

Rollout of COVID-19 vaccines in the EU/EEA: challenges and good practice

29 March 2021

Key findings

This document outlines the key challenges that countries are facing with the COVID-19 vaccination rollout and lessons learned to mitigate these challenges.

- The majority of responding countries (26/28, 96%) reported challenges related to the limited supply of COVID-19 vaccines, as well as frequent changes in timing of deliveries from vaccine producers, which can be unpredictable and can significantly affect the planning and efficiency of the rollout.
- The logistics to rollout vaccines with different characteristics around storage, transport and administration (e.g. timing of the second dose, indicated age groups, contraindications) is complex and half of the countries (n=12) reported challenges with effective strategies to limit discarding of unused vaccines (e.g. open vial wastage). Some countries avoid the wastage of vaccines by administering remaining doses to healthcare workers at the end of each vaccination session, or set up reserve lists of people willing to be vaccinated.
- Staffing shortages to administer vaccines was a challenge reported by six countries. Hiring and training more medical and even non-medical staff seems essential to progress in the mass vaccination campaign.
- Ten countries (36%) reported challenges around a shortage of equipment needed for vaccination, specifically with a lack of dead-space syringes and needles to extract more doses from vaccine vials. Stockpiling, when necessary equipment is available, and central distribution may help to overcome these challenges.
- Seven countries (25%) reported challenges around reaching certain populations, especially those individuals who have difficulties leaving their homes. Some countries try to address this challenge by running vaccination centres with multidisciplinary teams and by vaccinating immobile patients at home by their general practitioners.
- Six countries (21%) reported communication challenges related to misinformation and disinformation around COVID-19 vaccines, which may affect vaccine acceptance. Countries also reported challenges with communicating about prioritising certain groups and the rationale behind this; and communicating about the efficacy and safety of different vaccine products and decisions taken regarding the protocols for their administration at national level. The extent and issues of vaccine acceptance and hesitancy vary across countries with specific local social and cultural patterns.

Errata: 31 March 2021. In the final paragraph of the Conclusions, the text was revised to more accurately reflect the current situation, and a footnote was added on page 11.

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- Setting up systems for scheduling individual vaccination appointments and ensuring that the most effective system used to contact the different priority groups is a challenge for 10 countries (37%). While countries mostly try to have a digital system in place to first register and then secure a timeslot for vaccination, it is important to keep alternative systems to reach specific subgroups, such as the elderly, including paper-based registries and phone call options rather than relying solely on online registration.
- All reporting countries have either an immunisation information system or an electronic immunisation registry in place, or are currently implementing an ad-hoc system to record individual vaccination status. However, challenges regarding IT issues, data quality and data completeness have been mentioned. It was suggested that functioning systems for reporting suspected adverse events following immunisation are needed, and a proposal to have a plan in place to communicate about any adverse events that may occur.

The COVID-19 vaccine rollout is a dynamic process and this report provides a snapshot of the challenges countries are facing at this time.

Scope and background

In order to meet the vaccination targets set by the European Commission of at least 70% of the adult population to be vaccinated by summer 2021 [1] and targets set at national level, an effective and efficient deployment of vaccination campaigns is essential, especially considering the complexities of the large scale required for mass vaccination. Monitoring of the COVID-19 vaccine rollout in the EU/EEA shows that the level of vaccine uptake is increasing, yet still at a pace that makes meeting the EU targets challenging in most countries.

ECDC monitors the vaccine rollout in real time through its [Vaccine Tracker](#). As of 26 March 2021, the cumulative first dose uptake was 11.6% across the EU/EEA (range: 5.4-21.6%) and the full vaccination uptake was 5% (range: 1.2-9.5%). Among the elderly (aged 80 years and above) and healthcare workers, the median full vaccination uptake was 28.7% (range: 0.1%–68.8%) and 47.5% (range: 13–99.4%) respectively, and additional efforts are needed to achieve the target of 80% vaccine uptake in these prioritised groups by March 2021.

In addition to the uptake, the collection of data on the total number of doses distributed to the countries and administered to the population aims to inform about the pace and completeness of distribution and administration of the vaccine to the target groups, and to identify possible shortcomings in the deployment of the vaccines and any support needed accordingly. In addition to this system, different surveys collecting more qualitative data on the priority groups and the progress of the vaccination campaign, adaptation of vaccination policy and progress in monitoring and recording individual vaccinations status were undertaken and published in two ECDC technical reports [2,3].

The aim of this report is to share the challenges countries are facing with the rollout of the COVID-19 vaccine deployment process. It also aims to share lessons learned and good practice that countries have put in place to mitigate the challenges.

Target audience

Target audiences for this document are the European Commission, the Health Security Committee, the EU/EEA NITAG Collaboration and national public health institutes and ministries of health in the EU/EEA, as well as public health experts and decision-makers at subnational level in charge of implementing vaccine deployment plans.

Methods

The information provided in this report has been collected from responses to the vaccine questions asked to Member States via the Integrated Situational Awareness and Analysis (ISAA) report and through a one-off survey to gather further details about challenges countries are facing in the rollout of COVID-19 vaccines.

Integrated Situational Awareness and Analysis report

Questions on vaccines were sent by the European Commission to countries via the ISAA report. The ISAA report is prepared under the Integrated Political Crisis Response Mechanism (IPCR) of the Council of the European Union.

- Starting on 9 December 2020, a weekly set of questions is sent via the ISAA report to representatives of Member States, as validating authorities of the IPCR, in order to gather regular information on various topics around COVID-19. One section of these questions covers vaccination strategies and deployment. The representatives of countries gather the responses to the questions from different agencies and ministries in their countries.
- This report is based on the responses from countries to the vaccine-related questions received on 8 February 2021, 15 February 2021, 22 February 2021, 1 March 2021, 08 March 2021 and 15 March 2021.

Survey on challenges countries are facing with the vaccination rollout and solutions to mitigate them

A survey that aimed to map challenges with the vaccination rollout was sent out by the European Commission to Health Security Committee Members on 9 March 2021. It covered the following topics: vaccine supply, infrastructure and logistics, workforce, equipment, vaccination delivery sites, scheduling people for vaccination appointments, systems to monitor vaccinations, communication and uptake of vaccines, measures or solutions and good practice.

Response rate

In total, information comes from 28 EU/EEA countries (Austria, Belgium, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden). There was no response from Bulgaria or Slovenia.

- Twelve countries responded solely to the vaccine questions via the ISAA report (Cyprus, France, Germany, Ireland, Italy, Luxembourg, Malta, Norway, Portugal, Romania, Slovakia, Spain).
- Five countries responded solely to the survey on challenges (Estonia, Greece, Liechtenstein, the Netherlands, Poland).
- Eleven countries responded both to the questions via the ISAA report and the survey on challenges (Austria, Belgium, Croatia, Czechia, Denmark, Finland, Hungary, Iceland, Latvia, Lithuania, Sweden).

On 24 March 2021, there was an Health Security Committee meeting to share experiences and knowledge around the challenges countries are facing with the vaccination rollout and to share solutions, measures and good practice put in place to mitigate these challenges. Comments made by countries in this meeting were incorporated into the report.

Results

Vaccine supply and timing of delivery

The vast majority of responding countries (n=27, 96%) commented that the timing of deliveries is unpredictable and frequently changed by the vaccine producers. This situation significantly affects the planning and efficiency of the rollout, as countries may at times have lower vaccine supplies than anticipated and planned for.

Table 1. Challenges countries are facing around limited vaccine supply

Vaccine supply	Countries
Limited vaccine supply	Austria, Belgium, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden
The need to make adaptations to priority groups due to challenges around vaccine supply	Austria, Belgium*, Czechia, Denmark, Estonia, Finland, Greece, Iceland, Latvia, Poland, Spain, Sweden
Suspension/postponement of the vaccination campaign due to challenges around vaccine supply	Austria, Estonia, Latvia, Lithuania, the Netherlands

*Differs by region

Lessons learned and good practice to mitigate challenges

- Considering the lack of certainty regarding planned deliveries, **Belgium** has started to protect the administration of the second doses by creating a minimum reserve stock in case of delivery problems.

Logistics and infrastructure

Another key area where countries are facing challenges is around logistics and infrastructure. In particular, nearly half of the responding countries (N=12) mentioned challenges with effective strategies to limit discarding of unused vaccines (e.g. open vial wastage). Seven countries are vaccinating persons outside of target groups to avoid wasting doses (Table 2).

Table 2. Challenges countries are facing around logistics and infrastructure during vaccination rollout

Logistics and infrastructure	Countries
Strategies to limit discarding unused vaccines (e.g. minimising wastage of doses)	Belgium, Cyprus, Croatia, Germany, Greece, Hungary, Latvia, Liechtenstein, the Netherlands Portugal, Slovakia, Sweden,
Vaccinating outside of target groups to avoid wasting doses	Belgium, Latvia, Lichtenstein, the Netherlands, Portugal, Slovakia, Sweden
Managing different types of vaccines with regards to logistics, storage and/or administration	Croatia, Cyprus, Denmark, Greece, Hungary, Latvia
Strategies to ensure optimal stock management and avoid expiration of stocks (e.g. closed vial wastage)	Cyprus, France, Poland
Availability of shipping and transshipment	Croatia, Cyprus, Greece
Availability of storage capacities	Croatia, Cyprus
Availability of cold chain	Cyprus

Lessons learned and good practice to mitigate challenges

- **Belgium** suggests to start vaccination campaigns by first supplying hospitals with vaccines in order to use the expertise and experience of hospital pharmacists in handling vaccines which need to be stored in ultra-low temperature freezers and at -20° C, in order to test the procedures in a pilot phase before rolling out on a larger scale. The Standard Operational Procedures will thus be usefully adapted for mass vaccination centres.
- **The Netherlands** suggest running through scenarios for large scale vaccination campaigns with hospitals, general practitioners and Public Health services. **Denmark** are also running through national exercises to test the systems in place for the scale-up of the vaccination campaign.
- **Latvia** has created a special structural unit to coordinate mass vaccination, development and implementation of new solutions, including technological ones, such as the creation of an IT platform for managing the mass vaccination process.
- **Hungary** relies on the distribution system and the distributor that is used to rollout childhood vaccines.
- **Latvia** has continuously adjusted the principles and mechanisms of recalculations of daily deliveries of vaccines to the vaccination sites. **Estonia** also suggests to rapidly react to any changes in deliveries and adapt the vaccination strategy accordingly.
- **Estonia** has reinforced the logistics team and the national distribution hub team for organising the logistics.
- **Denmark** has put in place a monitoring system on the rollout of the vaccine programme.

To avoid wastage of doses countries have implemented the following solutions:

- In **Belgium**, due to the reluctance of some frontline healthcare workers to be vaccinated (in general, or with some specific vaccines), reserve lists were created with people from other groups to be vaccinated each day. Italy and Croatia have also developed reserve lists of people to contact for vaccination and Austria has a prioritisation list to be called for last minute vaccination.
- In Germany, they vaccinate those working in the vaccination centres or the mobile vaccination teams with any leftover vaccine doses at the end of each day
- In **the Netherlands**, they try to minimise the wastage of doses (which can be hundreds of wasted doses a day) by vaccinating healthcare workers at the end of each day (however as the majority of healthcare workers have been offered the vaccine, they are considering who will be vaccinated now with the daily excess doses).
- **Greece** vaccinates the armed forces and security guards in order to avoid wasting doses (overall Greece has an average vaccine dose wastage of 0.4%).
- In **Latvia**, in order to avoid wastage of vaccines they use the vaccine for the next prioritised target groups in the list at the end of each vaccination session (overall Latvia has an average vaccine dose wastage of less than 1%).
- Austria encourages vaccination sites to document all doses that are wasted and provide weekly reporting on this.

Workforce for administering vaccines

Scaling up the deployment to mass vaccination level will require an increase in qualified staff to administer the vaccines. Six countries (22%) are facing challenges around staffing shortages/lack of trained workforce to administer vaccines and four countries (15%) need to train additional (unqualified) staff.

Table 3. Challenges countries are facing around the workforce for administering vaccines

Workforce	Countries
Staffing shortages to administer vaccines/ lack of trained workforce to administer vaccinations	Croatia, Hungary, Latvia, Lithuania, Luxembourg, Malta
Necessity to train additional (unqualified) staff such as GPs and pharmacists	Denmark, Latvia, Poland
Willingness of staff to vaccinate	Croatia*, Greece, Latvia

**this differs by region*

Lessons learned and good practice to mitigate challenges

- **Malta** is currently hiring clinical staff on a temporary contract basis to increase the workforce.
- In **Poland**, due to the insufficient number of medical staff administering vaccines, they have started training other staff including biomedical analysts, physiotherapists and pharmacists.
- In **Estonia**, in order to strengthen the workforce, they have included vaccinators from the private sector (private healthcare providers).
- In preparation for mass vaccination, **Latvia** have started recruiting and training additional personnel and Lithuania are planning to expand groups of specialists to administer vaccines.
- **The Netherlands** has streamlined guidelines, with only one set of guidelines for all professionals, made by professionals and the national institute.

Equipment required for vaccination

Ten countries (36%) are facing the challenge of shortage of equipment needed for vaccination. The most common is a lack of dead-space syringes and needles needed to extract the additional doses from the vials (e.g. the sixth dose from the Comirnaty 5-dose vial).

Table 4. Challenges countries are facing around the equipment required for vaccination

Equipment	Countries
Shortages of equipment needed for vaccination, such as syringes, including shortage of low dead-space syringes/needles	Belgium, Croatia, Hungary, Latvia, Liechtenstein, Luxembourg, Malta, the Netherlands, Portugal
Shortages of personal protective equipment to deliver the vaccine	Estonia*, Latvia

**currently enough PPE for carrying out vaccinations, but additional supplies of PPE may be needed.*

Lessons learned and good practice to mitigate challenges

- **Malta** suggests procuring necessary materials from various manufacturers.
- **Cyprus** suggests centrally controlling equipment needed for vaccination.

Vaccination delivery sites

Seven countries (25%) are facing challenges around reaching certain populations for vaccination such as those living in rural areas, or people in a situation of socio-economic vulnerability and those at higher risk of more severe COVID-19 because of medical conditions. The most common challenge countries mentioned is reaching those individuals who have difficulties leaving their homes.

Table 5. Challenges countries are facing around delivery sites for administering vaccinations

Vaccination delivery sites	Countries
Reaching hard-to-reach populations (such as in rural areas)	Belgium, Denmark, Hungary, Latvia, Lithuania, the Netherlands, Slovakia
Reaching (medically or socio-economically) vulnerable population groups	Belgium, Denmark, Hungary, Latvia, Liechtenstein, Lithuania*, Slovakia
Availability of vaccination sites in order to cover the population eligible for vaccination	Germany, Latvia, Poland
The organisation, logistics and running of vaccination centres	Belgium, Latvia
Locating alternative vaccination sites for future mass vaccination	Hungary, Latvia
Size of centres set up for administering mass vaccinations	Latvia

*Different by region

Lessons learned and good practice to mitigate challenges

- **Latvia** suggests that vaccination centres are run with multidisciplinary groups (mainly health visitors, nurses, a doctor and university graduates for ancillary services).
- In **the Netherlands**, people who are unable to travel to a vaccination site are vaccinated at home by general practitioners.

Communication and uptake of vaccines

Most common challenges related to communication (reported by 21% reporting countries) refer to addressing the spread of vaccine misinformation and disinformation; communicating about prioritising certain groups and the rationale behind; and communicating about, the efficacy of different vaccine products and decisions taken regarding the protocols for their administration at national level (see Table 6).

Table 6. Challenges countries are facing around communication

Communication	Countries
Spread of vaccine misinformation and disinformation	Croatia, Cyprus, Czechia, Germany, Romania, Sweden
Communicating about prioritisation of population groups and the rationale behind the choices	Belgium, Croatia, Finland, Greece, Hungary, Iceland, Portugal
Communicating about the efficacy of different brands of vaccines or decisions made regarding the administration of specific vaccines at national levels (e.g. regarding vaccination schedule, or target groups eligible)	Belgium, Croatia, Denmark, Finland, Iceland, Latvia, Portugal
Communication challenges	Czechia, Germany, Norway
People who are eligible and scheduled to receive vaccines are refusing to take the vaccine	Cyprus, Czechia
Communicating with different population groups	Greece, Latvia, Lithuania, Sweden
Vaccine acceptance among those groups eligible for vaccination	Belgium, Latvia, Liechtenstein
Communicating about adaptations made to vaccination strategies	Finland, Latvia

Lessons learned and good practice to mitigate challenges

- **France** has put in place pedagogical communication.
- **Germany** suggests regular monitoring of vaccination uptake and vaccine acceptance. The Robert Koch Institute in Germany publishes results on this monitoring in their Epidemiological Bulletin [4].
- **Estonia** is currently putting more effort on communication and on raising awareness on COVID-19 vaccines: seminars/workshops for healthcare workers, including in healthcare institutions (e.g. hospitals); centrally organised workshops for healthcare professionals and the general population; engagement of scientists and experts for rapid response and communication.
- In **Poland**, as part of the #SzczepimySię campaign conducted by the Chancellery of the Prime Minister, numerous promotional and informational activities were conducted: a dedicated website www.gov.pl/szczepimysie; visual identification of the slogan and logo of the campaign; open files for materials to be used at vaccination centres; information boards, video materials targeting specific social groups; leaflets and information posters; participation of well-known and popular people such as actors and sports people in the promotion of the vaccination campaign.
- **Lithuania** suggests additional communication activities for hard-to-reach population groups.
- In **Lithuania**, the President of the Republic of Lithuania and members of Government and Parliament have been vaccinated publicly to try and increase public confidence in the AstraZeneca vaccine.
- In **Hungary**, vaccine acceptance builds on the confidence that people have in general practitioners.

- In **Latvia**, pro-active media relations, social media activities (towards specific target groups), educational activities toward target groups (Russian-speaking opinion leaders, media representatives, employees, teachers, etc.), active co-operation with municipalities, communication/advertising the campaign (to be carried out with the start of the vaccination of the larger population groups), cooperation activities with private companies spreading information about vaccines and motivating people to register for vaccination.
- **Finland** has prepared a large-scale campaign, especially targeting younger age groups, in preparation for mass vaccination. Lithuania has also started preparing for mass vaccination by further developing communication activities such as frequently asked questions etc.

Scheduling vaccination appointments

Setting up systems for scheduling individual vaccination appointments and ensuring that the most effective methods are used for contacting the different priority groups is a challenge that ten countries are currently dealing with.

Table 7. Challenges countries are facing around scheduling vaccination appointments

Scheduling vaccination appointments	Countries
Mechanisms in place for inviting people eligible for vaccination/inefficient booking systems for scheduling people for vaccinations	Belgium, Croatia*, Denmark, Germany, Hungary, Latvia, Liechtenstein, Poland, Portugal, Slovakia
Lack of capacity to ensure vaccination time slots are filled and backup plans for those that do not turn up	Belgium*, Denmark, Portugal
Identifying and contacting target groups for vaccination	Latvia

Lessons learned and good practice to mitigate challenges

- In **Croatia**, in order to reduce the pressure on general practitioners, who are the main providers of mass vaccination, a digital platform has been established that allows all citizens to apply for vaccination according to priority group and place of residence.
- **Estonia**: The older risk groups are contacted mainly by phone, to enable them to ask additional questions, even though this results in an additional burden for vaccinators. The younger risk groups are notified electronically about their vaccination appointment. Estonia has also piloted an online registration system in preparation for mass vaccination.
- In **Hungary**, the vaccination registration system is online for the general population and paper-based for the elderly (aged above 65 years).
- In preparation for mass vaccination **Lithuania** are developing a full functioning vaccination registration system.

Systems to monitor vaccinations

The recording of individual vaccination status through the implementation of immunisation information systems (IIS) or electronic immunisation registries (EIR), is a key component of the deployment of the vaccination campaign. Based on the record of the individual vaccination status, accurate coverage estimates will inform how the vaccination campaign performs in terms of reaching the target groups (equity) both at national and subnational level. It is key to collect information on the vaccination sites and to produce coverage estimates in the general population, as well as in specific population subgroups, such as healthcare workers. All countries are in the process of implementing ad-hoc systems when no IIS or EIR is in place and are sometimes scaling up the existing system. Two countries mentioned incomplete reporting as a challenge with their systems and some others mentioned delays and missing data on key variables.

Table 8. Challenges countries are facing with systems to monitor the vaccination

Systems to monitor vaccinations	Countries
Incomplete reporting, but not specific to any region of the national territory	Belgium, Sweden
Data from all vaccination sites do not reach relevant authorities within the agreed timeframe	Slovakia
Incomplete reporting from some specific parts of the country	The Netherlands
Data missing on key variables such as vaccine product, dose number, date dose administered	Hungary

Lessons learned and good practice to mitigate challenges

- Croatia suggests making sure that an efficient reporting system for Adverse Events Following Immunisation (AEFI) is in place. Countries should prepare for communicating AEFIs by knowing the background rates of health events (especially deaths by age group) in order to know how often to expect temporally related events.

Conclusions

Vaccines are a key part of a long-term strategy to bring SARS-CoV-2 under control. It is essential to rollout vaccinations rapidly to protect as many people as possible and to lower the opportunities for the virus to further evolve. As countries progress with the vaccination rollout, they are faced with challenges, particularly around the limited vaccine supply and the unpredictable timing of deliveries from manufacturers, minimising the wastage of doses and around communication, especially related to addressing disinformation and increasing vaccine acceptance and uptake. With the expected increase of vaccine deliveries in April/May, countries are preparing to scale-up their vaccination campaigns for mass vaccination. Based on what countries have shared, the following good practice for accelerating and achieving more effective and efficient vaccination deployment can be considered:

- Available vaccines should be prioritised for groups at the highest risk of severe disease (in particular, older adults) in order to efficiently reduce hospitalisations, ICU admissions and deaths, irrespective of any other considerations.
- An accurate, real-time inventory management system to assure the availability and maintenance of adequate supplies, minimise potential wastage and accurately forecast demand.
- Ability to rapidly react to any changes in deliveries and adapt the vaccination strategy accordingly.
- Expanding vaccination sites, especially opening vaccination centres for the start of mass vaccination.
- Increasing mobile vaccination teams to reach more vulnerable or hard-to-reach populations, such as those that cannot leave their homes due to mobility difficulties.
- Strategies to limit discarding and wastage of unused vaccine doses by vaccinating people from other priority groups (e.g. reserve lists).
- Increase and train more healthcare or non-healthcare staff to administer the vaccines (e.g. primary care staff, retired healthcare workers students from medical and nursing schools, etc.)
- Ensure communication strategies address misinformation and disinformation, improve vaccine acceptance and minimise hesitancy.
- Preparing communication campaigns, especially targeting younger age groups in preparation for mass vaccination.
- Ensuring efficient AEFI reporting systems are in place and that countries should prepare for communicating about any AEFIs.
- Running through scenarios for large scale vaccination with hospitals, general practitioners and Public Health services.
- Ensure close alignment and communication between involved actors throughout the vaccination campaign, including administrative regions, government agencies and the national government. Multilevel and multidisciplinary coordination is key to a successful rollout of the vaccines across the country.

Sharing country experiences and good practice and solutions for mitigating challenges is key to an effective rollout of vaccination across EU/EEA countries.

As countries are progressing in the rollout of COVID-19 vaccines, there are still unknowns in relation to their characteristics, as well as most effective and efficient deployment mechanisms. Non-pharmaceutical interventions should therefore continue to be applied, as recommended by public health authorities, alongside the introduction of COVID-19 vaccination.

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Annex. Detailed country feedback on the different challenges

Vaccine supply and timing of delivery

Many countries report that the number of vaccine doses supplied can change from week to week, and Ireland stated that last-minute alterations of the volumes and schedules of deliveries create significant logistical problems. The late confirmation of shipments, only two to six weeks in advance, makes planning difficult (Ireland, Luxembourg), alongside unpredictable schedules and volumes of deliveries, compared with the established weekly quotas, making it hard to plan more than one month ahead (Luxembourg, Malta). Similarly, according to the Netherlands, the number of vaccine doses delivered changes every week so the number of people to be vaccinated needs to be adapted accordingly. Estonia commented that if there was a sufficient amount of vaccine doses available, it would be a lot easier to distribute the doses without such prioritisation and that it is very difficult to organise the vaccination programme if the time of delivery and volumes of supply are communicated only a week in advance and volumes change a few days before the delivery date. According to Latvia, some of the deliveries were lower than planned; in addition, some deliveries were suspended due to uncertainties regarding cold chain compliance during international shipment.

In Portugal, due to limited vaccine supply, the timing between the first and second dose of Comirnaty was extended, and many countries responded that they had to suspend/postpone or slow down the vaccination campaign at a certain stage in different areas or regions (Austria, Croatia, Denmark, Estonia, Germany, Latvia, Liechtenstein, Lithuania, the Netherlands, Norway, Slovakia, Spain, Sweden). Many countries had to make adaptations to priority groups due to the irregularities of deliveries (Austria, Belgium, Czechia, Estonia, Finland, Greece, Iceland, Latvia, Poland, Spain, Sweden). In Poland, the National Vaccination Programme had to be adapted due to disruption in vaccine supply; similarly, Hungary had to adapt the vaccination plan to the characteristics (target groups, contraindication, storage conditions) of available vaccines to ensure that supplies were used as quickly as possible. Croatia commented that the slowdown of the rollout resulted in complaints from healthcare workers, media, and patients; and in Estonia prioritised groups have not yet been fully covered due to limited available vaccine supplies.

Limited vaccine supply has also made it difficult for some countries to accelerate and organise the scale up of mass vaccination (Estonia, Luxembourg), and in Liechtenstein the vaccination centre has only been operational at 30% capacity, although there is capacity for it to operate at 100%.

Logistics and infrastructure

Lichtenstein mentioned that there are more doses per vials than can be extracted and Hungary commented that the available syringes and needles are not always optimal to extract six doses from the Comirnaty vial and doses may be wasted if persons scheduled for their vaccination do not turn up. In addition, Lichtenstein also said that it can be difficult to match the number of vaccine doses with the exact number of persons scheduled for vaccination (especially when the frozen vaccines have to be taken out of the freezer several hours before vaccination), and also the lack of information from vaccine producers on product characteristics, for example transporting already prepared vaccine doses to vaccinate individuals in their homes. Latvia commented that there is an insufficient number of people to vaccinate in some vaccination facilities and/or during outreach vaccination sessions which can lead to a waste of vaccine doses.

In Estonia, the logistics for the high number of vaccination sites has been difficult and Latvia mentioned that various wholesalers must be outsourced for logistics which increases the administrative burden. Both Hungary and Estonia commented that the differing characteristics of the vaccine products in terms of storage, transport and administration (e.g. timing of the second dose, indicated age groups, contraindications) is a challenge they are facing. Due to these differing vaccine characteristics, Hungary commented that it can be difficult for healthcare workers to follow each recommendation for administering the various vaccines.

In the future, the main logistical challenges that countries foresee are around the organisation and preparation in scaling up for mass vaccination. Belgium responded that the logistical organisation of mass vaccination centres is a great challenge and they want to draw on the experience from other countries that have already started mass vaccination. Sweden foresees that a larger number of people may need to be vaccinated in a shorter time span during quarter two in order to reach national vaccination targets due to smaller deliveries of vaccines in quarter one. In Germany, they foresee that issues around deliveries from delivery centres to the vaccination centres may hamper vaccine availability in vaccination centres in the future.

Workforce for administering vaccines

Estonia mentioned that the hospitals in the capital are overburdened and therefore less qualified staff are recruited to administer the vaccines. Although there is currently adequate staff, they may require additional staff to administer vaccines in the future. In Latvia, there is a lack of medical staff, including the limited availability of general practitioners, to participate in the mass vaccination campaign. Croatia commented that in some cities, the willingness of general practitioners to vaccinate is low, however, this is not a countrywide problem; and Hungary mentioned that they are starting to see growing fatigue in the healthcare workers overall.

Equipment required for vaccination

Malta commented that the Joint Procurement has until now confirmed that there are no dead-space needles, which are needed to extract the additional doses from vaccine vials, included in the contract awards¹. Countries have commented that dead-space syringes and needles are very difficult to obtain and that there is a worldwide shortage. The supplies related to the vaccinations and the correct devices are limited and it is a challenge to maintain a suitable stockpile. Malta also reported challenges with medical materials to maintain vaccination rollout and Croatia responded that it is difficult to find isotonic saline in small packaging on the market. Latvia reported a shortage of personal protective equipment (PPE) to administer the vaccine, while Estonia currently has enough PPE, but foresees a shortage and a need for additional supplies considering the current epidemiological situation in the country.

Vaccination delivery sites

In Estonia, as vaccinations are provided in vaccination centres, individuals with certain disabilities and mobility challenges may be missed. A similar challenge has been referred to by Greece and Latvia, where it has been hard for people with mobility difficulties to access vaccination sites, or in Latvia to vaccinate immobilised patients in their homes. Hungary mentioned that as healthcare facilities are currently used as vaccination sites, the capacity and organisation of the mass vaccination campaign has been challenging for most of the healthcare facilities. A future challenge mentioned by Spain may be the difficulty in reaching homogenous vaccination coverage in different regions, these differences in vaccination rates by region could become a challenge. On a similar note, Hungary said that they distribute the vaccines to every county, however the age-distribution is different between counties so the coverage of the priority groups will differ between them.

Communication and uptake of vaccines

Vaccine acceptance has been reported as high, or not identified as a challenge, in some countries (Spain, Iceland, Finland; 80% acceptance in Sweden); especially among currently eligible individuals (Spain) and among the elderly (Sweden). Acceptance significantly increased in Poland from about 43% of the population willing to be vaccinated against COVID-19 at the end of 2020 to 75% more recently. In Estonia, the average percent of people who refuse the vaccine is about 4%.

Nevertheless, the extent and issue of vaccine acceptance varies across countries with specific local social and cultural patterns. In Liechtenstein, the refusal rate is estimated between 30% and 50% of the population, in Latvia 21% of the population does not want to be vaccinated and 8% is categorically against COVID-19 vaccination, with some active anti-vaccine movements in some regions; and vaccination acceptance is lower in hard to reach population than in the general population in Hungary. In Latvia, attitudes towards COVID-19 vaccination seem significantly less positive in people with lower income, lower education, in women compared with men, and in the Russian-speaking population (twice less sceptical towards vaccines than Latvian speaking one). In Estonia, the vaccine uptake is slightly lower among nurses and caregivers than among doctors; and lower among Russian-speaking individuals than in Estonian-speaking population. Resistance towards COVID-19 vaccines was also initially related to the perceived uncertainty around the safety profile of some products, or their novelty and abbreviated marketing procedures (Poland, Estonia). In Sweden some eligible people are refusing vaccination because they want a 'more effective' vaccine.

The spread of vaccine misinformation and disinformation, including fake news, is a common challenge in the EU/EEA (Croatia, Cyprus, Czechia, Germany, Lithuania, Romania, Sweden) and Latvia is currently addressing anti-vaccine movements both through social media and printed materials across the country.

In the initial phases of the vaccine rollout and with limited vaccine supplies, communicating effectively to the population about the prioritisation of certain population groups and the rationale behind the criteria has been

¹ The source of this information comes from Malta's input to questions via Integrated Situation Awareness and Analysis (ISAA) National Vaccination Strategies 08/02/2021, 15/02/2021, 22/02/2021, 01/03/2021, and 08/03/2021. The Commission cares to underline that Member States can order dead-space needles under the recent Joint Procurement contracts.

challenging in some countries (Croatia, Finland), as well as about the need to maintain sufficient vaccine supply in stock to ensure the administration of the second doses to those who need it (Norway).

More specifically, about COVID-19 vaccine products and their characteristics, countries mentioned challenges related to communication about the safety and efficacy of the different vaccines (Croatia); the safety profile in relation with adverse events in vaccinated people (Norway); the scepticism and unwillingness to be vaccinated with the COVID-19 AstraZeneca vaccine (Lithuania, France, Poland).

On the other hand, in some countries, a more positive preference for certain vaccine products has been reported, such as in Latvia, where around 40% of survey respondents indicated the wish to be vaccinated with the COVID-19 vaccine Sputnik V; similarly in Estonia, the Russian-speaking population is awaiting the Sputnik V vaccine.

Future challenges related to communication and vaccine acceptance include: lower acceptability in the phase of rollout when the general population will be included (Croatia); increase in disinformation (Sweden); and maintaining public trust in the vaccination campaigns against misleading information that may affect people's readiness to vaccinate (Latvia).

Scheduling vaccination appointments

In Hungary, the registration system allows people to register for vaccination but does not allow for booking a vaccination time. The National Health Insurance Fund sends the lists of the registered persons based on their risk groups to their general practitioners, who then have to organise the vaccination time, the place and which vaccine product should be used, which is shown to be very time consuming for them. In Germany the vaccination scheduling in vaccination centres is not fully functional in all the federal states and in Liechtenstein it has taken time for the appropriate IT tool to be developed for scheduling appointments. Latvia commented that they are having difficulties checking the status of risk groups and the verification of their diagnoses to ascertain that the condition meets the criteria for scheduling a vaccination appointment. Latvia also said that their system needs further improvements and better integration.

Systems to monitor vaccinations

Hungary reported that data can be missing on key variables such as vaccine product, dose number and the date of dose administered. There can also be errors in the data reported in the national database from subnational level and the reporting can be delayed. Denmark also mentioned that there can be some errors in the registration data in their national database. In the Netherlands, there is geographical disparities in the quality of the reporting. IT issues have been also faced by those who have to record the vaccination. Incomplete reporting and errors in encoding have been observed in Belgium. Estonia has an electronic system for monitoring vaccination in place but faces issues in the data quality and in access to more specific data by workplace and profession for example. The quality of the reporting is dependent on vaccinators. Continuous work is done to improve the overall quality of the system.