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What have European countries done to prevent the spread of COVID-19? Lessons from the COVID-19 Health system response monitor[☆]

Selina Rajan^{a,*}, Martin McKee^b, Cristina Hernández-Quevedo^c, Marina Karanikolos^d, Erica Richardson^e, Erin Webb^f, Jonathan Cylus^g

^a Department of Health Services Research and Policy, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, UK

^b Co-Director, European Observatory on Health Systems and Policies and Professor of European Health Policy, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, UK

^c European Observatory on Health Systems and Policies, London School of Economics and Political Science, Houghton Street, London WC2A 2AE, UK

^d European Observatory on Health Systems and Policies, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, UK

^e European Observatory on Health Systems and Policies, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, UK

^f European Observatory on Health Systems and Policies, Berlin Hub and Department of Health Care Management, Berlin University of Technology, H 80 Straße des 17. Juni 135, Berlin 10623, Germany

^g London Hub Coordinator, European Observatory on Health Systems and Policies, London School of Economics and Political Science, Houghton Street, London WC2A 2AE, UK

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ABSTRACT

Although some European countries imposed measures that successfully slowed the transmission of Covid-19 during the first year of the pandemic, others struggled, either because they acted slowly or implemented measures ineffectively. In this paper we consider the European experience with public health measures designed to prevent transmission of COVID-19. Based on literature and country responses described in the COVID-19 Health System Response Monitor from March 2020 to December 2020, we consider some critical aspects of public health policy responses. These include the importance of public health capacity that can scale up surveillance and outbreak control, including effective testing and contract tracing, of clear messaging based on an understanding of human behaviour, policies that address the undesirable consequences of necessary measures, such as support for those isolating or unable to earn, and the ability to implement at pace and scale a major vaccine rollout. We conclude that for countries to be successful at preventing COVID-19 transmission, there is a need for a clear strategy with explicit goals and a whole systems approach to implementation.

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Introduction

A year after the first cases of infection with SARS-CoV-2 were identified in Wuhan, and subsequently spread worldwide, it is a matter of regret that few countries in Europe have done well [1]. Even those that escaped the worst of the initial stage of the pandemic have had large numbers of deaths after they lifted restrictions in summer 2020. When faced with a rapidly spreading infection, the task of government, using the resources at its disposal, is to interrupt transmission and minimise the threat. This was done successfully in 2003 when cases of SARS, which has quite differ-

ent transmission dynamics, were identified in southern China. This time, however, it did not happen. While several countries, especially in the Asia Pacific region, rapidly pursued policies of eliminating domestic transmission of the virus, most countries failed to [2] and subsequently entered a cycle of repeated imposition and relaxation of restrictions. This has created an uncertainty that prevents meaningful planning, enables new variants to thrive selectively, and impacts adversely on the economy and many aspects of the lives of their populations.

Over time, more transmissible and, potentially more lethal, variants of the virus have emerged. By chance, the Omicron variant, which became dominant in 2022, seems milder in populations with high levels of existing immunity (although not elsewhere, as is apparent in Hong Kong) but that cannot be assumed for future variants. Even those countries that only reluctantly imposed severe restrictions, often late, have been forced to go beyond what they did in early 2020, such as closing schools and imposing border re-

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* Corresponding author.

E-mail addresses: selina.rajan@lshtm.ac.uk (S. Rajan), j.d.cylus@lse.ac.uk (J. Cylus).

strictions [3]. Yet, even with these measures, many countries are finding it difficult to achieve the rapid declines in infections seen in early 2020.

This makes it timely to take stock and reflect on the measures that have been taken, and begin to identify what worked and what did not as countries seek to develop plans to overcome the current threat. This serves not only to support a retrospective assessment of responses to the crisis on a country-by-country basis, but also provides insights into how countries may better prepare for future pandemics. In this paper we review the European experience with measures adopted in 2020 that were designed to interrupt disease transmission. This study is unique in that it is based on findings from the COVID-19 Health System Response Monitor (HSRM), a tool designed to collect information and comprehensively on health system pandemic responses in a comparable way across the European Region. While there are inevitable challenges with attribution, such a systematic approach is necessary for one to begin to understand the successes and failures of measures designed to prevent disease transmission.

Methods

The COVID-19 Health System Response Monitor (HSRM) was created in March 2020 in response to the COVID-19 outbreak to collate and disseminate timely information on how health systems in countries, mainly in the WHO European Region, are responding to the crisis (see www.covid19healthsystem.org). It is a joint initiative by the European Observatory on Health Systems and Policies, the WHO Regional Office for Europe, and the European Commission.

The HSRM content is structured broadly around the standard health system functions, [4] capturing information on policy responses related to governance, resource generation, financing, and service delivery. In addition, the HSRM also includes policy responses that aim specifically to prevent transmission of the virus and other non-health system measures. The information is collected and regularly updated based on an evolving set of questions that serve as prompts for country health policy experts contributing to the platform. By following a structured questionnaire and having a team of Observatory staff editing the responses, information is collected in a way that facilitates comparisons across countries. Where relevant, other material has been used to inform this paper.

Here we distil key policy insights emerging from the experiences of countries participating in the HSRM as they seek to interrupt disease transmission. Data collected from the HSRM between March 2020 and December 2020 serves as the primary source for this article. The structure of the HSRM divides this topic among several areas, including those to reduce the risk of transmission overall, the so-called non-pharmacological interventions that promote physical distancing, including quarantine, and those that seek to prevent further transmission of identified cases, involving finding, testing, contact tracing, and supported isolation. Key policy insights were drawn from country experiences using a deliberative process that included extensive review of the HSRM materials and structured discussions among the articles' co-authors, Observatory editors, and other experts. Where relevant, other material, including published literature and policy documents, inform the paper.

We did not seek definitive answers as to why some countries have dealt better with the pandemic than others at that time, given the extensive existing literature on this topic from diverse disciplines, [5,6] but rather to draw tentative lessons from the experiences of countries that have adopted particular measures and especially those that appear innovative. In turn, this can serve as a basis from which to begin discussions that eventually lead to an understanding of what seems to work, in what contexts, and why.

Ultimately, this analysis seeks to provide policymakers with policy options as they design their own responses to current and future crises.

Findings

We have identified five key lessons from the experiences of the countries included in the analysis and the broader literature. The first is that individuals' behaviours play an enormous role in driving down the number of cases and keeping them down, although steering individual behaviours has proven challenging in some settings. Second, there is a need for a system to identify those who pose a risk of transmission to others. Third, it is necessary to be able to identify those to whom they might transmit infection and take measures to interrupt it. Fourth, and often overlooked, is that isolation of those who are infectious is essential, and there must be systems in place to support this. Finally, there is a need to plan for the rollout of vaccination and what vaccination means for the continuation of other public health measures.

Individual behaviours play a major role in reducing transmission, but it can be challenging to influence these through policy measures

Regardless of whether a government adopts a suppression or a mitigation strategy, a comprehensive response will aim to drive down the rate of transmission, something that is achieved by a variety of what are termed nonpharmacological interventions. In essence, these are based on the knowledge that the virus is transmitted in situations where people come together in large numbers, in close proximity, for prolonged periods of time, indoors and without any physical barriers, such as face coverings, which act as a form of source control.

The success or failure of nonpharmacological interventions depends heavily on individuals' behaviours, ranging from following stay at home orders, to social distancing, or wearing a facemask. With regards to the latter, guidance has evolved with growing understanding of the virus and the importance of airborne transmission. Initially, many governments, and the WHO, believed that there was little benefit in wearing masks. However, even at the onset of the pandemic, some governments encouraged the general population to use face coverings (e.g. Belgium, Czechia, Poland), with some encouraging this by distributing them (e.g. Switzerland and Finland) or by encouraging people to make their own cloth masks (e.g. Belgium, Czechia). Other countries were more cautious, in some cases arguing that scarce supplies should be reserved for health and social care workers (e.g., UK, France). In some countries, policies differed among regions (e.g., Belgium, Germany, Italy). As evidence of their benefits grew, especially as a means of source control, so has their incorporation into responses [7,8]. However, there are still considerable differences in the extent to which any rules on their use are enforced or followed. Children have generally remained exempt from wearing a mask, but the exact age also varies between countries, for example exemptions have been only for those under 6 years of age in Spain, but mask requirements applied to those aged 12 and over in Switzerland.

A key question in all countries is how to achieve necessary behavioural changes at an individual level. There are sticks and carrots. Most countries have adopted some penalties for breaches of regulations, though, with varying degrees of enforcement. In general, however, these are seen as a last resort. Research on adherence to restrictions generally finds a high degree of support, providing there is trust in the messaging, [9] with people believing that their leaders are acting in good faith for the benefit of the public [10]. Unfortunately, there have been examples of loss of trust [11]. Thus, in England, there was a significant decline in trust following a well-publicised journey made by an adviser to the

Prime Minister, who was, at the time, suffering from COVID-19. Restrictions should be seen as fair, applying to everyone equally. It is also important that messages are clear, unambiguous, and answer the questions posed by the public. A survey in the UK found that just over 20% of the population reported understanding the government's restrictions during the January 2021 lockdown, although the vast majority believed they were adhering to them anyway [12]. Several governments have developed sophisticated communications strategies to address fear and uncertainty, such as the Finland Forward (Suomi toimii) campaign. In these campaigns there is a danger in focusing on breaches of regulations, even though they are often considered newsworthy when they involve celebrities or behaviour that is widely viewed as outrageous, as they misleadingly suggest that this is the norm. As far as possible, measures to reduce transmission should be developed in consultation with those affected to ensure that they are feasible and, where possible, efforts must be focussed on mitigating their most adverse consequences.

Finding cases requires testing capacity that in most countries did not exist at the beginning of the pandemic

Unlike some infectious diseases, where those who are infectious can be identified from clinical signs and symptoms, SARS-CoV-2 can be transmitted by people who appear otherwise healthy, either because they will not manifest symptoms or they are in the few days prior to symptoms developing. Therefore, it is necessary to test for the presence of the virus. There are two types of test in use for this purpose, one using Reverse Transcriptase Polymerase Chain Reaction (RT-PCR), which converts the virus' RNA to DNA and amplifies it in a series of cycles of heating and cooling, until it reaches levels that can be detected by biochemical probes. Samples must be transported to a laboratory, and the whole process can take several days. The second employs rapid antigen tests, which give an instantaneous result, rather like a pregnancy test. Each has advantages and disadvantages. Thus, RT-PCR may detect fragments of viral RNA persisting after the individual is no longer infectious. Antigen tests may miss individuals with low levels of virus in their upper respiratory tract. Both are susceptible to differences in the quality of sampling. Consequently, they are not substitutes for one another, but rather tools that can be employed for particular purposes in different circumstances.

Fortunately, thanks to the rapid genetic coding undertaken by Chinese researchers, it was possible to test for the presence of the virus early in the pandemic. However, the immediate practical challenge was how to scale up testing capacity. Some countries, like Germany, were able to take advantage of their extensive existing laboratory capacity, which had benefited from its strong diagnostics industry. Similarly, many other countries repurposed existing laboratories (e.g., Croatia, France, Lithuania, Norway), while some smaller countries, at least initially, sent samples abroad (Ireland and Finland). Denmark took time to scale up capacity, only achieving its maximum level in late October 2020 when it delivered the highest number of tests per confirmed case in Europe, including extensive testing of exposed contacts, something that has not been sustained in most countries.

As testing capacity increased, so did the groups who were tested. Initially, most countries limited testing to symptomatic travellers arriving from places known to be high-risk and their symptomatic contacts [13]. In the first half of 2020, as it became clear that community spread was occurring in most European countries, testing criteria was expanded. However, capacity remained limited, so testing was still restricted to certain groups. In general, people with severe symptoms, and especially those requiring hospitalisation, were the highest priority, followed by health (and sometimes social care) workers. However, many coun-

tries struggled even to cover these groups. As testing capacity increased, coverage was extended to those in long-term care institutions and, in some countries, contacts of confirmed cases, other frontline workers, people at high risk of COVID-19 complications, and eventually other groups.

At first, all testing was undertaken using RT-PCR, still considered the gold standard for identifying anyone carrying the virus by the WHO. While most attention has focused on testing of individual samples, there are some other approaches that have been considered when prevalence is low. One is pooled RT-PCR testing, where samples are combined into batches. Only if they yield a positive result are the individual samples tested [14]. Several countries, including China, USA, Germany, Portugal, New Zealand, Rwanda, and Uruguay, have used this to increase testing capacity considerably [15]. Another surveillance method is to test for the presence of the virus in sewage samples, for example, those from buildings in which people live communally, such as student accommodation. Positive results can be followed up by individual testing.

It became clear that to identify cases and interrupt transmission, testing had to be integrated within a larger system. Such a system requires several elements, [16] including:

- A well-functioning procurement (or production) and distribution mechanism to ensure reliable supply of necessary materials (e.g., swabs, transport media, reagents, primers, assays and RT-PCR machines);
- Sufficient infrastructure and logistical expertise to enable samples to reach the laboratory in a timely manner;
- Strong laboratory capacity to rapidly analyse samples and report results, which requires adequate infrastructure and a workforce with sufficient skills.

For those eligible for a test, the first step is to get one. There are, essentially, two ways of doing this. The first involves the individual concerned going to a testing centre, which can be in a semipermanent facility, typically in areas with high population densities, or mobile units serving typically isolated rural areas. It is important to consider how individuals will reach these centres, with some countries, such as South Korea, pioneering drive-through centres, but this is dependent on a high level of access to vehicles. The second approach involves home testing kits, as used in Austria, Estonia and the UK, among other countries, but they rely on efficient postal or courier services. The UK labelled certain post-boxes as priority ones, increasing the number of collections. Home testing also requires that those taking samples do so accurately, as otherwise there is a risk of false negatives.

At first, all testing was undertaken using RT-PCR, still considered the gold standard for identifying anyone carrying the virus by the WHO. While RT-PCR testing dominated the early part of the pandemic, by autumn 2020 antigen tests were becoming widely available, with the WHO supporting their use for symptomatic testing in low and middle income country settings where laboratory facilities are unavailable [17]. These have also been taken up in some high income countries, being used in a variety of ways, typically to complement PCR testing. Slovakia, the Czech Republic, Austria, Italy, and the UK have undertaken mass screening using these devices [18]. They have the obvious advantage of speed of reporting, as well as low-cost and they do not require a laboratory and trained staff. However, especially when samples are taken by inexperienced individuals, they can have a relatively low sensitivity. Although initial evaluations suggested that these tests could detect over 80% of RT-PCR detected cases, real world analyses, performed in Liverpool in the UK suggested that outside of health-care settings, they only detected 50% of cases, although, crucially, around 70% of the most infectious cases [19]. As a consequence, initial optimism that mass screening with rapid antigen tests might

reduce prevalence has been the subject of heated debate. The incidence of infection rebounded quickly in Slovakia after a nationwide screening programme and modelling from France suggests that any likely benefits of mass asymptomatic testing could last as few as ten days [20]. Concerns have also been raised that the most disadvantaged may be less likely to access rapid antigen tests, which could in turn worsen inequalities. Instead, there is a growing understanding that rapid antigen tests need to be used in a much more focused way, [21] for example, with repeat testing as a means to support continuity in certain workplaces, especially when they are part of a policy that has been codisigned with those involved, based on a detailed understanding of the context. For example, rapid antigen tests have been used in school outbreaks in the UK, where children and staff are tested regularly. Italy has also used them for testing in schools, while in Germany they were used to minimise spread in care homes. Crucially, while a positive result almost always means that the individual is infectious, a negative result cannot be relied upon to permit them to engage in activities that this others at risk. Practically, their use is not without challenges; resourcing the tests and the staff to deploy them as well as ensuring that staff are adequately trained in reading and acting on the results is critical but time consuming [19,22]. Most importantly, testing must be complemented with rigorous contact tracing, effective isolation of cases and adequate support to help disadvantaged groups and keyworkers to isolate as otherwise the test itself is of no value.

Contact tracing is crucial to interrupt disease transmission, but few countries had sufficient capacity at the onset of the pandemic

Contact tracing is a core public health function and is at the centre of any response to an outbreak of infectious disease. WHO defines contact tracing as “the process of identifying, assessing and managing people who have been exposed to a disease to prevent onward transmission”, with critical elements including: community engagement and public support; careful planning and consideration of local contexts, communities, and cultures; a workforce of trained contact tracers and supervisors; logistics support to contact tracing teams; and a system to collate, compile, and analyse data in real-time.

Although all countries employ contact tracers in normal times, for example, attached to tuberculosis or sexual health clinics, they are often few in number. Consequently, there was a need to scale up capacity substantially. This has been approached in different ways. One has been to divert existing health workers, including administrative staff and those recently retired, to contact tracing. A second has been to set up de novo structures. Serbia provides an example of the former model. The Minister of Health reported that 4,500 health workers were redeployed as contact tracers, including 1,500 doctors, complemented by recruitment of new staff who were given a basic level of training, including use of contact tracing tools. The United Kingdom, in contrast, did not make use of all of its existing workforce in local government public health departments initially, although some had expertise in contact tracing. Instead, it contracted with outsourcing corporations who recruited 18,000 contact tracers, which combined with contracts for testing involved a budget of £15 billion for the entire test and trace operation allocated before November 2020. Some of these contact tracers were employed through subcontracts with companies more usually involved in activities such as direct marketing or debt recovery, while others were from the large number of people who were no longer working as a result of the pandemic. These groups received very basic training, but could refer cases to more experienced operators, including health professionals. By August 2020, their numbers were reduced to 15,000, when the existing local public health departments were brought into the system following

widespread concerns about the performance of the national programme [23]. In contrast, Germany did use its existing capacity, with the federal Health Ministry supporting the 375 local public health offices with €50 million to digitise tracing operations and recruit additional tracers under an agreement between the federal and state governments. Signed on March 25th, that included standards for service provision, including at least one contact tracing team of five people per 20,000 inhabitants [24]. Similarly, in Austria the local health offices perform contact tracing and monitor contacts in quarantine.

Contact tracing should, ideally, work in two directions. Forward tracing seeks to identify all those who have been in contact with an infected individual at a time when that individual is likely to have been infectious and instructing them to isolate to prevent onward infection. Backwards tracing involves retracing the steps that the infected individual took to identify where and how they became infectious and then seeking to locate those who may have been exposed at the same time. This is particularly important with COVID-19 given the importance of what are termed “superspreading events”, at which one individual may infect many others. Speed is essential and this requires a tracing system that is sufficiently resourced, with appropriate technology. It also needs to recognise that contact tracing is a skilled role. Tracers must be able to gain the trust of those they speak to, seeking to identify all contacts and recognising that there may be many reasons why some individuals do not wish to disclose them. Ideally, this would be done in person, seeking to understand the circumstances of the infected person, but many countries have used telephone-based systems. A few have systems based on SMS messaging. Obviously, neither of these are ideal when people may be reluctant to disclose contacts. The challenges are illustrated by a pilot in the UK where the interview to identify the contacts of a confirmed case lasted around 80 minutes, with each infected person having an average of 30 contacts [25]. In contrast, telephone-based contact tracing often identifies only 2-3 contacts, often limited to those in the same household.

Yet even the best contact tracing systems will be overwhelmed when numbers increase markedly, as happened in Germany where retrospective tracing ceased in late 2020. Thus, contact tracing is most effective as a means of either preventing an increase at the start of a pandemic or suppressing outbreaks once rates have been reduced to low levels by non-pharmacological interventions.

Support for those who need to isolate has been insufficient in many countries, despite being essential to ensure people stay at home

A comprehensive response to a pandemic requires a system to isolate and support cases once they have been detected. Yet most attention is often devoted to testing and contact tracing, with much less consideration given to enabling confirmed cases and their close contacts to isolate effectively and for long enough to ensure they do not spread the disease further. There are two groups who may be required to isolate. The first is those who have been in contact with a case. Countries have adopted different durations of isolation of contacts but most are consistent with a 10-day infectious period [26]. The second is those coming from a high-risk area, where quarantine is part of border controls. There has been considerable resistance to imposing border controls in Europe, in contrast to the situation in the Asia-Pacific region, although the situation in Europe is changing with the emergence of new variants of the virus in late 2020 that are more transmissible. The case for border controls is especially strong in islands, such as Iceland [27] or New Zealand, [28] where 69% of cases were imported, reinforcing the importance of effective quarantine in travellers.

Without support, many people will find it difficult to isolate when instructed to. Surveys from the UK in the summer 2020 found that adherence was as low as 20% for isolation and 11% for

quarantine with the most recent data suggesting that only 13% of individuals with symptoms of COVID-19 isolate at all [12].

As with efforts to steer other individual behaviours, measures to increase the probability that cases and contacts will isolate include sticks and carrots. Five main facilitators have been proposed to support isolation [29]. The first is providing financial support for isolation, especially for those who will lose income if they cannot work, as this is a major constraint for many people, especially those in the informal economy. Some countries provided support through the welfare system, such as the UK and Finland, although there have been concerns that the sums provided (a one off payment of £500 could be claimed in the UK to support isolation) were inadequate [30]. Measures to support people isolating are more likely to be effective if those who might use them can be assured that any funding is certain, in other words, that they do not have to apply to a scheme with a high risk of failure, and will be provided for rapidly. Consequently, there is a strong argument for a universal grant, even if this may go to some who do not need it. In such cases, some of the funds involved can be reclaimed through the tax system.

The second is to provide supported accommodation as was the case initially in Sweden, where financial support was provided, as well as accommodation in hotels. Denmark and some other countries outside Europe have also provided hotel facilities for people who could not self-isolate at home.

The third is to reduce quarantine where possible, and the expansion of testing capacity has made it possible for some countries to link quarantine to testing [31]. The UK relaxed its rules to allow travellers returning from low risk countries to be released from quarantine if they test negative on Rt-PCR 5 days after their return, but they had to purchase the test privately [32]. Serial testing with rapid antigen tests for 5 days was proposed in the UK, but not implemented.

The fourth measure is to impose penalties, as seen in Italy (with fines up to 5,000 Euros), the UK, and Germany, encouraging the public to make informed decisions about the risks to themselves and their contacts, and in some cases by criminalising breaches.

The fifth measure is to ensure that cases and contacts are appropriately monitored to ensure they are sufficiently supported to facilitate their isolation. Thus, some 'Test-to-Care' models developed in the USA directly address barriers that prevent socioeconomically vulnerable populations from isolating quarantine [33]. These include lack of access to culturally-appropriate COVID-19 education, lack of access to food and social support, and the potentially catastrophic financial consequences of being unable to work. Following implementation, 10% more individuals disclosed their household contacts than previously, and others requested temporary relocation to a hotel room for isolation despite initially declining this service. On the other hand, the 'Everyone In' campaign, which repurposed hotels in the UK to house homeless people during lockdown to limit exposure, was seen as successful. Other measures of support are also particularly important including access to food parcels and social support.

Vaccination rollout strategies can vary but early successes should not result in an immediate end to public health measures

The final consideration in developing a comprehensive pandemic response is the rollout of a vaccination strategy. This has been one of the most controversial issues in Europe during the entire pandemic, with serious political implications. In brief, two countries in Europe, Israel and the United Kingdom, were able to approve and secure supplies of vaccines before the European Union did so. They scaled up vaccination rapidly, reaching a high proportion of their population within a few weeks, although the United Kingdom then lost momentum. While others increased up-

take rapidly, some, such as Romania and Bulgaria, continued to struggle.

The differences in approval and procurement of vaccine supplies continue to be the subject of fierce debate, which goes beyond the scope of this paper. However, the speed of rollout of vaccination has varied among European Union member states, all of which eventually received sufficient supplies of vaccines. Moving forward, it is essential that the reasons for these differences are understood as they point to fundamental differences in the capacity and performance of national public health systems that have profound implications for their ability to respond to any future pandemic. The components of a comprehensive vaccination strategy have been set out previously and should be well known, [34] but the necessary structures are not in place everywhere. It is also not clear that policymakers everywhere have engaged fully with those who must implement vaccine roll out [35].

Finally, while achieving high levels of vaccine coverage will be crucial in controlling this virus, some caution is required. Vaccination should not be seen as a substitute for intensive efforts to drive down circulating levels of the virus and ongoing surveillance of infection rates among those vaccinated is crucial. Continued circulation has allowed variants that are to varying degrees, less well neutralised by existing vaccines. Although the vaccines can be repurposed to account for newly emerging variants, the logistic challenges involved in revaccinating the population point to the importance of avoiding this outcome if possible.

Discussion

Governments across the world have demonstrated a lack of preparedness, particularly regarding their public health capacity in tackling a pandemic, despite some having plans in place to tackle other infectious diseases such as influenza. Importantly, some of those that, when assessed prior to the pandemic, were scored as being most prepared for a pandemic, have fared worst, such as the United States and the United Kingdom, respectively first and second in the Global Health Security index, published in 2019 [6]. While this, and other assessments, focused mainly on the technical capacity to respond, this is only one of the factors determining how successful a country might be. A country with the best systems in place will struggle if its leaders reject concepts of evidence. Similarly, the task of responding to a pandemic is made much more difficult in a country where large numbers of people live precarious existences, [36] requiring them to choose between getting tested and risking isolation or going to work to put food on the table.

In a fast-moving situation, where infections are rising exponentially and when uncontrolled, rapid and decisive action is necessary. For this to happen, several things need to be in place [37]. First, there must be a well-functioning surveillance system, able not only to track overall trends, but to identify patterns, such as clustering of cases in areas of disadvantage or in minority ethnic communities. Unfortunately, many countries lack such systems and, even where they exist, there may be restrictions on the data that are collected and analysed. The United Kingdom is one of very few countries that records data on ethnicity, now known to be a major determinant of COVID-19 infections and adverse outcomes [38]. Countries must also have effective decision-making systems within government. Especially in the face of opposition from other government departments, such as those concerned with the economy or certain sectors such as tourism, health ministers must have both the institutional status and personal qualities to make the arguments for action. Yet, in no government is the post of health minister one of the great offices of state. Having a head of government who understands the science, is willing to take appropriate advice, and can act decisively is a major advantage, as seen in

countries as diverse as New Zealand, Uruguay, and Republic of Korea.

An effective response requires the public to change their behaviour *en masse*. It has been striking how, in Europe and beyond, many people have been willing to accept measures that were previously thought unimaginable, such as the widespread use of face coverings. The experience of the pandemic has demonstrated the limited capacity in many countries in the behavioural sciences, both to undertake ongoing research on the attitudes and practices of the population and to interpret the evidence for policymakers.

Perhaps the most important lesson that can be learned from the European experience is the need for a clear strategy with explicit goals and a whole systems approach to implementing it. There is no single measure that will bring this pandemic under control. Instead, there is a need for systems that can reduce the risks of transmission, reducing the intensity of interactions between people and, where this is not possible, ensuring that people come together in safe environments, while providing support for those who find such measures difficult, perhaps because of their regular employment. Systems are also needed to ensure that, when outbreaks occur, they are rapidly dealt with. This requires a set of coordinated measures to find, test, trace, isolate, and support those who are infected and their contacts. Any deficiency in such a system greatly reduces the value of the whole enterprise. Looking ahead, now that vaccines are more widely available, it is apparent that some countries still need to invest in the systems required to achieve high and equitable levels of coverage, particularly in communities with a high level of vaccine hesitancy. Finally, given the cliché that viruses do not respect borders, there is a need for an international response, including sharing of information, which remains a problem given the incompatibility of data systems and definitions.

There are a number of limitations of this analysis to consider. First, information in the HSRM is reported by country experts. While every effort is made to validate this information, errors are possible. Likewise, this is a qualitative, comparative review of policy responses. Although there do seem to be certain patterns and commonalities between well-performing countries during the pandemic, we cannot be absolutely sure about the causal linkages between public health measures and reductions in disease transmission. Indeed, there are a multitude of factors that determine the degree to which a country will be affected by a pandemic like Covid-19. Finally, only the topics which are covered within the HSRM template are able to be discussed in detail within this paper.

Conclusion

This study sought to synthesize lessons from Europe on some of the key public health measures put in place to control the spread of Covid-19 in 2020. Since that time, new variants have created additional challenges. However, the fundamental principles involved in tackling an airborne infection continue to apply, with measures that reduce the opportunities of the virus to spread and interrupt it if it does. Where Countries that performed well initially, but faltered subsequently, often did so because they relaxed their earlier measures. However, scientific advances mean that much more is also now possible, including administration of safe and effective vaccines and better treatment regimes, including new medical interventions.

Sharing information on what works and what does not is crucial to inform preparedness for future health system shocks. The exchange of knowledge on which policies work in which circumstances, with the European Observatory COVID-19 Health System Response Monitor, [15] is an example of what can be done, and of a concerted international action to “build back better” after the pandemic is over, drawing on, for example, the findings of the

Monti Commission on health and sustainable development in Europe [39].

Declaration of interest

None.

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