Can Geographically Targeted Vaccinations Be Ethically Justified? The Case of Norway During the COVID-19 Pandemic

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This article discusses the fairness of geographically targeted vaccinations (GTVs). During the initial period of local and global vaccine scarcity, health authorities had to enact priority-setting strategies for mass vaccination campaigns against COVID-19. These strategies have in common that priority setting was based on personal characteristics, such as age, health status or profession. However, in 2021, an alternative to this strategy was employed in some countries, particularly Norway. In these countries, vaccine allocation was also based on the epidemiological situations in different regions, and vaccines were assigned based on local incidence rates. The aim of this article is to describe and examine how a geographical allocation mechanism may work by considering Norway as a case study and discuss what ethical issues may arise in this type of priority setting. We explain three core concepts: priority setting, geographical priority setting and GTVs. With a particular focus on Norway, we discuss the potential effects of GTV, the public perception of such a strategy, and if GTV can be considered a fair strategy. We conclude that the most reasonable defence of GTV seems to be through a consequentialist account that values both total health outcomes and more equal outcomes.

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Introduction

During the initial period of local and global vaccine scarcity, health authorities had to enact priority-setting strategies for mass vaccination campaigns against COVID-19. In most countries, these strategies have focused on reducing mortality and morbidity by protecting healthcare workers and high-risk groups, such as the elderly and immunocompromised persons (ECDC, 2021a). Some countries also prioritised other groups, such as teachers or essential service personnel (Cylus *et al.*, 2021; European Union Agency for Fundamental Rights, 2021).

These strategies all base priority setting on personal characteristics, such as health status or profession. However, in 2021, an alternative to this strategy was employed in some countries, particularly Norway. In these countries, vaccine allocation was also based on the epidemiological situations in different regions, and vaccines were assigned based on incidence rates rather than risk groups.

The aim of this article is to examine how a geographical allocation mechanism may work by considering Norway as a case study and discuss what ethical issues may arise in this type of priority setting, with a focus on vaccine distribution. This article proceeds as follows: we begin by explaining three core concepts: priority setting, geographical priority setting and *geographically targeted vaccinations* (GTVs). Next, we provide examples of GTVs. We then present the dynamic priority-setting model in Norway, which was conducted during the pandemic—followed by the description of the GTV strategy in Norway. Next, we proceed to discuss the potential effects of GTVs and the public perception of such a strategy. We then consider whether and to what degree GTV can be considered a fair strategy. In conclusion, we do not take a final stance on whether GTVs are fair but opt for the necessity of highlighting the conceptual and normative question before this method is employed in the future.

Preliminaries

Priority setting involves ranking interventions to ensure you do the most important things first. Such priority setting is necessitated when the demand for beneficial health interventions exceeds the available resources. Usually, priority-setting systems are sought within public healthcare systems, often with ideals of being transparent and legitimised. Moreover, priority-setting discourses put the principle of equality into effect. For the purposes of this paper, we understand this as treating equal cases alike and treating unequal cases differently.

Geographical priority setting is best understood as an attempt to balance regional differences in the epidemiological situation over time to maximise health benefits. As such, it is primarily concerned not with health equity but with evening out persisting differences in the incidence and prevalence of infections between regions. Equity in this case is the absence of unfair differences between groups. As we will discuss later, this approach *may* produce results similar to approaches that prioritise the worst-off and socially vulnerable groups but do not necessarily have to do so.

In this article, we understand *GTV* as a form of geographical priority setting, where—under conditions of vaccine scarcity—vaccines are allocated to the areas that are hardest hit by an epidemic instead of focusing exclusively on prioritising risk groups or professional groups. GTV does not have to be limited to a single country, but in the case of COVID-19, we are unaware of international strategies that have employed this distribution principle as systematically as Norway has.

Prioritising geographical areas regarding vaccination is not a novel concept and has been used for disease control with ring vaccination for smallpox and Ebola. Similarly, it has also been discussed in the case of an influenza pandemic (Araz *et al.*, 2012; Williams and Dawson, 2020) and a cholera outbreak (Lee *et al.*, 2019). Moreover, such a geographical priority setting was discussed as an alternative strategy in countries other than Norway during the COVID-19 pandemic (Schmidt *et al.*, 2021; Wrigley-Field *et al.*, 2021).

Furthermore, GTV and prioritising risk groups can be complementary strategies, such as when high-risk groups in prioritised regions are the first to be vaccinated. However, GTV inevitably entails that risk groups in prioritised areas will be vaccinated more quickly than risk groups elsewhere.

It is also important to note that other vaccination strategies can result in a geographically uneven distribution of vaccines. For instance, prioritising healthcare workers and risk groups may result in a higher level of vaccine coverage in municipalities with large hospitals or regions with a more significant proportion of elderly residents. However, in these instances, the geographic variation in vaccine coverage is a by-product of the vaccination strategy, not its intended outcome, which distinguishes it from GTV.

The Difference Between Prioritising the Most Vulnerable and GTV

Throughout the COVID-19 pandemic, several proposals have been made about how vaccine priority setting can address and remedy underlying social inequities (Schmidt 2020). These approaches focus on the often explicitly formulated goal of vaccine priority plans to reduce or, in any case, not to increase existing (health) inequities and suggest a prioritisation order that uses social inequality as a prioritisation criterion (Schmidt *et al.,* 2021). Depending on which areas are ranked highest for prioritisation, such an approach may, in practice, look similar to a utilitarian strategy, which would be benefit maximising, harm minimising or both. If, for example, areas with the most significant deprivation are densely populated urban areas with a high proportion of persons with underlying medical risk factors, their prioritisation would be justified both from a harm prevention and mitigation of social inequality perspective. On the other hand, if health inequities are most significant in sparsely populated rural areas, the prioritisation of these populations may be justifiable from a health-equity perspective but not from a utilitarian perspective, which would recommend that vaccines be sent to areas where the greatest number of people with underlying risk factors can be protected and where the risk of transmission is highest.

The difference between the two approaches is, thus, what they ultimately aim to maximise. GTV still has at its core a consequentialist approach to maximise health benefits and minimise harms. It tries to maximise health benefits (in Norwegian health policy-making, these are commonly measured in quality-adjusted life years [QALYs] but it recognises that such a maximisation strategy may also have harmful effects, due to the social burden of stringent infection prevention control [IPC] measures in regions with high incidence, for instance, curfews and school closures). On the other hand, approaches that focus on health equity accept that this goal may not necessarily maximise utility but reduce inequity to the greatest possible extent.

Examples of GTV

In preparing for the arrival of COVID-19 vaccines, GTV was described as a possible distributive approach by both the World Health Organisation (WHO) and the European Centre for Disease Prevention and Control (ECDC) (WHO, 2020; ECDC, 2021b). However, remarkably few countries chose to adopt GTV as a strategy for COVID-19 vaccination despite plans to adjust their vaccination strategy according to the epidemiological situation (ECDC, 2021c). Aside from Norway's use of GTV, which we discuss in greater details below, we know only a couple of examples of GTV being used with COVID-19 vaccines.

In January 2021, France sent 50,000 vaccine doses to areas with high infection rates and strict infection control measures (Haute Autorité de Santé, 2021). Croatia also implemented GTV, although this decision was made in response to an earthquake, not because of the epidemiological development of the pandemic (International Federation of Red Cross and Red Crescent Societies, 2021). As a result of the limited implementation of GTV, we know little about its related challenges. To examine these challenges more closely, this article considers the Norwegian experience of implementing GTV in practice.

Dynamic Priority Setting in Norway

The Norwegian government adopted its vaccination strategy and principles for prioritisation in November 2020 (Ministry of Health and Care Services, 2020). They were based on recommendations from the Norwegian Institute of Public Health (NIPH), which received input from an ad hoc ethics advisory group (henceforth: the advisory group).

In December 2020, the advisory group established by NIPH recommended that high-risk groups initially be prioritised to receive the first doses of the COVID-19 vaccines (NIPH, 2020) in order to reduce the risk of death and severe illness. Based on this recommendation, the Norwegian government decided that elderly individuals, nursing home residents and frontline healthcare workers should receive the first available COVID-19 vaccine doses. The distribution of the vaccine doses was based on the proportion of citizens above 65 years of age and healthcare workers in each of Norway's 356 municipalities (Ministry of Health and Care Services, 2020).

However, the advisory group's initial recommendation acknowledged considerable uncertainty regarding choosing the most effective vaccination strategy. Accordingly, the advisory group recommended that NIPH should regularly review and adjust its priority-setting strategy. The advisory group's report was also sensitive to the fact that different courses of the pandemic would cause varying degrees of burden on the healthcare system and society and that a vaccine strategy

would have to be flexible to account for these burdens; the report described such a strategy as 'dynamic' (Figure 1) (NIPH, 2021a).

From the outset, the advisory group proposed that GTV should be considered in 'instances where significant geographic differences in the distribution of disease burden became apparent, and the expected impact of geographic priority setting would be higher' (NIPH, 2021a). This was because Norwegian municipalities vary vastly in both population size and density. The capital region of Norway is home to a million people. At the same time, small and more remote municipalities in Northern Norway often have fewer than a thousand inhabitants spread out over large geographic areas. It was, therefore, reasonable to assume that significant geographic variations in infection rates would occur and that burdens due to infection control measures were likely to vary between different parts of the country. The advisory group delivered an initial recommendation but was not consulted at later stages of the pandemic and did not comment on updates and revisions to the original prioritisation order.

Geographically Targeted Vaccination in Norway

While the first phase of the vaccine rollout did not include GTV, the *Norwegian Ministry of Health and Care Services* (HOD) asked NIPH to re-evaluate the initial vaccination strategy. NIPH proposed an adjusted strategy on 24 February 2021, which recommended GTV in areas with high incidence. In its recommendation, NIPH outlined three different scenarios: considerable, moderate or no GTV (NIPH, 2021a).

Oslo had a high proportion of COVID-19 cases early in 2021 and was thus considered for the receipt of extra vaccine doses. The proposal for considerable GTV focused on redistribution to Oslo by increasing its allocation by a factor of 3. This would have resulted in a 20 per cent reduction for all other municipalities for a number of weeks. The proposal for moderate GTV was based on the weekly mean infection rate per municipality from 17 August 2020 to 31 January 2021 (per 100,000 inhabitants; National Institute of Public Health, 2021a). Under this proposal, outliers with a high transmission rate over time could be prioritised and receive more vaccine doses. The third option that NIPH outlined was to continue as before, without GTV. NIPH ultimately recommended the moderate GTV strategy, and the Norwegian government followed this advice (Table 1; Ministry of Health and Care Services, 2021a). Based on the GTV strategy, from 15 March 2021 to 15 June 2021, four municipalities in the eastern part of Norway and six districts in Oslo received an additional 20 per cent of vaccines compared to the original distribution schedule. Conversely, 330 municipalities received a 3 per cent vaccine reduction in the same period. While this sounds like a modest reduction, it is worthwhile to remember that there was still a considerable shortage of vaccines at the time, and neither all risk groups nor all healthcare workers had been vaccinated.

On 26 April 2021, NIPH suggested that the GTV strategy should be extended due to changes in the epidemiological situation (National Institute of Public Health, 2021b). At this point, the eastern part of Norway had persistently experienced high infection rates, with corresponding high pressure on hospitals, while the rest of the country had lower infection rates (Table 2). Several municipalities in the Eastern part of Norway also had to introduce strict infection control measures to control the spread of outbreaks. These included social distancing measures, closures of public spaces and work-from-home orders, perceived by many as severe restrictions on personal freedom (Oslo Municipality, 2021).

Mathematical modelling also showed that prioritising vaccination within high-incidence areas was likely to reduce the overall incidence throughout the country because small municipalities with few or no COVID-19 patients had experienced outbreaks due to people travelling from high- to low-incidence areas (Holden *et al*., 2021). A final argument for introducing GTV in Norway was that the most vulnerable risk groups in Norway had already been vaccinated by April 2021. This latter argument meant that redistributing vaccines from low-incidence to high-incidence areas would not result in withholding vaccines from those with the greatest need for protection.

To identify municipalities that would experience the most significant benefit from GTV, NIPH used historic infection data and mathematical modelling based on infection rates, the risk of hospital admissions, the burden of infection control measures and the vaccination rates within the municipalities. The final method used to decide which municipalities to prioritise was published on 26 April 2021 (NIPH, 2021b) and was based on the following calculations:

1. The number of unvaccinated individuals in each 5-year age group was measured for each municipality.

Table 1. The expected prevented hospital admissions in individuals 45–74 years old in municipalities receiving more (P – municipalities) and fewer vaccine doses (M – municipalities) in the period from 15 March 2021 to 15 June 2021

Scenario	Expected change in the epidemic in P—municipalities[a] (per cent)	Expected change in the epidemic in M—municipalities[b] (per cent)	Increase of vaccines to P – municipalities (per cent) and reduction in M—municipalities (per cent)		Expected prevented hospital admissions per municipality		
					P	M	Total
A	25	0	20	3	12	-1	**11**
B	25	0	40	6	25	-3	**22**
C	50	0	20	3	19	-2	**17**
D	50	0	40	6	37	-3	**34**
E	25	25	20	3	15	-2	**13**
F	25	25	40	6	31	-4	**27**
G	50	25	20	3	19	-2	**17**
H	50	25	40	6	37	-4	**34**
I	50	50	20	3	19	-2	**17**
J	50	50	40	6	37	-4	**33**

[a]P—municipalities consisted of six districts in Oslo and four municipalities in Eastern Norway with 50 hospital admissions per 100,000 inhabitants from Week 34 in 2020 to Week 4 in 2021 and included 162,266 individuals 45–74 years old.
[b]M—municipalities consisted of 330 municipalities that had ≤4 hospital admissions in the period from 20 August 2020 to 20 February 2021 in inhabitants 45–74 years old.

2. Each 5-year age group was assigned a hospital admission risk rating based on national hospital admission data throughout the pandemic.
3. By combining 1 and 2, a score was calculated to represent how much benefit each municipality would experience from extra vaccines, given the age distribution of its unvaccinated residents.
4. This benefit score was then multiplied by the municipal-level infection rate over the most recent 6 weeks.

Based on NIPH's modelling, the 24 municipalities with the highest benefit score were prioritised to receive a 60 per cent increase in their vaccine doses. In contrast, 309 municipalities received about 35 per cent fewer doses in up to 7 weeks. Twenty-three municipalities were considered neutral, meaning they were neither prioritised to receive more or fewer vaccines. On 19 May 2021, the Norwegian government decided to expand its GTV strategy and to prioritise the 24 municipalities (Ministry of Health and Care Services, 2021b) (Figure 2) as recommended by NIPH.

What Was the Effect of GTV?

Norway has conducted some preliminary evaluations of GTV, which suggest that prioritised areas experienced a somewhat faster decrease in COVID-19 cases (Norwegian Institute of Public Health, 2021a). Modelling studies from other countries seem to confirm this trend. (Fuady *et al.*, 2021; Wrigley-Field *et al.*, 2021). A government report also suggests that a timelier introduction of GTV may have reduced hospital admissions by up to 10 per cent during Spring 2021. However, the underlying calculations still need to be published and peer reviewed (Norwegian Official Report, 2022). The government's report does not include estimates for the total effect of GTV. Estimating the effect size of GTV remains challenging due to low levels of hospitalisation in Norway and the relatively modest use of GTV. For the remainder of our discussion, we assume that the way GTV was implemented in Norway had a clear but modest effect on reducing severe morbidity and mortality. However, our focus is on the conceptual and normative questions this strategy raises.

Public Perception

The use of GTV in areas with high incidence over time was a controversial policy and generated substantial public discussion among those in favour of and against the measures (Olsen *et al.*, 2021). An economic advisory

Table 2. Covid-19 incidences and hospital-admissions from week 45 2020 to week 15 2021 (November 2nd 2020 – April 18th 2021) of five different regions in Norway

	Inhabitants (01.01.2022)	Population density (inhabitants/km^2)	Incidence (per 100,000)	Hospital admissions (per 100 000)	Deaths (per 100 000)
Oslo	697,010	1628	3646	124	15
Vestland	638,821	20	868	22	5
Rogaland	482,645	56	967	29	4
Trøndelag	471,124	12	641	11	2
Nordland	240,345	7	477	12	1

group for the Norwegian government argued strongly in favour of GTV and stated that it could reduce the expected deaths and hospital admissions due to COVID-19 (Holden *et al.*, 2021).

At the same time, 26 mayors from smaller Norwegian municipalities demanded the removal of the GTV policy, which they perceived to be unfair. They argued that outbreaks could occur anywhere, including in less densely populated areas that often have more limited healthcare resources at their disposal (Olsen *et al.*, 2021). Indeed, the COVID-19 pandemic provides examples of such outbreaks; at the end of January 2021, the municipality of Ulvik experienced an outbreak in which 13 per cent of its inhabitants were infected with the Alpha variant (National Institute of Public Health, 2021d). Other objections raised included a complaint that the strategy unfairly penalised regions that had successfully controlled the spread of infection (Stenberg *et al.*, 2021). Many individuals also considered GTV to be a political question: should the capital be prioritised rather than rural areas? They also wondered whether this strategy departed from a well-established principle in Norwegian health policy: the principle of equal access to health services (Time *et al.*, 2021).

GTV thus presented a genuine dilemma for vaccine distribution: a potential reduction in mortality and morbidity of unknown magnitude (estimated by mathematical modelling and previously untested) had to be weighed against the risk of delaying the vaccination of at-risk populations in areas that had so far experienced low incidence but could experience disease outbreaks at any time (Norwegian Institute of Public Health, 2021b).

GTV also affected the administration of subsequent vaccine doses in non-prioritised areas. Small municipalities that received fewer vaccine doses due to GTV also experienced delays in completing second-dose and booster vaccinations due to minimum dose intervals. These delays caused additional frustration, especially for people who had to delay international travel, which required two vaccine doses and a valid vaccine certificate. GTV also resulted in relatively large discrepancies in vaccine coverage across different age groups. A consequence of this was that younger persons in high-incidence areas who were considered low risk for experiencing severe disease, hospitalisation and death received their vaccine doses before older people with a higher individual risk for complications in low-incidence areas.

Is GTV Fair?

In Norway, much of the discussion around GTV focused on whether it constituted an unfair distributive solution. By outlining some of the implications of GTV, we describe in what contexts the policy may be appropriate and what concerns policy-makers may need to address when deciding (not) to implement it.

Individual Versus Collective Risk Factors

Most vaccine prioritisation strategies are based on vaccinating those with the highest risk of severe disease or death before vaccinating other groups, that is, focusing on *personal* risk factors. Meanwhile, GTV focuses on *collective* risk factors. This latter focus means that an individual's personal risk level only matters in relation to the person's environment and the current risk level of community transmission. Thus, with GTV, two people with the same underlying risk factor can be treated differently depending on where they live. What ultimately determines prioritisation is an additional circumstantial risk factor, namely the threshold incidence value defined for prioritising one geographic area over another. Because population density in Norway varies enormously between rural and urban municipalities, GTV primarily resulted in a prioritisation of people living in big cities on the cost of those living in rural areas.

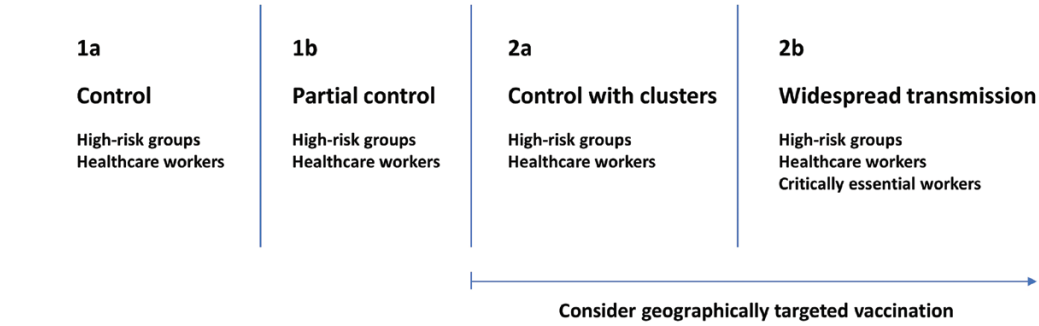

Figure 1. Dynamic prioritisation following epidemiological scenarios. The ethical advisory group proposed that the vaccination strategy should be thought of as dynamic and adjusted according to epidemiological changes during the pandemic.

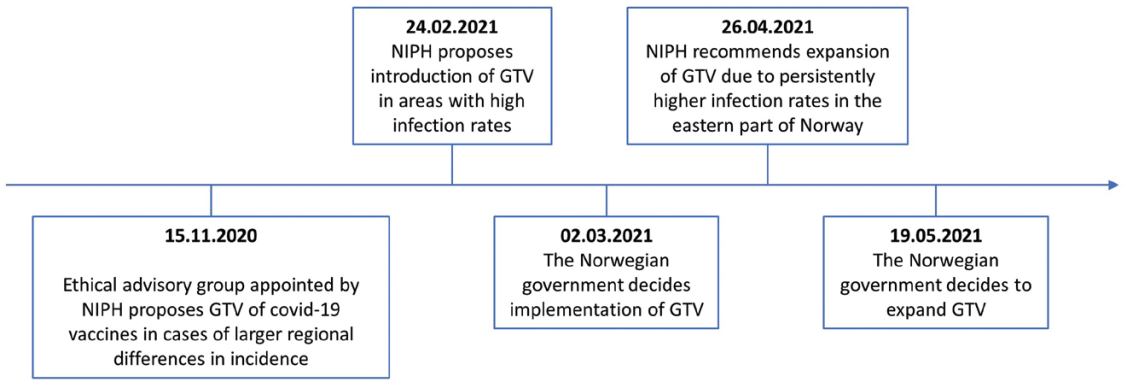

Figure 2. A timeline of Norway's geographically targeted vaccination (GTV) strategy. The suggestions from the NIPH and the resulting decisions made by the Norwegian government are shown.

Is GTV Not an Inevitable Feature of Any Prioritisation Plan?

A curious characteristic of GTV is that—in the absence of a homogenous distribution of groups proposed for prioritisation (healthcare workers, certain age groups, people with underlying disease)—GTV inevitably occurs, even when it is not explicitly chosen as a distributive strategy. In Norway, the density of healthcare workers per 100,000 inhabitants varies significantly between rural and urban areas, and all university hospitals are located in bigger cities. As a result, vaccine coverage rates for younger population groups were initially highest in municipalities close to university hospitals (i.e. where the employees lived). Similarly, there is a gradient in age distribution between rural and urban areas, with elderly people making up a larger share of the population in rural municipalities. These demographic factors have direct implications for vaccine distribution and represent an uneven geographic distribution. Complicating the picture further is that these effects may pull in opposite directions (e.g. more healthcare workers live in urban areas, which increases the share of vaccines that the area receives, while the average age of inhabitants in cities is lower, thereby reducing the relative share of vaccines that would go to this area in a phase where older age groups are prioritised). Thus, GTV is, in fact, merely an amplification of a naturally occurring imbalance in vaccine distribution that is the result of demographic variations.

Preventive Versus Reactive Vaccination Strategies

We usually think of vaccination as a preventive measure. GTV blurs the line between preventive and reactive

measures by effectively using vaccination as a tool to reduce infection rates in especially exposed areas. In the case of COVID-19, this is a dubious strategy because more than one dose of vaccine is required, and an optimal protection is only achieved after several weeks, at which point local outbreaks may have subsided. To be considered a fair distributive principle, GTV, therefore, works on the assumption that epidemiological differences are stable over time and that incidence rates will not rise in non-prioritised areas, which would lead to a change in which populations are at increased risk. Otherwise, GTV would merely serve as a compensatory principle benefiting regions that previously experienced higher infection levels.

Differences in Risk

Whether GTV will be found acceptable by people assigned a lower priority is likely to depend on the difference in risk for people in prioritised and non-prioritised areas. If the baseline risk for both groups of people is considerable and the risk reduction offered by GTV is marginal, then the case for this strategy looks much weaker. Conversely, if the risk to the individual varies significantly between regions, GTV may be generally more acceptable because people in prioritised areas have more to gain.

Another relevant point about the risk that received limited attention in the context of GTV was the matter of which health outcomes were used to determine eligibility for geographic distribution. The GTV strategy in Norway was based on the number of unvaccinated individuals, the hospital admission risk of different age groups and the infection rates from the most recent 6 weeks in each municipality (National Institute of Public Health, 2021b).

Focusing only on hospitalisation, GTV in Norway did not account for a broad range of other health outcomes. In Norway, the risk of hospital admission among the adult population due to COVID-19 was generally low. However, early reports from Norway found that symptoms in some non-hospitalised patients were still persistent 3–8 months after infection (Søraas *et al*., 2021). This pattern means that some proportion of those who were infected and did not require hospitalisation, nevertheless, experienced a severe and long-lasting illness and that hospitalisation alone may be too imprecise an indicator of the severity of the disease.

This challenge of imprecision raises essential questions about what *should* serve as an appropriate measure for GTV in future pandemic scenarios. Suppose the aim is to measure the burden of disease accurately. In that case, a mere focus on hospital admissions and deaths may underestimate the effects of infection in some parts of the population and lead to an unfair distribution model. Such unfairness can even be exacerbated if the threshold for hospital admission varies between regions. Furthermore, the GTV model implemented in Norway presumes that the same strategy can reduce hospital admissions and deaths. While this may be a reasonable assumption, we can nevertheless imagine scenarios in which these two goals conflict and where it will therefore be even more important to specify clearly in advance which goals a GTV strategy should achieve, how these should be ranked if they are not fully compatible and how their implementation can be measured.

Timing of GTV

As described earlier, Norway did not introduce GTV at the beginning of its vaccination campaign, which meant that the highest-risk groups and many healthcare workers were already vaccinated. This approach was consistent with the strategy of dynamic prioritisation (Figure 1), which only opened for GTV in situations where widespread community transmission occurred. At the beginning of the vaccination campaign, this was not the case. The fact that the Norwegian GTV approach was introduced later in the vaccination campaign meant that some of the hardest decisions about a fair vaccine distribution did not have to be made because those at the highest risk of severe disease or death and healthcare workers were already vaccinated. Nevertheless, this raises the question of whether the justifiability of GTV is dependent on the timing of its introduction. An earlier introduction of GTV would have exposed people at very high risk of severe disease if infected in low-incidence areas to more extended periods without protection from the first vaccine dose. We do not have reliable estimates of what the effect of an earlier introduction of GTV on the overall disease burden and its regional distribution would have been. However, it is easy to imagine that any epidemiological advantage would have come at the cost of fear and distress of high-risk groups in low-incidence areas. On the other hand, an earlier introduction of vaccines to areas with a sizeable potential burden in terms of high infection rates could be advantageous to the country as a whole, as the pandemic was likely to be most damaging in the larger cities.

Another point to remember is that at the beginning of the COVID-19 vaccine rollout, vaccine doses were so scarce that any reduction of vaccine delivery to small municipalities would have meant a complete stop of

vaccine supply. A redistribution to municipalities with a higher burden would effectively have meant that no one in these municipalities could have been vaccinated. Such a redistribution would likely have undermined public trust in the vaccination campaign and posed a severe risk to the healthcare sector in parts of the country if not a single healthcare worker could have been vaccinated. The public response to GTV that we described earlier shows that the policy was still considered controversial at a point where there was a much greater availability of vaccines.

Equality of What?

A critical consideration in assessing the justifiability of GTV is what both proponents and opponents of the strategy have called 'the principle of equality' (Time *et al.*, 2021). We find it helpful to discuss two principles of equality: *equality in access* and *equality in outcomes* (Oliver and Mossialos, 2004).

Equal allocation according to population size at risk promotes equality when it is understood as equal access. The principle of equal access to health services is widely accepted in Norway (Ringard *et al.*, 2013). Based on this approach, a municipality would receive vaccines based on the proportion of its population as a part of the total national population and whom they consider the most vulnerable and most eligible for vaccination. On the other hand, a concern for equal health outcomes could justify the geographic targeting of COVID-19 vaccines to areas with high incidence over time. This concern aligns more clearly with a consequentialist distribution of vaccines. A high infection rate in specific areas creates a more significant health burden for parts of the population. Suppose the goal is to reduce inequalities in outcomes that we consider essential. In that case, it is better to provide vaccines to those whose risk of severe outcomes will be most diminished by vaccination, such as individuals in areas with high infection rates (provided that infection rates remain stable over time) who are also at risk of severe illness or death. Before implementing GTV, NIPH discussed whether vaccine distribution should follow a moderate or considerable geographic prioritisation strategy. We understand these vaccination strategies as a moderate consequentialist distribution and an extensive consequentialist distribution strategy, respectively. The two strategies differ in outcomes (to what extent different areas should be prioritised), but both aim to reduce infection rates, hospital admissions and COVID-19 deaths. Both these strategies differ from the initial Norwegian vaccination strategy without geographic prioritisation.

Because GTV was carried out in a situation of vaccine scarcity, it is a zero-sum game, where a prioritisation based on outcomes inevitably reduces available vaccines to de-prioritised regions, thereby undermining the principle of geographical equality of access. In other words, if vaccine doses are scarce, and the disease burden is unevenly distributed across the country, then equality of outcome can only be achieved at the cost of equality of access. This was the case in Norway, where mostly densely populated municipalities were prioritised, and the distribution was achieved at the cost of the access of vaccines to rural and less populous municipalities.

One way of applying the principle of equality of outcome in the case of the pandemic can be to seek to minimise the COVID-19 risk to the individual evenly and would therefore have to prioritise areas with a higher incidence over areas with low incidence. However, recall that this strategy presupposes two things:

I). Geographical differences in incidence rates must remain stable over time.
II). We must be able to identify and agree upon the size of the risk differential that justifies GTV and what indicators we should use to warrant its use.

As we saw earlier, both (I) and (II) were not necessarily the case in Norway. Due to the need to administer subsequent doses at precise intervals, the flare-up of regional outbreaks, and the lock-in of a distributive model, meant that some smaller municipalities may have received too few doses. Similarly, as we discussed earlier, reducing hospitalisation and death as the chosen indicators may have made us overlook the effects of other crucial parts of the disease burden.

This shows that an appeal to equality needs to be made more specific if it is to function as an argument for or against GTV. Concerns for different types of equality and equity and the choice of indicators used to implement GTV will result in different distributive scenarios. Thus, rather than merely appealing broadly to equality as a motivating factor, decision-makers should specify which equality conditions they base their decisions on.

Transparency

The GTV in Norway required defining a threshold value that qualified a municipality for prioritisation. Similarly, a decision had to be made about the extent of vaccine redistribution to prioritised areas and how much historical data should be considered in defining the average incidence rate per municipality. Neither of these values had a 'correct' or 'optimal' level; thus, some people (and

municipalities) narrowly missed out on prioritisation due to the adopted threshold value. This is unsurprising and applies to all threshold values for priority setting (Bertram *et al*., 2016). However, in instances where the threshold could reasonably have been defined differently, it is of particular importance that reasoning, methods and decision processes are made public to allow those affected by the decision to understand which considerations were considered and to appeal them if necessary. While there are good arguments for and against GTV, its introduction in Norway was communicated transparently to the public, and the relevant documents that outlined the method and distributive implications were made available at the time of the policy's introduction. Even though the process of GTV was considered transparent by the public in general, it was still perceived as unfair by the inhabitants in the municipalities that had high infection rates but were not prioritised for COVID-19 vaccines in the implementation of GTV, illustrating the complexity of transparency (Olsen *et al*., 2021).

Summing Up

GTV is a consequentialist distribution mechanism that recognises total health outcomes, the distribution of outcomes, and the disutility of prolonged social distancing measures in high-incidence areas as part of its overall calculation of good and bad consequences. It can be justified by egalitarian consequentialist principles, but should be contrasted with a health-equity model, such as that of Schmidt et al (Schmidt *et al*., 2021). As such, GTV should not be viewed as a distribution mechanism that differs substantially from traditional priority-setting plans that focus on maximising health outcomes (in this case: QALYs). It is an extension of such an approach, with particular attention to those who are worst-off in terms of risk due to high infection rates. In this paper, we show that while inequality in outcomes from regional variation in necessary IPC measures is important, it is not the only principle that matters.

Conclusion

The aim of this article was to examine how a geographical allocation mechanism may work by considering Norway as a case study and discuss what ethical issues such priority setting may raise. The example of GTV conducted in Norway, which we have described in this article, presents a unique insight into how to develop a method for GTV and the types of arguments, misconceptions, and needs for clarification that can arise along the way. This article does not assess the empirical evidence for the effectiveness of GTV. Instead, we have emphasised such a distributive strategy's underlying assumptions and premises. Moreover, we have highlighted a set of conceptual and normative questions that policy-makers should consider when considering GTV in future pandemics in other countries outside Norway. We conclude that the most reasonable defence of GTV seems to be through a consequentialist account that values both total health outcomes and more equal outcomes. Moreover, if one accepts that GTV is foundationally a consequentialist vaccination strategy, then the question of whether to introduce GTV will be a question of which harms and benefit we should take account of, and the empirical effectiveness of such a strategy.

Abbreviations:

ECDC: The European Centre for Disease Prevention and Control,
GTV: Geographically targeted vaccinations,
HOD: Norwegian Ministry of Health and Care Services,
IPC: Infection prevention control,
NIPH: Norwegian Institute of Public Health,
QALY: Quality-adjusted life year,
WHO: World Health Organization

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