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|  | EUROPEAN COMMISSIONDIRECTORATE-GENERAL FOR HEALTH AND FOOD SAFETYPublic health, country knowledge, crisis management**Health Security and Vaccination** |

**EU health preparedness:**

**Elimination strategy: a potential strategy to respond to COVID-19 within the EU?**

Draft discussion paper for the Health Security Committee

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**Introduction**

On 22 January 2021, the European Commission raised the topic of strategic choices for pandemic responses, in particular the elimination strategy, for reflection at the Health Security Committee (HSC). This paper is prepared to provide an overview of experiences implementing this strategy outside the EU and to further support discussions in the HSC on a potential application in the EU setting.

A recent analysis by Baker et al. (2020) has presented elimination as the optimal response strategy for COVID-19 and other emerging pandemic diseases.[[1]](#footnote-1) The goal of the elimination strategy is to rapidly escalate the stringency of control measures to halt chains of transmission. Countries pursuing elimination have a target of zero community transmission but accept that outbreaks from border control failures may occur, resulting in a transitory loss of elimination status until community transmission is once again stopped. This strategy has enabled countries like New Zealand and Australia to enjoy prolonged periods with no community cases.[[2]](#footnote-2) The elimination approach diverges from the suppression strategy commonly used in most high-income nations such as those in North America and Europe, as the goal of the latter is to flatten the epidemic curve without expecting to end community transmission. This analysis aims to assess whether elimination could be a preferred strategy for the EU Member States (MS) and outlines possible steps to implement such a strategy.

1. **Elimination Strategy in theory and practice**
	1. **Definition**

The elimination strategy, which is a proactive rather than reactive strategy, aims to reduce community transmission to near zero through a highly stringent lockdown followed by the introduction of a high-performing surveillance system, with sufficient volumes of testing to provide reasonable assurance of detecting outbreaks in a given period.[[3]](#footnote-3) This surveillance system aims to identify and end outbreaks before they become unmanageable.

Different scholars have also referred to this strategy as ‘Zero COVID,’ ‘COVID-zero,’ ‘max suppression,’ or ‘low endemicity’. However, it is important to specify that because countries pursuing this strategy accept that temporary outbreaks that may occur, this strategy does not entail sustained epidemiological elimination, which is difficult to achieve without universal vaccination, nor eradication, which is not considered feasible due to the existence of non-human reservoirs of COVID-19.[[4]](#footnote-4)

According to Baker et al. (2020), COVID-19 elimination is defined by three components:

* Absence of newly diagnosed COVID-19 infections from community transmissions within a defined jurisdiction or region and for a specified period (e.g., 28 days since the last known case in the community was placed into isolation)
* Presence of a high-performing surveillance system
* Acceptance of suitable exemptions (e.g., infections among incoming travellers detected at the border or cases of potential community transmission linked to staff or travellers in an isolation or quarantine facility)
	1. **Learning from other countries**

One of the lessons learned from the COVID-19 crisis is that the government’s choices are at least as important as the individual’s choices in shaping the evolution of the pandemic. Heterogeneous public policy interventions have led to heterogeneous medical, social, and economic outcomes. These results vary greatly between countries that have used the same umbrella strategies, such as suppression and mitigation, but implemented them differently and with different timing. However, the differences in performance are even more pronounced when we compare countries that adopted suppression strategies to those that implemented elimination strategies. As of today, countries like New Zealand, China, Vietnam, Taiwan and Singapore have mortality rates below 10 per million, which is more than 100 times lower than the US and EU averages.[[5]](#footnote-5) Although the circumstances of the aforementioned countries are different from those of other countries, the relative success of their responses despite their diversity in terms of population size, style of government, and geography indicates that elimination can be achieved in a variety of settings.

The key objectives of New Zealand’s elimination strategy are summarized below[[6]](#footnote-6):

1. Identify and stop each transmission chain. This element requires highly active case-finding in high-risk populations, case isolation, and rapid tracing, testing, and quarantine of contacts.

2. Prevent undetected transmission. Given the difficulty in detecting all transmission chains, additional control measures outside of the public health system are needed to reduce transmissibility and contact rates (e.g. physical distancing, cough etiquette, and hand hygiene).

3. Prevent the introduction of new transmission chains into New Zealand using border control measures, including quarantine of incoming travelers and/or travel restrictions.

4. Ensure all actions taken are designed and implemented to promote equity and to reduce the burden of both the disease and the control measures on disadvantaged populations.

Table 1. summarises how the roadmap was implemented in Melbourne, Australia.[[7]](#footnote-7) The city, which has 4,3 million inhabitants and just under 500 inhabitants per sq. km, managed to reduce incidence from 150 cases per 100,000 per 7 days (IZ7) to 10 cases per 100,000 within a few weeks. After that, it took Melbourne 4 weeks to get a stable incidence of 0.

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| Table 1. Implementation of Elimination Strategy in Melbourne, Australia |
|  | **Phase 1** | **Phase 2** | **Phase 3**  | **COVID-Free Zone** |
|  | For 14 (cons.) days IZ7<10  | For 14 days IZ7<5  | For 14 days IZ7=0  | For 28 days IZ7=0  |
| Social | **Curfew Leaving home:** only with a valid reason**Public gatherings:** up to 5 people can meet outdoors **Visitors to the home:** 1 if living alone  | **No curfewLeaving home:** no restrictions **Public gatherings:** up to 10 people outdoors**Visitors to the home:** 1 household, up to 5 people  | **No curfewLeaving home:** no restrictions**Public gatherings:** up to 50 people outdoors **Visitors to the home:** up to 20 people, contact details  | **No curfewLeaving home:** no restrictions**Public gatherings:** no restrictions **Visitors to the home:** no restrictions, contact details  |
| Education, Childcare | **Daycare:** open **Schools:** remote learning, staged return for grade levels 1 and 2  | **Daycare:** open **Schools:** remote learning, staged return for grade levels 3 to 10  | **Daycare:** open **Schools:** remote learning, staged return for grade levels 3 to 10  | **Daycare:** open **Schools:** onsite learning **Vocational Schools:** onsite learning  |
| Work | Permission of more workplaces according to industry roadmaps | **Home office,** where possible  | **Home office,** where possible  | **Phased return to onsite work**  |

Note: for “Work,” exceptions applied to critical infrastructures and essential jobs.

Source: Baumann et al. (2021)

* 1. **Segmentation Strategy**

One of the arguments that have been used against the elimination strategy is that eliminating COVID-19 is more challenging in large, densely populated areas. This potential problem has led some experts to propose enforcing the elimination strategy in gradual stages, arguing that it would be more achievable to implement it this way on a larger scale. This segmentation strategy would involve implementing the elimination strategy first in smaller areas, such as at the regional or municipal level.[[8]](#footnote-8) The strategy would then be scaled up, because the gradual expansion of COVID-free areas would increase policy adherence in the population of the other areas, making elimination more achievable. However, even in this strategy, effective border control and quarantine would play key roles in maintaining the COVID-free status while expanding the COVID-free areas.

1. **Steps to implement the Strategy in the EU Setting**

**2.1 Creating COVID-free zones**

The purpose of this section is not to prescribe a specific strategy, but rather to present which strategic and conceptual solutions, based on empirical observations and the most recent scientific evidence, can be applied to the EU setting. If the EU MS were to implement an elimination strategy it would be recommended to consider the lessons learned from the countries that have already been successful in enforcing it. More in general, there would be a need for a strong collaboration between MS, with an emphasis on training and exchange of best practices.

The recommendations below shall be adjusted to consider political and legal possibilities as well as value judgments. Taking into consideration that elimination strategies require strong political commitment, the most important element to identify in such a strategy would be whether an elimination strategy is implemented jointly by all EU MS or only individually by some MS.

An elimination strategy applied at the EU level would require the MS to define common public health measures and standards that aim to achieve and maintain COVID-free zones. These zones are the central element of the strategy and shall be rapidly and progressively expanded across the EU. Following the argument that inspired the segmentation strategy, which is that eliminating COVID-19 is more challenging in large, densely populated areas, the recommendation is not to consider entire countries as zones, but rather narrowing zones to smaller areas. In fact, the smaller the zones and the less mobility between them, the faster a COVID-free status can be reached.[[9]](#footnote-9) However, given that zoning needs to be locally enforceable and politically and socially acceptable, each MS should set its own parameters. For instance, France could opt for regions, the Netherlands could opt for provinces, and smaller countries like Luxembourg could opt to be considered as one zone.

Following Baumann et al. (2021), COVID-free zones could be established in the three steps outlined in Table 2. below. The first two phases would lead to the introduction of the COVID-free zones, enforcing a lockdown until reaching an incidence of 10/100,000 and then further reduction to 0. The city of Melbourne (4.3 million inhabitants) took approximately a month to reduce the incidence from 10 to 0.

The third phase would instead focus on the preservation of COVID-free zones, which should be done in conjunction with a clear reopening plan defined in steps and the reintroduction of local measures to respond to potential infection flare-ups. Australia’s example shows that the existence of a clear plan is important for the morale and cohesive cooperation of its citizens.

Table 2. Elimination Strategy phases

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| **Phase 1: Lockdown phase** | **Phase 2: Intermediate phase** | **Phase 3: Protecting and expanding COVID-free zones phase** |
| Until an incidence of Z7<10 is reached  | Incidence of Z7<10 | For 14 days IZ7=0  |
| **Characteristics:** New infections and death rates decrease, positive competition between regions. Massive testing. | **Characteristics:** Initial easing of restrictions is possible without jeopardizing the goal of zero risk incidence. | **Characteristics:** Extensive and permanent opening.**Remaining measures:** Restrictions on mobility to/from non-COVID-free zones. Monitoring and early detection of outbreaks. |

Source: Baumann et al. (2021)

**2.2** **Surveillance System**

Once a COVID-free zone is established, the priority then shifts from non-pharmaceutical interventions aimed at obtaining zero community transmission to Find, Test, Trace, Isolate, Support (FTTIS) programmes aimed at avoiding the reintroduction of the virus. The optimisation of these programmes is a crucial component of the strategy. These programmes must be zone-based and locally-led to generate capacity and efficiency and must include social and financial support for cases and contacts to isolate.[[10]](#footnote-10) Recent academic evidence shows that to efficiently contain the spread of the virus, it is essential to reduce the time between infection and isolation of infected persons.[[11]](#footnote-11)[[12]](#footnote-12)[[13]](#footnote-13) This would require rapid and massive testing in conjunction with comprehensive contact tracing and the immediate isolation of both infected and suspected cases. Some measures that may support this goal include:

* mass testing at hotspots
* PCR wastewater tests
* “Back ward tracing” systems which provide more information about superspreading events and the main routes of transmission[[14]](#footnote-14)
* a universal approach to quarantine hotels[[15]](#footnote-15)

Elimination progress, success, and maintenance can be monitored using common measures of viral spread such as[[16]](#footnote-16):

* estimates of R-value
* the size and duration of outbreak clusters
* the source of clusters (the proportion of cases originating from non-COVID-free zones)
* whole-genome sequencing

**2.3 Border Management**

A cooperative approach between MS would facilitate the success of a COVID-free strategy. In fact, an EU-level elimination strategy would not only be more effective but also easier to implement.[[17]](#footnote-17) However, closing borders within the EU is not necessary for the success of the strategy. Obstacles to the free movement of goods, services, and people would have a rapid and negative economic, social, and political impact. Rather, it is recommended to have a system based on limiting travel only to essential travel, continuing testing, contact tracing, and quarantine measures in the case of new outbreaks. Incoming travelers from non-COVID-free zones would be required to present a negative test and quarantine upon arrival. Measures allowing exemptions for people who need to cross the border for work or other purposes are possible, as is zone-crossing that takes into account work and travel patterns, as happened in Australia. Moreover, borders would only matter where they are between a COVID-free zone and a non-COVID-free zone, restricting travel from zones where community transition still exists to zones where there is no community transmission.

1. **Potential limitations**

The fact that a policy has been effective in the past does not necessarily mean that the same policy would be the most effective approach at this stage of the pandemic. The vaccine rollout is indeed a potential game-changer, a factor that cannot be ignored in modelling a scenario. In particular the alleged reduction of virus transmission of vaccinated people would have massive influence on any kind of exit strategies. However, these data from Israel still need a thorough review before exit and elimination strategies can be further shaped.

Elimination strategies are based on highly stringent lockdowns which can collide with competing societal interests, such as well-being and education, and may disproportionally affect disadvantaged groups. Moreover, they are also notably associated with a greater upfront economic cost.[[18]](#footnote-18) Although the countries that have implemented elimination strategies in the past year have managed to offset the costs and economically outperform those that opted to suppress the virus, a cost-benefit analysis would be needed to assess the cost-effectiveness of the policy considering vaccination rollout.

In fact, according to the analysis produced by the Organisation for Economic Co-operation and Development and the World Bank, the rapidity of vaccine deployment will be a decisive factor in defining countries’ economic performance in 2021.[[19]](#footnote-19)[[20]](#footnote-20) Therefore, it could be argued that, purely in terms of economic output, in a scenario in which the EU MS were to meet the target of vaccinating a minimum of 70% of the entire adult population by summer 2021, the EU MS could potentially be better off economically with a suppression strategy rather than with an elimination strategy.

Pandemic fatigue – seen as an increasing number of people not adequately following recommendations and restriction – is another aspect worth considering in evaluating whether the elimination strategy could be replicated in Europe. The World Health Organization has reported that, despite documented public support for pandemic response strategies, EU MS are reporting signs of pandemic fatigue in their population.[[21]](#footnote-21) It is important to remember that the countries that have implemented such a policy did so at an earlier stage in the pandemic, with potentially lower levels of pandemic fatigue. Given that an elimination strategy would require a high level of policy adherence to be successful, an increase in pandemic fatigue may compromise its effectiveness.

1. **Elimination Strategy as a Plan B for the EU**

The previous section has highlighted some of the areas where further work would be needed to establish whether introducing an elimination strategy at the EU level would be cost-effective at the present stage. However, even if these counterarguments were substantiated by further research, they only take into consideration the best-case scenario which involves a successful, rapid vaccine rollout. If this scenario were to change due to externalities such as the spreading of vaccine-resistant variants of COVID-19 in Europe, then the elimination strategy would not only be a pragmatic approach but would also become the preferred policy choice, making it the perfect Plan B for Europe.

The recent emergence of new variants of the virus is a real cause for concern.[[22]](#footnote-22) Besides having been linked to potentially increased severity of the disease, the variants appear to be somewhere between 50–70% more transmissible, meaning that the virus can spread more easily and more quickly, increasing the burden on overstretched healthcare systems.[[23]](#footnote-23) One of the potential implications of the increased spread of the virus is that it would make herd immunity more difficult to achieve. A recent study on the B.1.1.7 variant has estimated that reducing the value of R below 1 would require 82% of the UK population to be vaccinated with the Pfizer vaccine, which compares negatively against the 69% required with the old variant.[[24]](#footnote-24) The study also suggests that, due to the new variants, the AstraZeneca vaccine alone would not be sufficient to guarantee herd immunity even if the entire UK population was to be vaccinated. The emergence of recent variants has raised concerns about potential impacts on the effectiveness of vaccines. While at this stage there is no full picture when it comes to the effectiveness of treatments and vaccines on new strains, it is clear is that these new variants will continue to emerge and that the EU needs to anticipate and prepare for this challenge. From the evidence gathered until now, one of the apparent positive aspects of the elimination strategy is that even if the virus mutates, non-pharmaceutical interventions – and therefore elimination strategies – would still be effective.[[25]](#footnote-25) Thus, an elimination strategy would allow MS to decrease the burden on healthcare systems either while getting closer to achieving herd immunity or, in the case of vaccine-resistant variants, during the development time that would be needed for vaccines to be modified.

**5**. **Elements for future discussion**

Vaccine rollout is crucial to returning life to normal; however, it cannot be the only component of a COVID-free strategy. It is not too early to consider other potential strategies that can be implemented in case of negative externalities. Considering the potential threats posed by the new variants, anticipating future challenges, and having an alternative plan appears to be a necessity. Furthermore, recent academic evidence finds the timing of intervention a key factor in determining the effectiveness of non-pharmaceutical interventions against COVID-19, with earlier interventions appearing to be more effective in preventing widespread transmission and reducing the number of deaths.[[26]](#footnote-26)[[27]](#footnote-27)[[28]](#footnote-28)[[29]](#footnote-29) In this context, while further work is needed to assess the cost-effectiveness of the various strategies and to optimise implementation plans, the potential use of an elimination strategy or segmentation strategy is to be considered in the EU.

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