public health measures that attempt to limit transmissibility of COVID-19, in the first instance, have been crucial factors in inhibiting the spread of COVID-19. While the particular selection of measures used varies by country, understanding their relative effectiveness and potential for uptake has been necessary for epidemiological modelling of infection rates, and will still be important in the 'new normal'.

Monitoring this repertoire of measures relies on acknowledging when measures have outlived their usefulness, anticipating when to trigger and release extant measures, and operationalising a robust impact assessment framework. Such impact assessments should reflect high-stakes, non-economic domains, including crime, education, wellbeing, and civic engagement.

### c. Improve public confidence in vaccines

It is widely accepted that vaccine confidence is vital to immunisation programmes in general. For COVID-19, vaccines stand apart, as they do not offer contagion control in the typical sense (they do not significantly reduce one's chance of becoming infected), but they are efficacious against the severity of the disease.

This is important for two reasons. Firstly, the general upper limits of disease severity will affect public perceptions of progress towards endemic status, which in turn may affect their willingness to adapt to lessening or strengthening of contagion controls on an ongoing basis. And secondly, the effective severity will affect actual rates of hospitalisation, which will be one of the key indicators of the progression of the pandemic.

### d. Have a clear threshold for endemic status

The requirements for endemic status are not strictly defined, but it broadly captures the idea that the disease has become relatively predictable in its emergence and epidemiology, and that societies are prepared to accept the levels of mortality and

other accompanying losses. When this happens and how this translates into mortality and morbidity metrics will vary from country to country.

For many Western countries, the benchmark metrics which are regularly cited are those relevant for influenza, which has its own relatively stable pattern of occurrence annually. This is largely because there is some correspondence in respiratory symptoms between COVID-19 and the flu, and also perhaps it is more palatable to express the correlated risk of dying from either disease.

Nevertheless, other headline metrics are still salient in public minds, including hospitalisation rates, new daily or weekly infections, rates of recovery and even rates of absence from work. In adapting to the 'new normal' it will be necessary to achieve some notional convergence in perceptions of these metrics, so that we can better quantify the impact of adverse situations like waning immunity, or new, clinically significant variants.

#### e. Contingency plans for 'special populations'

Despite the hopefulness of moving toward endemic status for the majority of society, policymakers must remain sensitised to the fact that not everyone will benefit equally from learning to live with COVID-19.

Extra care and investment must be made for groups with special needs or limitations, including those who are immunocompromised, shielding, elderly, afflicted with comorbidities, socioeconomically deprived, and even vaccine hesitant. This final point will be the hallmark of whether we have truly moved forward, beyond the pandemic.

### 1.4 What does this mean for the G7?

The G7 is no stranger to global crisis response. It moved aggressively in 2008 to take collective action to address the financial crisis. Yet the 'contagion' effects in the financial markets at the time should not be confused with the state of the COVID-19 pandemic now. Here we are not concerned with the misalignment of views on how

negligible low-probability events actually are, nor do we have two centuries of medical theory to rely on to support public health systems. A more cautious, deliberate approach is required here, one that recognises the exposure to long-tail risks as COVID-19 moves through the global population in all its variant forms.

The recent G7 Health Ministers' meeting in June 2021 reaffirmed their commitment to encourage high quality scientific research into COVID-19, as well as to continue to monitor for equitable global access to safe and effective vaccines, and to promote vaccine confidence. Indeed, lessons learned from the G7 could prove formative for a new WHO Global Vaccine Action Plan for the coming 'COVID decade'.

Yet, arguably, the G7 faces an even greater challenge in navigating through the current anticipatory 'new normal', compared with the start of the pandemic. Unlike during the 'shock' at the beginning of 2020, the public in G7 societies are now more settled with the span of public health measures, vaccination programmes and awareness campaigns. They are no longer 'passive' consumers of policy, but rather have a higher degree of agency and strategic sensibilities when it comes to epidemiological controls for COVID-19.

This means that the points noted above which are relevant to policymakers are interrelated, and perhaps may be better encapsulated in a singular concept of 'vaccine engagement'. This would entail the dynamics of vaccine confidence, moderated by individual and cultural characteristics. It also the idea that the public may embrace cost-benefit trade-offs between contagion controls, vaccine programmes and even the prospect for natural immunity.

The core message for G7 policymakers is that it is favourable to capture the principle above under a holistic banner of 'vaccine engagement', focussing on public sensitivities, cost-benefit assessments, risk aversion, and centrality of particular health measures in the space of active contagion controls. This is all underscored by the need for effective public communication protocols, as well as a suitable policy for the education of younger generations on vaccination.

## 1.5 What have we done?

This study focuses on the idea that vaccine engagement will be the central theme as countries attempt to move toward endemic status with respect to COVID-19. We expect the findings and recommendations in this report will supplement formal impact assessments frameworks that account for economic and social wellbeing effects of COVID-19 policy changes. The key assumptions driving this study are:

1. The less virulent Omicron variant gives hope for endemic equilibrium, but we will exist in a period of transition while we seek more understanding of waning immunity profiles and the potential for more virulent strains to emerge. This period marks the beginning of the 'new normal'.

2. Although many G7 governments are now limiting their severity of use, contagion controls in the form of public health and safety measures (PHSMs) will continue to be relevant and relied upon during this period, given the risks above.

3. It is likely that PHSMs will evolve and be adapted in the future, particularly those which become more cost-effective and less intrusive as investment is made in R&D, including new drugs for treatment and contact tracing apps.

4. The concept of vaccine hesitancy will become more complex, as we being to understand correlations of patterns of infection between COVID-19 and influenza.

5. Governments will still rely on health experts and scientific advisors to shape policymaking options, but public sentiment will play a much larger role in the effectiveness of centralised policymaking than it did at the beginning of the pandemic.

Against these background assumptions, this study reconceptualises the relationship between vaccination policies and other PHSMs as the main driver of

public vaccine engagement. We propose that this relationship is predicated on individual, utilitarian, and political positioning of the costs, benefits and risks associated with policy responses to COVID-19.

We focus comparatively on England and Japan as these G7 countries had large pockets of unvaccinated or partially vaccinated communities prior to the Omicron wave. While it is recognised that logistics and vaccine availability may have had a role to play, understanding the profile of vaccine engagement in such communities, whether positive or negative, may have significant bearings on wider G7 policy action.

There were three main stages of data collection and analysis:

1. A review of PSHM activity in England, Japan, and the wider G7.
2. A survey comprising questions related to:
    a. Vaccine hesitancy
    b. General state of anxiety
    c. General inclination or propensity to take risks
    d. Ranked preferences of a shortlist of PHSMs
    e. A discrete choice experiment (DCE) which attempts to identify respondents' trade-offs between PHSMs
3. Focus groups which supplemented the survey to provide deeper insights into individuals' assessment of costs, benefits, and risks within COVID-19 vaccination policies, alongside other PHSMs.

### 1.5.1 Survey demographics

Data collection for the survey was administered by Qualtrics through their dedicated panels in England and Japan. 1400 participants took part in the survey from each of London in England, and Osaka in Japan. The breakdown of participant demographics is shown in the table below.

| | | England (n) | % | Japan (n) | % |
|---|---|---|---|---|---|
| **Age** | | | | | |
| | 18 - 39 | 516 | 36.9% | 214 | 15.3% |
| | 40 - 59 | 498 | 35.6% | 736 | 52.6% |
| | 60 + | 386 | 27.6% | 450 | 32.1% |
| **Gender** | | | | | |
| | Male | 641 | 45.8% | 960 | 68.6% |
| | Female | 754 | 53.9% | 436 | 31.1% |
| | Non-binary | 5 | 0.4% | 4 | 0.3% |
| **Ethnicity / Nationality** | | | | | |
| | White British | 879 | 62.8% | | |
| | White European | 130 | 9.3% | | |
| | Black British | 34 | 2.4% | | |
| | Asian British-Bangladeshi | 24 | 1.7% | | |
| | Black British-African | 60 | 4.3% | | |
| | Black British-Caribbean | 46 | 3.3% | | |
| | Asian British-Indian | 93 | 6.6% | | |
| | Asian British-Pakistani | 32 | 2.3% | | |
| | Arab | 9 | 0.6% | | |
| | Other / Mixed | 93 | 6.6% | | |
| | Japanese | | | 1,395 | 99.6% |
| | Chinese | | | 1 | 0.1% |
| | Korean | | | 4 | 0.3% |

| | | England (n) | % | Japan (n) | % |
|---|---|---|---|---|---|
| **Job status** | | | | | |
| | Not working | 307 | 25.2% | 340 | 26.8% |
| | Trade, manufacturing, or industry | 184 | 15.1% | 522 | 41.1% |
| | Professional services | 456 | 37.4% | 207 | 16.3% |
| | Hospitality, transportation, or 3rd sector | 130 | 10.7% | 109 | 8.6% |
| | Health, welfare, and social work | 143 | 11.7% | 93 | 7.3% |
| | Other | 180 | 14.8% | 129 | 10.1% |
| **Vaccination status** | | | | | |
| | Unvaccinated | 121 | 8.6% | 177 | 12.6% |
| | One shot | 54 | 3.9% | 3 | 0.2% |
| | More than one shot | 1,202 | 85.9% | 1,211 | 86.5% |
| | Prefer not to say | 23 | 1.6% | 9 | 0.6% |

The three age brackets captured here roughly correspond to `young` (18 – 39), `mature` (40-59), and elderly (60 +), corresponding to the broad thresholds at which the public would be considered at increasing levels of from more severe COVID-19, if they are infected. Since commercial research panels tend to reflect some age groups and genders more than others, these characteristics were used to derive survey weights to adjust the data analysis to be more representative of the population. The weights were based on 2012 OECD census data, for both England and Japan. For instance, for Japan, the most underrepresented group was females aged 60+, while the most overrepresented group was males aged 40-59. Panel respondents in England were more representative of the population in general (survey weights were close to 1).

### 1.5.2 Subgroup analysis

Analysis of subgroups based on demographics is a common feature of quantitative methods applied to survey data. In this study, subgroup analysis was performed where appropriate and where numbers in each category were large (>200), because several of the techniques depend on large sample sizes. Age, gender, job status and vaccination status were all used for subgroup analysis. Because of the small number, non-binary participants were excluded from gender analyses (treated as missing records). Similar considerations were used for the vaccination status category 'prefer not to say`. Job status was collapsed into the following table to ensure numbers were greater than 200. The 'Not working' category includes students, the unemployed, and retirees.

| | England (n) | % | Japan (n) | % |
|---|---|---|---|---|
| **Job status** | | | | |
| Not working | 307 | 21.9% | 340 | 24.3% |
| Trade, manufacturing and other | 364 | 26.0% | 651 | 46.5% |
| Secondary front-facing services | 456 | 32.6% | 207 | 14.8% |
| Primary front-facing services | 273 | 19.5% | 202 | 14.4% |

A decision was made to exclude ethnicity / nationality from the subgroup analysis. This is mainly because the level of aggregation necessary to generate adequate sample sizes based on the respondents` demographics would obscure the nuanced differences between ethnic categories. Furthermore, respondents from Japan were overwhelmingly identified as Japanese, with only a handful identifying as Chinese or Korean. This would not allow for meaningful comparison across between England and Japan based on ethnicity or nationality. Nevertheless, some interpretative information may be recoverable from analysis by job status, as there is a significant association with ethnicity for respondents from England. In particular, Black & Minority Ethnic respondents are overrepresented in the `Health, welfare, and social work` professions `Hospitality, transportation, or 3rd sector`, while White British respondents were more

likely to be 'Not working', relative to other groups. The summary table below shows collapsed categorisation with overweighted cells in bold.

| | White British | Other non-British | Black & Minority Ethnic British | Total |
|---|---|---|---|---|
| **Not working** | **222*** | 41 | 44 | 307 |
| **Trade, manufacturing and other** | 228 | 57 | 79 | 364 |
| **Secondary front-facing services** | 284 | 74 | 98 | 456 |
| **Primary front-facing services** | 146 | 39 | **88*** | 273 |
| **Total** | 880 | 211 | 309 | 1400 |

### 1.5.3 Focus Groups

We carried out focus group discussions (FGDs) to supplement the survey with more in-depth qualitative data. Approximately 60 participants were recruited in each of England and Japan, averaging 4-6 participants in each group. There were two types of FGDs. The first `core` FGDs (majority of participants 48-50 per country) comprised activities which paralleled the survey questions, but which were framed to provide more insight into why respondents may choose certain answers, or to test the validity of experimental assumptions. The second `reflective` FGDs (approximately 10-12 participants per country) were designed to challenge participants with preliminary findings and ask not for their individual views, but to comment on behalf of the public, in terms of the findings. Overall, there were 123 FG participants in the total study (60 from the UK and 63 from Japan).

# 2.0 Classifying Public Measures for Public Accessibility

## 2.1 Should 'systems of public measures' be publicly accessible?

Perhaps one universal fact that can be derived from the experience of the pandemic is a new grasp of public measures, which have been generally understood as rules, guidance or regulations put forward by governments and global organisations to advise the public or in some instances prohibit human movement in efforts to curb or reduce the spread of the COVID-19 virus. Given that an average member of the public in any given country can now ramble about some form of guidance or restrictions around testing, travelling or indoor functions is testimony to a new common language that has been globally established around public measures. Though, most members of the general public cannot seem to confidently explain how decisions are made around the selection and/or severity of public measures, in particular the regulations around which public measures are put in place, for how long or informed by which version of data.

It is important to note, there has been an overwhelming emergence of global studies around the construction of policy regarding evidence and rationale informed approaches are present from the USA in the *Proceedings of the National Academy of Sciences of the United States of America* (Berger, et al.,2021), which tracks how policy makers respond to time sensitised decision making with limited information at hand. Or *The Health Foundation, Covid-19 Policy Tracker* (Dunn, et al., 2020) which captures a timeline of national policy and health system responses in England with data capturing critical dates of announcement and changes. More frequently referenced sites like *Our World in Data, Policy Responses to the Coronavirus Pandemic* (Hannah, et al., 2020) presents public measures in terms of global responses as they have been impactful to various functions in society e.g., schools and workplaces versus stay at home restrictions. While these are a few samples of policy investigations which involve understanding public measures, it is quite difficult for an average member of the public to easily access this information and perhaps even more difficult to relate

to how these measures might continue to impact their lives as we learn to adapt to a new normal with the uncertainties of emerging variants of the virus.

## 2.2 Importance of engaging with public measures

There have been ongoing efforts to help contextualise how to gauge control over outbreak pockets by flexing the range and severity of public measures. Though it is not very clear, to general members of the public which options that are on the table for implementation and how public opinion is weighed into consideration of these grand impactful decisions to help control the spread of the virus. It is pertinent now that global discussions around COVID-19 are inclusive of making long-term plans to adjust to a new-normal that might be populated with the emergence of new and unknown variants, heightening the need to engage the public in the on-going decision making for general inclusive public safety and wellbeing. While one can assume there are complex models and intricate datasets guiding policy makers some examples of models cast doubts on the wholesomeness or attentiveness of decisions on rolling out public measures that are inclusive of public opinion.

For instance, the early OECD's report on *Flattening the Covid-19 peak: Containment and mitigation policies* (March 2020) introduced public measures as being contextualised into two types of strategies that of containment and mitigation. Public measures for *containment* were aimed to minimise the risk of transmission from infected to non-infected individuals to control or stop an outbreak, and could include measures like contact tracing, quarantining etc. On the other hand, measures associated with *mitigating* strategies involved efforts to slow the spread of the disease and reduce the burden of the disease on the health care sector, and included measures like improved personal hygiene, social distancing, or even national lockdown. If we were to focus solely on the types of public measures encouraged under each strategy we can discern that it is not always clear which measure is clearly classified as belonging to any one particular strategy and while being mutually exclusive might not be the aim as all efforts to reduce the spread of disease would be welcomed, this does create several issues for policy makers especially when

considering how to communicate clear messages to the general public about rationales for the changes in policy and continued long-term management of new and emerging variants.

The report on the *Considerations for implementing and adjusting public health and social measures in the context of COVID-19* (World Health Organization, 2021) surveys the importance and scope of public measures and provides advice based on a 'situational assessment' which is derived from the transmission level and the response capacity of a particular cluster or outbreak in any given country. The report provides situational guidance from levels 0-4, where 0 is low-level minimal infection and close to zero cases all the way to increasing in escalation to level 4 which is categorised as an out-of-control epidemic with full blown public measures like business closure and national lockdown being implemented to contain the infection or death rate. Much like the above OECD (2020) report is it difficult to categorise which public measures shift between these situational levels 0-4 in terms of determining mutual exclusivity. It is also confusing how levels of severity are adjusted between situational levels to manage the mechanisms of reducing from say a Level 3 to a Level 2 and what might be some of the rationales in place to help create transparency around the decision-making processes. This brings us to the question what might be an ideal framework that is user-friendly and publicly accessible to be both informative and inclusive of public opinion?

## 2.3 What is a desirable classification system for public measures?

The characteristics of a desirable classification system that is palatable for public consumption and relation would be one that has the following characteristics:

a) *Mutual exclusivity – a description of public measures which are clearly distinguishable from each other, such that their categories were explicitly defined so that there was no confusion over some measures being duplicated in categories.*

b) *Holistic or all-encompassing* – which means as detailed as possible without becoming a cognitive overload of public measures, but a list of all possible global measures that could be considered at any given time especially regardless of the outbreak or rate of disease progression.

c) *Prioritised levels* – having public measures presented in a manner where important characteristics like situation levels could be presented to help distinguish an order of which public measures are softer policies that can be kept maintaining general public health even in cases with low outbreak or infection numbers, even if as a reminder of which measures one can anticipate being reintroduced in sequence should the disease spread or even reduce.

d) *Exclusion* – while one can conversationally speak about some public measures more than others, a transparent framework would also highlight the areas of under-performance which might still have potential to be incorporated given the changing nature of variant types or at the requests of the general public to try and improve health options at a national level.

## 2.4 Global public measures used over the course of the pandemic

The WHO defines public health and social measures (PHSM) as measures or actions by individuals, institutions, communities, local and national governments and international bodies to slow or stop the spread of infectious disease, such as COVID-19 (WHO, 2022). In the efforts to track, understand and collate these measures WHO in collaboration with the London School of Hygiene and Tropical Medicine (LSHTM) have collated a dataset which brings together a range of measures using a variety of web-based sources where this data is then cleaned and coded using a WHO taxonomy (summarised in Table 1 below) in efforts to standardise terms and categories.

*Table 1: WHO Taxonomy of PHSM*

| International travel | Individual | Environmental | Biological | Drug-based | Other | School measures | Offices, businesses, institutions and operations | Detecting and isolating cases | Domestic travel | Tracing and quarantining contacts | Gatherings, businesses and services | Special populations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Suspending or restricting international | Wearing a mask | Increasing room humidification | Using vaccines for prevention | Using medications for treatment | Legal and policy regulations | Closing | Closing | Passive case detection | Suspending or restricting movement | Quarantine of contacts | Restricting private gatherings at home | Shielding vulnerable groups |
| Suspending or restricting international ferries or ships | Using other personal protective equipment | Improving air ventilation | Using antibodies for prevention | Using medications for prevention | | Adapting | Adapting | Isolation | Stay-at-home order | Contact tracing | Cancelling, restricting or adapting private gatherings outside the home | Protecting populations in closed settings |
| Restricting visas | Physical distancing | Cleaning and disinfecting surfaces and objects | | | | | | Active case detection | Restricting entry | | Cancelling, restricting or adapting mass gatherings | Protecting displaced populations |
| Restricting exit | Performing respiratory etiquette | | | | | | | | Closing internal land borders | | Cancelling, closing, restricting or adapting public gatherings outside the home | |
| Restricting entry | Performing hand hygiene | | | | | | | | | | | |
| Providing travel advice or warning | Limiting face touching | | | | | | | | | | | |
| Exit screening and isolation or quarantine | | | | | | | | | | | | |
| Entry screening and isolation or quarantine | | | | | | | | | | | | |
| Closing international land borders | | | | | | | | | | | | |

These codes have been used as Level 1 categories to sort the PHSM that have been administered across different sectors or general activities in the society. However, the total WHO dataset is further categorised by Level 2 descriptors which comprise over 40 different labels to help code and classify the type of PHSM being implemented (see Table 2 below).

While this remains a live and extensive database summarising PHSM from across the global, if the dataset (as it currently is presented in Table 2) is shown to a general member of the public it would be challenging to make sense of how the levels are distinct and or can be incorporated into policy as a means of setting regulations for public compliance. Table 2 also shows the activity frequency between Levels 1 and 2 in the dataset.

*Table 2: WHO PHSM (all categories)*

| | International travel | Individual | Environmental | Biological | Drug-based | Other | School measures | Offices, businesses, institutions and operations | Detecting and isolating cases | Domestic travel | Tracing and quarantining contacts | Gatherings, businesses and services | Special populations | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Active case detection | | | | | | | | | 984 | | | | | 984 |
| Adapting | | | | | | | 4254 | 9332 | | | | | | 13586 |
| Cancelling, closing, restricting or adapting public gatherings outside the home | | | | | | | | | | | | 5074 | | 5074 |
| Cancelling, restricting or adapting mass gatherings | | | | | | | | | | | | 5380 | | 5380 |
| Cancelling, restricting or adapting private gatherings outside the home | | | | | | | | | | | | 2069 | | 2069 |
| Cleaning and disinfecting surfaces and objects | | | 283 | | | | | | | | | | | 283 |
| Closing | | | | | | | 3582 | 4629 | | | | | | 8211 |
| Closing internal land borders | | | | | | | | | | 409 | | | | 409 |
| Closing international land borders | 1279 | | | | | | | | | | | | | 1279 |
| Contact tracing | | | | | | | | | | | 1849 | | | 1849 |
| Entry screening and isolation or quarantine | 5457 | | | | | | | | | | | | | 5457 |
| Exit screening and isolation or quarantine | 103 | | | | | | | | | | | | | 103 |
| Improving air ventilation | | | 57 | | | | | | | | | | | 57 |
| Increasing room humidification | | | 3 | | | | | | | | | | | 3 |
| Isolation | | | | | | | | | 531 | | | | | 531 |
| Legal and policy regulations | | | | | | 2089 | | | | | | | | 2089 |
| Limiting face touching | | 38 | | | | | | | | | | | | 38 |
| Passive case detection | | | | | | | | | 2793 | | | | | 2793 |
| Performing hand hygiene | | 122 | | | | | | | | | | | | 122 |
| Performing respiratory etiquette | | 45 | | | | | | | | | | | | 45 |
| Physical distancing | | 390 | | | | | | | | | | | | 390 |
| Protecting displaced populations | | | | | | | | | | | | | 86 | 86 |
| Protecting populations in closed settings | | | | | | | | | | | | | 629 | 629 |
| Providing travel advice or warning | 503 | | | | | | | | | | | | | 503 |
| Quarantine of contacts | | | | | | | | | | | 457 | | | 457 |
| Restricting entry | 3368 | | | | | | | | | 1084 | | | | 4452 |
| Restricting exit | 288 | | | | | | | | | | | | | 288 |
| Restricting private gatherings at home | | | | | | | | | | | | 709 | | 709 |
| Restricting visas | 351 | | | | | | | | | | | | | 351 |
| Shielding vulnerable groups | | | | | | | | | | | | | 673 | 673 |
| Stay-at-home order | | | | | | | | | | 6088 | | | | 6088 |
| Suspending or restricting international ferries or ships | 370 | | | | | | | | | | | | | 370 |
| Suspending or restricting international flights | 1939 | | | | | | | | | | | | | 1939 |
| Suspending or restricting movement | | | | | | | | | | 6883 | | | | 6883 |
| Using antibodies for prevention | | | | 11 | | | | | | | | | | 11 |
| Using medications for prevention | | | | | 20 | | | | | | | | | 20 |
| Using medications for treatment | | | | | 39 | | | | | | | | | 39 |
| Using other personal protective equipment | | 93 | | | | | | | | | | | | 93 |
| Using vaccines for prevention | | | | 4504 | | | | | | | | | | 4504 |
| Wearing a mask | | 4512 | | | | | | | | | | | | 4512 |
| | 13658 | 5200 | 343 | 4515 | 59 | 2089 | 7836 | 13961 | 4308 | 14464 | 2306 | 13232 | 1388 | 83359 |

Using the activity frequencies this data was further reduced by a process of collapsing both Levels 1 and 2 into groups which can be considered discrete using the guidance of where PHSM crossed over both Levels multiple times. This process of classification led to a simpler summary of 7 Level 2 types and 19 Level 1 subgroups (see Table 3 below), which makes the total representation of PHSM easier to understand by removing instances of repetition across levels and much easier to navigate in terms of understanding the totality of options present for policy makers in any given country over the course of the pandemic.

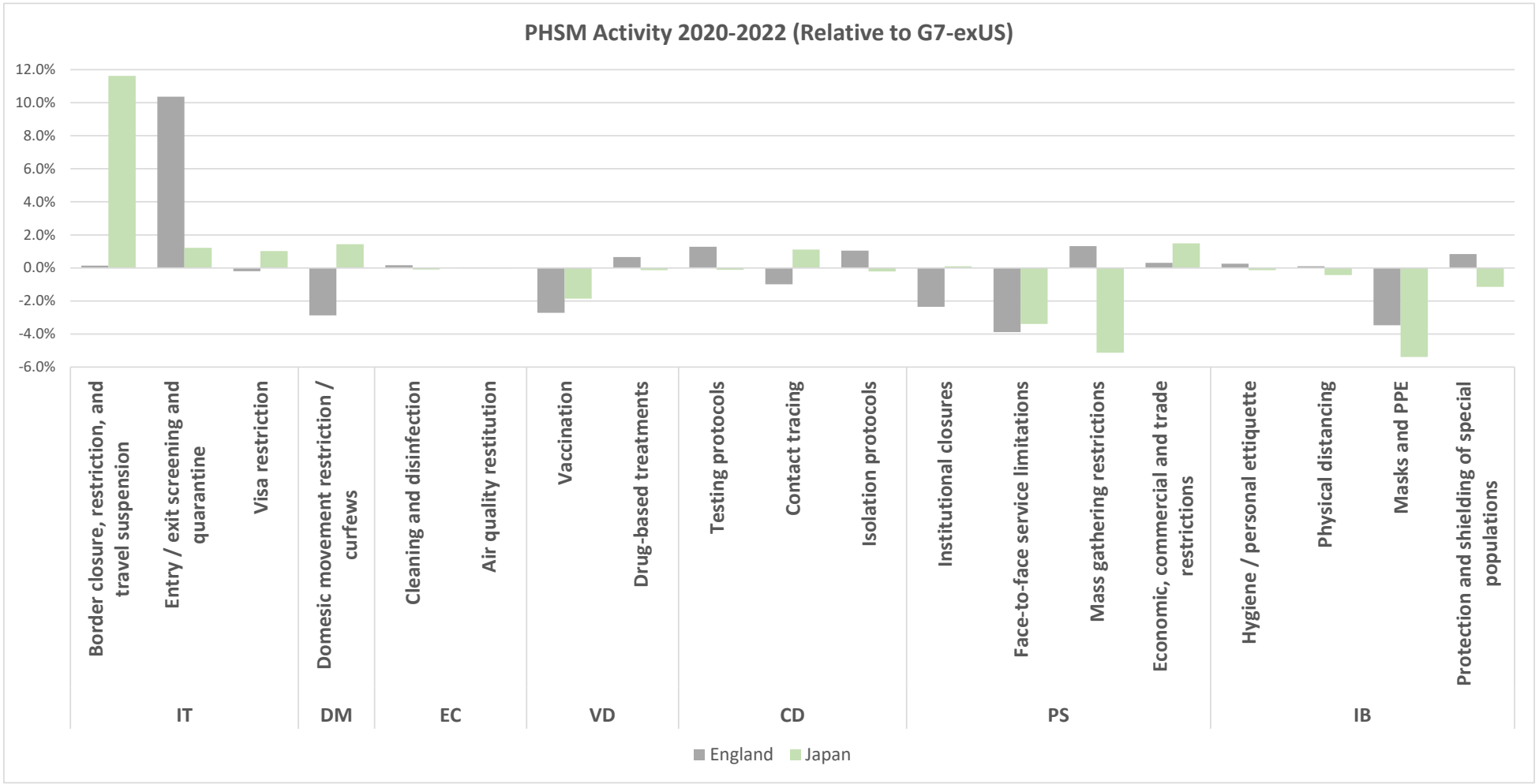
*Table 3: Reduced Levels via classifications of Levels*

| | International travel | Domestic travel | Environmental control | Vaccines and drugs | Case detection, tracing and isolation | School, business, and service operations | Individual behaviour | Total |
|---|---|---|---|---|---|---|---|---|
| **Border closure, restriction, and travel suspension** | **7244** | | | | | | | **7244** |
| Entry / exit screening and quarantine | **6063** | | | | | | | **6063** |
| Visa restriction | **351** | | | | | | | **351** |
| **Domesic movement restriction / curfews** | | **14464** | | | | | | **14464** |
| **Cleaning and disinfection** | | | **283** | | | | | **283** |
| Air quality restitution | | | **60** | | | | | **60** |
| **Vaccination** | | | | **4515** | | | | **4515** |
| Drug-based treatments | | | | **59** | | | | **59** |
| **Testing protocols** | | | | | **3777** | | | **3777** |
| Contact tracing | | | | | **1849** | | | **1849** |
| Isolation protocols | | | | | **988** | | | **988** |
| Institutional closures | | | | | | **8211** | | **8211** |
| **Face-to-face service limitations** | | | | | | **13586** | | **13586** |
| Mass gathering restrictions | | | | | | **13232** | | **13232** |
| Economic, commercial and trade restrictions | | | | | | **2089** | | **2089** |
| **Hygiene / personal ettiquette enforcement** | | | | | | | **205** | **205** |
| Physical distancing | | | | | | | **390** | **390** |
| Masks and PPE | | | | | | | **4605** | **4605** |
| Protection and shielding of special populations | | | | | | | **1388** | **1388** |
| | 13658 | 14464 | 343 | 4574 | 6614 | 37118 | 6588 | 83359 |

Given the discussions in the earlier sections about creating a classification system with desirable features for the general public to better engage in policy discussions through being able to understand and relate to the entire scope of possible or most utilised public measures in any given country, the next step is to try and assimilate a system for public consumption. The most common question might now be why members of the public would want to engage with a classification system and the answer quite simply is that many of these policies which are intended to limit or at best control the movement of humans in shared spaces are costs imposed onto the public with the intended benefits of disease control or management.

Table 4 shows the relative levels of PHSM activity for England and Japan since the start of the pandemic, compared with the average of the G7 activity (excluding the US). It's evident that there is broad consistency across countries, except for key areas of

international travel, as well as for case detections and mass gathering restrictions. These relationships give clues to where policy may have been over or under-targeted or perhaps not as responsive as intended.


PHSM Activity 2020-2022 (Relative to G7-exUS)
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
-2.0%
-4.0%
-6.0%
Border closure, restriction, and travel suspension
Entry / exit screening and quarantine
Visa restriction
Domesic movement restriction / curfews
Cleaning and disinfection
Air quality restitution
Vaccination
Drug-based treatments
Testing protocols
Contact tracing
Isolation protocols
Institutional closures
Face-to-face service limitations
Mass gathering restrictions
Economic, commercial and trade restrictions
Hygiene / personal ettiquette
Physical distancing
Masks and PPE
Protection and shielding of special populations
IT
DM
EC
VD
CD
PS
IB
England
Japan

Tables 5 and 6 (below) present country specific PHSM classification systems for England and Japan (respectively). The benefits of using this type of system are twofold in the sense that it increases transparency of how a range of systems can anticipate costs associated both in the short-term vs long and the extent of the impact alongside the associated effectiveness of the risk taken, whether it is anticipated to be effective in its implementation and help with contagion management. Second to this, such a classification system also helps policy makers preview the extent of the burden being placed on the public with given changes in demand to help with contagion spread. This classification system also allows for other policy measures (as discussed earlier situational levels (WHO) and containment/mitigation strategies (OECD) to be included as part of the overlay of the classification and in this format also be applied in attempts to reduce the risk of both cognitive overload of collapsing multiple classification systems and removing the repetition of categories in efforts to keep the PHSM mutually exclusive.

*Table 4: Cost-Benefit PHSM Classification - England*

| England | | | Upfront Cost | | Ongoing Cost | | Effectiveness Risk | |
|---|---|---|---|---|---|---|---|---|
| | **Situational Level** | **Containment/Mitigation** | **Individual** | **Social** | **Monitoring** | **Enforcement** | **Implementation** | **Efficacy** |
| Border closure, restriction, and travel suspension | 4 | Mitigation | High | High | Medium | High | High | Medium |
| Entry / exit screening and quarantine | 4 | Containment | High | High | High | High | Medium | High |
| Visa restriction | 4 | Mitigation | Medium | Medium | Medium | Medium | High | Medium |
| Domesic movement restriction / curfews | 3 | Mitigation | Low | High | High | High | Medium | Low |
| Cleaning and disinfection | 0 | Containment | Low | Low | Medium | Medium | High | High |
| Air quality restitution | 1 | Mitigation | Low | Medium | High | High | Medium | Medium |
| Vaccination | 4 | Mitigation | Medium | Medium | Medium | Medium | High | High |
| Drug-based treatments | 0 | Mitigation | Low | Low | Medium | Medium | Medium | Low |
| Testing protocols | 2 | Containment | Low | Low | Low | Medium | Medium | Medium |
| Contact tracing | 2 | Mitigation | Low | Low | Medium | High | Medium | Low |
| Isolation protocols | 3 | Containment | High | High | Medium | Medium | Medium | High |
| Institutional closures | 3 | Mitigation | High | High | High | High | High | Medium |
| Face-to-face service limitations | 3 | Mitigation | Medium | High | Medium | Medium | Medium | High |
| Mass gathering restrictions | 2 | Mitigation | High | High | Medium | Medium | Low | High |
| Economic, commercial and trade restrictions | 3 | Mitigation | Medium | Low | Medium | High | Medium | Medium |
| Hygiene / personal ettiquette | 0 | Mitigation | Low | Low | Low | Low | Low | Medium |
| Physical distancing | 3 | Mitigation | Medium | Medium | Low | Medium | High | High |
| Masks and PPE | 1 | Mitigation | Low | Medium | Low | Low | Low | Medium |
| Protection and shielding of special populations | 3 | Containment | Medium | Medium | Medium | Medium | Low | Low |
| | | | | | | | | |
| | | | | | | | | |

*Table 5: Cost-Benefit PHSM Classification - Japan*

| Japan | | | Upfront Cost | | Ongoing Cost | | Effectiveness Risk | |
|---|---|---|---|---|---|---|---|---|
| | **Situational Level** | **Containment/Mitigation** | **Individual** | **Social** | **Monitoring** | **Enforcement** | **Implementation** | **Efficacy** |
| Border closure, restriction, and travel suspension | 4 | Mitigation | Medium | Medium | Medium | High | High | Medium |
| Entry / exit screening and quarantine | 4 | Containment | High | High | High | High | Medium | High |
| Visa restriction | 4 | Mitigation | Medium | Medium | Medium | Medium | High | Medium |
| Domesic movement restriction / curfews | 3 | Mitigation | High | High | High | High | Medium | Low |
| Cleaning and disinfection | 0 | Containment | Low | Low | Medium | Medium | Low | Medium |
| Air quality restitution | 1 | Mitigation | Low | Medium | High | High | Medium | Medium |
| Vaccination | 4 | Mitigation | High | Low | Medium | Medium | High | High |
| Drug-based treatments | 0 | Mitigation | Medium | Low | Medium | Medium | Medium | Low |
| Testing protocols | 2 | Containment | Medium | Medium | Low | Medium | Medium | Medium |
| Contact tracing | 2 | Mitigation | Low | Low | Medium | High | Medium | Low |
| Isolation protocols | 3 | Containment | High | High | Medium | Medium | Medium | High |
| Institutional closures | 3 | Mitigation | High | High | High | High | High | Medium |
| Face-to-face service limitations | 3 | Mitigation | Medium | High | Medium | Medium | Medium | High |
| Mass gathering restrictions | 2 | Mitigation | High | High | Medium | Medium | Low | High |
| Economic, commercial and trade restrictions | 3 | Mitigation | Medium | Low | Medium | High | Medium | Medium |
| Hygiene / personal ettiquette | 0 | Mitigation | Low | Low | Low | Low | Low | Medium |
| Physical distancing | 3 | Mitigation | Medium | Medium | Low | Medium | High | High |
| Masks and PPE | 1 | Mitigation | Low | Medium | Low | Low | Low | Medium |
| Protection and shielding of special populations | 3 | Containment | Medium | Medium | Medium | Medium | Low | Low |

# 3.0 Engaging with the health experts

## 3.1 Seeking consensus on PSHMs

Following the development of the classification schema above, health experts from England and Japan were consulted to understand the levels of significance they would attach to each of the 19 Level 2 categories of PHSMs.

The reason for this was twofold. Firstly, to capture how close or divergent their views were on the necessary policies which are most important to target when dealing with COVID-19, and secondly to shortlist an appropriate set of Level 2 measures for use in the survey DCE.

The health experts comprised the project team members, who have all worked in some capacity on a remit of healthcare, as well as senior consulting specialists from various health organisations, comprising the project's Health Advisory Panel (HAP).

The tool used to develop each expert's set of preferences was Multi-Criteria Decision Analysis (MCDA). This is a series of techniques that orders preferences using a series of pairwise comparisons between individual measures (as opposed to asking panellists to rank all 19 measures outright). The pairwise comparisons are then systematically combined and reviewed for consistency (if necessary, repeating the ranking until consistency is achieved).

Up to a certain threshold of consistency, this indirect process of evaluation reflects the trade-offs that each expert conceives, while reducing potential response bias that more likely occurs when rankings are attested directly. One major benefit of MCDA is that it allows for hierarchical representation of the measures being ranked. This helps remove the burden of completing an inordinate number of pairwise comparisons.

For instance, with 19 measures, there would conceivably be 19x18/2 = 171 pairwise comparisons between Level 2 measures. However, since these are also arranged within higher Level 1 categories, it is more efficient to perform comparisons within,

and then across, each of the 7 Level 1 categories. This led to a reduced set of only 51 total comparisons for each expert.

A second benefit of MCDA is that preferences can be aggregated, and this process of aggregation is what generates ‘consensus’ for decision-making. In this way, we can observe experts’ consensus rankings for Level 2 measures across England and Japan respectively. These preferences are determined via a set of ‘priority weights’ which are assigned to each measure with the total weight normalised to 100%, shown in the following table.

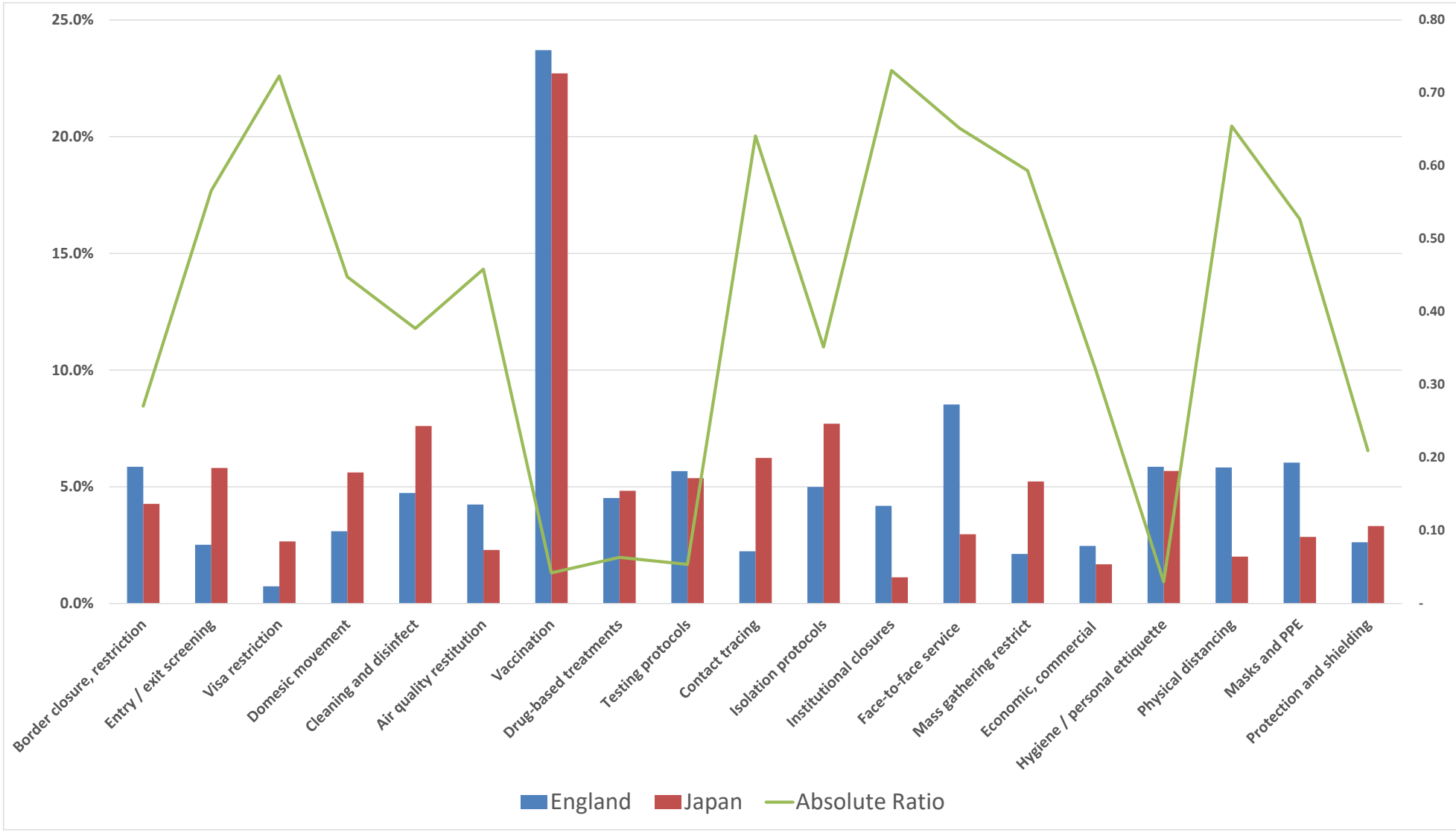
| | England Experts Priority | | | | Japan Experts Priority | | | |
|---|---|---|---|---|---|---|---|---|
| **Level 2 Measures** | **EN1** | **EN2** | **EN3** | **EN4** | **JP1** | **JP2** | **JP2** | **JP4** |
| Border closure, restriction, and travel suspension | 5% | 11% | 8% | 2% | 1% | 1% | 9% | 5% |
| Entry / exit screening and quarantine | 2% | 7% | 4% | 1% | 5% | 0% | 6% | 21% |
| Visa restriction | 0% | 2% | 1% | 0% | 2% | 0% | 4% | 11% |
| Domestic movement restriction / curfews | 2% | 2% | 7% | 2% | 6% | 4% | 3% | 9% |
| Cleaning and disinfection | 3% | 5% | 2% | 2% | 18% | 5% | 5% | 4% |
| Air quality restitution | 13% | 1% | 0% | 19% | 5% | 1% | 2% | 1% |
| Vaccination | 35% | 22% | 9% | 20% | 11% | 23% | 24% | 13% |
| Drug-based treatments | 5% | 7% | 1% | 5% | 2% | 5% | 3% | 6% |
| Testing protocols | 3% | 9% | 4% | 3% | 2% | 12% | 2% | 5% |
| Contact tracing | 1% | 1% | 1% | 11% | 1% | 8% | 16% | 3% |
| Isolation protocols | 1% | 4% | 7% | 5% | 4% | 5% | 10% | 4% |
| Institutional closures | 4% | 3% | 2% | 5% | 0% | 1% | 0% | 2% |
| Face-to-face service limitations | 6% | 11% | 5% | 5% | 4% | 2% | 2% | 3% |
| Mass gathering restrictions | 1% | 5% | 1% | 2% | 2% | 6% | 8% | 2% |
| Economic, commercial and trade restrictions | 2% | 1% | 8% | 1% | 1% | 1% | 3% | 1% |
| Hygiene / personal etiquette enforcement | 7% | 3% | 2% | 9% | 19% | 11% | 1% | 1% |
| Physical distancing | 5% | 1% | 9% | 6% | 10% | 2% | 0% | 1% |
| Masks and PPE | 2% | 5% | 22% | 1% | 2% | 10% | 0% | 4% |
| Protection and shielding of special populations | 2% | 0% | 7% | 2% | 6% | 5% | 1% | 2% |

While perhaps there was a majority who placed the most priority on vaccination, there were strong contenders for alternative first prioritisation, such as masks and protective equipment, and cleaning, disinfection, and personal hygiene. This is perhaps less surprising if we note that some experts are used to clinically sterile environments, but it does show that there may be more subjectivity in experts' positions on contagion control measures that expected *a priori*. The rank correlations between experts' priority levels are shown below.

| **Rank Correlations** | EN1 | EN2 | EN3 | EN4 |
|---|---|---|---|---|
| EN1 | | 28% | 15% | 57% |
| EN2 | | | 21% | -7% |
| EN3 | | | | -14% |

| **Rank Correlations** | JP1 | JP2 | JP3 | JP4 |
|---|---|---|---|---|
| JP1 | | 24% | 0% | -7% |
| JP2 | | | 4% | -4% |
| JP3 | | | | 50% |

While no pair of experts' rankings demonstrates large negative correlation, on balance there does not seem to be much congruence in evaluation of PHSM importance based on these metrics, with the highest pairs at moderate correlations of 50-60%. The figure below shows the differences in consensus rankings for each measure at the country level, between England and Japan.


25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
-
Border closure, restriction
Entry / exit screening
Visa restriction
Domesic movement
Cleaning and disinfect
Air quality restitution
Vaccination
Drug-based treatments
Testing protocols
Contact tracing
Isolation protocols
Institutional closures
Face-to-face service
Mass gathering restrict
Economic, commercial
Hygiene / personal ettiquette
Physical distancing
Masks and PPE
Protection and shielding
England
Japan
Absolute Ratio

There is a wide range of difference in the estimated priority levels of each measure (shown by the absolute ratio metric). A summary of the differential levels of agreement between England and Japan is shown below.

| **Measure** | **EN-JP Agreement** |
|---|---|
| Border closure, restriction<br>Vaccination<br>Drug-based treatments<br>Testing protocols<br>Hygiene / personal etiquette<br>Protection and shielding | HIGH<br>(<10%) |
| Domestic movement<br>Cleaning and disinfect<br>Air quality restitution<br>Isolation protocols<br>Economic, commercial | MEDIUM<br>(10-15%) |
| Entry / exit screening<br>Visa restriction<br>Contact tracing<br>Institutional closures<br>Face-to-face service<br>Mass gathering restrict<br>Physical distancing<br>Masks and PPE | LOW<br>(>15%) |

Feedback from the HAP and project team members suggests that the areas of 'LOW' agreement are those that are either spatially and geographically driven (like international travel screening and mass gathering restrictions) or are culturally positioned (such as wearing of masks).

# 4.0 Public determination of PSHM influence

## 4.1 Reducing the set of measures

A similar PSHM ranking exercise was carried out with the public, using the survey. However, here respondents were asked to rank only 6 of the 19 Level 2 measures. The 6 chosen were derived using the joint MCDA consensus from England and Japan as a starting point. 2 HAP members were additionally recruited from the US to use the priority levels as an additional country comparator, since the US had a very different profile of available vaccines. The top 7 Level 2 measures for each group is shown in the table below.

| Rank | England | Japan | England-Japan Consensus | US |
|---|---|---|---|---|
| 1 | Vaccination | Vaccination | Vaccination | Vaccination |
| 2 | Face-to-face service limitations | Isolation protocols | Isolation protocols | Mass gathering restrictions |
| 3 | Masks and PPE | Cleaning and disinfection | Cleaning and disinfection | Drug-based treatments |
| 4 | Border closure, restriction, and travel suspension | Contact tracing | Hygiene / personal etiquette enforcement | Contact tracing |
| 5 | Hygiene / personal etiquette enforcement | Entry / exit screening and quarantine | Testing protocols | Cleaning and disinfection |
| 6 | Physical distancing | Hygiene / personal etiquette enforcement | Face-to-face service limitations | Isolation protocols |
| 7 | Testing protocols | Domestic movement restriction / curfews | Border closure, restriction, and travel suspension | Air quality restitution |

While the health experts broadly agree that vaccination is of utmost of note is that in the England-Japan consensus, measures that were linked to individual monitoring and responsibility for action were more clearly held in importance, compared with either country individually. The US reference was of interest as well since it contained 3 prioritised measures which were not ranked as highly as Japan and England, namely, mass gathering restrictions, drug-based treatments, and air quality restitution.

Judgement was used to elicit the final list of measures for inclusion in the survey:

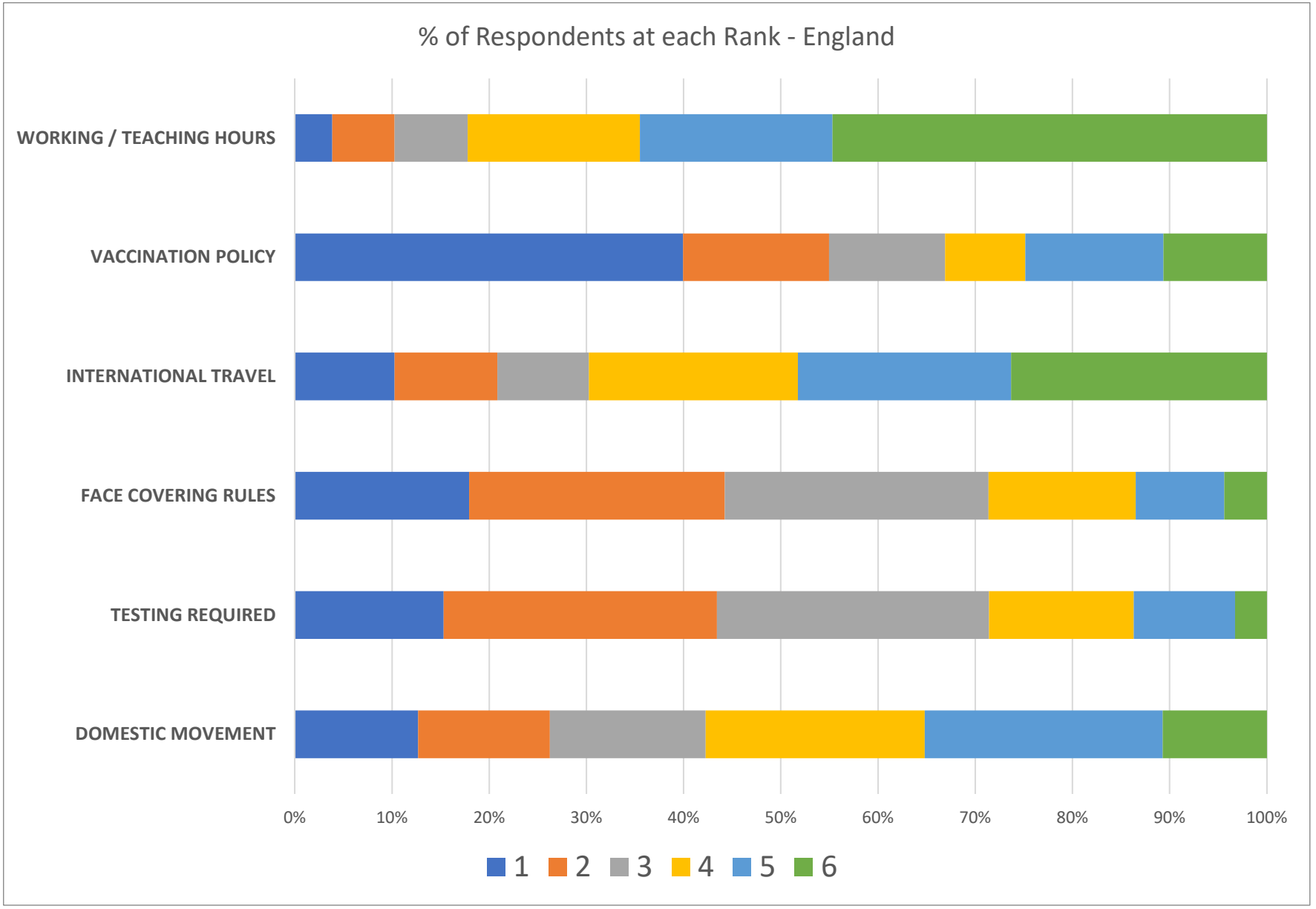
Vaccination
Domestic movement restriction / curfews
Masks and PPE (face covering rules)
Testing protocols
Face-to-face service limitations (working / teaching hours)
Border closure, restriction, and travel suspension (international)

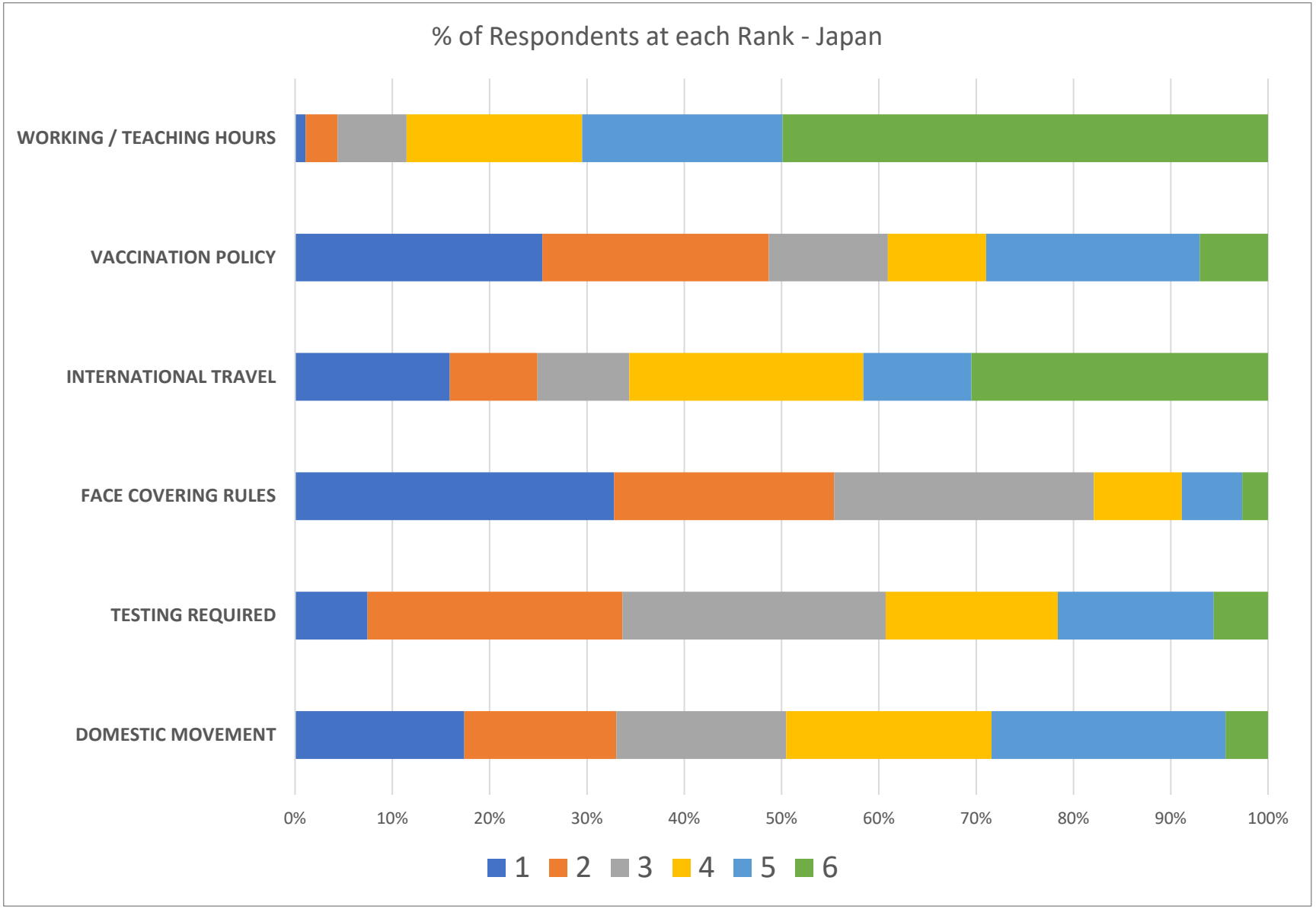
The 'Cleaning and disinfection' measure was originally included but subsequently dropped after poor statistical performance in the pilot analysis for the survey DCE.

## 4.2 Analysis of measure rankings

Survey respondents were asked to rank the list of measures above from 1 (highest) to 6 (lowest), in order of importance for controlling the spread of COVID-19 within their country (either England or Japan).

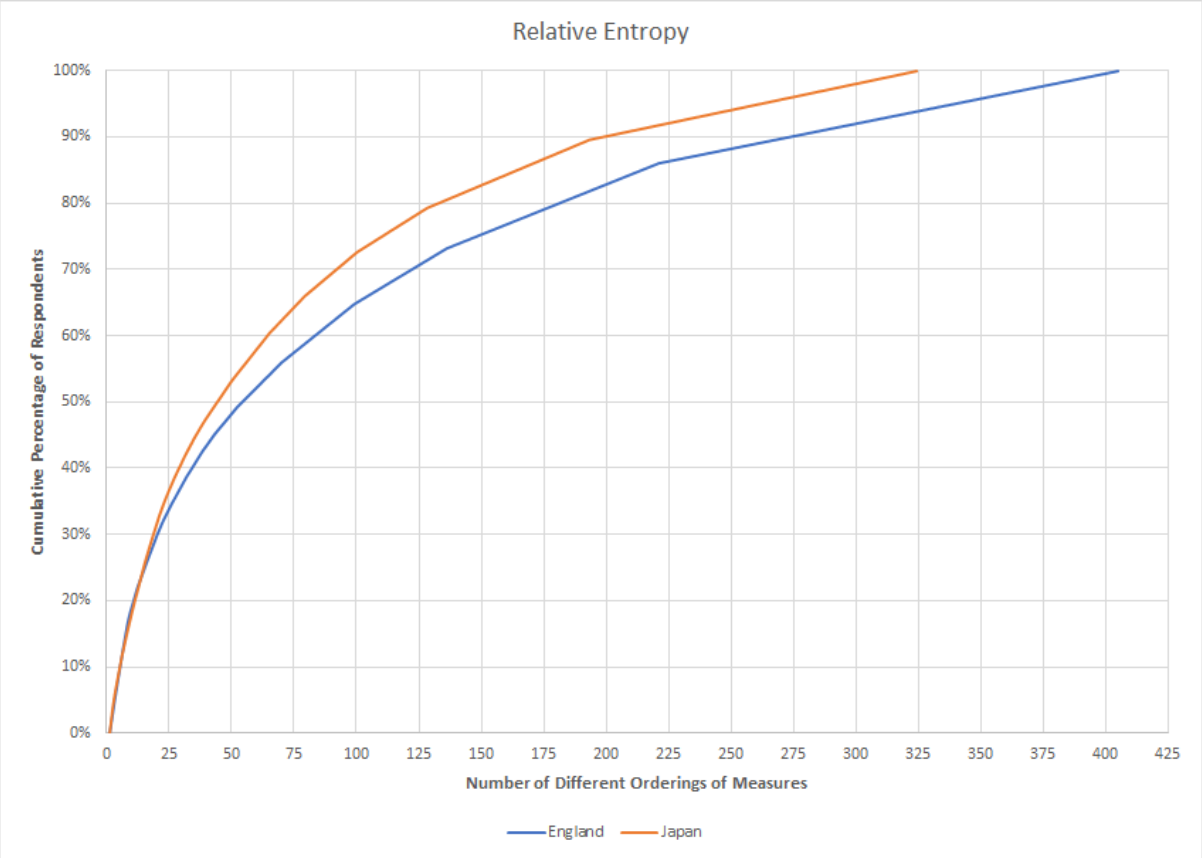
The baseline tallies of respondents for each rank (1 to 6) level per measure is shown in the figures below.


% of Respondents at each Rank - England
WORKING / TEACHING HOURS
VACCINATION POLICY
INTERNATIONAL TRAVEL
FACE COVERING RULES
TESTING REQUIRED
DOMESTIC MOVEMENT
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
1
2
3
4
5
6

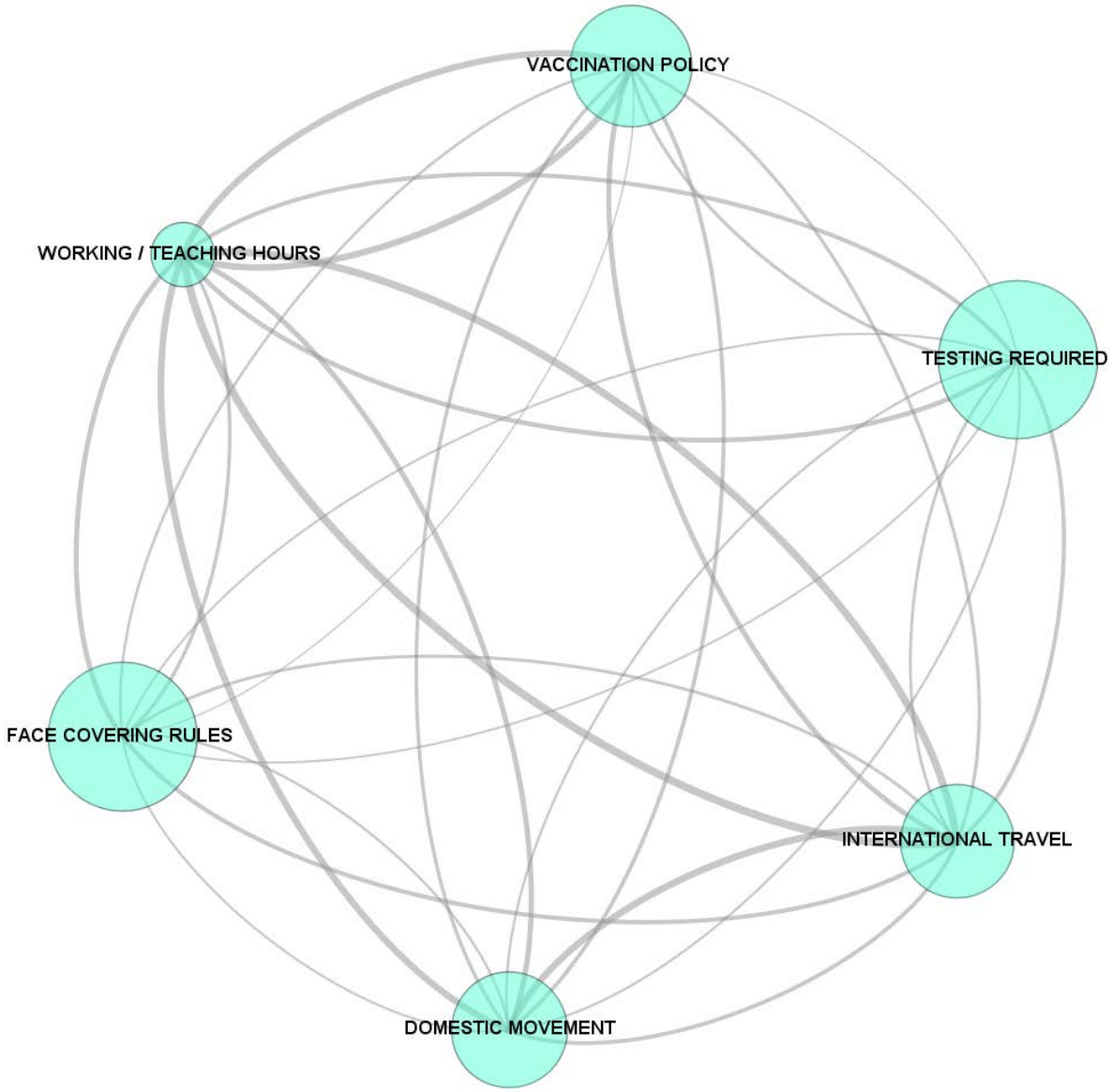

% of Respondents at each Rank - Japan
WORKING / TEACHING HOURS
VACCINATION POLICY
INTERNATIONAL TRAVEL
FACE COVERING RULES
TESTING REQUIRED
DOMESTIC MOVEMENT
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
1
2
3
4
5
6

It is apparent that vaccination policy was ranked first out of all measures available for England but was second to face covering rules in Japan. Note that one limitation of this analysis is that it disregards information about the ordered links between selected policy measures.

We can look at this another way to see the limitations with this interpretation. The graph below shows that out of a possible 720 different permutations of rankings available (6 factorial), the England sample spanned just over 400 different orderings, while the Japan sample arranged about 325 different orderings. When we consider the top 50% of each sample based on total common orderings, that still accounts for as many as 50 different preferred orderings in England and 45 in Japan. What this means is that there is a high degree of spread of preference orderings among the measures, with the normalised entropy of the curves below determined as 5.44 for England and 5.22 for Japan. These numbers suggest there is too much dispersion to be properly accounted for by the summary charts above which profile only the measures by aggregation according to rank position.



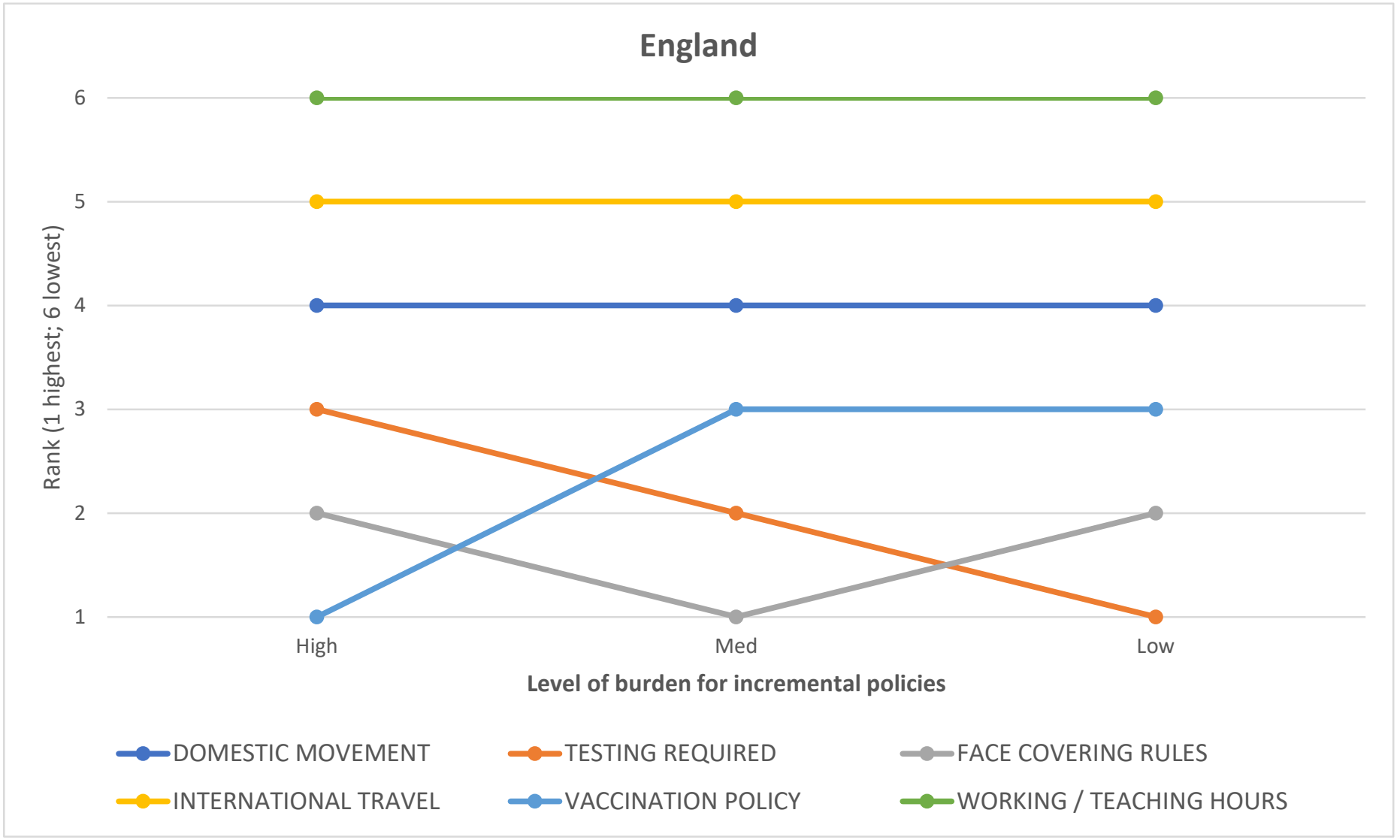
To get a more legitimate view on the dynamics of how the public perceives bundles of measures, it is instructive to instead consider a network diagram which shows the directional links between the various measures. This allows us to also weight the links in a more realistic manner than the tabular representation above (which implicitly assumes all links are of equal weighting). For instance, it is reasonable that there is a stronger affinity between the measures ranked as 1 and 2 than the measures ranked at 5 and 6. This is reflected in the network graph below for England, with thicker lines joining the measures (nodes) representing a weaker relationship between them, and vice versa for thinner lines.

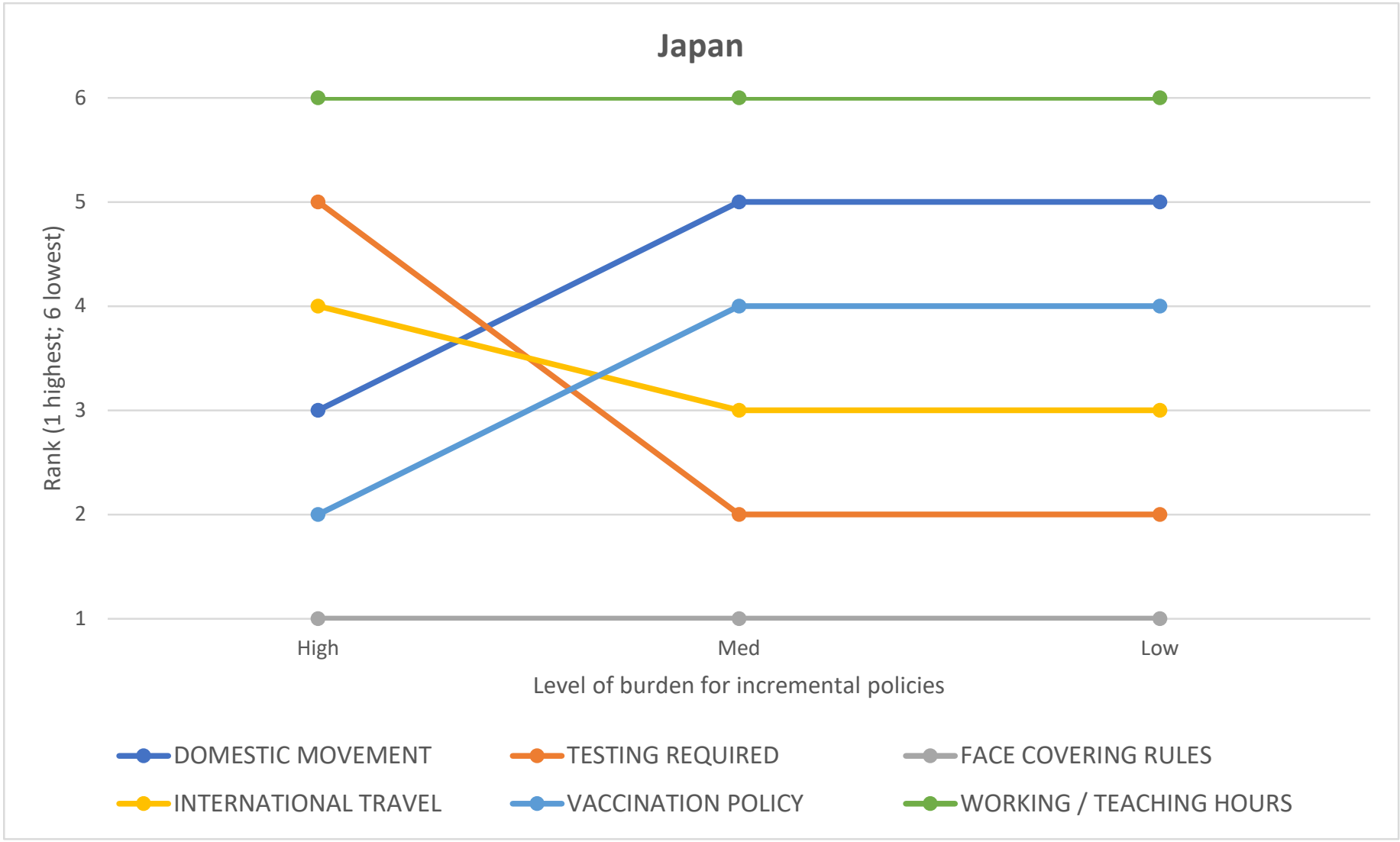



It can be seen, for example, there are stronger affinities between face covering rules and testing, comparted with working / teaching hours and international travel measures. The network graph for Japan has a roughly equivalent configuration. The additional benefit of this representation is that we can now determine more reliably the importance of a PHSM based on its 'closeness centrality' to the other measures, which in turn is derived from the weights of the directed relationships. The closeness centrality is a metric which indicates how influential a node is within a network, and the size of the circles in the diagram is scaled to this metric for each measure. In this respect, we can see that testing and face covering rules are actually more influential

than vaccination policy, when the more realistic relationships between measure affinity is taken into account.

We can also incorporate a dimension of centrality that considers incremental policy measures as being burdensome to the public and representing a frictional cost when included on top of pre-existing measures. The figure above shows the relative influence of measures when incremental policy change is of low public burden. The supporting figures below show how these metrics change when the policy burden is at medium and high levels, for both England and Japan.


England
Rank (1 highest; 6 lowest)
6
5
4
3
2
1
High
Med
Low
Level of burden for incremental policies
DOMESTIC MOVEMENT
TESTING REQUIRED
FACE COVERING RULES
INTERNATIONAL TRAVEL
VACCINATION POLICY
WORKING / TEACHING HOURS


Japan
6
5
4
3
2
1
Rank (1 highest; 6 lowest)
High
Med
Low
Level of burden for incremental policies
DOMESTIC MOVEMENT
TESTING REQUIRED
FACE COVERING RULES
INTERNATIONAL TRAVEL
VACCINATION POLICY
WORKING / TEACHING HOURS

The pattern for England demonstrates that when policy change burden is high for the public, focussing on vaccination policy may be the most effective line of action. However, if incremental policy changes are not onerous, then it may be more pragmatic to position face covering and testing guidance as the most important measures before invoking vaccination policy changes.

Conversely, in Japan, face covering guidance is most likely to be influential within PHSM directives, and vaccination policy may be less influential than guidance around testing and international travel when there is lesser public burden for policy change.

The ranking exercise was also carried out as a focus group activity, but in this version the participants were asked to rank in relation to a particular epidemiological profile of cases, death rates and hospitalisation trends. The profile was then changed, and participants asked whether they would re-rank the importance of their measures to adapt to the changes. This exercise was important because it allows for insights into the ways participants would naturally bundle measures dynamically, in addition to providing some intuition as to how they see policy measures responding to 'shocks', or sharp changes in the headline levels of infections, hospitalisations and deaths.

The average changes in ranking for each measure is summarised in the tables below, according to whether the overall change allowed for improvements (better), or deterioration (worse) in deaths, cases, and hospitalisations, in turn.

**JAPAN**

| Better | Vaccination | Masks | Testing | Working Hours | Domestic Travel | International Travel | Abs. Deviation |
|---|---|---|---|---|---|---|---|
| Deaths | -0.26 | - | 0.18 | -0.13 | 0.13 | 0.08 | 0.77 |
| Cases | 0.20 | - | 0.25 | -0.25 | -0.25 | 0.05 | 1.00 |
| Hospitalisation | 0.03 | 0.13 | 0.30 | -0.23 | -0.30 | 0.07 | 1.07 |

| Worse | Vaccination | Masks | Testing | Working Hours | Domestic Travel | International Travel | |
|---|---|---|---|---|---|---|---|
| Deaths | 0.30 | -0.10 | - | -0.10 | -0.20 | 0.10 | 0.80 |
| Cases | -0.38 | -0.03 | 0.07 | -0.03 | 0.28 | 0.10 | 0.90 |
| Hospitalisation | -0.42 | -0.26 | -0.11 | 0.05 | 0.63 | 0.11 | 1.58 |

**ENGLAND**

| Better | Vaccination | Masks | Testing | Working Hours | Domestic Travel | International Travel | Abs. Deviation |
|---|---|---|---|---|---|---|---|
| Deaths | -0.04 | 0.17 | -0.04 | 0.33 | -0.08 | -0.33 | 1.00 |
| Cases | -0.50 | -0.31 | 0.63 | 0.13 | 0.19 | -0.13 | 1.88 |
| Hospitalisation | -0.08 | -0.23 | 0.31 | - | 0.08 | -0.08 | 0.77 |

| Worse | Vaccination | Masks | Testing | Working Hours | Domestic Travel | International Travel | |
|---|---|---|---|---|---|---|---|
| Deaths | -0.38 | -0.25 | 0.50 | 0.08 | 0.13 | -0.08 | 1.42 |
| Cases | -0.06 | 0.09 | 0.03 | 0.25 | -0.06 | -0.25 | 0.75 |
| Hospitalisation | -0.26 | 0.03 | 0.20 | 0.29 | - | -0.26 | 1.03 |

What is apparent is that testing stands out as a measure that both countries are prepared to activate as the primary choice, regardless of whether the underlying circumstances have improved or deteriorated. Furthermore, the approach to vaccination appears to be different between the countries. England participants appeared to be ready to adjust vaccination policy as being of lesser importance regardless of the situational change. However, Japanese participants escalated the importance of vaccination policy in the case of worsening death rates or improvement in the number of cases. This preference structure is consistent with the rationales presented by the Japanese participants that the primary aim of the vaccines is to reduce transmissibility as well as reduce the severity of the disease. By comparison, the participants in England were more likely to be sceptical of the vaccine efficacy, especially given that they did not decouple the elements of transmissibility from the virulence of COVID-19. This is because several participants had either been infected multiple times despite being vaccinated or had known someone familiar to them in similar circumstances with multiple infections. This led to a more natural disbelief in the overall efficacy of the vaccines, which may explain the trends observed.

## 4.3 Research aims and objectives

This project has two core aims:

(i) To investigate the civic willingness of communities in Japan and the UK, to adapt to potential changes to COVID-19 policies, guidance and social expectations.

(ii) To understand how associations between relevant characteristics of citizens in these communities can be used to promote vaccine engagement via the target audiences.

These aims are supported by the following objectives:

(i) Identify a reasonable set of policy responses from those taken or planned by selected OECD governments across the world, which would be relevant to both Japan and the UK

(ii) Estimate statistical models for 'willingness to adapt' (WTA) based on prospective static 'health scenarios' derived from the policy response

(iii) Model the riskiness of the health scenarios using real-world infection, hospitalization trends and death rates, and calibrate with each community's COVID-19 risk exposure in these scenarios.

(iv) Complement modelled WTA with qualitative assessment of individuals' response to dynamic (event-driven) health scenarios.

(v) Establish associations between individuals'' modelled WTA and their demographic characteristics, vaccine confidence, general anxiety levels, health related risk aversion.

(vi) Outline school curriculum guidance for establish a concept of 'vaccine literacy' connecting health enquiries from educators and civic engagement to establish vaccine engagement in Japanese and British schools.

# 5.0 The Psychology of vaccine engagement

## 5.1 Defining 'vaccine engagement'

Before considering the public's risk-adjusted cost and benefit profiles of vaccination policies relative to other contagion control PHSMs, it is useful to take a psychological view on vaccine engagement. The more traditional construct which health experts tend to work with is 'vaccine hesitancy'. Alternative positive terms which may be encountered in place of 'hesitancy' are 'willingness', 'confidence', 'acceptance' or 'intention'. While there may be slight differences in the ways authors choose to define these, they all essentially entail a multitude of psychological factors which cannot be easily distinguished from each other, and which are highly context sensitive. We will keep the term 'hesitancy' for the remainder of this report.

Aside from innate attitudes and beliefs affecting vaccine hesitancy, further complications arise in its definition when structural barriers to uptake are considered, for example, a narrow geographical distribution of health services, or availability of vaccine stocks. These can in turn reinforce negative attitudes to vaccines. Determinants of vaccine hesitancy have been widely analysed and compiled into various frameworks. Such frameworks do not necessarily need to be disease-specific, but naturally some determinants tend to be of greater importance than others, depending on the disease. The most widely used frameworks are highlighted in the WHO's Strategic Advisory Group of Experts (SAGE) publication from their Immunization Working Group (SAGE, 2014). This presents a succinct, easy-to-follow model of hesitancy *mechanisms* comprising 'confidence', 'convenience', and 'complacency' (also known as the 3C model), along with a more in-depth Vaccine Hesitancy Matrix, which looks at determinants based on their *source*.

The term 'vaccine engagement' is preferred in our current context because it emphasises the relational aspects of how vaccines are considered alongside other PSHMs. This is particularly more relevant for COVID-19 because these relationships have not been well explored or developed, from the viewpoint of the public, as PSHMs have been in a state of flux since the start of the pandemic, and communications from

policymakers have tended to be withdrawn, rather than inclusive. This way of activating PSHMs which relies inherently on public trust in officials, experts and policymakers may not be sustainable under the 'new normal', because the public have been evaluating the course of the pandemic, mistakes as well as successes, in their own right.

Vaccine engagement therefore repositions the burden of trust on policymakers to *trust* in the public when making decisions related to COVID-19 countermeasures in the future. This parallels the way the term 'engagement' is used in psychology, relying on cognitive, behavioural, and emotional factors to converge in determining the actions people take when making decisions. In the context of vaccine engagement for COVID-19, these factors will moderate the quality of relationships between the public and policymakers, materialising as a mutual 'trust'.

## 5.2 Vaccine Hesitancy in relation to Risk and Anxiety

The main factors considered in this report are 'cognitive', in the sense that we assume there is an underlying rationality and consistency to the way the individuals think about their risk-adjusted costs and benefits when making decisions within PHSMs. However, it is worth considering firstly two important behavioural and emotional factors, namely, individuals' propensity for risky behaviour in the health domain, and individuals' general state of anxiety.

Risk-taking behaviours are typically attributed to stable characteristics of individuals which tend to inform how they will act or make decisions when faced with some degree of uncertainty over the outcome. This uncertainty does not need to be 'objective' of course, all that matters is that the individual's evaluation of outcomes is relatively stable so that it is generalisable to a 'habitual' behaviour. In the domain of health, risk-taking propensity is explored against cigarette smoking, driving without seatbelts, or avoiding birth control. These are all 'objectively' risky, in the sense that there are statistical evidence bases which affirm their expected outcome according to population level distributions. Yet it is apparent that subjective risk-adjusted costs and

benefits of these activities are not aligned with the population-level distributions for many individuals.

The divide between subjective and population-level statistics is even more pronounced when it comes to COVID-19, vaccines, and human immunity since the scientific base has not converged to agreement on many levels. This is also conflated with the propagation of misinformation and 'fake news', compounding the challenge for a clear stance on whether it is riskier to take vaccines, to support PHSMs which suppress the economy, or to put faith in 'natural' immunity.

Of course, there may not be an obvious binary solution. Risk-taking propensity may affect both vaccine hesitancy and whether an individual *actually takes* the vaccines. This is because the factor may act along different channels of 'confidence', 'complacency', or 'convenience' simultaneously. The challenge would be to understand how this propensity is attributed between hesitancy and actualised behaviour. Can we predict whether an individual with a high risk-taking propensity will take the vaccine or not?

Similar arguments hold for the general levels of anxiety or distress which individuals may feel, especially when compounded by incomplete or misinformation about COVID-19 as well as the vaccines. For instance, a female may be more distressed about reports of infertility after taking the vaccine, but there will likely be a channel which leads from her general feeling of anxiety to cause worry about the prospect of 'long COVID' if she were to become infected. The long-tailed uncertainty inherent in both these lines of action makes it difficult to assess this person's actual engagement with the vaccine.

The following analysis builds on these arguments to try to decompose the effects of risk-taking propensity and generalised anxiety on vaccine uptake, based on data from the survey respondents. Specifically, we assume that risk-taking propensity and generalised anxiety directly affect the probability or likeliness of an individual taking a COVID-19 vaccine, but that there is also an *indirect effect* of these characteristics on vaccine uptake, via the separate channel of vaccine engagement. We further assume

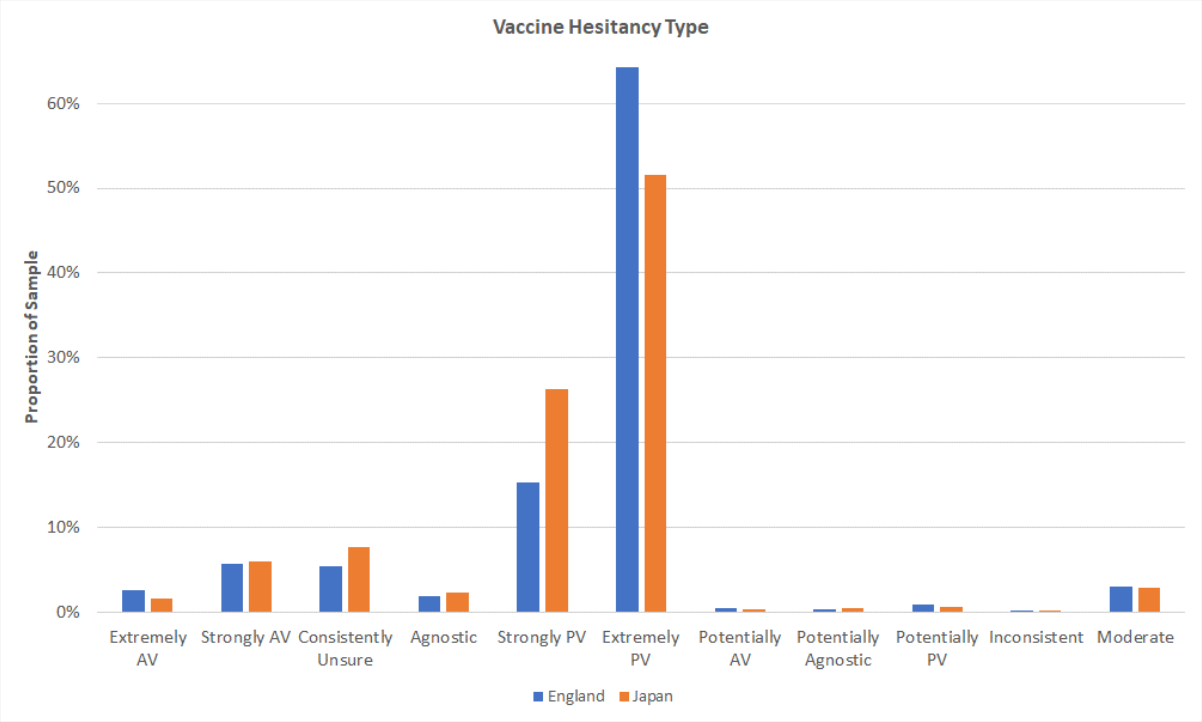
that vaccine engagement can be partially measured by COVID-19 specific vaccine hesitancy.

## 5.3 Population vaccination status given risk and anxiety profiles

COVID-19 specific vaccine hesitance was measured by the Oxford Coronavirus Explanations, Attitudes, and Narratives (OCEANS) II scale. This 7-question scale has demonstrated good psychometric properties. It was adapted slightly for this study because the original format was developed prior to COVID-19 vaccines and was therefore forward-looking. The wording of some questions was amended to reflect the prospect of ongoing boosters and it was also translated to better contextualise for Japanese respondents. Factor analysis shows that the scale retained its psychometric properties in both the England and Japan settings and exhibited strong goodness-of-fit measures against the data collected. Each question is scored from 0 to 5, with 5 representing a strong positive response toward COVID-19 vaccines. The full set of responses is shown in the table below.

| Question | Response | England (n) | % | Japan (n) | % |
|---|---|---|---|---|---|
| 1. Would you take COVID-19 vaccines as often as recommended by health professionals? | | 1400 | | 1400 | |
| | I don't know | 31 | 2% | 44 | 3% |
| | Definitely not | 78 | 6% | 48 | 3% |
| | Probably not | 73 | 5% | 87 | 6% |
| | I may or I may not | 109 | 8% | 105 | 8% |
| | Probably | 320 | 23% | 630 | 45% |
| | Definitely | 789 | 56% | 486 | 35% |
| 2. If a vaccine is strongly advised when a new COVID-19 variant emerges: | | 1400 | | 1400 | |
| | Don't know | 33 | 2% | 45 | 3% |
| | I will refuse to get it | 77 | 6% | 78 | 6% |
| | I will put off (delay) getting it | 72 | 5% | 34 | 2% |
| | I'm not sure what I will do | 124 | 9% | 109 | 8% |
| | I will take it when offered | 493 | 35% | 602 | 43% |
| | I will want to get it as soon as possible | 601 | 43% | 532 | 38% |
| 3. I would describe my attitude towards receiving COVID-19 vaccines as: | | 1400 | | 1400 | |
| | Don't know | 28 | 2% | 23 | 2% |
| | Against it | 61 | 4% | 48 | 3% |
| | Quite uneasy | 109 | 8% | 134 | 10% |
| | Neutral | 173 | 12% | 169 | 12% |
| | Pretty positive | 477 | 34% | 584 | 42% |
| | Very keen | 552 | 39% | 442 | 32% |
| 4. If a new COVID-19 variant emerges and a vaccine is available at my local pharmacy, I would: | | 1400 | | 1400 | |
| | Don't know | 59 | 4% | 125 | 9% |
| | Never get it | 72 | 5% | 91 | 7% |
| | Avoid getting it for as long as | 82 | 6% | 59 | 4% |
| | Delay getting it | 89 | 6% | 62 | 4% |
| | Get it when I have time | 291 | 21% | 473 | 34% |
| | Get it as soon as possible | 807 | 58% | 590 | 42% |
| 5. If my family or friends were thinking of getting a COVID-19 vaccination, I would: | | 1400 | | 1400 | |
| | Don't know | 49 | 4% | 80 | 6% |
| | Ask them to delay getting the vaccination | 37 | 3% | 16 | 1% |
| | Suggest that they do not get the vaccination | 44 | 3% | 24 | 2% |
| | Not say anything to them about it | 217 | 16% | 415 | 30% |
| | Encourage them | 379 | 27% | 515 | 37% |
| | Strongly encourage them | 674 | 48% | 350 | 25% |
| 6. With respect to COVID-19 vaccination, as recommended by health professionals, I would describe myself as: | | 1400 | | 1400 | |
| | Don't know | 46 | 3% | 40 | 3% |
| | Anti-vaccination | 25 | 2% | 32 | 2% |
| | Unwilling to get the vaccine | 101 | 7% | 94 | 7% |
| | Not bothered about getting the vaccine | 97 | 7% | 146 | 10% |
| | Willing to get the vaccine | 509 | 36% | 581 | 42% |
| | Eager to get the vaccine | 622 | 44% | 507 | 36% |
| 7. Taking a COVID-19 vaccination is: | | 1400 | | 1400 | |
| | Don't know | 38 | 3% | 45 | 3% |
| | Really unimportant | 49 | 4% | 43 | 3% |
| | Unimportant | 43 | 3% | 52 | 4% |
| | Neither important nor | 133 | 10% | 230 | 16% |
| | Important | 376 | 27% | 597 | 43% |
| | Really important | 761 | 54% | 433 | 31% |

It is also possible to contextualise the strength of individuals' responses to each question to characterise him or her as being either anti-vaccination (AV) or pro-vaccination (PV). This breakdown is shown in the figure below for each country.

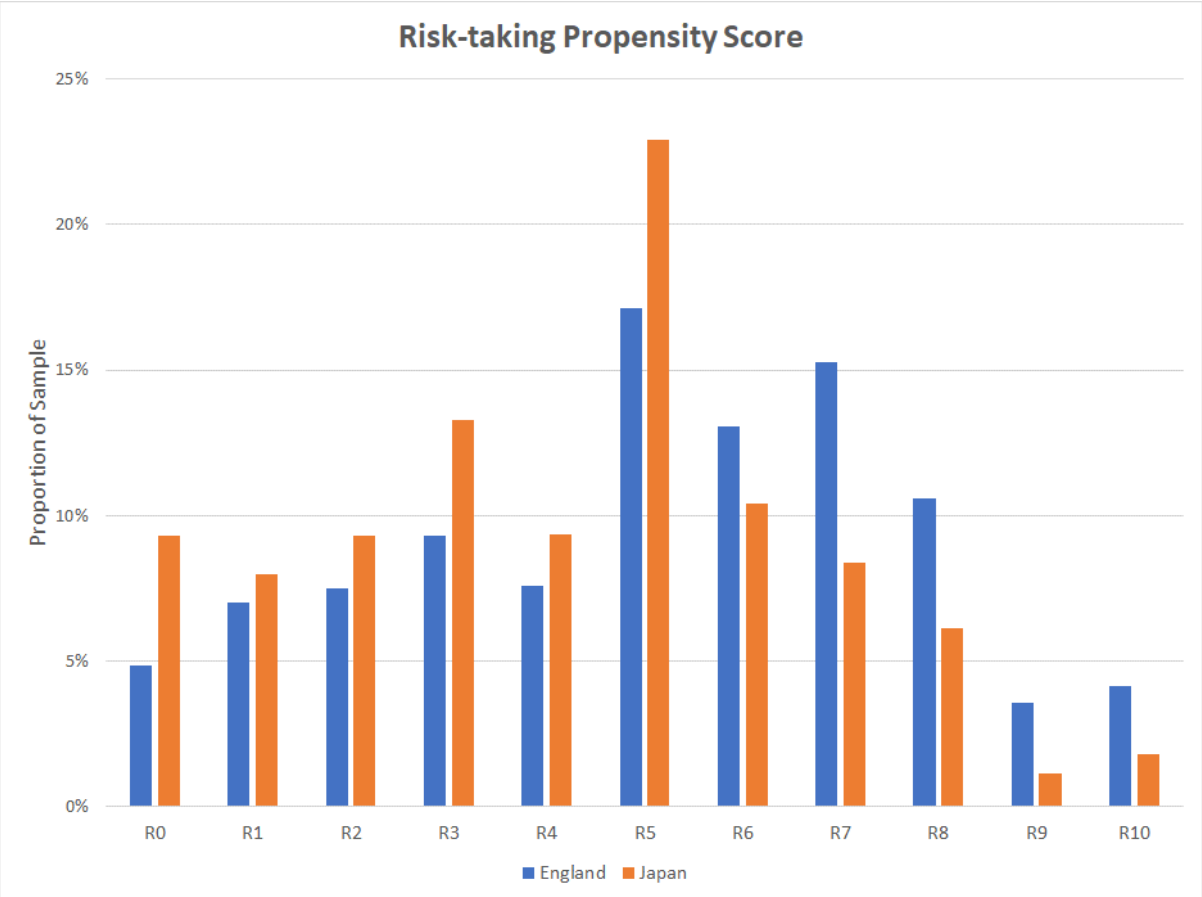



This profile shows there are many nuanced grades of hesitancy which can be derived from the instrument, but most respondents in both countries appear to be strongly or extremely PV. When we compare this against individuals' actual reported vaccination status, we can see a clear natural relationship.

| | Unvaccinated | One | Two | Three | Four | Prefer not to say | Total |
|---|---|---|---|---|---|---|---|
| **Extremely AV** | 46 | 6 | 6 | 0 | 0 | 1 | 59 |
| **Strongly AV** | 124 | 3 | 28 | 6 | 0 | 2 | 163 |
| **Consistently Unsure** | 42 | 6 | 113 | 14 | 1 | 7 | 183 |
| **Agnostic** | 16 | 0 | 23 | 3 | 1 | 16 | 59 |
| **Strongly PV** | 24 | 18 | 424 | 111 | 4 | 3 | 584 |
| **Extremely PV** | 9 | 21 | 837 | 746 | 6 | 1 | 1620 |
| **Potentially AV** | 3 | 1 | 5 | 2 | 0 | 1 | 12 |
| **Potentially Agnostic** | 6 | 0 | 5 | 0 | 0 | 0 | 11 |
| **Potentially PV** | 4 | 0 | 10 | 6 | 0 | 1 | 21 |
| **Inconsistent** | 2 | 0 | 4 | 0 | 0 | 0 | 6 |
| **Moderate** | 22 | 2 | 45 | 13 | 0 | 0 | 82 |
| **Total** | 298 | 57 | 1,500 | 901 | 12 | 32 | 2,800 |

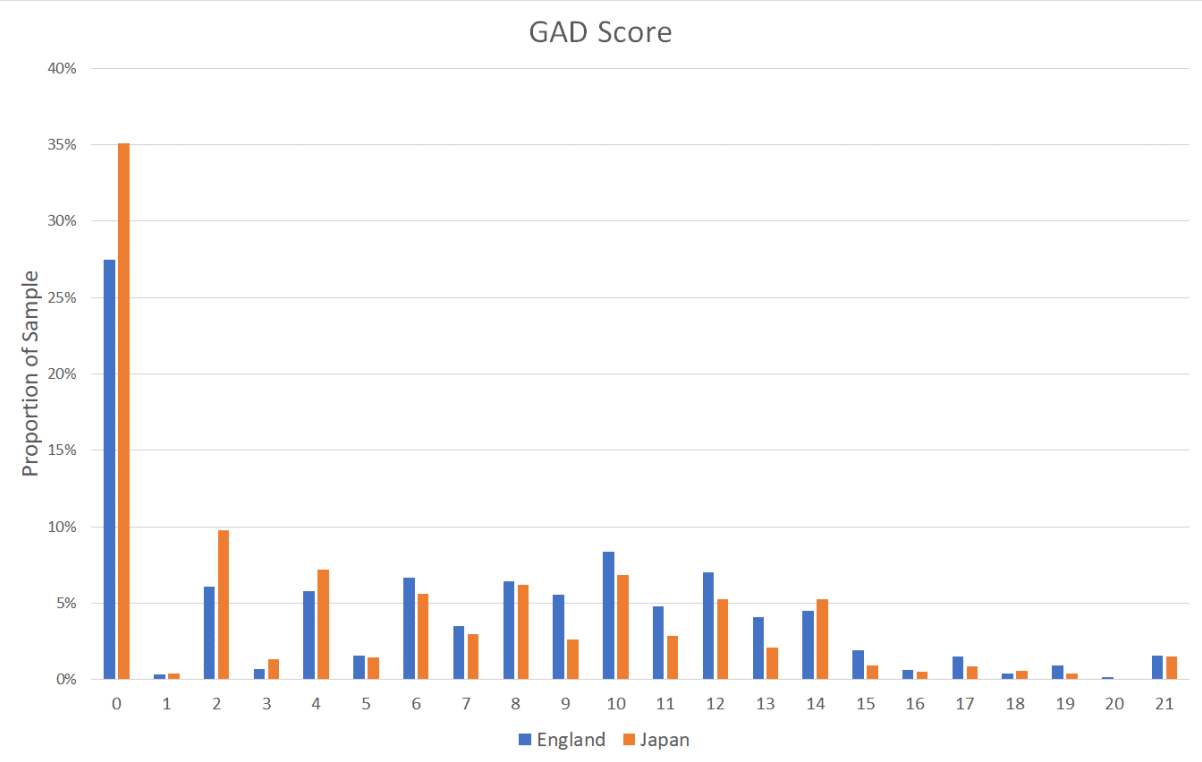
Extremely and strongly AV individuals tend to be unvaccinated, PV individuals tend to have at least 2 shots, and those who preferred not to disclose their vaccination status tended to be agnostic towards the vaccines.

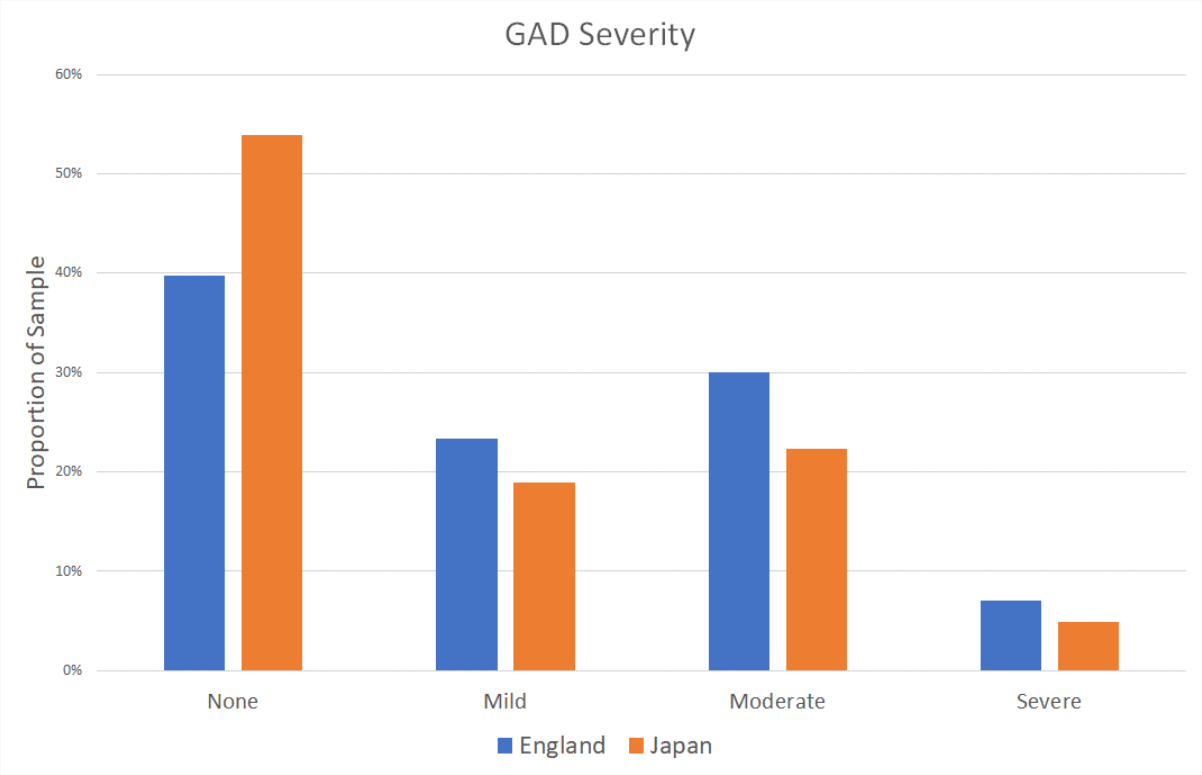
Risk-taking propensity was measured using a single question: “How willing are you to take risks, in general?” (Dohmen et al., 2011). Arguably, there are other psychometric scales which exist that try to attend to risk-taking propensity in the health domain specifically (Blais & Weber, 2006), but recent meta-analysis of DOSPERT in particular points to unreliability in this domain (Shou & Olney, 2020). The results for each country are shown in the figure below, with each score prefixed as “R” to indicate the specific risk-taking propensity level.




The average score for England is 5.09 and that for Japan is slightly below at 4.17. The distributions appear as expected with the mode at R5 and few individuals at the extremes of the scale, close to a ‘normal’ distribution.

Generalised anxiety is measured by a well-known clinical screening tool (GAD7) for General Anxiety Disorder. This disorder affects those whose long-term anxiety makes it challenging to relax, such that the constant background anxiety level may affect decision making in day-to-day life. Scores on the scale range from 0 to 21 in increasing severity with clinically accepted thresholds indicating a ‘mild’ to ‘severe’ condition. The figures below show these distributions for each country.






The distribution of scores is more complex here. Even though the modal score is 0 (no diagnostic generalised anxiety), there is still a fair proportion of individuals from both country samples with moderate levels of anxiety (scores between 5 and 10).

### 5.3.1 Formalising the model

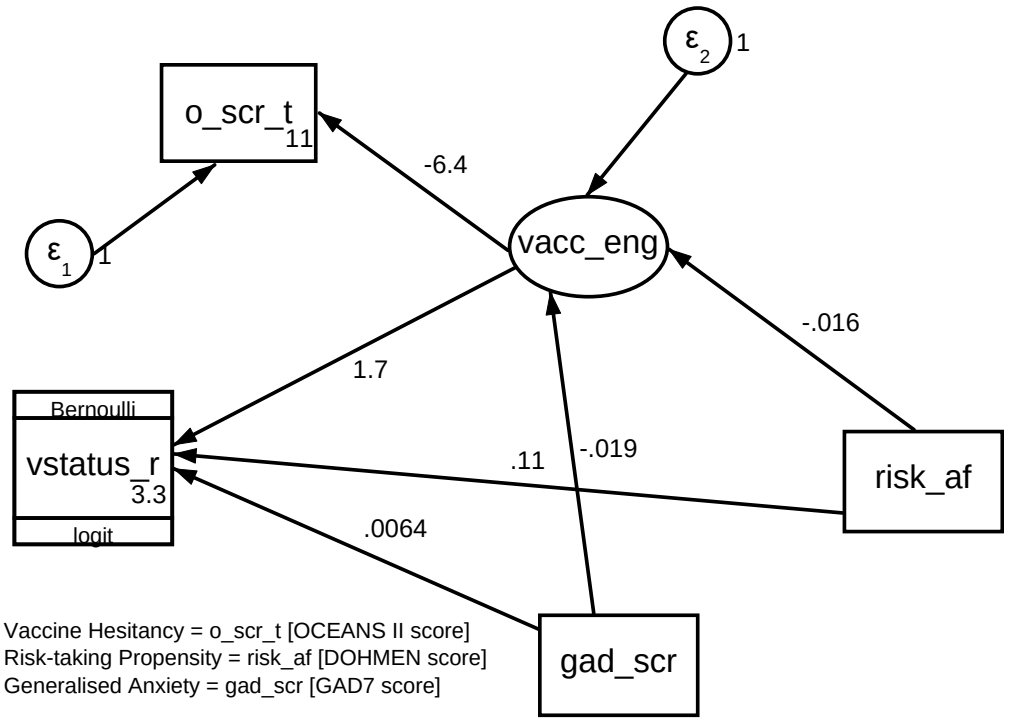
Are these measures related somehow? To justify a model where risk-taking propensity and generalised anxiety affect vaccine uptake indirectly through vaccine engagement, we must be reasonably sure that these measures do not carry the same information about individuals. We consider this using an exploratory factor analysis, which is a technique that looks for common variations among the scores for each of these three measures in the sample. The table below shows uniqueness scores for each measure by country.

| | **Uniqueness Score** | |
|---|---|---|
| **Measure** | **England** | **Japan** |
| GAD7 (anxiety) | 0.9156 | 0.9754 |
| OCEANS II | 0.9327 | 0.9413 |
| Dohmen (risk-taking propensity) | 0.9546 | 0.9189 |

The closer these measures are to 1, the more unique they are relative to the others, meaning that we can be reasonably certain they do not overlap in the characteristics they are meant to discern.

The final model is developed as a 'structural equation model' (SEM). This is effectively a series of interrelated regressions involving the measures we have produced directly from the data. The technique also allows us to specify vaccine engagement as a 'latent' variable (one which cannot be directly observed or measured), which acts as one potential channel for vaccine hesitancy, risk-taking propensity, and generalised anxiety to influence vaccine uptake probability. The final estimated models for England and Japan are shown below.

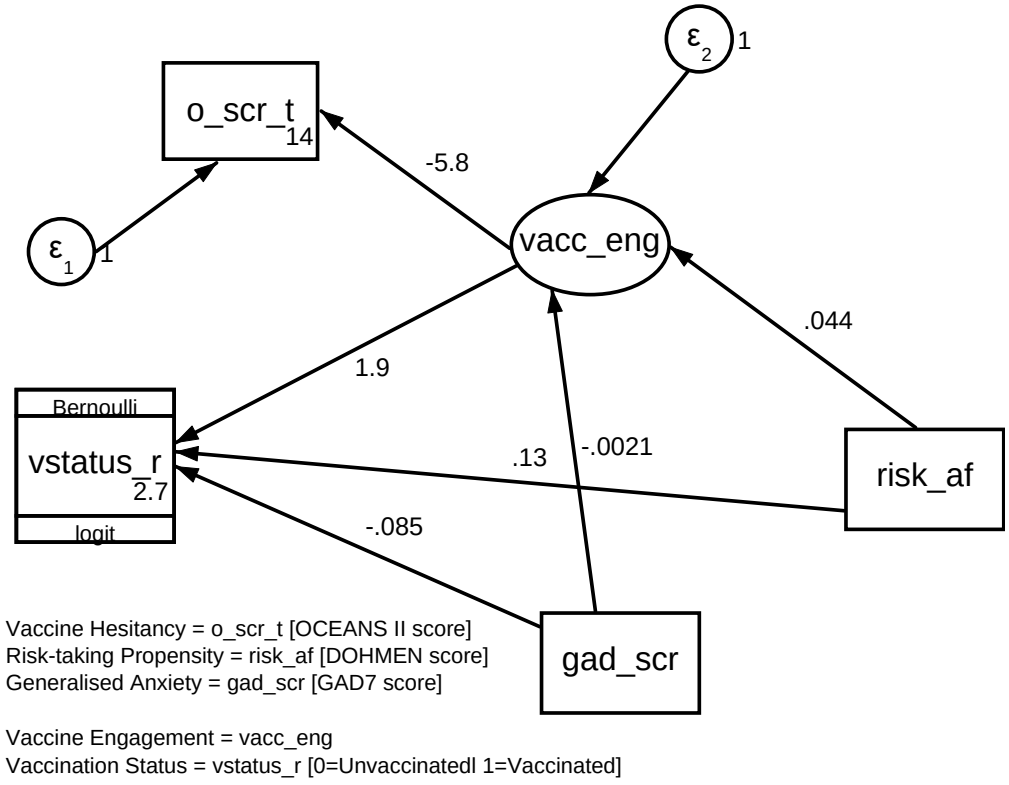
Structured Equation Model for England




Vaccine Hesitancy = o_scr_t [OCEANS II score]
Risk-taking Propensity = risk_af [DOHMEN score]
Generalised Anxiety = gad_scr [GAD7 score]

Vaccine Engagement = vacc_eng
Vaccination Status = vstatus_r [0=Unvaccinatedl 1=Vaccinated]

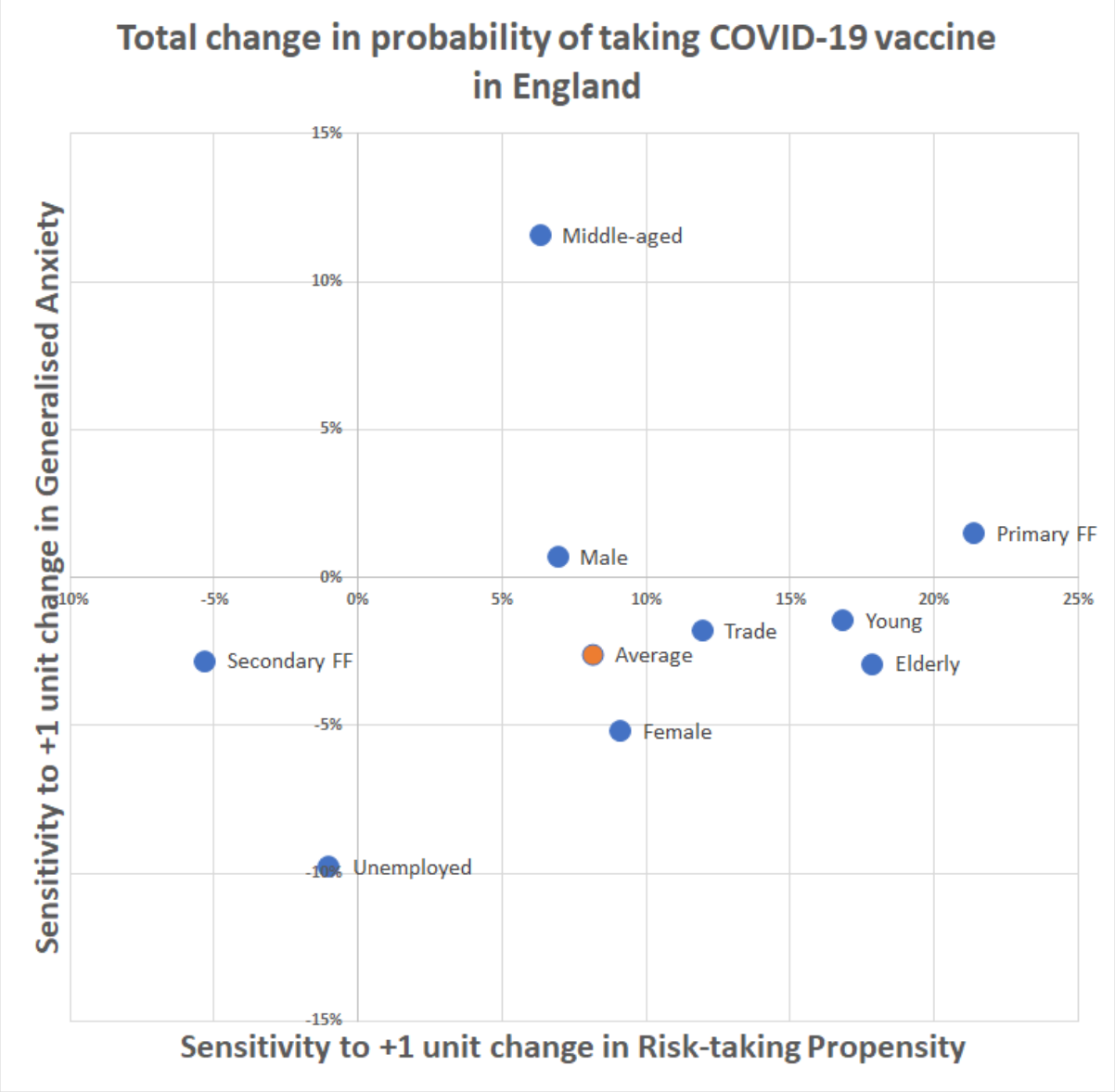
Structured Equation Model for Japan

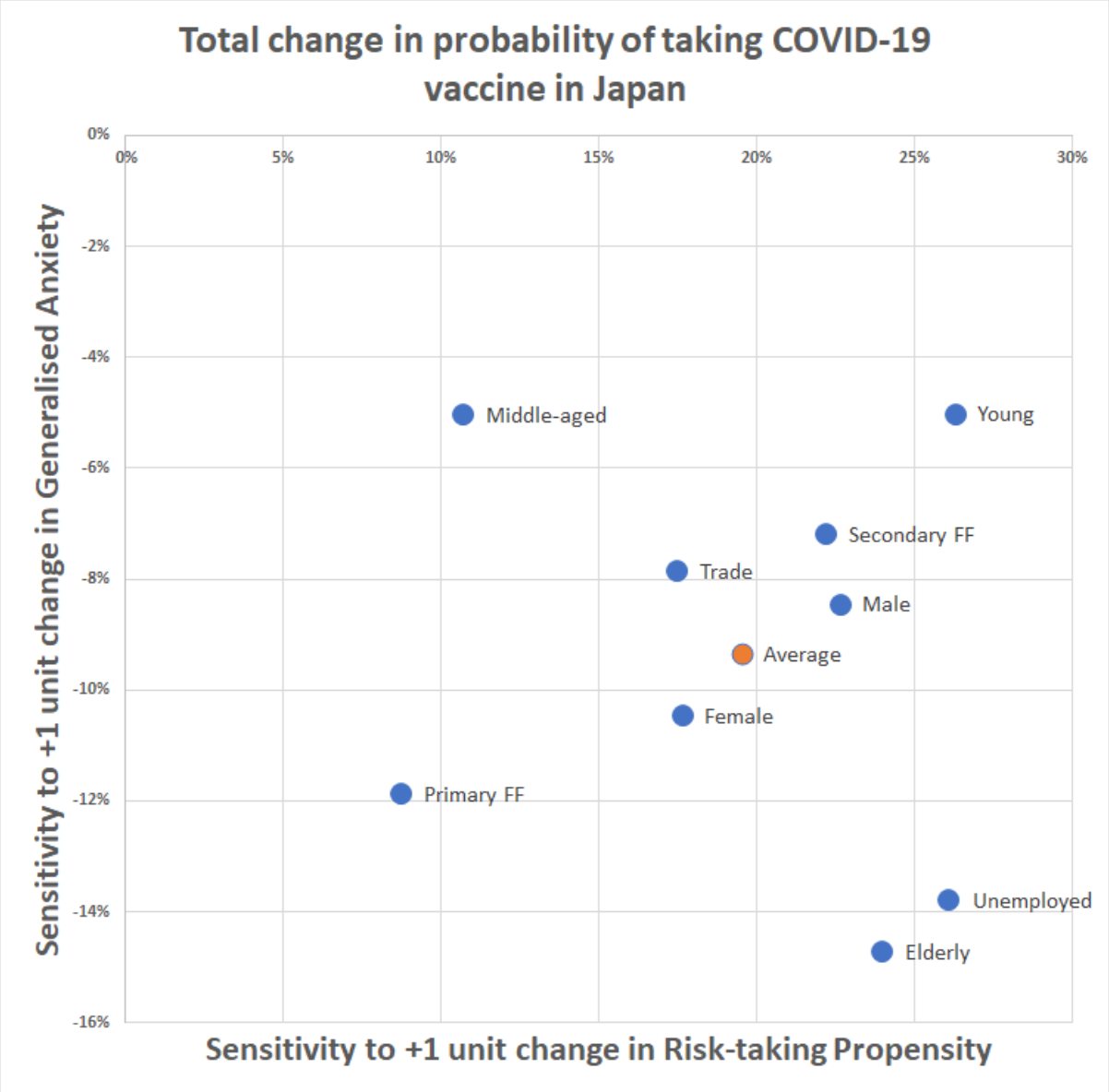



The numbers along the pathways are the coefficients of the regression equation along the path. For instance, the path connecting 'vacc_eng' to 'o_scr_t' shows us that on average 1 unit of increase in vaccine engagement reduces an individual's vaccine hesitancy score (on the OCEANS II scale) by 6.4 for England, and 5.8 for Japan. Likewise, 1 unit of increase in risk-taking propensity ('risk_af') improves vaccine engagement by 0.044 units on average for Japan, but actually *decreases* it by 0.016 units on average for England. The effect on vaccination uptake probability ('vstatus_r') is more complex to interpret, as these coefficients are given in 'logit' (or the logarithm of odds-ratio) terms. For instance, 1 unit change in generalised anxiety score ('gad_scr') has -0.085 logits of impact on the vaccination uptake probability for Japan, which translates to reducing the probability of uptake by 9%. This is via a direct pathway. Generalised anxiety also influences vaccination uptake probability via an *indirect* pathway, through vaccine engagement. The measure of this effect for Japan

would be (-0.0021)*(1.9) = -0.004 logits. This translates to roughly 0.5% reduction in the probability of taking the vaccine. Decomposing the direct and indirect effects of changes in risk-taking propensity and generalised anxiety in this way demonstrates the challenge of managing vaccine engagement by considering vaccine hesitancy only.

It is also instructive to observe how these structural relationships change by subgroup. Standardised tests for model invariance at various subgroups levels supported that the model coefficients vary significantly depending on the demographic considered. The scatter plots below formalise this by showing the overall change in vaccine uptake probability relative to 1 unit change in each of risk-taking propensity and generalised anxiety, by age, gender, and job status.

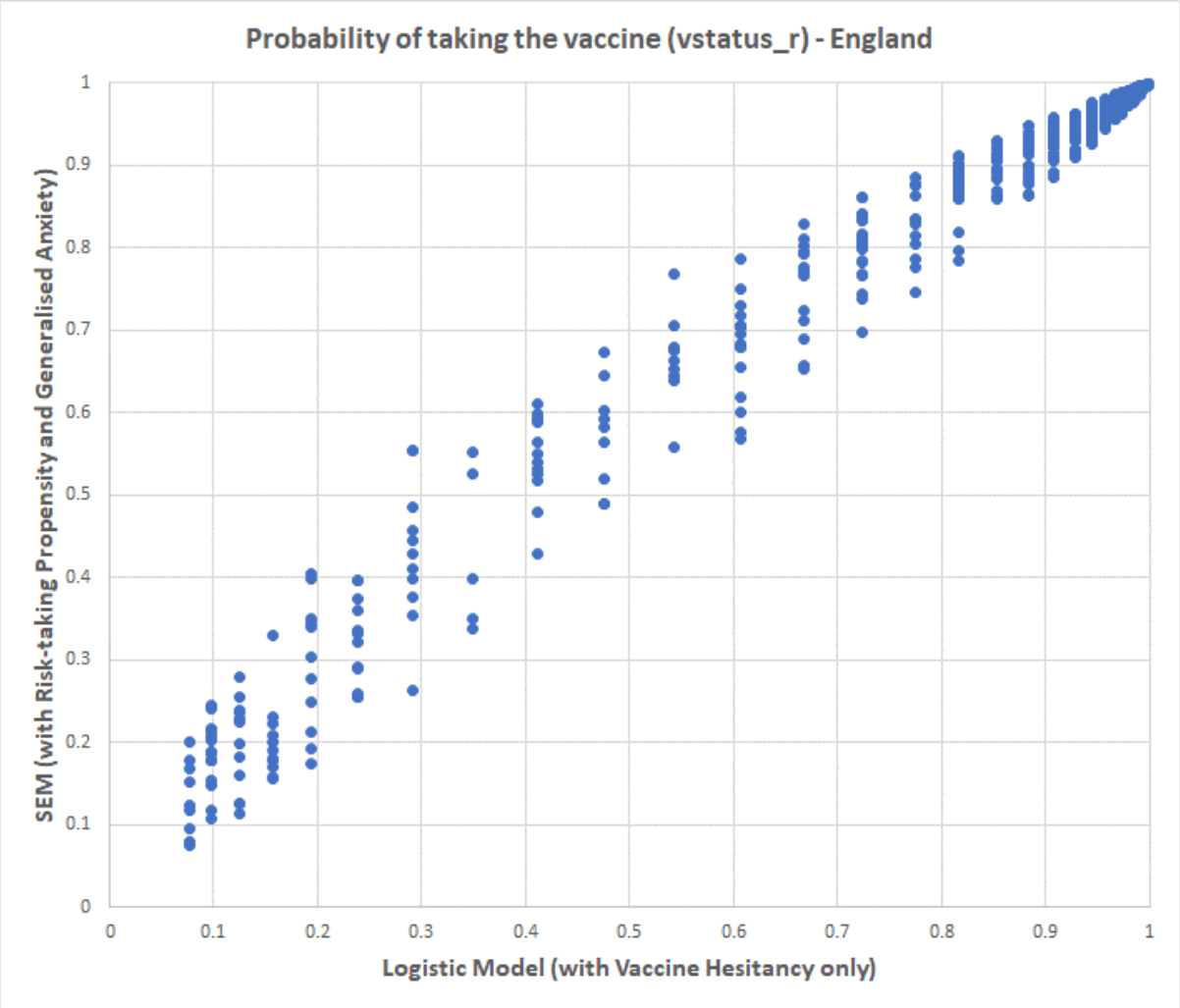





The two countries vary markedly in the *sensitivities* of each subgroup. For Japan, an increase in risk-taking propensity universally has a positive impact on the relative probability of taking the vaccine, and the opposite is true for an increase in generalised anxiety. This suggests that at a foundational level, the Japanese sample is more innately risk-averse and uneasy about vaccination, independently of the indicators of vaccine hesitancy. The England sample paints a different picture, as individuals who are unemployed as well as those in secondary front-facing professions (like office workers) decrease their likeliness of taking the vaccine with higher risk-taking propensity. There is a similar reversal of views with respect to increase in generalised anxiety for males, mature individuals (between 40-59) and those in primary front-facing professions (including healthcare, social work and third sector organisations). It

is possible to speculate on causal reasons for this (for instance, the relative ethnic makeup of certain professions) but they cannot be evidenced fully in this explanatory account.

Finally, we can compare the predicted probabilities (in sample) of vaccine uptake from a pure logistic regression against vaccine hesitancy only, versus the results from the SEM. Only the graph for England is shown here, as the pattern for Japan is similar.




It can be seen that the additional variables of risk-taking propensity and general anxiety allow for a greater predictive range than vaccine hesitancy alone, under the SEM assumptions of a mediating structure. Overall, these analyses suggest that there is merit in approaching vaccine engagement with a holistic assessment of cognitive, as well as behavioural and emotional aspects, beyond those accounted for naturally in disease-specific vaccine hesitancy measures. We should also be sensitive to both the direct and indirect effects involved in the complex mechanisms of action from

behavioural and emotional factors. There may be unintended consequences to interventions that assume linear and direct impacts only. It is useful to promote further investigations into subgroup activity, as assuming homogeneity in behavioural factors across broad groups may dilute the overall efficacy seen in vaccine engagement programmes.

# 6.0 Public Health and Social Measures (PSHMs)

## 6.1 Understanding the cost-benefit profile

The focus of this section is understanding the trade-offs the public may envision when considering vaccination alongside other PHSMs. Such trade-offs relate to the cognitive expression of vaccine engagement and rely on individuals to be able to rationalise some risk-adjusted cost-benefit framework, such that they can weigh the pros and cons of various PHSMs. There are several caveats involved with this approach. Firstly, individuals may not be able to explicitly convey the value relationships they uphold across PHSMs. This is not a blocker in itself, as there are techniques which can be used to derive aggregate preference patterns across individuals based on relatively simple binary comparisons. These preference patterns in turn hold enough information about cost-benefit relationships to derive the implicit trade-offs.

Secondly, individuals` preferences may not always be internally consistent and may deviate based on the amount of information they are given within the options for PHSMs which they have to choose from. Again, this in itself is not a blocker as quantitative models can be built up in increasing levels of sophistication to examine various assumptions about the consistency of preferences.

Finally, even when choices are consistent, estimates of how individuals would make trade-offs may be biased because they exhibit bounded rationality and cognitive biases. Bounded rationality means that under real-world, dynamic settings, individuals may optimise their cost-benefit profiles according to different targets that do not take all relevant information at hand into account. This can lead to sub-optimal preferences and decision making in the short-term, compared with the longer-term, where more information about available options and risks would be assimilated. Cognitive biases are deviations in the way individuals subjectively weight their options because of their own subjective beliefs, attitudes, and emotions. These final issues cannot be solved by standard quantitative techniques, but they can be mitigated to an extent by adding a qualitative dimension to investigations.

With the above points in mind, our approach taken to understand PHSM trade-offs comprised:

(i) a discrete choice experiment (DCE) which forced survey respondents to choose between two scenarios involving a given epidemiological profile of COVID-19 (cases, death rates, and trends in hospitalisation), along with a handful of PHSMs at set levels; and

(ii) focus groups based similar choice sets which further investigated participants` rationales for their preferences.

## 6.2 What is a Discrete Choice Experiment?

A discrete choice experiment (DCE) is a quantitative methodology that attempts to value the different factors or elements that influence individuals' choices. It belongs to a family of techniques that make a fundamental assumption that each relevant options over which people make decisions can be characterised by a series of 'attributes'. Each attribute is allowed to vary over certain 'levels'. These levels may be discrete (categorical), or they may be continuous. Any given option must comprise some combination of available attributes, but each attribute may be present at a single, unique level. The full set of options available is called a 'choice set'. The idea behind a DCE is that individuals can be presented with a series of *hypothetical* choice sets, each of which contains a different mix of attributes (at unique levels in each option), and based on individuals' selection of a single option from each choice set, a pattern of preferences across the entire sample can be exposed. DCE's are attractive because they rely on standard economic principles which can be adaptive into incentive packages for policymaking, or they can supplement quantitative impact studies (Connor et al., 2021; Manipis, Street, Cronin, Viney, & Goodall, 2021).

## 6.3 Attributes

In the current contest, the primary 'attributes' used in each choice set correspond to 6 PHSMs which were shortlisted from the 19 base categories discussed (see Section 6.0) and which were used in the ranking exercise. For the DCE, 2 or 3 levels were

derived for each primary PSHM attribute, based on team expertise and suggestions from the Health Advisory Panel. A breakdown of the primary PHSM measures available and the corresponding levels is shown in the table below.

| PHSM Category | Level | Description |
|---|---|---|
| DOMESTIC MOVEMENT restrictions | 1<br>2 | Commuting limited to local town, city, or prefecture<br>Overnight curfews (stay indoors 9pm to 6am) |
| WORKING / TEACHING HOURS for businesses and schools | 1<br>2 | Regular (maintains economy)<br>Minimal (relieves health services) |
| INTERNATIONAL TRAVEL restrictions | 1<br>2<br>3 | Fewer flights (but no quarantines)<br>Frequent flights (but long quarantines)<br>Bans on ALL non-essential entry and exit |
| FACE COVERING RULES in public spaces | 1<br>2 | RECOMMENDED only - not enforced<br>MANDATORY - fines for non-compliance |
| TESTING REQUIRED to access indoor events | 1<br>2 | Temperature checks (easy but unreliable)<br>Lateral flow / antigen (uncomfortable but reliable) |
| VACCINATION POLICY<br><br>(national) | 1<br><br>2<br>3 | General information campaign - NO PENALTIES if unvaccinated<br>Vaccines STRONGLY ADVISED - LIMITED services if unvaccinated<br>Vaccines COMPULSORY for everyone |

There were also 3 secondary 'attributes' corresponding to the current epidemiological profile of COVID-19 in each scenario:

(i) number of new cases per million people per week (ranging from 200 to 4000);

(ii) percentage of excess deaths per month (ranging from -10% to 25%);

(iii) overall trend in the number of hospitalisations over the previous 2 weeks (either 'rising' or 'falling').

The ranges above have been calibrated based on the actual ranges observed by England and Japan between March 2020 to August 2021, with some additional margin for ease of calibration in the models.

The idea here behind exploring these attributes is that they correspond to the headline indicators the public is used to seeing that tells them how severe the local

state of COVID-19 is, and ultimately, they inform the metrics which will be used to judge the acceptability of PHSMs. The interesting feature here is that it is not apparent in advance which metric individuals will choose to make their cost-benefit evaluations, nor is it likely that the public would be aware of the quantitative thresholds at which they deem to accept or reject the levels of PHSMs. A sample choice set with the full set of primary and secondary attributes is shown below. The full survey comprised 81 choice sets, which were split into 9 blocks of 9 questions each, to minimise the cognitive burden on respondents (each respondent answers a single block only).

| Question | Situation A | Situation B |
|---|---|---|
| **Current levels of COVID-19 cases and deaths** | | |
| DEATHS per month compared to normal | 25% MORE | Normal death rate |
| NEW CASES per million people every week | 300 | 3,800 |
| HOSPITAL ADMISSIONS 2-week trend | FALLING | FALLING |
| **Proposed measures (given levels above)** | | |
| DOMESTIC MOVEMENT restrictions | Overnight curfews (stay indoors 9pm to 6am) | Daytime commuting limited to local town or prefecture |
| WORKING / TEACHING HOURS for businesses and schools | Regular (maintains economy) | Minimal (relieves health services) |
| FACE COVERING RULES in public spaces | RECOMMENDED only not enforced | MANDATORY fines for non-compliance |

In economic terms, we can think about each scenario as providing a 'consumption bundle' of the (hypothetical) *current* impacts of COVID-19 (within the secondary epidemiological profile), alongside the PHSMs, which serve as a proxy consumption bundle for the *expected future* impacts of COVID-19. Each choice set effectively asks respondents to choose their optimal consumption bundle of 'current' plus 'future' COVID-19 impacts, while relying on them to interpret the future bundle according to their own cost-benefit assessments of the PHSMs. In this way, of presenting the scenarios in each choice set, we can derive an 'exchange rate' (or in economic terms, a numéraire), by which to derive the public's 'willingness to adapt' (analogous to the economic concept of marginal rate of substitution between two consumables) to each

measure. In our current study, this numéraire will be set as the number of new cases per million per week.

Two additional points are noteworthy. Firstly, no choice set was developed where there was an obvious 'dominant' set of secondary attributes. That is, there was not a situation where respondents would have to choose between Scenario A and Scenario B, where the epidemiological profile for A was worse than B (or vice versa) across all of cases, deaths, and hospitalisation trend. This ensured respondents could not remove the 'current' consumption bundle of COVID-19 impacts from consideration.

Secondly, other authors (Romano, Sotis, Dominioni, & Guidi, 2020) have noted that the presentation of COVID-19 morbidity and mortality data has a direct impact on public preferences (e.g. presenting as linear versus logarithmic scales). The extent to which this affects the current study was not explored, but it is worth noting that the number of new cases needed to be expressed in terms of the total national population per day as the Japanese pilot study respondents could not relate to the 'per million people per week' expression. The relevant data was converted back to original terms for the analysis.

## 6.4 Willingness to adapt results

The DCE analysis was performed using several statistical models, each with its own set of nested assumptions which were tested against the data for fit. The baseline 'gold standard' model used is called the conditional logit model. The underlying principle is that the amount of 'utility' or satisfaction that an individual derives from a particular attribute is proportional to the level of the attribute (i.e., it changes linearly with increasing or decreasing levels). All of the attributes in our study are categorical with the exception of death rates and number of new cases which are provided as continuous variables. It is important to note that only a continuous variable can be used as a numeraire to derive the 'willingness to adapt'. Categorical variables were expressed as binary variables for each level.

The conditional logit model assumes individuals' preferences are homogenous (tastes are fixed) and that they express their preferences at consistent scales across attribute levels (scales are fixed). This model is the easiest to develop but is quite restrictive in terms of being able to fit real world data. Real preferences can be expected to vary across individuals, but in addition, there tends to be heterogeneity in the way individuals express their preferences across attribute levels. The mixed logit model allows the assumptions about homogenous tastes and scales to be relaxed, albeit at a high computational cost. Taste heterogeneity is naturally accounted for in a mixed logit model, and scale heterogeneity can be accommodated by specifying correlations between the estimated 'willingness to adapt' parameters in the model.

The results of 3 models (conditional logit, mixed logit without correlation and mixed logit with correlations) are shown on the following page. The relevant model of interest is highlighted in blue in each case. Conditional logit is appropriate for Japan because the standard deviation for the parameter estimates from the mixed logit were not significant (i.e. the hypothesis that they are different from zero could not be accepted). Similarly, mixed logit with correlations was appropriate for England since the standard deviation and correlations for the international travel and domestic movement attributes are significant.

Level 2 (Vaccines STRONLY ADVISED) of the vaccination policy measure was excluded from the model, since convergence of the model failed because of its high degree of association with the Level 3 (COMPULSORY). A similar association lies between Levels 2 and 3 of the international travel measure, but it did not cause the model to fail, so both levels are retained, with the understanding that there may be some bias in these estimates.

The numbers in the table are the 'willingness to adapt' parameter estimates of interest; corresponding p-values are shown in brackets. Higher numbers in general reflect a greater resistance or apprehension toward the level of the measure modelled. For the PHSMs, this can be interpreted as the rise in the number of new cases per million per week which it would take to demonstrate to the public that the particular level of the measure is necessary, relative to the baseline measure level. These are expressed in relative terms by construction – the DCE is not designed to

provide estimates of an absolute utility derived from preference data. This may not seem natural for attributes like domestic movement (where the baseline is daytime restrictions versus the modelled night time curfew). In this case the numbers can be interpreted in reverse. For example, for England, the mixed logit estimate is -380 new cases per million per week. This is not meaningful as a negative number normally, but since there is no interpretive ranking between daytime and night-time restrictions, it can be reversed to give +380 as the number of new cases required to convince the public to activate daytime commuting restrictions, relative to night-time curfews. This normalisation is not appropriate in all cases for the estimates provided. For instance, it may not be reasonable to suggest that it would take an additional 3,321 new cases to convince the public that temperature checks are necessary, relative to lateral flow / PCR tests (in the England conditional logit). In this setting these negative estimates are spurious and simply indicate the public have no further recourse to deny the more 'onerous' level. The same applies for the Japan estimates for face covering rules, testing, and working and teaching hours. These estimates are also not significant, so they may very well be positive, with some causal explanation, but the data cannot attest to this.

The key points of interest for the PHSMs are the threshold for accepting compulsory vaccines is estimated at around 1,672 new cases for Japan, and 2,442 for England. For a better comparison we can scale the relevant model numbers by the number of peak cases per million per week in August 2021. This is shown in the final table.

| **JAPAN** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Attribute: | | INTERNATIONAL TRAVEL | INTERNATIONAL TRAVEL | DOMESTIC MOVEMENT | WORKING / TEACHING HOURS | FACE COVERING RULES | TESTING REQUIRED | VACCINATION POLICY | DEATH RATE | HOSPITALISATION TREND |
| Baseline level: | | Few flights (no quarantine) | Few flights (no quarantine) | Daytime commuting | Regular hours | Recommended only | Temperature checks | General info campaign | N/A | Falling |
| Modelled level | | Frequent flights (with quarantine) | Entry and exit bans | Night time curfews | Minimal hours | Mandatory with fines | Lateral flow / PCR | Compulsory vaccines | (Continuous) | Rising |
| Model: | | | | | | | | | | |
| Conditional Logit | Tastes and scales fixed | **2242 (0.02)** | **-3938 (0.00)** | **2498 (0.00)** | -830 (0.36) | -763 (0.30) | -256 (0.75) | **1672 (0.02)** | **248 (0.00)** | **3349 (0.00)** |
| Mixed Logit (no correlations) | Tastes vary; scales fixed | **2249 (0.02)** | **-3909 (0.00)** | **2512 (0.00)** | -798 (0.36) | -765 (0.38) | -365 (0.67) | **1667 (0.05)** | **246 (0.00)** | **3353 (0.00)** |
| Mixed Logit (with correlations) | Tastes and scales vary | **2311 (0.02)** | **-3845 (0.00)** | **2463 (0.00)** | -811 (0.35) | -741 (0.39) | -317 (0.71) | **1700 (0.05)** | **245 (0.00)** | **3346 (0.00)** |

| **ENGLAND** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Attribute: | | INTERNATIONAL TRAVEL | INTERNATIONAL TRAVEL | DOMESTIC MOVEMENT | WORKING / TEACHING HOURS | FACE COVERING RULES | TESTING REQUIRED | VACCINATION POLICY | DEATH RATE | HOSPITALISATION TREND |
| Baseline level: | | Few flights (no quarantine) | Few flights (no quarantine) | Daytime commuting | Regular hours | Recommended only | Temperature checks | General info campaign | N/A | Falling |
| Modelled level | | Frequent flights (with quarantine) | Entry and exit bans | Night time curfews | Minimal hours | Mandatory with fines | Lateral flow / PCR | Compulsory vaccines | (Continuous) | Rising |
| Model: | | | | | | | | | | |
| Conditional Logit | Tastes and scales fixed | **1044 (0.18)** | **111 (0.88)** | **-309 (0.64)** | 1756 (0.04) | -5046 (0.00) | -3286 (0.00) | **2313 (0.00)** | **218 (0.00)** | **4357 (0.00)** |
| Mixed Logit (no correlations) | Tastes vary; scales fixed | **1007 (0.20)** | **129 (0.87)** | **-312 (0.62)** | 1793 (0.03) | -5076 (0.00) | -3314 (0.00) | **2330 (0.01)** | **218 (0.00)** | **4340 (0.00)** |
| Mixed Logit (with correlations) | Tastes and scales vary | **1080 (0.18)** | **200 (0.80)** | **-380 (0.56)** | 1890 (0.03) | -5211 (0.00) | -3321 (0.00) | **2442 (0.01)** | **225 (0.00)** | **4425 (0.00)** |

| **Willingess to adapt** | | **- relative to August 2021 peak in each country** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Attribute: | | INTERNATIONAL TRAVEL | INTERNATIONAL TRAVEL | DOMESTIC MOVEMENT | WORKING / TEACHING HOURS | FACE COVERING RULES | TESTING REQUIRED | VACCINATION POLICY | DEATH RATE | HOSPITALISATION TREND |
| Baseline level: | | Few flights (no quarantine) | Few flights (no quarantine) | Daytime commuting | Regular hours | Recommended only | Temperature checks | General info campaign | N/A | Falling |
| Modelled level | | Frequent flights (with quarantine) | Entry and exit bans | Night time curfews | Minimal hours | Mandatory with fines | Lateral flow / PCR | Compulsory vaccines | (Continuous) | Rising |
| Japan | Conditional logit | **174% (0.02)** | **-305% (0.00)** | **194% (0.00)** | -64% (0.36) | -59% (0.30) | -20% (0.75) | **130% (0.02)** | **19% (0.00)** | **259% (0.00)** |
| England | Mixed logit with correlations | **22% (0.18)** | **4% (0.80)** | **-8% (0.56)** | 38% (0.03) | -106% (0.00) | -67% (0.00) | **49% (0.01)** | **5% (0.00)** | **90% (0.00)** |

It can be seen on this relative basis that the Japanese public's resistance to the most onerous compulsory level of vaccine is almost 4 times that of England, when expressed in terms of peak cases experiences by August 2021 (prior to Omicron). Similar ratios apply to the other estimates for the measures. Note that for both countries, the ratios for the death rates and hospitalisation trends are of the same order of magnitude. These can be interpreted as the decrease in new cases which would be equivalent to a 1% fall in the rate of excess deaths (or in the 2-week trend in hospitalisations). The number of hospitalisations is seen to have a clear importance in both countries as a headline item.

A secondary point of note is the high levels of apprehension in Japan to domestic movement restrictions. This was also represented in the focus group discussions, as the participants felt that curfews would be radically ineffective and would only make commuting even more strenuous for those who have to cross prefecture borders. The England sample was marginally more sensitive to daytime restrictions but were not convinced they could be activated with warranty. Finally, the Japan cohort appeared to be comfortable with complete bans on international travel. This was again alluded to through the focus groups, as it was generally thought that COVID-19 risks are higher in other countries.

## 6.5 Latent class modelling

The models applied above are sufficient to provide the generalised expected public reaction to vaccines, but the parameter estimates provided do not easily extend to demographic subgroups or natural clusters of like-minded people in the sample. To account for this, we run a latent class logit model. This model looks for natural clustering (or classes) with similar preference structures and also allows for easier representation of interaction effects with demographic variables. The benefit is that we are able to split the population under investigation into representative groups that might naturally align willingness to adapt. The cost of this approach is that we lose the benefits of acknowledging preference heterogeneity at an individual level, as this is assumed to be constant within a class.

The analysis suggests 3 distinct classes in England, and 4 in Japan. The estimates for these classes, along with their proportions are shown in the next figures. Note that Class 1 (30%) in England and Class 3 (37%) in Japan are clear vaccine hesitant groups. The difference is that the group in Japan appears to be strongly averse to measures in general, while the group in England appears more relaxed about measures which are socially defined, rather than measures which they must comply with individually. Class 1 (15%) in Japan and Class 2 (27%) in England are broadly willing to comply with almost any measure, including mandatory vaccination rules. The remaining classes have relatively more erratic preference structures whose estimates are not significant in general. These classes can be interpreted as inconsistent, although on average the estimates do suggest they would be vaccine hesitant to a significant degree. It is interesting to note that no classes were identified which would be only hesitant against vaccines but relaxed about other measures.

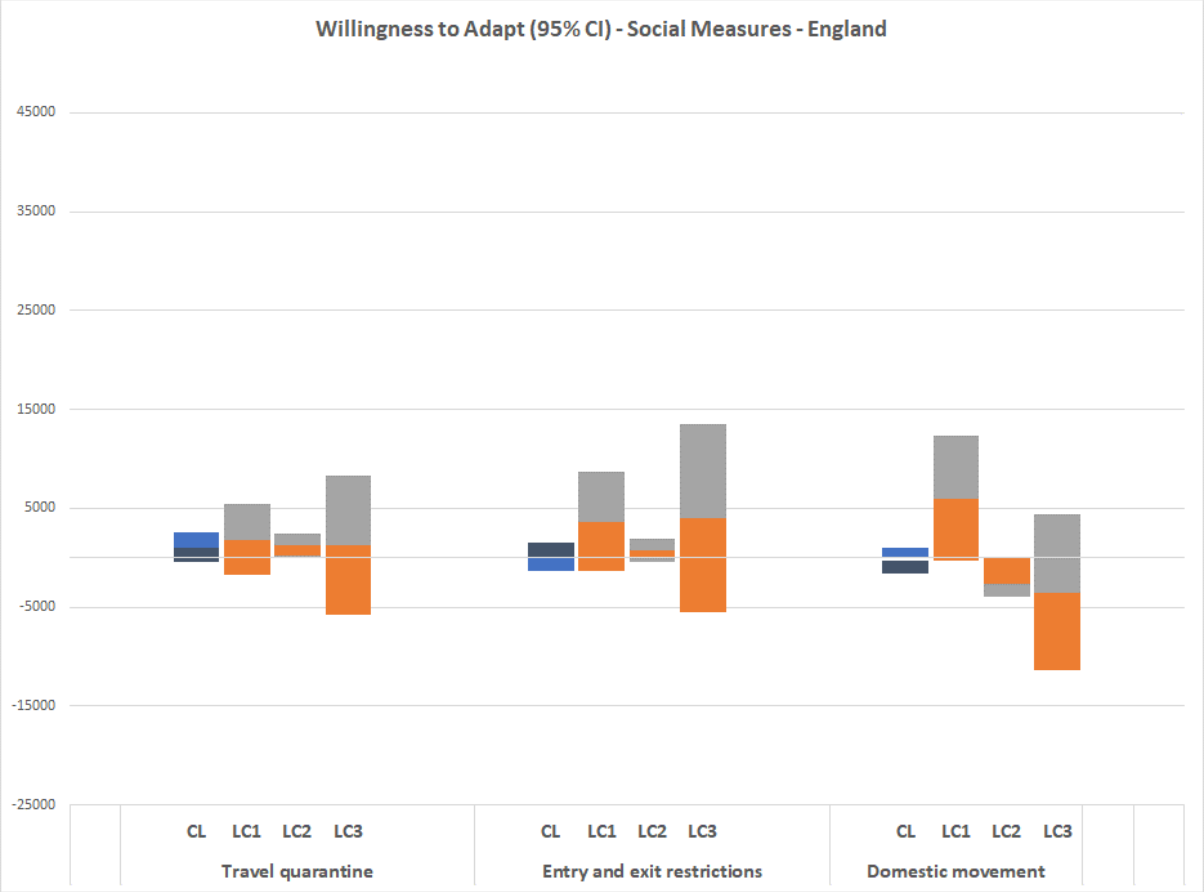
On the following page, final parameter estimates alongside the confidence levels are shown to scale for all models and classes, for each attribute level individually. One interesting observation is that the population level estimates for willingness to adapt to mandatory face covering rules were slightly negative (but not significant), while for both vaccine hesitant and measure accepting classes, the coefficients were strongly positive and significant. One rationale for this could be the population estimates were distorted by the inconsistent groups but are a true reflection of the feeling of wearing masks in the general population. This is reinforced by the focus group discussions, where participants regularly alluded to the fact that mask wearing is already done by choice, but if the government decides to intervene and make it mandatory with fines, it will face a backlash. There was no comparable sentiment from the England focus group participants, who rather engaged with considerations for special populations and people who had medical reasons for being unable to wear masks.

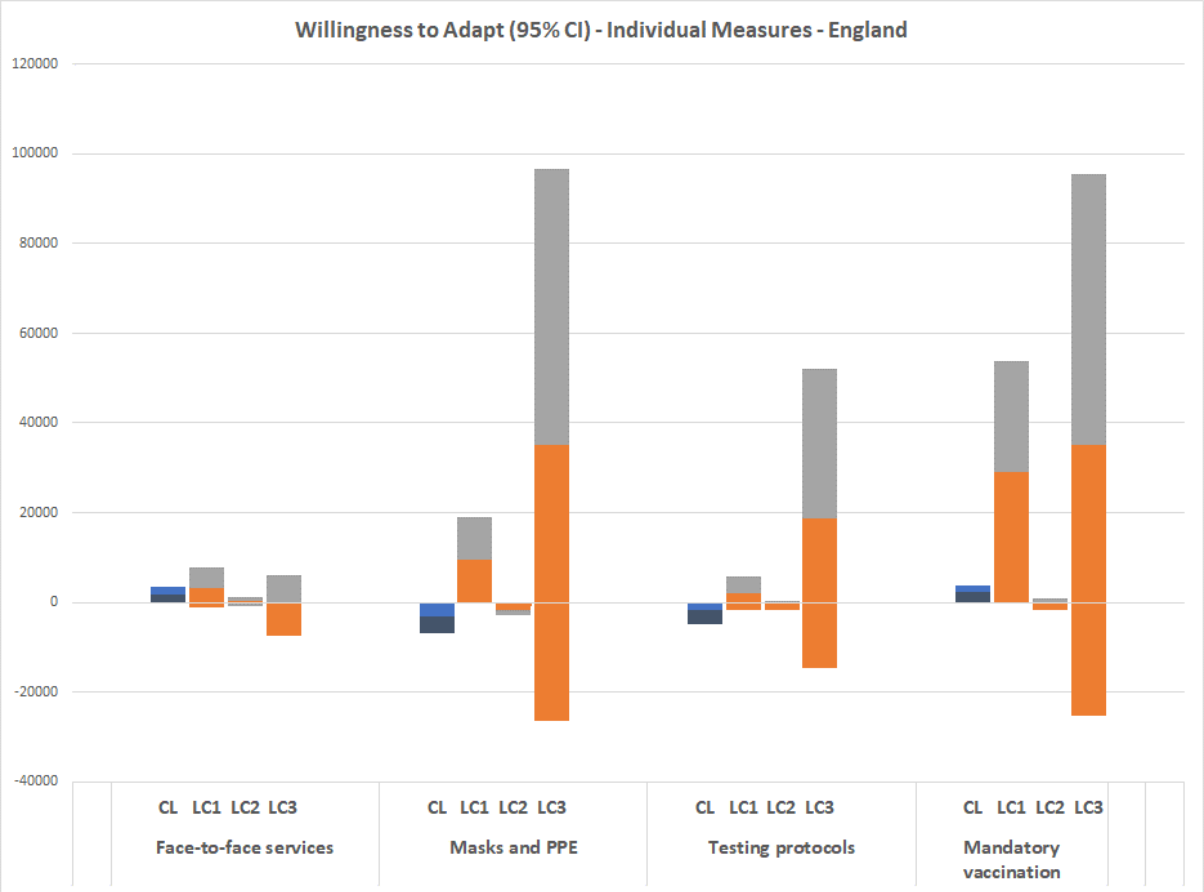
**JAPAN**

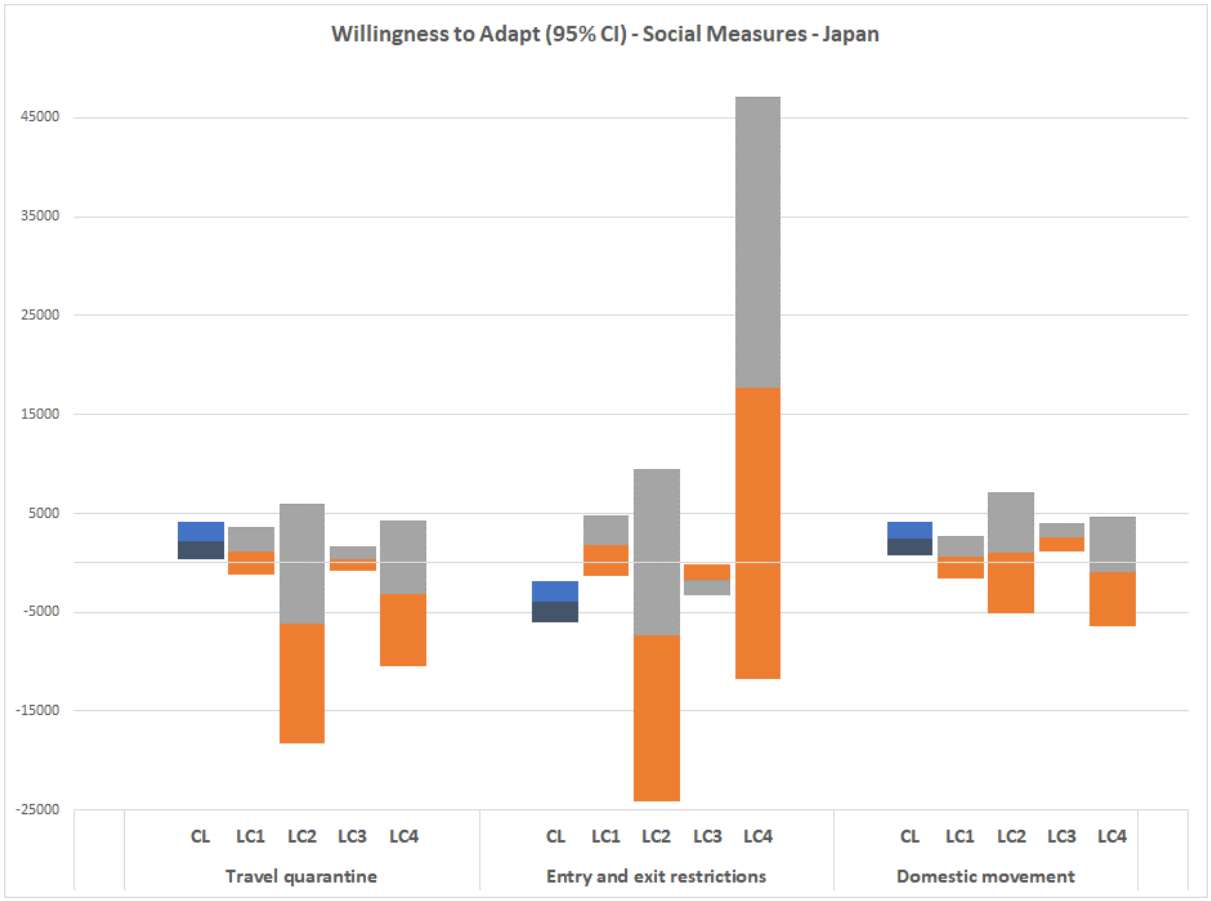
| Attribute: | | INTERNATIONAL TRAVEL | INTERNATIONAL TRAVEL | DOMESTIC MOVEMENT | WORKING / TEACHING HOURS | FACE COVERING RULES | TESTING REQUIRED | VACCINATION POLICY | DEATH RATE | HOSPITALISATION TREND |
|---|---|---|---|---|---|---|---|---|---|---|
| Baseline level: | | Few flights (no quarantine) | Few flights (no quarantine) | Daytime commuting | Regular hours | Recommended only | Temperature checks | General info campaign | N/A | Falling |
| Modelled level | | Frequent flights (with quarantine) | Entry and exit bans | Night time curfews | Minimal hours | Mandatory with fines | Lateral flow / PCR | Compulsory vaccines | (Continuous) | Rising |
| Model: | | | | | | | | | | |
| Class 1 - 15% | Tastes and scales fixed in class | 1180 (0.33) | 1766 (0.26) | 568 (0.61) | **597 (0.70)** | **1952 (0.06)** | **2592 (0.06)** | -4153 (0.11) | **314 (0.00)** | **2402 (0.00)** |
| Class 2 - 17% | Tastes and scales fixed in class | -6168 (0.32) | -7287 (0.39) | 1046 (0.74) | **-3267 (0.51)** | 1466 (0.71) | 16103 (0.28) | 1679 (0.62) | 282 (0.24) | -5010 (0.37) |
| Class 3 - 37% | Tastes and scales fixed in class | 416 (0.51) | **-1685 (0.04)** | **2543 (0.00)** | **790 (0.31)** | **5865 (0.00)** | **2227 (0.02)** | **7894 (0.00)** | **99 (0.00)** | **2100 (0.00)** |
| Class 4 - 31% | Tastes and scales fixed in class | -3109 (0.41) | 17736 (0.24) | -869 (0.76) | **8399 (0.26)** | 29130 (0.20) | 1476 (0.69) | 17853 (0.17) | -304 (0.32) | 6095 (0.17) |

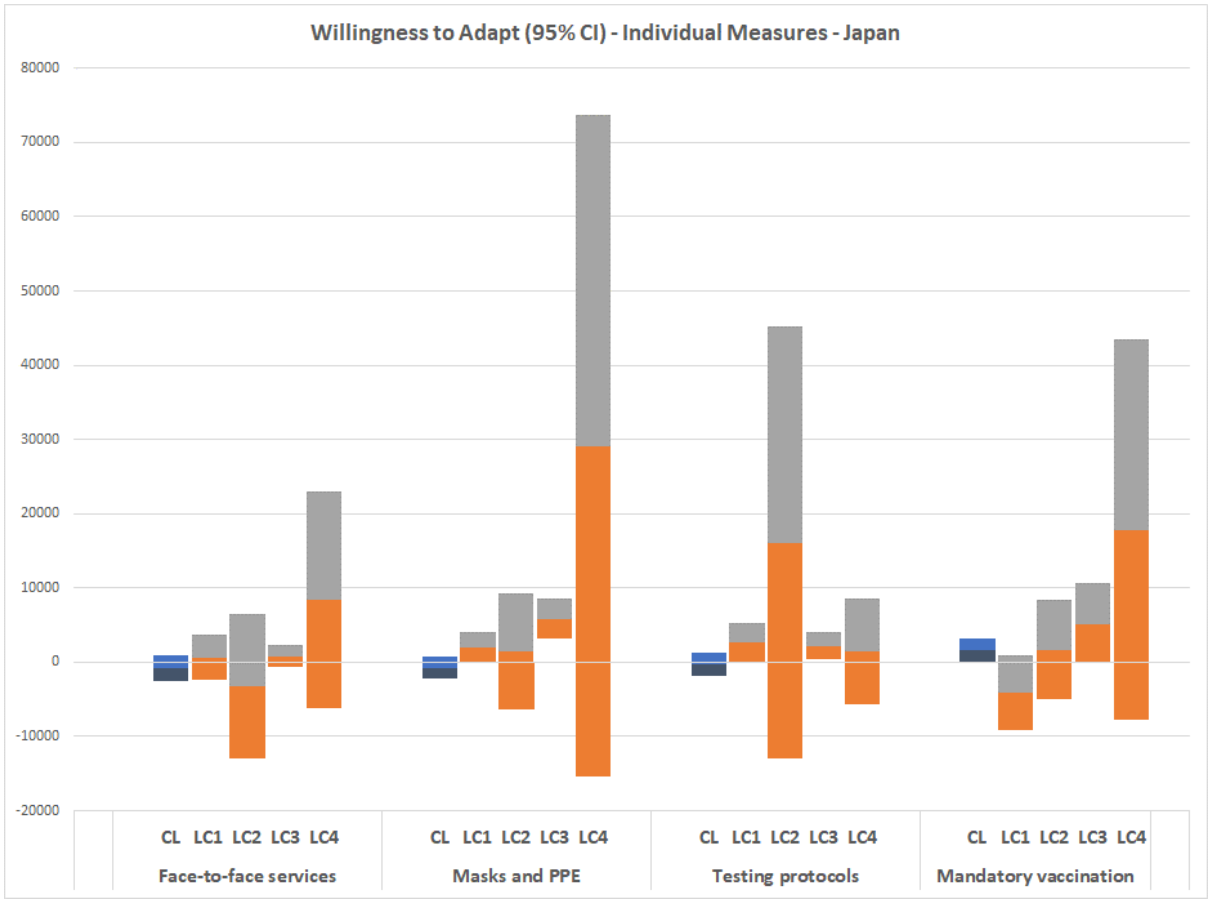
**ENGLAND**

| Attribute: | | INTERNATIONAL TRAVEL | INTERNATIONAL TRAVEL | DOMESTIC MOVEMENT | WORKING / TEACHING HOURS | FACE COVERING RULES | TESTING REQUIRED | VACCINATION POLICY | DEATH RATE | HOSPITALISATION TREND |
|---|---|---|---|---|---|---|---|---|---|---|
| Baseline level: | | Few flights (no quarantine) | Few flights (no quarantine) | Daytime commuting | Regular hours | Recommended only | Temperature checks | General info campaign | N/A | Falling |
| Modelled level | | Frequent flights (with quarantine) | Entry and exit bans | Night time curfews | Minimal hours | Mandatory with fines | Lateral flow / PCR | Compulsory vaccines | (Continuous) | Rising |
| Model: | | | | | | | | | | |
| Class 1 - 30% | Tastes and scales fixed in class | 1857 (0.30) | 3685 (0.15) | **5987 (0.06)** | 3230 (0.16) | **9554 (0.04)** | 2065 (0.27) | **29072 (0.02)** | **164 (0.04)** | **5366 (0.02)** |
| Class 2 - 27% | Tastes and scales fixed in class | **1308 (0.02)** | 791 (0.19) | **-2621 (0.00)** | 242 (0.63) | **-1758 (0.00)** | -659 (0.18) | -535 (0.43) | **211 (0.00)** | **3626 (0.00)** |
| Class 3 - 42% | Tastes and scales fixed in class | 1236 (0.73) | 4038 (0.41) | -3496 (0.38) | -627 (0.85) | 35070 (0.27) | 18587 (0.28) | 35134 (0.25) | 286 (0.23) | 4651 (0.25) |


Willingness to Adapt (95% CI) - Social Measures - England
45000
35000
25000
15000
5000
-5000
-15000
-25000
CL LC1 LC2 LC3
Travel quarantine
CL LC1 LC2 LC3
Entry and exit restrictions
CL LC1 LC2 LC3
Domestic movement


Willingness to Adapt (95% CI) - Individual Measures - England
120000
100000
80000
60000
40000
20000
0
-20000
-40000
CL LC1 LC2 LC3
Face-to-face services
CL LC1 LC2 LC3
Masks and PPE
CL LC1 LC2 LC3
Testing protocols
CL LC1 LC2 LC3
Mandatory vaccination


Willingness to Adapt (95% CI) - Social Measures - Japan
45000
35000
25000
15000
5000
-5000
-15000
-25000
CL LC1 LC2 LC3 LC4
Travel quarantine
CL LC1 LC2 LC3 LC4
Entry and exit restrictions
CL LC1 LC2 LC3 LC4
Domestic movement


Willingness to Adapt (95% CI) - Individual Measures - Japan
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
-20000
CL LC1 LC2 LC3 LC4
Face-to-face services
CL LC1 LC2 LC3 LC4
Masks and PPE
CL LC1 LC2 LC3 LC4
Testing protocols
CL LC1 LC2 LC3 LC4
Mandatory vaccination

## 7.0 Schools & Education on 'Vaccine Literacy / Engagement'

An important component of this research is the efforts we have made to consolidate the lessons learnt during this project, and retrospectively consider how 'adapting to a new normal' is inclusive of practices we set in motion to carry the lessons learnt from the COVID-19 pandemic to the younger generations. In this section we detail the tasks undertaken with university academics, curriculum designers (academic and governmental) and teachers (both primary and secondary levels) from England and Japan. The main outcome of this collaborative effort is to try and identify some universal policy recommendations, which can be used across G7 countries, or taken into consideration by government departments and Education Ministers when considering how to think of amending school curricula to incorporate the teaching of vaccine literacy / engagement.

At the beginning of 2022, an appeal was made to Education academics from the School of Education (University of Roehampton) and the Faculty of Education (Nagasaki University) to work collaboratively through a series of meetings alongside school teachers and education professors from both countries to discuss some of the new challenges presented as schools in both countries re-opened after disrupted periods of school closure due to outbreaks of COVID-19. It is important to note that given the disruptions to schooling many scholars have been focusing on the logistical aspects of teaching as functioning outside of the physical institution of schooling (Jogie & Berry, 2022), as well as the challenges with hybrid or online learning (Rahayu & Wirza, 2020), as well as the administrative management of teachers returning to work and shared staffroom spaces and abiding by new or enforced school rules or government guidance with ventilation, classroom cleaning, personal hygiene and mask wearing (to name a few) (Leask & Younie, 2021). However, this project sets aside logistical issues to focus more attentively on the changes that should be considered to the academic/ teaching curriculum to reflect the formalisation of the global experiences of the COVID-19 disease and the social disruptions caused by the pandemic.

## 7.1 Envisioning a 'vaccine literacy' module in the curriculum

In both Japan and England, education curricula for primary and secondary curricula are designed using a top-down approach (i.e., Ministry to schools to teachers to pupils). However, the immediate effects of the COVID-19 pandemic in terms of how it has disrupted the teaching and learning processes has been felt by pupils, teachers, and schools (in that order) and while there have been logistical considerations to stabilise teaching and learning environments there have been limited published conversations on how educators might want to reflect on the knowledge components of lessons learnt from the pandemic.

In Stage 1 of our consultations with teachers and researchers in Japan and England we discussed the potential for the creation of a section of 'vaccine literary' by teachers when discussing health in schools. This raised a few questions for consideration in the session and the summary of the main points raised in discussion:

1. *What do we currently teach about 'vaccine literacy' in primary and secondary schools?*

   In both primary and secondary curricula in Japan and the UK children learn about infectious diseases (e.g., bacterial infections and viral diseases such as influenza and measles), in terms of recognising illness and disease and how they are commonly spread. In primary schools[1], children are educated more about health in relation to body awareness and when speaking of illness, it's with the intention to recognise changes in the body by being able to identify and describe for example, feelings of malaise, exhaustion, nausea or fever. Whereas older children in secondary schools learn more about the complexity and scientific composition of disease in terms of understanding illness in relation to understanding what changes happen within the body to make a person unwell and how vaccines and drug-based treatments helps with treatment and cure.

[1] In Japan primary school aged children 6-12 years old, whereas in the UK primary school children are 5-11 years old. In both countries secondary school children are aged from 12-18 year olds.

2. *What are some of the challenges we might encounter if introducing a module on COVID-19 into school curricula?*

   Teachers in both countries reflected that COVID-19 was structurally changing the nature of teaching and learning especially with the investment of online/hybrid classrooms where pupils /teachers can function in remote spaces. This shift in practice has opened more questions from students and parents if whether this adaptation is permanent or just in relation to COVID-19. This question is one example that poses a challenge for teachers in terms of knowing or this case not knowing the boundaries of COVID-19 such that it might be taught in a module. Though, two main areas to emerge as needing specific curriculum attention are (i) guidance on discrimination regarding specifically targeting teaching pupils around social behaviours and COVID-19, and (ii) mental wellbeing support that is exclusively around the experiences of anxiety, trauma or distress caused by COVID-19.

3. *As educators, can we make a case of importance for this discussion with younger generations in classrooms?*

   During the online discussions, the team noted some specific cultural differences of the student-teacher relationships that emerge in British versus Japanese classrooms. For instance, teachers in the UK commented on guiding younger students questioning their compliance with protocols, in terms of trying to critically understand how these measures were consistently helping protect against the disease. Whereas, Japanese teachers noted that younger children diligently listened to the guidance of teachers as a means to try and help each other and their community to fight the disease. Given these cultural differences, we endeavoured to find out what children in schools wanted to know about COVID-19 especially as we are now two years into living in the pandemic.

## 7.2 Questions kids ask?

For stage 2 of the comparative activities the team set the task to investigate what children wanted to learn about COVID-19 as a means to understand if there were any specific themes or concepts emerging that might need to be incorporated into a formal curriculum. The research team advised teachers on the broad content we would like to ask and teachers in the study took it upon themselves to collect data in their own specific ways using convenience samples.

Guidance provided to ask questions included:

1. What do students want to know about vaccines?
2. Are there themes emerging from these discussions on anecdotes? How are these related to our previously discussed ideas about vaccine literary – would we make changes?
3. What are the types of questions being asked about Covid-19 in classrooms, what seems to concern students the most?
4. Most students derive their knowledge from their family, where and how are students updating their knowledge about Covid-19?

The following details the approach and the findings from both countries:

### 7.2.1 UK Case Study

Teachers in the UK opted to conduct a focus group with young people from the LAC service part of Birmingham Trust. There were seven (young people, YP) participants (4 under the age of 12 and 3 over the age of 12).

- The YP participants expressed frustration about the visible lack of leadership by example, there were too many inconsistencies from the government, community and even within their school to understand why public measures were being enforced on YP in schools if they were not being considered critical enough for adults and people in the media to comply with regulations.

- YP participants expressed cognitive biases around the effectiveness of some of the measures such as mask wearing or even testing not being reliable based on their personal experiences of doing 5 tests in a day with 2 negative and 3 positive outcomes.
- YP participants felt generally confused by the frequency of rules and regulations changing and, in some instances, not consistent, for instance wearing masks in corridors but not when seated in classrooms.
- Participants expressed interest in talking more about COVID-19 in classes but noticed that teachers do not seem comfortable to keep discussing it.
- Students felt happy to avoid exams but felt the disruption to schooling impacted their social life in terms of meeting their friends and having their usual routines. There were concerns that school disruption will create a setback in their general education preparation for the workplace and this was an anxiety they feared other generations would not be able to relate to, and that they might not receive compassion from future employers.

*Table 6: Sample Questions YP Participants would ask scientists (UK)*

| |
|---|
| *How does the vaccine help and yet it also kills people, so how does it kill people at the same time?* |
| *Why can't you make a jab that will completely stop the disease?* |
| *How was the vaccine developed so quickly?* [Though a young person answered that he is not worried because lots of countries have been working on it] |
| *How long will it last for?* |
| *How much testing has there been done on young people to make sure it is safe for young people?* |
| *Are there side effects that the Government isn't telling us about?* |
| *How much did it cost to produce?* |
| *Will the vaccine protect against all Covid-19 variants?* |
| *Why have some countries not got the vaccine?* |

### 7.2.2 Japan Case Study

Teachers in Japan conducted a questionnaire with 180 pupils (aged 10-12 years old who are currently in their 5th/6th grades of elementary school), and discussions with 20 teachers from

elementary and middle schools. Aside from the general disruptions to classes and school-based events children expressed interest and concern about:

- Exposure and risks of COVID-19 to their families and friends in terms of if being sick themselves would cause harm to those around them or an inconvenience for their family members if they worked in the medical field/ profession.
- Children revealed concerns about becoming sick and potentially infecting their classmates. Some also worried about being discriminated against if they became infected.
- The children also expressed more interest in how the disease responds to drug treatments and how the vaccine provides protection, but it was noted from teachers that there is limited to no questions being asked proactively by children to teachers to seek clarification or discussion about vaccinations or COVID-19 more broadly.

*Table 7:Table 6: Sample Questions YP Participants would ask scientists (Japan)*

| |
|---|
| *Does the Covid-19 vaccine work when I take it in specific times?* |
| *What is the reason behind side effects from the COVID-19 vaccine?* |
| *Which is more risky, influenza or COVID-19?* |
| *When should I be vaccinated?* |
| *Which company's vaccine should I get?* |
| *What is the point of multiple doses of vaccinations?* |
| *I would like to know more about the medication for treating COVID-19* |
| *I want to know how many of my friends have been vaccinated?* |
| *When will the third round of vaccination be available?* |
| *What is the effective combination of COVID-19 vaccines?* |
| *I would like to know more about the vaccine for the Omicron strain being developed by Pfizer* |

## 7.3 Comparative Analysis

In stage 3 of our collaborative activities, teachers and curriculum researchers reflected on findings and discussions from both countries to try and assess the strengths and challenges faced by school educators in Japan and the UK.

Discussions in the session focused on:

1. As reflections were shared about the practices from overseas schools, what are the highlights for us from what we have read and heard?
2. Based on our activities what do we believe should be the most important points posed to the Ministry of Education for inclusion of 'vaccine literary' in the curriculum?
3. What are the lessons learnt from this activity done together: do we believe there is scope to develop or test our hypothesis further in a larger funded study? What might some of the variations (e.g. types of schools, years of teacher expertise and skills etc) that we might want to assess in greater detail in a new project?

In summary the group decided that there are two approaches of designing a COVID-19 related unit for school-based curricula and between both countries the aim would be to:

(i) Teach about COVID-19 – an interdisciplinary scientific curriculum that revisits components of how we address science communication to make students more autonomous about their thinking with particular emphasis on how and where we research information. It seems critical to model the steps of thinking through facts and myths that circulate (e.g., through social media) especially in times like now where the scientific answers about COVID-19 are not definite.

(ii) Teaching through COVID-19 and vaccines – there is certainly scope in both countries to consider developing a health education module that focuses on social wellbeing especially in regards to how COVID-19 has disrupted our common social conventions particularly with the introduction of public measures that help with hygiene and reduce the risk of spreading infectious diseases.

One point of noticeable difference was the extent to which body-awareness was taught in the UK as opposed to that of Japan. In the UK, children seemed much more autonomous to challenge responses in terms of independently debating the advantages and disadvantages of taking vaccines. Whereas, in Japan, children are likely to act in accordance with the greater good of their family, community and society as a whole. Though, it was determined that if children could balance their civic duties with a more critical mindset of how to interpret public

health information this would be a life-long skill to help these children, in their adult years, make decisions about infectious diseases and any future pandemics which require vaccines.

## 7.4 Policy recommendations for school curricula across the G7

There are five policy recommendations that are suggested resulting from this collaborative study between educators in Japan and the UK, which are believed to be useful for designing a COVID-19 module that can be offered across all education systems in the G7:

1. Social wellbeing – it is believed that vaccine status will be a longstanding consideration going into the future years, therefore from a sociological viewpoint it is important to consider how we manage the hidden inequalities or discrimination that can result from one's vaccination status.

2. Personal hygiene – lifelong lessons on maintaining health in public spaces including the consideration of public measures that were used during the pandemic. Important to educate children on how conventions of mask wearing when unwell, or frequent habits of hand-washing and bodily fluid etiquette can become habitual to prevent the spread of disease (including good practice for influenza).

3. Mental wellbeing – addressing current anxieties or emerging concerns from COVID-19 and vaccination. Of particular focus is the 'grieving generation' of children across the world who have lost loved ones, friends and even teachers. This common grief needs to be addressed in a module that talks about mental wellbeing and coping with human loss from a shared illness or disease. Concerns behind vaccination should also be approached with care due to worries that some might express (e.g., potential side effects and adverse events following immunization, effectiveness of the vaccine).

4. Health complications – learning about Covid in relation to more common health concerns (e.g. asthma). This is to address the needs of special/vulnerable populations and children who live with particular underlying health conditions. It is important to learn about one's vulnerabilities and making an assessment of risk taking behaviours.

5. Resources – how to be critical of content read in the media, heard from peers or seen in news especially critical thinking and a general awareness of cognitive and information bias. Using COVID-19 as a stimulus of content will be a good way to help children think through the complexities of seeking a reasonable response even in current times where there are no certain answers to questions they might have.

## Research Team

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Dr Jogie is the Institutional Research Culture Lead at the University of Roehampton, Senior Lecturer at the School of Education and Director for Advance HE's Diversifying Leadership Programme. Dr Jogie is currently leading as Principal Investigator on nine different research awards ranging across different disciplines as her research takes an interdisciplinary approach to education, social justice and human flourishing. She engages with contemporary theories across these domains, looking towards 'education for social wellbeing'.

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Was the lead researcher on the COVIDA Study (2020), investigated the psychological impact of COVID-19 on NHS health care staff. His work was included as evidence in a UK Parliamentary Office of Science & Technology (POST) submission to a Commons Select Committee (May, 2021).

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Is a joint PhD student at the London School of Hygiene and Tropical Medicine and Nagasaki University specialising in infectious disease epidemiology and mathematical modelling. She consults for the World Health Organization (WHO) headquarters (HQ) as an epidemiologist in the R&D Blueprint unit in the department of Health Emergencies Preparedness and Response, assisting with the Solidarity Trial Vaccines as part of the COVID-19 pandemic response. Previously, she was a Technical Officer at WHO HQ for five years in the Immunization, Vaccines and Biologicals department. She coordinated the vaccine

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