

TECHNICAL REPORT

Overview of the implementation of COVID-19 vaccination strategies and deployment plans in the EU/EEA

21 April 2022

Key messages

This report provides an updated overview of the progress with national COVID-19 vaccination strategies and deployment in European Union/European Economic Area (EU/EEA) countries, including updates on:

- overall vaccine uptake and uptake by target group;
- vaccination strategies and policies;
- challenges and good practice with the roll-out, including vaccine acceptance and uptake.

Vaccine COVID-19 roll-out overview

- As of 10 April 2022, over 1.2 billion vaccine doses have been administered in the EU/EEA, 328 million people have completed the primary vaccination course and over 239 million individuals have already received a further dose of vaccine in addition to the primary course (all 30 countries reporting).
- Since the start of COVID-19 vaccine deployment in December 2020, the cumulative vaccine uptake in the total EU/EEA population has reached 72.5% (range: 29.5–86.2%) for the complete primary course and 52.8% (range: 8.8–70.6%) for an additional dose. Among adults (aged 18 years and older) the cumulative vaccine uptake reached 83.3% (range: 35.2–94.7%) for the complete primary course and 63.7% (range: 10.8–88.2%) for an additional dose (pooled data from 30 reporting countries). However, progress differs across countries, with two countries still reporting less than 50% of the total population having completed the primary vaccination course (Bulgaria and Romania).
- The median uptake of full vaccination with a completed primary course among older adults aged 60 years and above has reached a plateau, at just above 91%. Median uptake of completed primary vaccination has reached 74.7% in 18–24 year-olds; 78.4% in 25–49 year-olds and 85.4% in 50–59 year-olds (27 countries reporting). In eligible adolescents and children the median uptake of full vaccination with a completed primary course is 23.2% in those aged under 18 years (29 countries reporting); 72% in 15–17 year-olds and 38% in 10–14 year-olds (27 countries reporting). Among older adults aged 60 years and above, the median uptake for an additional dose has already reached 82.8% (range: 13–100%; 26 countries reporting).

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Vaccination strategies and policies during roll-out

- All EU/EEA countries offer vaccination to those aged 12 years and over. A total of 28 countries are recommending vaccination to all children aged 5–11 years and two countries are recommending vaccination only for those aged 5-11 years with risk factors.
- Twenty-two countries recommend specific COVID-19 vaccine products for particular population groups. The adaptation is mainly based on age-specific recommendations for Vaxzevria, Spikevax and COVID-19 Vaccine Janssen.
- All 30 countries recommend an additional primary dose as an extension of the primary course for those with weakened immune systems and all countries are recommending a booster dose for different groups in the general population to improve protection in individuals whose immunity may wane after completing the primary course¹. Half of the EU/EEA countries are recommending booster doses for all adults aged 18 years and over and half are recommending boosters for adolescents. A total of 13 countries are recommending boosters to all those aged 12 years and over and two countries are recommending them to all those aged 16 years and over. Nine countries have also now started recommending a second booster dose (four doses) to different vulnerable population groups, such as residents in long-term care facilities (LTCFs) and the elderly, with various age cut-offs.
- Nineteen countries (19/24) have changed their vaccination strategies in light of the circulation of the Omicron variant of concern (VOC), with the majority of countries having reduced the interval for administration of the booster dose after completion of the primary course and enhanced risk communication initiatives.
- In the majority of countries, vaccination is not mandatory. Six countries have mandatory vaccination in place for different population groups, in particular healthcare workers and/or workers in LTCFs, and one country is planning to make vaccination mandatory in the future.

Vaccine acceptance, hesitancy, and uptake

- Many countries are trying to reach population groups that still have low uptake, such as underserved groups that do not have adequate access to healthcare, vulnerable groups and young people.
- Countries are using a range of strategies to encourage vaccine acceptance and address vaccine hesitancy or increase uptake. These include measures such as mobile and pop-up vaccination teams/clinics; targeted communication strategies; outreach initiatives and intersectoral partnerships for community-based interventions. Some countries have also introduced incentives to be vaccinated and many countries require vaccination certificates in order to gain access to places/events.

The roll-out of national vaccination campaigns is an ongoing process, and this report provides a snapshot of the progress to date.

Scope of this document

ECDC has previously published eight technical reports on vaccination strategies and vaccine deployment across EU/EEA countries, on 2 December 2020 [1], 1 February 2021 [2], 29 March 2021 [3], 6 May 2021 [4], 14 June 2021 [5], 23 September 2021 [6], 11 November 2021 and 31 January 2022 [7]. This ninth technical report provides an updated overview of the progress with national COVID-19 vaccination strategies in EU/EEA countries, including updates on vaccine uptake overall and by target group; vaccination strategies and policies in place; vaccine acceptance and hesitancy; challenges faced by countries in increasing uptake and good practices to mitigate these challenges.

Target audience

Target audiences for this document are the European Commission, the Health Security Committee (HSC), the EU/EEA National Immunisation Technical Advisory Groups (NITAGs), national public health institutes and ministries of health in the EU/EEA, and public health experts and decision-makers at sub-national level responsible for implementing vaccine deployment plans.

¹ **Explanation of distinction between 'additional' and 'booster' doses:** booster doses are for people who responded adequately to the primary vaccination series, whereas additional primary doses are for those with weakened immune systems who did not respond adequately to primary vaccination. Booster doses are given to vaccinated people (i.e. those who have completed a primary series of COVID-19 vaccination) to restore protection after it would have waned. On the other hand, additional primary doses may be given to people with severely weakened immune systems as part of a primary vaccination series, since they may not achieve an adequate level of protection from the standard primary vaccination.

Methods

The information provided in this report was collected from the sources set out below.

Integrated Situational Awareness and Analysis report

The European Commission sends questions on vaccines to EU/EEA countries for the Integrated Situational Awareness and Analysis (ISAA) report. The ISAA report is prepared under the Integrated Political Crisis Response Mechanism (IPCR) of the Council of the European Union [8,9].

- Since 9 December 2020, a weekly set of questions has been sent via the ISAA report to country representatives, as validating authorities of the IPCR, to obtain regular information on various topics related to COVID-19. One section of these questions covers vaccination strategies and deployment. The representatives gather the responses to the questions from the various agencies and ministries in their countries.
- This report is based on responses from countries to the vaccine-related questions received between 17 January 2022 and 14 March 2022. Where relevant, data are included from responses provided before January 2022. The response rate from countries to each question is specified in the sections below.
- A draft version of this report was sent to the Health Security Committee Members for verification and validation, and to complement any missing information.

Data from The European Surveillance System

ECDC has implemented a monitoring system to collect information on vaccine roll-out (the number of doses distributed to EU/EEA countries and administered, by age group and other prioritised population) since mid-January 2021, in conjunction with the World Health Organization's Regional Office for Europe. EU/EEA countries have been reporting data on the COVID-19 vaccine roll-out through The European Surveillance System (TESSy), which can be viewed in the COVID-19 Vaccine Tracker [10] and in the weekly COVID-19 country overviews on ECDC's website [11]. The information on the COVID-19 vaccine roll-out presented in this report is based on the most recent data reported by EU/EEA countries to TESSy and displayed in the Vaccine Tracker as of 23 January 2022. The Vaccine Tracker may be consulted for additional details and country-specific [disclaimers on data](#).

Results

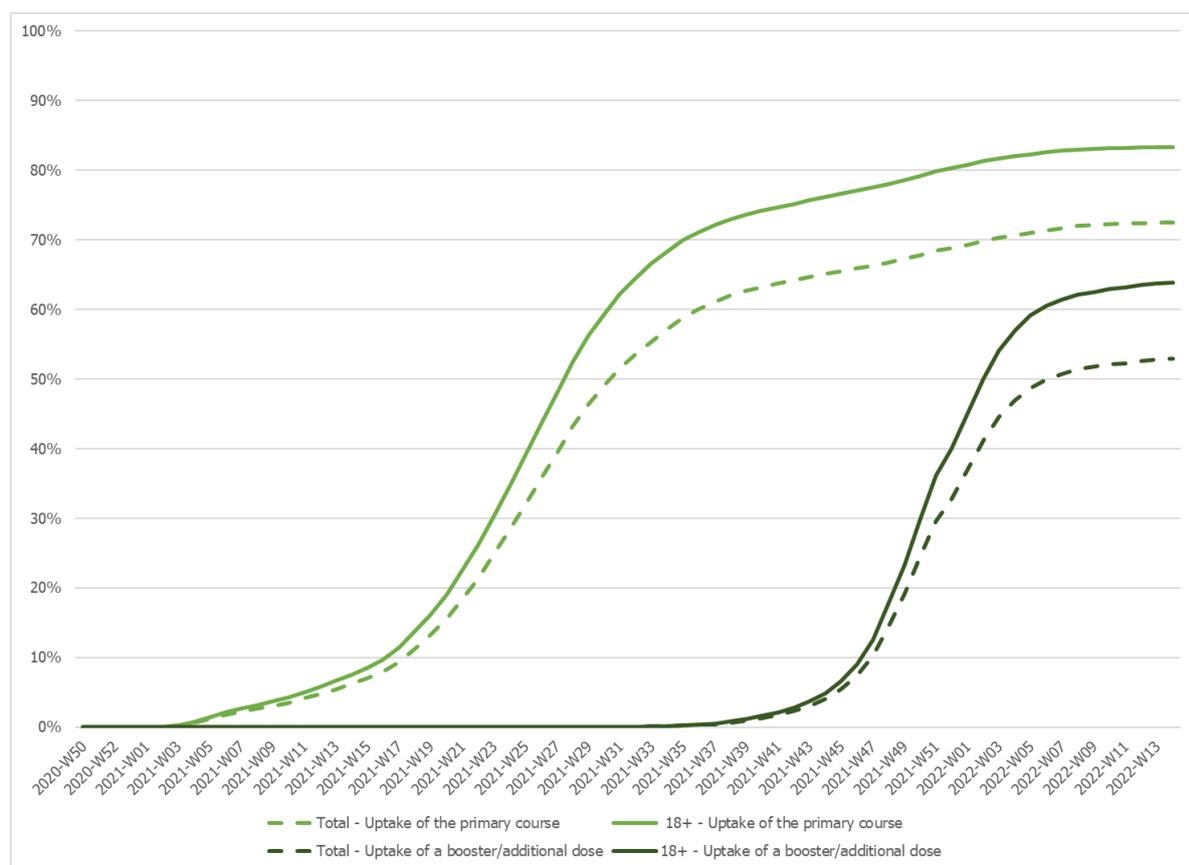
COVID-19 vaccine roll-out overview

As of 10 April 2022 (week 14, 2022), over 1.2 billion vaccine doses have been administered in the EU/EEA, 328 million people have received a complete primary vaccination course and over 239 million individuals in the EU/EEA have already received a vaccine dose in addition to the primary course (this includes both booster doses and additional primary doses administered as an extension of the primary course – e.g. for severely immunocompromised individuals) [10].

Since the start of COVID-19 vaccine deployment in December 2020 and as of 10 April 2022, the cumulative vaccine uptake in the total EU/EEA population has reached 72.5% (range: 29.6–86.2%) for the completed primary course and 52.9% (range: 8.9–70.7%) for an additional vaccine dose (pooled data from 30 reporting countries). Among adults (aged 18 years and over) in the EU/EEA, the cumulative vaccine uptake has reached 83.3% (range: 35.2–94.7%) for the complete primary course and 63.9% (range: 10.8–88.4%) for an additional vaccine dose (pooled data from 30 reporting countries) (Figure 1) [11]. In individuals under 18 years, the cumulative uptake of the primary course is 23.3% and this has been progressing slowly over the past month.

Overall, progress continues to vary across EU/EEA countries (Figure 2) and a few EU/EEA countries are lagging behind, with two still reporting less than 50% uptake of the primary vaccination course in the total population (Bulgaria and Romania).

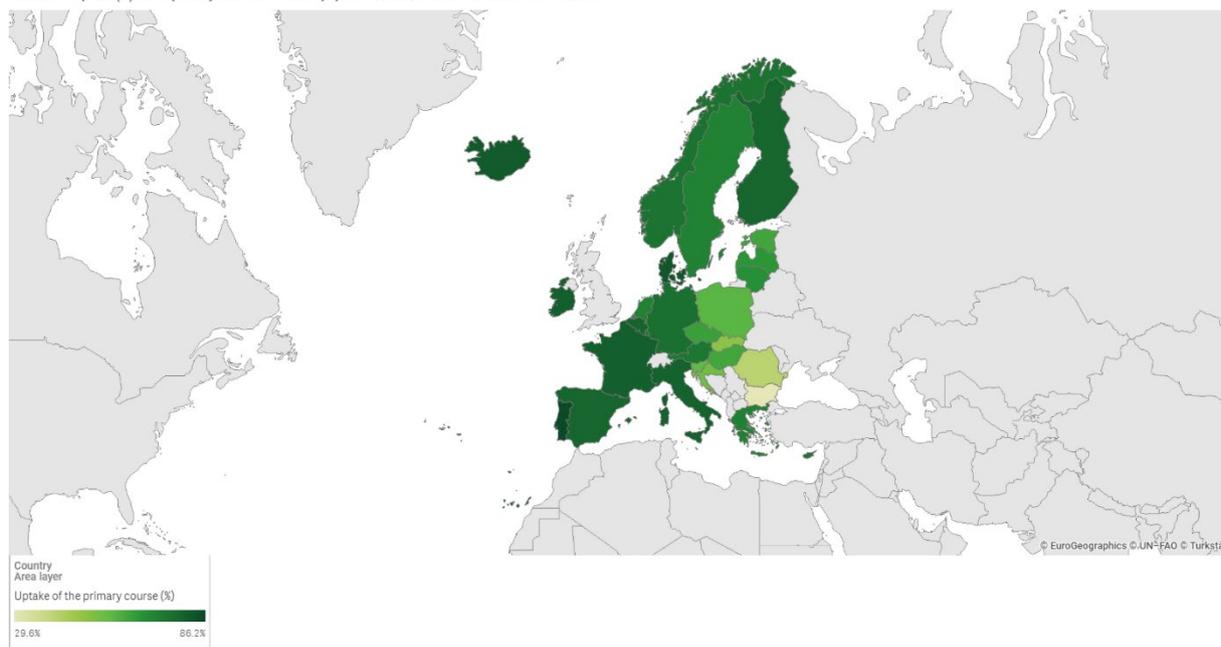
Figure 1. Cumulative vaccine uptake of a complete primary course and an additional dose of COVID-19 vaccines among adults (18+ years) and total population in EU/EEA countries as of week 14, 2022



Source: TESSy data reported by 30 countries as of week 14, 2022. The total population includes children and adolescents for whom the vaccine is not yet indicated (e.g. under five years) or who may not be included in national target groups yet.

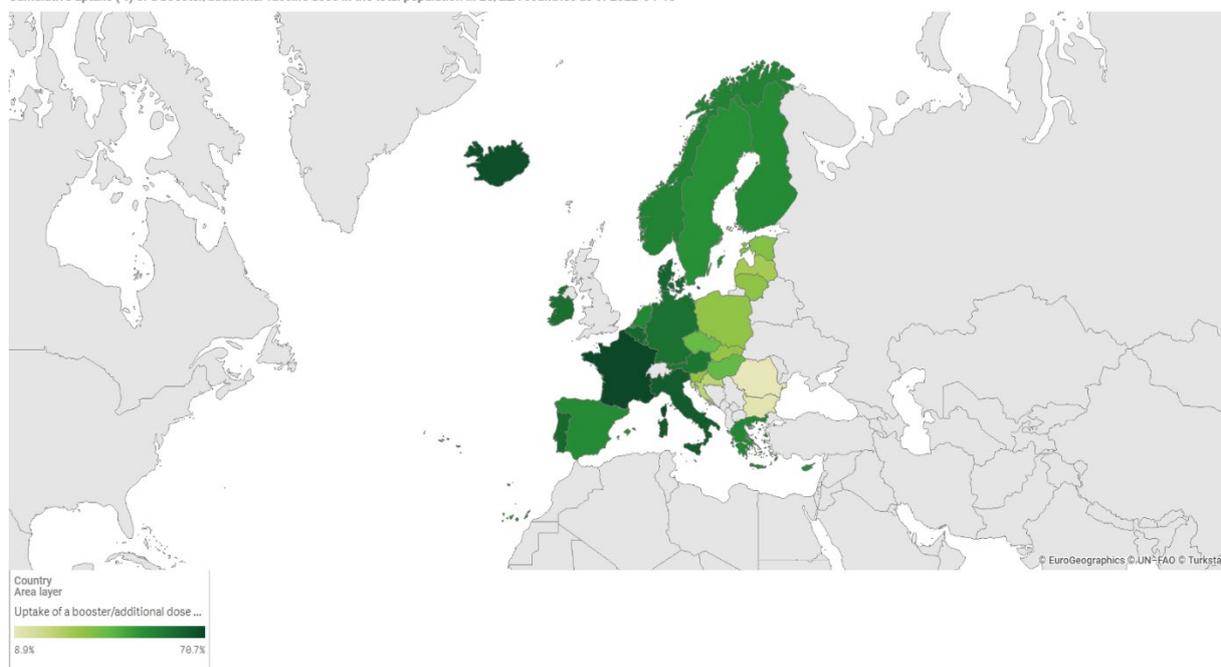
Figure 2. Cumulative uptake of a complete primary course and additional dose of COVID-19 vaccines in the total population by EU/EEA country as of week 14, 2022

Cumulative uptake (% of the primary course in the total population in EU/EEA countries as of 2022-04-13



Data as of 2022-04-13 || (c) European Centre for Disease Prevention and Control 2021 www.ecdc.europa.eu || The boundaries and named shown on this map do not imply official endorsement or acceptance by European Union || Reproduction is authorised, provided source is acknowledged

Cumulative uptake (% of a booster/additional vaccine dose in the total population in EU/EEA countries as of 2022-04-13



Data as of 2022-04-13 || (c) European Centre for Disease Prevention and Control 2021 www.ecdc.europa.eu || The boundaries and named shown on this map do not imply official endorsement or acceptance by European Union || Reproduction is authorised, provided source is acknowledged

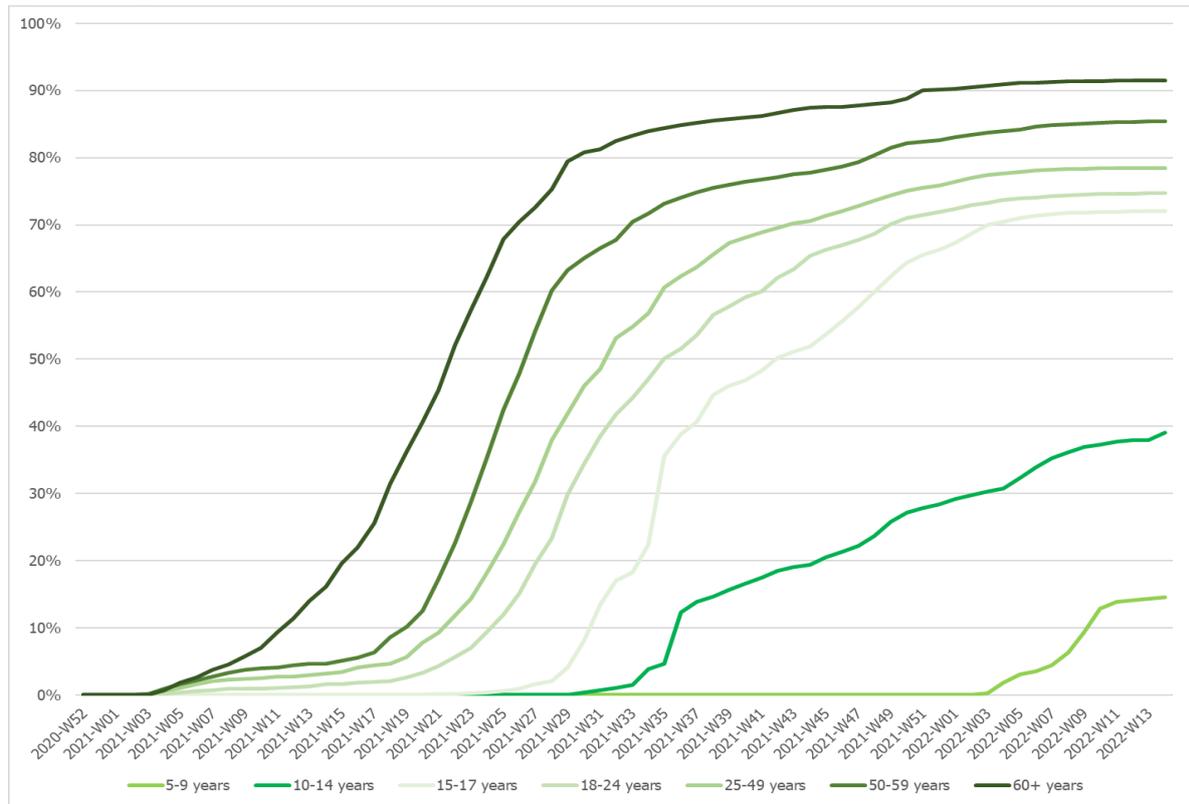
Source: TESSy; data reported by 30 countries as of week 14, 2022. See the [Notes on data](#) in ECDC's Vaccine Tracker for country-specific disclaimers.

Note: 'additional primary doses' are doses administered in addition to the primary course, either as an extension of the primary course (e.g. in immunocompromised individuals) or a booster dose to individuals who have completed the primary course.

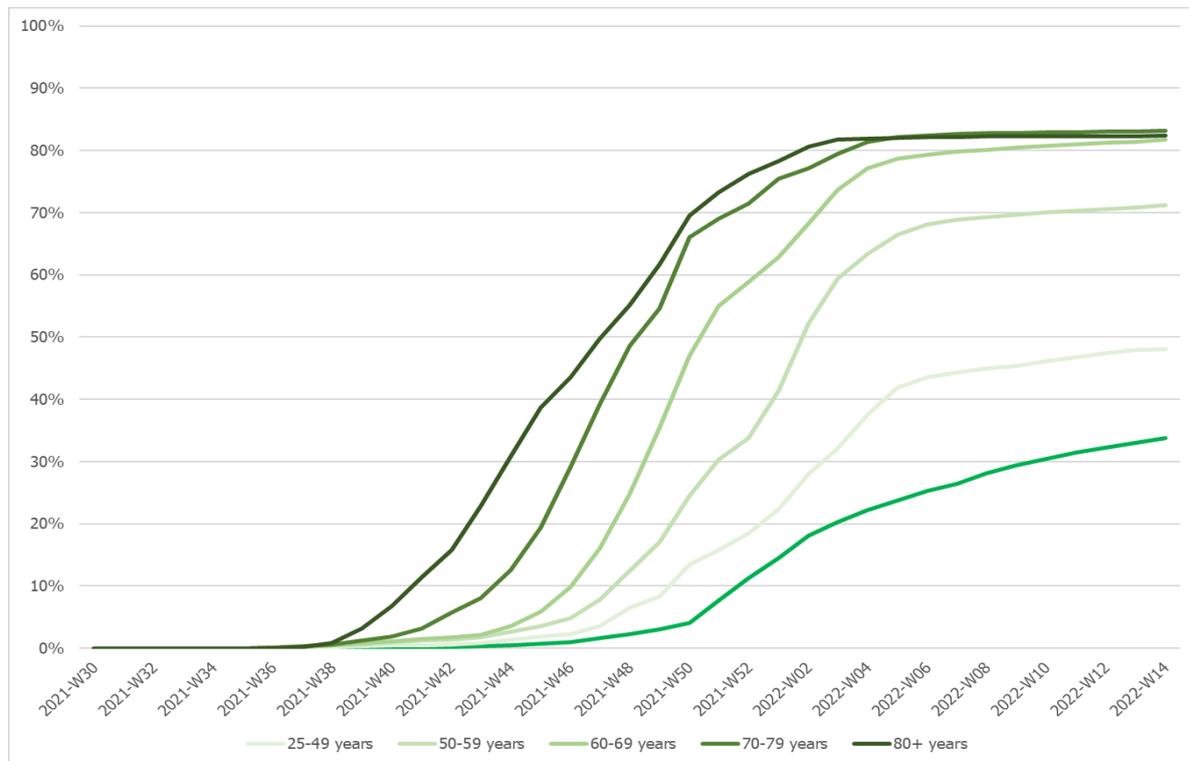
As of 10 April 2022, the median uptake of the primary course among older adults aged 60 years and above in the EU/EEA reached a plateau at just above 91.5%. It reached 74.7% in 18–24-year-olds; 78.4% in 25–49 year-olds and 85.4% in 50–59 year-olds (27 countries reporting). In eligible adolescents and children the median uptake is 23.2% for those aged under 18 years (29 countries reporting), 72% in 15–17 year-olds and 38.1% in 10–14 year-olds (27 countries reporting) (Figure 3). Among older adults aged 60 years and above the median uptake for an additional dose has already reached 83.3% (29 countries reporting).

Figure 3. Median cumulative uptake of vaccination with a) a primary course and b) an additional dose by age group in EU/EEA countries, as of week 14, 2022

a) Primary course



b) Additional dose



Source: TESSy data reported by 30 countries as of week 14, 2022; for age groups 10–14 years, data are available for 17 countries (Austria, Croatia, Cyprus, Czechia, Denmark, Finland, Greece, Iceland, Ireland, Latvia, Liechtenstein, Lithuania, Luxembourg, Poland, Portugal, Slovakia and Spain) and for age groups 15–17 years data are available for 18 countries (Austria, Croatia, Cyprus, Czechia, Denmark, Finland, Greece, Iceland, Ireland, Latvia, Liechtenstein, Lithuania, Luxembourg, Poland, Portugal, Slovakia, Spain and Sweden).

Table 1 shows a summary of the cumulative uptake of the primary course and additional dose in the total population, adults (18+ years), elderly (60+ years) and individuals under 18 years. More information on the COVID-19 vaccine roll-out in EU/EEA countries can be found on [ECDC's Vaccine Tracker](#) [10] and in the weekly [COVID-19 country overviews](#) [11].

Table 1. Summary table of COVID-19 vaccine uptake by target population as of week 14, 2022

Vaccine uptake	Uptake (range)	Reporting countries
Primary course in the total population	72.5% (range: 29.6–86.2%)	All 30 EU/EEA countries.
Additional dose in the total population	52.9% (range: 8.9–70.7%)	All 30 EU/EEA countries.
Primary course among adults (18+ years)	83.3% (range: 35.2–94.7%)	All 30 EU/EEA countries.
Additional dose among adults (18+ years)	63.9% (range: 10.8–88.4%)	All 30 EU/EEA countries.
Primary course among people aged 60+ years (median)	91.5% (range: 38–100%)	29 (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden).
Additional dose among people aged 60+ years (median)	83.3% (range: 13.4–100%)	29 (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden).
Primary course among those under 18 years (median)	23.3% (range: 2.1–44.7%)	29 (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden).

*Source: TESSy; data reported as of week 14, 2022.

Vaccination strategies and policies during roll-out

Countries continue to adapt vaccination strategies and policies based primarily on the changing epidemiological situation at country and sub-national level, new information regarding the efficacy of the various COVID-19 vaccines, safety, effectiveness (including the duration of protection from the vaccines against different outcomes), and new evidence on the virus and its impact on human health.

The vaccination policies captured in this section include vaccination of adolescents aged 12–17 years and children 5–11 years; timing between doses; recommendations for vaccination in those previously infected; recommendations regarding vaccine products for age or target groups; recommendations for an additional primary vaccine dose or a booster dose; changes in vaccination strategies in light of the Omicron VOC; mandatory vaccination and use of vaccination certificates.

Vaccination of adolescents and children 5–17 years

All 30 EU/EEA countries are recommending vaccination for all 12–17-year-olds. Following authorisation of a lower dose of Comirnaty for children aged five to 11 years [12] and Spikevax for 6–11 year olds [13], 28 of the 30 countries are currently recommending vaccination for all children aged 5–11 years. Two countries are recommending vaccination for those children aged 5–11 years with risk factors.

Table 2. Countries recommending vaccination of children aged 5–11 years (n=30)

Vaccination of children aged 5-11 years	Countries
Yes, for all children.	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway*, Poland, Portugal, Romania, Slovakia, Slovenia, Spain.
Yes, but only for children with risk factors.	Germany [^] , Sweden.

* It is recommended that children aged 5-11 years with severe underlying disease should be given a two-dose primary series, children with no underlying disease can be vaccinated with both one and two doses, if they and their parents agree.

[^] Vaccination is also recommended for 5–11-year-olds who are in the vicinity of relatives or other contact persons at high risk of developing severe COVID-19, who cannot be vaccinated themselves or for whom there is reasonable suspicion of insufficient protection after vaccination. Vaccination can also be given to children between the ages of five and 11 years with underlying conditions if the children and their parents or guardians so wish, after obtaining medical advice.

The majority of the responding countries are following the indication authorised by EMA for this age group. In Spain, children aged five to 11 years are recommended two doses of the Comirnaty paediatric formulation, with an interval of eight weeks and upwards between doses (to achieve a better immune response and safety profile). Norway report that two doses of vaccine with an 8–12-week interval is being recommended for children with severe underlying conditions, and the vaccine is being made available for healthy children in the same age group if parents would like to vaccinate their children. In Portugal, children aged 5–11 years are recommended two doses of the Comirnaty paediatric formulation, with an interval of six-to-eight weeks in between.

Plan to expand vaccination to children aged <5 years

The majority of countries are currently discussing an expansion of vaccination to children aged <5 years if vaccines are authorised by EMA for this age group. Two countries are planning to expand vaccination to <5 years, five countries are not planning to expand, and five countries have not yet discussed this issue.

Table 3. Plan to expand vaccination to children aged under five years (n=26)

Plan to expand vaccination to children aged <5 years	Countries
Yes, for all children.	Lithuania, Malta
No	Belgium, Croatia, Ireland, The Netherlands, Sweden
Under discussion	Czechia, Finland, Germany, Latvia, Luxembourg, Poland Romania
Have not discussed yet	Austria, Cyprus, Liechtenstein, Norway, Slovenia, Spain

Recommendation of COVID-19 primary vaccination in individuals previously infected with SARS-CoV-2

Based on the most recently reported information, 17 countries currently recommend the full primary vaccination schedule for people who have previously been infected, while 13 countries recommend only one dose (for vaccines with a two-dose schedule).

Table 4. Recommendations of COVID-19 vaccination in individuals previously infected (n=29)

Recommended vaccination dose for individuals previously infected with SARS-CoV-2	Countries
Full vaccination course.	Belgium, Bulgaria, Cyprus, Czechia, Denmark, Hungary, Ireland, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Romania, Poland, Slovakia, Slovenia, Sweden.
One dose (for those vaccines that have a two-dose regimen).	Austria*, Croatia*, Estonia^, Finland France, Germany, Greece, Iceland, Italy, Latvia, Norway, Portugal^, Spain^~.

* A second dose may be administered in accordance with the EMA Summary of Product Characteristics (SmPC) if there is a need (e.g. problems entering a country that requires two doses even from those who have recovered from COVID-19). Otherwise, a second dose is recommended, but only as of four months after the first dose. A third dose is recommended as of 6 months after the second dose for individuals aged 12 years and above.

^ A second dose may be administered if there is a need (e.g. problems entering a country that requires two doses even from those who have recovered from COVID-19).

~ Full primary vaccination course is recommended for people ≥ 65 years old and people ≥ 5 years old with immunosuppression treatment or/and very high-risk conditions.

Recommendation of specific COVID-19 vaccine products to any target group/age group

Six of the 28 responding countries are following the EMA Summary of Product Characteristics (SmPC) for all vaccines (Bulgaria, Hungary, Latvia, Lithuania, Poland, Romania), while 22 countries recommend specific COVID-19 products for certain target and/or age groups, mainly relating to the use of Vaxzevria and/or the COVID-19 Vaccine Janssen in older age groups, only above a certain age. Nine countries have suspended or paused the use of certain COVID-19 vaccine products in their vaccination campaigns: Vaxzevria is not being used in Denmark, Liechtenstein, Malta, the Netherlands, Norway or Sweden. COVID-19 Vaccine Janssen is not being used in Denmark, Finland, Sweden or Norway. The use of Spikevax has been paused in Sweden for anyone born 1991 or later and in Finland Spikevax is not given to men under 30 years. In Iceland, Spikevax has been paused and is only being used for booster doses in individuals aged over 60 years. Spikevax has been temporarily suspended in Slovenia, and in Austria, France, Germany and Norway Spikevax is only recommended for those aged 30 years and over.

Table 5. Details of country recommendations for specific COVID-19 vaccine products in specific age or target groups (n=22)

Country	Comirnaty	Spikevax	Vaxzevria	COVID-19 Vaccine Janssen
Austria	Preferably recommended for pregnant women.	≥ 30 years		
Belgium			≥ 41 years	≥ 41 years
Croatia	Recommended for pregnant women.	≥ 30 years	≥ 50 years	
Cyprus	Recommends preference for mRNA vaccines in individuals aged <50 years.	Recommends preference for mRNA vaccines in individuals aged <50 years.	Not recommended for individuals with thrombotic/thrombocytopenia syndrome.	Not recommended for individuals with previous capillary leak syndrome.
Denmark			Vaccine no longer used but can be given to people who want it after consultation with a doctor.	Vaccine not used but can be given to people who want it after consultation with a doctor.
Estonia			≥ 50 years	≥ 18 years
Finland		Men aged ≥ 30 years	Vaccine no longer used.	≥ 65 years
France		≥ 30 years	≥ 55 years	≥ 55 years
Germany	From five years and upwards. The only vaccine recommended for pregnant women.	≥ 30 years	≥ 60 years	≥ 60 years

Country	Comirnaty	Spikevax	Vaxzevria	COVID-19 Vaccine Janssen
Greece			≥60 years	
Iceland		Stopped use other than for booster doses or individuals aged >60 years.	>55 years women >40 years men without risk factors that increase the risk of thrombosis.	
Ireland	Recommended for the booster vaccine for ≤29 years	≥30 years (individuals under 30 years who received a previous dose of Spikevax should receive Comirnaty as a second or subsequent dose.	≥50-69 years; not recommended for pregnant women.	≥50-69 years; <50 years if two-dose vaccine not feasible. Not recommended for pregnant women.
Italy			≥60 years	≥60 years
Latvia	Recommended for adolescents and young adults (12-25 years).	Recommended from the age of 26 years.	≥18 years	≥18 years
Liechtenstein	From the age of five years and upwards. Special formulation for children.	Recommended for persons ≥30 years	Not approved.	Only used for those aged ≥18 years with medical contraindications against vaccination with mRNA vaccines or for people who refuse vaccination with mRNA vaccine.
Luxembourg	mRNA vaccine for people under <30 years and pregnant women. For people aged 30-54 years at risk of severe COVID-19, preference should be given to mRNA vaccines, if available.	mRNA vaccine for people under <30 years and pregnant women. For people aged 30-54 years at risk of severe COVID-19, preference should be given to mRNA vaccines, if available.	Those aged 30–54 years can register to be voluntarily vaccinated. ≥55 years	≥30 years
Malta	Recommended from five years.	Recommended from 12 years.	Not being used.	≥18 years
The Netherlands	Recommended for pregnant women.	Recommended for pregnant women. Used for booster vaccine in those aged ≥50 years.	Not used in current vaccination programme.	Only if explicitly requested for people aged ≥ 18 years (pregnant women are excluded and risk groups are advised to be vaccinated with an mRNA vaccine).
Norway		≥30 years	Not used	Not used
Portugal			≥ 60 years	Recommended for all people aged ≥50 years and only for males aged <50 years.
Slovenia	Recommended for those under 30 years.		Only recommended in the event of contraindication of other vaccines or if explicitly requested by the individual.	Temporarily suspended
Spain	Recommended for the elderly (≥70), pregnant women, individuals with high-risk conditions. For other age groups – according to availability. Recommended for booster doses ≥5 years	Recommended for elderly (≥70), pregnant women and individuals with high-risk conditions. For other age groups – according to availability. Recommended for booster doses ≥12 years	≥60 years	≥40 years
Sweden		Paused for individuals aged >30 years.	Not used	Suspended.

Additional primary dose and booster dose recommendations

Booster doses are for people who responded adequately to the primary vaccination series, whereas additional primary doses are for those with weakened immune systems who did not respond adequately to primary vaccination. Booster doses are given to vaccinated people (i.e. those who have completed a primary series of COVID-19 vaccination) to restore protection after it would have waned. On the other hand, additional primary doses may be given to people with severely weakened immune systems as part of a primary vaccination series, since they may not achieve an adequate level of protection from the standard primary vaccination.

For individuals with weakened immune systems, all 30 countries recommend an additional primary dose as an extension of the primary vaccination course for those who are immunocompromised. Twenty countries are also recommending a booster dose for immunocompromised individuals following the extended primary three-dose vaccination series (four doses).

In the general population, all 30 countries are also recommending booster doses for waning immunity to different age groups. Half of the EU/EEA countries (15/30) are recommending booster doses for all adults aged 18 years and over. For younger age groups, fifteen countries are recommending boosters for adolescents. In particular, 13 countries are recommending them to all those aged 12 years and over and two countries are recommending boosters to all those aged 16 years and over.

Since the last vaccine deployment report, there are now nine countries that have also started recommending a second booster dose (four doses) to various vulnerable groups in the general population, such as the elderly, with different age cut-offs and time intervals between the first booster dose (third dose) and the second booster dose (fourth dose) as set out below:

- Cyprus - for those aged 70+ years and healthcare workers, with a five-month interval;
- Finland - in those aged 80+ years, with a three-month interval;
- France - for those aged 80+ years and those aged 65+ years with risk factors, with a six-month interval;
- Germany- for those aged 70+ years with a three-month interval and healthcare workers, with six-month interval;
- Greece - for those aged 60+ years, with a four-month interval;
- Hungary - for the elderly and those with chronic disease and to anyone who requests it, with a four-month interval;
- Ireland - for those aged 65+ years, with a six-month interval;
- The Netherlands - for those aged 70+ years, with a four-month interval;
- Sweden - for those aged 65+ years, with a four-month interval).

Table 6. Details of recommendations for an additional dose and/or a booster dose (n=30)

Country	Recommendation and timing of additional doses and booster doses of COVID-19 vaccination for individuals with weakened immune systems (i.e. immunocompromised and immunosuppressed)	Recommendation for booster doses of COVID-19 vaccination and timing for the general population
Austria [14]	<p>Recommendation: Additional dose for individuals ≥5 years (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose is given at least 28 days after second dose. At least four weeks later, testing of neutralising antibodies is recommended to find out whether any immune response has occurred. If no neutralising antibodies can be detected after the additional third dose, an additional fourth dose is recommended at least four weeks after the third dose (off-label). In the event of negative neutralising antibody test four weeks after third dose, administration of fourth dose is recommended.</p>	<p>Recommendation: One booster dose for individuals ≥12 years (primary two-dose vaccination series plus a booster dose). Individuals 5–11 years of age only if immunocompromised and after individual risk-benefit-evaluation with physician. Two booster doses (fourth dose) for immunocompetent individuals is not generally recommended due to lack of scientific data, but can be considered in persons aged ≥65 years or at high-risk of developing severe COVID-19 following individual risk-benefit-evaluation with physician and at the explicit request of the person to be vaccinated.</p> <p>Timing: Individuals aged 18 years and above: booster given as of four months after the second dose; persons aged 12 to 17 years: as of six months after the second dose. After one dose with COVID-19 Vaccine Janssen a second dose is recommended 28 days after the first dose (preferably with mRNA-vaccine), COVID-19 Vaccine Janssen can also be used again for the second dose, in this case an interval of at least two months between the first two doses is recommended and a third dose at the above-indicated intervals (four months) is also recommended for people vaccinated with COVID-19 Vaccine Janssen. Two booster doses (fourth doses) can be considered as of six months after the first booster (third dose) for people aged ≥65 years or at high-risk of developing severe COVID-19, following individual risk-benefit-evaluation with physician and at the explicit request of the person to be vaccinated.</p>

Country	Recommendation and timing of additional doses and booster doses of COVID-19 vaccination for individuals with weakened immune systems (i.e. immunocompromised and immunosuppressed)	Recommendation for booster doses of COVID-19 vaccination and timing for the general population
Belgium [15]	<p>Recommendation: Additional dose for individuals aged 5-11 years (extended primary three-dose vaccination series). One booster dose (fourth dose) for individuals >12 years (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least 28 days after second dose followed by a booster dose (fourth dose) at least three months after the third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥18 years (primary two-dose vaccination series plus a booster dose).</p> <p>Timing: Booster given at least four months after primary vaccination with mRNA-based vaccines; four months after primary vaccination with Vaxzevria; two months after single dose of COVID-19 Vaccine Janssen.</p>
Bulgaria [16]	<p>Recommendation: Additional dose for individuals (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose given at least 28 days after second dose.</p>	<p>Recommendation: One booster dose for individuals age ≥12 years (primary two-dose vaccination series plus a booster dose).</p> <p>Timing: Booster dose given at least three months after primary vaccination for those aged ≥18 years. For those aged 12-17 years at least six months after primary vaccination.</p>
Croatia [17]	<p>Recommendation: Additional dose plus one booster dose (four doses) for individuals aged ≥5 years (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least eight weeks after second dose, followed by a booster dose at least three months after the additional dose.</p>	<p>Recommendation: One booster dose for individuals ≥18 years (primary two-dose vaccination series plus a booster dose). Also recommended for children aged 12 years and over with underlying risk factors and at increased risk of severe disease.</p> <p>Timing: Booster dose given at least three months after primary vaccination; two months after single dose of COVID-19 Vaccine Janssen.</p>
Cyprus [18]	<p>Recommendation: Additional dose plus one booster dose (four doses) for individuals irrespective of age (extended primary three-dose vaccination series plus a booster).</p> <p>Timing: Additional dose given at least four weeks after second dose followed by a booster dose at least five months after the third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥12 years (two dose primary vaccination series with mRNA-based vaccines plus booster dose with Comirnaty). Two booster doses given to those aged >70 years, residents and staff at LTCF, healthcare professionals (two dose primary vaccination series plus two booster doses (second booster dose with mRNA-based vaccines)).</p> <p>Timing: First booster dose given at least five months and two weeks after primary vaccination, second booster dose at least five months after the first booster dose.</p>
Czechia [19]	<p>Recommendation: Additional dose for individuals (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose given at least one month after second dose.</p>	<p>Recommendation: Once booster dose for individuals aged ≥12 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least three months after primary vaccination for those aged >60 years, LTCF residents and staff, healthcare workers and people with chronic conditions. For the rest of the population five months after primary vaccination. Two months after single dose of COVID-19 Vaccine Janssen.</p>
Denmark [20]	<p>Recommendation: Additional dose plus one booster dose for individuals (extended primary three-dose vaccination series plus a booster).</p> <p>Timing: Additional dose given at least one month after second dose and a maximum of eight months afterwards or at earliest convenience (different timings depending on the risk group) followed by a booster dose at least three months after the third dose.</p>	<p>Recommendation: Three doses for individuals aged ≥18 years (2 dose primary vaccination series plus booster dose).</p> <p>Timing: Booster given at least 140 days after primary vaccination.</p>
Estonia [21]	<p>Recommendation: Additional dose for individuals (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose given at least one month after second dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥18 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster given at least three months after primary vaccination with mRNA-based vaccines; and Vaxzevria; two months after single dose vaccination with COVID-19 Vaccine Janssen. Recovered individuals – five months after recovery.</p>
Finland [22]	<p>Recommendation: Additional dose plus a booster dose for individuals aged >12 years (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least two months after second dose followed by a booster dose at least 3-4 months after the third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥18 years and persons aged 12-17 years in risk groups (two dose primary vaccination series plus booster dose).</p>

Country	Recommendation and timing of additional doses and booster doses of COVID-19 vaccination for individuals with weakened immune systems (i.e. immunocompromised and immunosuppressed)	Recommendation for booster doses of COVID-19 vaccination and timing for the general population
		<p>Two booster doses for individuals aged ≥ 80 years, residents of LTCFs (two dose primary vaccination series plus two booster doses).</p> <p>Timing: One booster dose given to those over 60 years of age and at-risk groups aged over 18 years is recommended 3-4 months after primary course. For persons between 18 and 60 years of age, a booster dose is recommended 4-6 months after primary course. In 12–17-year-olds six months after primary course. For those vaccinated with Janssen vaccine, a booster dose is recommended two months after the primary course. Second booster dose given at least three months after the first booster dose.</p>
France [23]	<p>Recommendation Additional dose plus a booster dose for individuals (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least one month after second dose, followed by a booster dose as least three months after the third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥ 12 years (two dose primary vaccination series, plus booster dose). Two booster doses for individuals aged ≥ 80 years, residents of LTCFs aged >65 years who are at risk of severe disease and want to have it (two dose primary vaccination series plus two booster doses).</p> <p>General population: Booster dose given at least three months after primary vaccination and a second booster dose given at least six months after the first booster dose.</p>
Germany [24]	<p>Recommendation Additional dose plus two booster doses for individuals aged ≥ 5 years (extended primary three-dose vaccination series plus two booster doses).</p> <p>Immunocompromised individuals: Additional dose is given at least one month after the second dose followed by a booster dose given at least three months after the third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥ 12 years and 5- to 11-year-olds at increased risk of severe illness (two dose primary vaccination series plus booster dose). Two booster doses for individuals aged >70 years, residents of LTCFs and people at risk of developing severe illness in support facilities, workers in medical and nursing facilities (especially those in direct contact with patients and residents) (two dose primary vaccination series plus two booster doses).</p> <p>Timing: Booster dose given at least three months after primary vaccination for those ≥ 12 years. For 5–11-year-olds, booster dose given at least six months after primary vaccination. Second booster dose at least three months after first booster dose for those at risk. For personnel in medical and nursing facilities, first booster dose given at least six months after the second booster dose.</p> <p>For those vaccinated with COVID-19 Vaccine Janssen, a second dose with an mRNA vaccine is recommended one month after primary course to optimise immunisation. A booster of mRNA should follow after at least three months.</p>
Greece [25]	<p>Recommendation Additional dose plus one booster dose for individuals aged ≥ 12 years (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least four weeks after second dose, followed by a booster dose at least three months after the third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥ 18 years (two dose primary vaccination series plus booster dose). Two booster doses for those aged ≥ 60 years.</p> <p>Timing: One booster dose given at least three months after primary vaccination. Two months after primary vaccination with COVID-19 Vaccine Janssen. Second booster dose at least four months after first booster dose.</p>
Hungary [26]	<p>Recommendation: Additional dose plus one booster dose for individuals (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least 28–56 days after second dose, followed by a booster dose at least four months after third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥ 12 years (two dose primary vaccination series plus booster dose). Two booster doses for the elderly, and those with chronic disease and also available to anyone who asks for it (two dose primary vaccination series plus two booster doses).</p> <p>Timing: One booster dose given at least four months after primary vaccination followed by a second booster dose at least four months after first booster dose.</p>
Iceland [27]	<p>Recommendation: Additional doses for individuals (extended primary three-dose vaccination series).</p>	<p>Recommendation: One booster dose for individuals ≥ 16 years (two dose primary vaccination series plus booster dose).</p>

Country	Recommendation and timing of additional doses and booster doses of COVID-19 vaccination for individuals with weakened immune systems (i.e. immunocompromised and immunosuppressed)	Recommendation for booster doses of COVID-19 vaccination and timing for the general population
	<p>Timing: Additional dose given at least three months after second dose.</p>	<p>Timing: Booster dose given at least five months after second dose.</p>
Ireland [28]	<p>Recommendation: Additional doses for individuals aged 5-11 years (extended primary three-dose vaccination series). Additional dose plus one booster dose for individuals aged ≥12 years (extended primary three-dose vaccination series plus one booster dose).</p> <p>Timing: Additional dose given at least two months after second dose for those aged ≥12 years and 28 days after second dose for those aged 5-11 years. Booster dose given to those aged ≥12 years at least three months after the third dose.</p>	<p>Recommendation: One Booster dose doses for individuals aged ≥12 years (two dose primary vaccination series plus booster dose). Two booster doses for those aged ≥65 years (two dose primary vaccination series plus two booster doses).</p> <p>Timing: One booster dose is given to those aged >16 years at least three months after the primary vaccination and for 12–15-year-olds the booster dose is given at least six months after the primary vaccination dose. Second booster dose given at least four months after first booster dose.</p>
Italy [29]	<p>Recommendation: Additional dose plus a booster dose for individuals (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least 28 days after second dose, followed by a booster dose fourth months after third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥12 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: One booster dose given at least four months after primary vaccination.</p>
Latvia [30]	<p>Recommendation: Additional dose for individuals (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose given at least one month after second dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥18 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least three months after primary vaccination with mRNA vaccines. Two months after single dose of COVID-19 Vaccine Janssen. Three months after primary vaccination with Vaxzevria.</p>
Liechtenstein [31]	<p>Recommendation: Additional dose for individuals (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose given at least 28 days after second dose.</p>	<p>Recommendation: One booster dose for individuals ≥12 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least four months after primary vaccination.</p>
Lithuania [32]	<p>Recommendation: Additional dose for individuals (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose given at least 28 days after second dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥18 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least 90 days months after primary vaccination; 60 days after single dose of COVID-19 Vaccine Janssen.</p>
Luxembourg [33]	<p>Recommendation: Additional dose plus a one booster dose for individuals aged ≥18 years (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least 12 weeks after second dose followed by a booster dose at least three months after the third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥12 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least three months after primary vaccination with mRNA-based vaccines; four months after primary vaccination with Vaxzevria; one month after single dose of COVID-19 Vaccine Janssen followed by an optional third dose at least three months after the second dose.</p>
Malta [34]	<p>Recommendation: Additional dose for individuals (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose given at least 28 days after second dose.</p>	<p>Recommendation: One booster dose for individuals ≥18 years (2 dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least three months after primary vaccination.</p>
The Netherlands [35]	<p>Recommendation: Additional dose plus a booster dose for individuals (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose at least four weeks after second dose followed by a booster dose at least three months after third dose.</p>	<p>Recommendation: One booster dose for individuals 18-69 years (two dose primary vaccination series plus booster dose). Two booster doses for individuals aged ≥70 years, residents in LTCFs, adults with Down syndrome (two dose primary vaccination series plus two booster doses).</p> <p>Timing: One booster dose at least three months after primary vaccination, followed by a second booster dose at least three months after the first booster dose.</p>

Country	Recommendation and timing of additional doses and booster doses of COVID-19 vaccination for individuals with weakened immune systems (i.e. immunocompromised and immunosuppressed)	Recommendation for booster doses of COVID-19 vaccination and timing for the general population
Norway [36]	<p>Recommendation: Additional dose plus a booster dose for individuals (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least four weeks after second dose, followed by a booster dose at least three months after the third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥ 18 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least 20 weeks after primary vaccination with mRNA-based vaccines; COVID-19 Vaccine Janssen dose is followed by mRNA vaccine after at least 8-12 weeks, followed by a booster with mRNA vaccine at least 20 weeks after second dose.</p>
Poland [37]	<p>Recommendation: Additional dose plus a booster dose for individuals (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least four weeks after second dose, followed by a booster dose at least three months after third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥ 12 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least five months after primary vaccination; two months after single dose of COVID-19 Vaccine Janssen.</p>
Portugal [38]	<p>Recommendation: Additional dose plus a booster dose for individuals (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose of mRNA vaccine given at least three months after second dose (minimum 28 days) followed by a booster dose of mRNA vaccine six months (minimum five months) after the third dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥ 18 years (two dose primary vaccination series plus booster dose) prioritised in the following order:</p> <p>Timing: Booster dose of mRNA vaccine given six months (minimum five months) after primary vaccination for mRNA vaccines or Vaxzevria. Three months after primary vaccination with COVID-19 Vaccine Janssen.</p>
Romania [39]	<p>Recommendation: Additional dose for individuals (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose given 28-120 days after second dose.</p>	<p>Recommendation: One booster dose doses for individuals aged ≥ 12 years (two dose primary vaccination series plus booster dose) especially for people at high risk of exposure, vulnerable people and on request for those who have completed the full vaccination course more than six months ago.</p> <p>Timing: Booster dose given at least four months after primary vaccination.</p>
Slovakia [40]	<p>Recommendation: Additional dose doses for individuals (extended primary three-dose vaccination series).</p> <p>Timing: Additional dose given at least four weeks after second dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥ 18 years (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least three months after primary vaccination.</p>
Slovenia [41]	<p>Recommendation: Additional dose plus one booster dose for individuals (extended primary three-dose vaccination series plus a booster dose)</p> <p>Timing: Additional dose given at least four weeks after second dose followed by a fourth dose at least three months after the third dose.</p>	<p>Recommendation: One booster dose for individuals ≥ 18 years and 12-17 years with chronic diseases. Healthy individuals 12-17 years can choose to get a booster (2 dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least three months after primary vaccination with mRNA vaccines or mixed schedule; at least two months after primary vaccination with Vaxzevria or COVID-19 Vaccine Janssen.</p>
Spain [42]	<p>Recommendation: Additional dose plus one booster dose for individuals (extended primary three-dose vaccination series plus a booster dose).</p> <p>Timing: Additional dose given at least 28 days after second dose, followed by a booster dose at least five months after the third dose.</p>	<p>Recommendation: One booster dose for individuals ≥ 18 years prioritised from oldest to youngest age groups (two dose primary vaccination series plus booster dose).</p> <p>Timing: Booster dose given at least five months after primary vaccination with mRNA vaccines; at least three months after primary vaccination with Vaxzevria or COVID-19 Vaccine Janssen.</p>
Sweden [43]	<p>Recommendation: Additional dose plus two booster doses for individuals ≥ 18 years (extended primary three-dose vaccination series, plus two booster doses).</p> <p>Timing: Additional dose given at least two months after second dose, followed by a first booster dose at least three months after third dose and a second booster dose at least three months after the first booster dose.</p>	<p>Recommendation: One booster dose for individuals aged ≥ 18 years (two dose primary vaccination series plus booster dose). Two booster doses for individuals aged ≥ 65 years, LTCF residents, people who have home care (hemtjänst) or home healthcare (hemsjukvård), people ≥ 18 with Down syndrome (two dose primary vaccination series plus two booster doses).</p> <p>Timing: First booster dose given at least three months after primary vaccination and the second booster dose given four months after the first booster dose.</p>

Sources: ISAA survey responses and validation from countries. Rapid desk review of official sources.

Recommendation for booster dose following a breakthrough infection

The majority of the 20 countries that responded to this question are recommending a booster dose following a breakthrough infection, with the time intervals recommended varying between countries.

Table 7. Recommendations of booster dose of COVID-19 vaccination in individuals previously infected (n=20)

Recommend booster dose following breakthrough infection	Countries
Yes	Austria, Croatia, Czechia, Cyprus, Hungary, Ireland, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovenia, Spain, Sweden
No	Finland*, Germany, Latvia, Lithuania, Norway*

* A booster dose can be administered if necessary, for example in order to receive a valid vaccination certificate.

Countries provided further information on the timing for administering a booster dose following natural infection, as set out below:

- Austria: a booster dose is recommended for persons aged 12 years and above six months after the second dose or shortly before 180 days since recovery from breakthrough infection. If infection occurred within 20 days before or after vaccination, both events are considered as one immunological event and thus, infection has no effect on the recommended vaccine schedule.
- Cyprus: 14 days from recovery.
- Hungary: four months after recovery.
- Ireland: three months after symptoms started or after receiving a positive test result if aged 16 years or older, and six months after symptoms started or after receiving a positive test result if aged 12 to 15 years.
- Luxembourg: one month after positive PCR test at the earliest.
- Malta: four weeks from date of positive test.
- Netherlands: three months after infection.
- Poland: 30 days after previous infection.
- Portugal: six months (minimum five months).
- Slovenia: three to six months after last event.
- Spain: at least four weeks after the infection (but the recommended interval is five months);
- Sweden: as soon as the person is healthy.
- Germany: a booster is not necessary if infection (positive PCR) occurred more than three months earlier, after the first series of vaccinations.

Changes in vaccination strategies in light of the Omicron VOC

Of the 24 countries that responded to this question, 19 reported that they have changed their vaccination strategy in light of the circulation of the Omicron VOC, with the majority of countries reducing the interval for administering the booster dose after completion of the primary vaccination course. Most countries reduced the interval from six months to five or three months. The Netherlands reported that several of the strategies mentioned above had already been put in place prior to increased concern over the circulation of the Omicron VOC. Austria reported that there is an increased focus on communicating about the effectiveness of the vaccination against the Omicron variant and that an infection is not the same as severe disease and vaccinated individuals are less likely to become seriously ill or end up in intensive care units. Finland has enhanced vaccination activity by strengthening the role of occupational healthcare – e.g. allowing nurses to vaccinate. In Hungary from the 1 May, only those aged over 18 years who have received the third dose of vaccine will be considered fully vaccinated and the national immunity card will be converted into a vaccination card. Hungary also reported that recovery certificates issued on the basis of infection will expire on 1 May. In Slovenia they have begun recommending booster doses to those who have recovered from COVID-19 and received their primary vaccination series.

Five countries (Bulgaria, Denmark, Lithuania, Poland, Romania) reported that they have not changed their vaccination strategy due to the Omicron VOC.

Table 8. Changes in vaccination strategies in light of the Omicron VOC (N=25)

Changes in vaccination strategies	Countries
Reducing the interval for administering the booster dose after completion of the primary series.	Austria, Cyprus, Czechia, Estonia, Finland, Germany, Greece, Ireland, Latvia, Liechtenstein, Luxembourg, Malta, the Netherlands, Norway, Portugal, Slovenia, Sweden.
Enhanced risk communication initiatives to increase uptake of primary series and boosters.	Austria, Cyprus, Estonia, Finland, Germany, Greece, Hungary, Latvia, Liechtenstein, Luxembourg, Malta, the Netherlands, Portugal, Slovenia.
Extending the eligibility criteria for booster doses.	Belgium, Finland, Luxembourg, Malta, the Netherlands, Portugal, Slovenia, Spain.
Re-opening community-based vaccination sites to accelerate deployment of booster doses.	Belgium, Latvia, Liechtenstein, Luxembourg, Malta, Spain.
Re-opening health facility-based vaccination sites to accelerate deployment of boosters.	Hungary, Liechtenstein, Luxembourg, Malta, Spain.

Mandatory vaccination

At the start of vaccination campaigns in the EU/EEA, vaccination was not mandatory in any of the countries for any population groups. There are now seven countries with mandatory vaccination in place for healthcare workers and/or workers in long-term care facilities (France, Germany, Greece, Hungary, Italy, Latvia and Poland). There are some countries specifying that vaccination is mandatory for other groups, including Hungary, where legislation has been introduced to make COVID-19 vaccination mandatory for those working in public education, law enforcement, the military, the civil service and the tax inspectorate. In addition, employers also have the right to require that their employees get vaccinated. In Latvia, vaccination is mandatory for employees and officials of state and local government institutions, educational staff, medical staff, security and rescue staff, prison staff and those working in specific private institutions. In Lithuania, there are plans to introduce mandatory COVID-19 vaccination and the government has decided to submit amendments to the Law on the Prevention and Control of Communicable Diseases of the People to the Seimas (Lithuanian Parliament). These amendments will make vaccination compulsory for medical and social workers. In Poland, mandatory vaccination is in place for medical professionals, pharmacy workers and medical students. In Austria, since 5 February 2022 COVID-19 vaccination has become mandatory for all those over 18 years old resident in Austria. This law making vaccination mandatory for the general population was suspended in March 2022. Vaccination is not mandatory in any other EU/EEA countries.

Table 9. Mandatory vaccination (n=30)

Mandatory vaccination	Countries
Yes, for certain population groups.	Austria*, France, Germany, Greece, Hungary, Italy, Latvia, Poland.
Planned mandatory vaccination.	Lithuania.
No.	Belgium, Bulgaria, Croatia, Czechia, Cyprus, Denmark, Estonia, Finland, Iceland, Ireland, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden.

*The law making vaccination mandatory for the general population in Austria was suspended in March 2022

COVID-19 vaccination certificates

Countries are using vaccination certificates for medical purposes, and the majority are also using them for travel purposes. Several of the responding countries have been using vaccination certificates to enable people to gain access to specific locations/events (e.g. restaurants, museums, concerts, etc.): Austria, Belgium, Bulgaria, Croatia, Cyprus, Estonia, Finland, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania and Slovenia). In Poland a vaccination certificate is not obligatory in order to access specific locations/events but those that do have a certificate are exempt from any limitations. Portugal responded that the EU digital COVID certificate is used for domestic purposes, such as visiting residents in nursing homes and enabling visitors to access hospitalised patients. The EU digital COVID certificate is also required at border control, however it is no longer required for accessing events and locations. A number of countries also report that they are now discontinuing the use of vaccination certificates for access to locations/events.

Current challenges and good practice with vaccine roll-out

Vaccine uptake and acceptance

It is vital to reach pockets of unvaccinated individuals in order to increase vaccination coverage and protection against severe disease, hospitalisation and death. There is no 'one-size-fits all' approach to increasing vaccination uptake in diverse populations as this is a complex issue and the underlying reasons for lower uptake vary considerably among and within countries. Countries are using several different strategies to increase uptake in their populations.

Challenges in increasing vaccine uptake in different population groups

Healthcare workers and LTCF workers

The majority of countries that responded to this question reported that they were not facing challenges with the increase of uptake among healthcare workers and LTCF workers. Belgium reported challenges with the increase of uptake in healthcare workers and five countries reported challenges with the increase of uptake in both healthcare workers and LTCF workers (Bulgaria, Finland, Germany, Slovenia, Sweden).

Table 10. Challenges with increasing vaccine uptake in healthcare workers and/or LTCF workers (n=25)

Facing challenges with increasing vaccine uptake in healthcare workers and/or LTCF workers	Countries
No challenges to the increase of uptake in these groups.	Cyprus, Denmark, Estonia, Hungary, Iceland, Ireland, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Spain.
Challenges to the increase of uptake in healthcare workers.	Belgium.
Challenges to the increase of uptake in LTCF workers	Austria, Czechia.
Challenges to the increase of uptake in both healthcare workers and LTCF workers.	Bulgaria, Finland, Germany, Slovenia, Sweden.

Elderly population

Eight of the 23 reporting countries indicated that there were challenges to increasing vaccine uptake among the elderly.

Table 11. Challenges with increasing vaccine uptake in the elderly population (n=24)

Challenges with increasing vaccine uptake in the elderly population	Countries
No challenges to increasing vaccine uptake in the elderly population.	Belgium, Croatia, Cyprus, Denmark, Finland, Hungary, Iceland, Ireland, Liechtenstein, Luxembourg, Malta, Portugal, Romania, Spain, Sweden.
Yes, facing challenges with increasing vaccine uptake in the elderly population.	Austria, Czechia, Estonia, Germany, Latvia, Lithuania, the Netherlands, Slovenia.

Young people and children

More than half of the 22 countries who responded to this question are facing challenges in increasing vaccine uptake among young adults and adolescents (approximately 12–35 years of age) and ten (10/19) countries are facing challenges in increasing vaccine uptake among children over five years. Spain reported that there are many people in younger population groups delaying the booster dose due to recent COVID infection (caused by the high incidence of Omicron and the recommendation to wait five months from infection). Sweden also reported that many people in this age group have been naturally infected with Omicron and are therefore delaying booster doses.

Cyprus reported that some of the measures put in place to increase uptake include weekly vaccinations given in remote communities, schools and businesses (on request) by mobile vaccination units; increases in working hours, appointments through a portal and walk-in vaccination centres; vaccination lectures in schools with a low vaccination rate and in businesses (on request) and continuous updates on the subject in the media.

In Finland to increase uptake they have run media campaigns and increased the possibilities for vaccination - for example, without needing to make a reservation and by arranging vaccination in schools for children.

Lithuania reported enhanced communication and placing restrictions on unvaccinated individuals to try and increase the uptake of vaccines in the younger age groups.

Spain reported that although coverage is 93.6% for 12 to 19 year-olds, 84.3% for 20-to-29 year-olds and 84.9% for 30-to-39 year-olds, it is becoming very difficult to increase this coverage.

Table 12. Challenges with increasing vaccine uptake in young adults and adolescents (approximately 12–35 years) (n=22)

Challenges with increasing vaccine uptake in young adults and adolescents	Countries
No challenges with increasing vaccine uptake in young adults and adolescents.	Belgium, Bulgaria, Denmark, Iceland, Ireland, Latvia, Malta, Portugal, Romania.
Yes, facing challenges with increasing vaccine uptake in young adults and adolescents.	Austria, Cyprus, Czechia, Estonia, Finland, Germany, Hungary, Lithuania, Liechtenstein, Luxembourg, the Netherlands, Slovenia, Spain, Sweden.

Table 13. Challenges with increasing vaccine uptake in children aged 5-11 years (n=20)

Challenges with increasing vaccine uptake in children aged 5-11 years	Countries
No challenges with increasing vaccine uptake in young adults and adolescents.	Belgium, Czechia, Germany, Hungary, Luxembourg, Malta, the Netherlands, Portugal, Romania.
Yes, facing challenges with increasing vaccine uptake in young adults and adolescents.	Austria, Cyprus, Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Liechtenstein, Slovenia, Spain.

Challenges with increasing uptake of booster doses

Of the 14 countries that responded to the question on whether they are facing challenges in increasing the uptake of booster doses, eight countries reported that confirmed this to be the case. Three countries said that the delay in receiving a booster dose is related to the fact that many people are not eligible for a booster dose yet, as a result of having been recently infected and due to the recommendation to wait for a certain period after infection/recovery before getting a booster dose (Cyprus, the Netherlands, Portugal and Spain).

Table 14. Challenges with increasing vaccine uptake of booster doses (n=14)

Challenges with increasing vaccine uptake of booster doses	Countries
No challenges with increasing vaccine uptake of booster doses	Belgium, Czechia, Malta, Portugal, Romania
Yes, facing challenges with increasing vaccine uptake of booster doses	Austria, Cyprus, Finland, Hungary, Ireland, Liechtenstein, Lithuania, the Netherlands, Slovenia, Spain

Socially vulnerable or underserved populations

Countries identified the various socially-vulnerable populations with whom they are facing challenges in relation to increasing uptake or access to vaccines. The majority of countries are facing challenges increasing uptake among ethnic minorities. Some countries consider that there are challenges with access and uptake in all the socially-vulnerable groups identified below, however this remains unquantified.

Table 15. Challenges with increasing vaccine uptake in socially-vulnerable or underserved populations (n=15)

Main population groups in which there are challenges for the increase of vaccine uptake	Countries
Ethnic minorities	Austria, Czechia, Denmark, Finland, Latvia, Lithuania, the Netherlands, Sweden
Irregular migrants	Austria, Denmark, Latvia, Lithuania, Sweden
People experiencing homelessness	Austria, Denmark
People with alcohol or drug dependence	Austria, Denmark
People with mobility issues	Austria, Latvia
Prison populations	Latvia
Low socio-economic strata	Austria, Denmark, Hungary, Latvia, the Netherlands, Sweden
Other	Germany, Iceland, The Netherlands, Slovenia, Spain.

Other groups identified as being a challenge in terms of increasing vaccine uptake include groups in the Netherlands who are generally more hesitant towards the government and governmental institutions and anti-vaccination groups in Spain. Similarly, in Germany there is a percentage of the population (less than 10%) who are not willing to receive vaccination and not open to being persuaded to do so. Iceland reported that some migrant workers come to the country without vaccination and although the reason was unknown, it could be lack of access to healthcare. Programmes had been put in place to try and reach these groups – for example through their employers.

Drivers of low vaccination

A few countries described some of the drivers of low vaccination acceptance and uptake in different population groups. Many countries mentioned issues of mistrust, misinformation and low perception of risk in young people as some of the main drivers of low vaccination in different population groups.

Table 16. Drivers of low vaccination (n=14)

Country	Drivers of low vaccination in different population groups
Austria	Current research (Austrian Corona Panel Project, September 2021) shows that 34% are concerned about possible side effects; 21% are of the opinion that the certified vaccines are not safe; 44% do not feel sufficiently informed about the mode of action of the vaccines; 65% see vaccination as self-protection and only 51% assumed that this contributed to the protection of others. The Austria Corona Panel Project (February 2022) currently shows that the unvaccinated population mainly mistrusts the government, experts and health authorities. Therefore, official vaccination campaigns are having limited impact.
Croatia	Vaccine hesitancy related to distrust and misinformation about vaccine side effects and safety concerns (long-term impact on health) and a strong anti-vaccination campaign especially in social media, distrust of leading institutions and public authorities. A low perception of risk of COVID-19 in people who refuse to get vaccinated, especially young people.
Cyprus	There is mistrust and a low perception of risk in younger age groups, particularly in the age group 16-29 years. For parents of children aged 5-11 years there is fear about possible future side effects, not enough testing of the vaccines, the feeling that the vaccine is unnecessary to protect children and the fact that they do not trust new technology. Those aged 20-29 years are more sceptical than other age groups. Nurses/midwives have concerns about the vaccine's expedited development and fear of side effects.
Estonia	The main issues are related to vaccine hesitancy, chiefly mistrust about vaccine safety. In addition, misinformation relating to vaccine efficacy and low risk perception is challenging. There is a lack of understanding as to why the younger population has to be vaccinated.
Finland	Among those of migrant origin the main reasons for lower vaccine uptake include insufficient access to reliable and official information on vaccine safety, misinformation, mistrust towards the public authorities and structural barriers in accessing vaccines (poor digital skills, poor access to information as to who is entitled to vaccines and where these are available). There are concerns regarding the safety of vaccines for adolescents (12-15 years). Additionally, parents who have not been vaccinated themselves are not likely to allow their children be vaccinated. The age structure of persons of migrant origin in Finland is younger than that of the general Finnish population. The challenges in vaccine uptake among young people of migrant origin are similar to those observed among the general population. It may be challenging for young people to perceive COVID-19 as a danger to themselves. Additionally, some key influencers in social media have also been distributing misinformation on vaccines.
Germany	In Germany, according to the results of a survey on repeated cross-sectional monitoring of knowledge, risk perception, protective behaviour and trust during the current COVID-19 outbreak [44], people who hesitate to get vaccinated tend to rely on others, look for a great deal of information for and against the decision and weigh up the risks heavily. They also consider the vaccination to be a little less safe and are less convinced that by being vaccinated they will be able to return to normal, have more contact with others or make a contribution towards combatting the pandemic. People who completely refuse to get vaccinated (compared to those who are vaccinated) have stronger safety concerns and consider vaccination unnecessary as they believe that COVID-19 poses no threat to them. In contrast to other unvaccinated individuals, practical barriers do not play a role. They are less convinced that they will be able to return to normal through vaccination and have more contact with others.
Hungary	Misinformation and low perception of the risk of infection could be key factors. Major access issues in vaccine availability have not been observed.
Latvia	For the elderly, minorities and population groups with low socioeconomic status, there is misinformation and mistrust about the safety of vaccines and a low perception of risk.
Lithuania	According to empirical data, there is a distrust of COVID-19 vaccines and there are many rumours and false information being spread on the Internet. To try and counter this, vaccination promotion measures are being implemented and the COVID-19 certificate is widely used in Lithuania.
Malta	Malta has managed to fully vaccinate over 96% of the eligible population (aged >12 years). The remaining pockets of hesitancy are among migrant workers due to exposure to a large volume of misinformation from their home countries. It can also be difficult to communicate with them through health messages and education campaigns organised by the Ministry of Health because this population group is less likely to follow local media - both mainstream and social media.

Country	Drivers of low vaccination in different population groups
The Netherlands	Some of the drivers of low vaccination acceptance and uptake in different groups are low perception of risk, doubt about long-term effects, concern about side effects, mistrust of government in general, misinformation or insufficient information.
Slovenia	There is distrust around vaccine safety and a low perception of the risk of COVID-19 in young people. Young people are mainly concerned about the side effects of vaccination, the long-term impact of the vaccine on health and the safety of vaccines.
Spain	Spain reported a low perception of risk in young people, access issues in some socially vulnerable groups (such as seasonal agricultural workers) and mistrust in anti-vaccination groups. The Institute of Health Carlos III is coordinating the World Health Organization (WHO) Behavioural Insights survey on COVID-19, COSMO-SPAIN, to monitor the behaviour and attitudes of the population related to COVID-19 in Spain. The last round of the survey, produced in December 2021, includes an analysis of the reasons why vaccinations have not been completed [45].
Sweden	In Sweden, low vaccination coverage is associated with age (fewer young adults vaccinated), income and education (fewer vaccinated among those with low income and education), country of birth (fewer vaccinated among people born outside Sweden).

Strategies and measures in place for increasing vaccine uptake and acceptance

Countries are putting in place a number of strategies and measures to increase vaccine uptake and acceptance in certain population groups. The majority of countries are using mobile and pop-up vaccination teams and clinics, followed by targeted communication strategies, other outreach initiatives and intersectoral partnerships for community-based interventions.

Hungary: in view of the success of the previous vaccination campaigns and the appearance of the Omicron virus variant in Hungary, a vaccination campaign was announced which took place every Thursday, Friday and Saturday in January 2022 at hospital vaccination sites and the specialist offices of district healthcare services. In addition, doctors (GPs) are also arranging vaccination promotion events and weekend vaccination action days.

Table 17. Strategies and measures in place for increasing vaccine uptake and acceptance (n=26)

Strategies in place for increasing vaccine uptake and acceptance	Countries
Mobile and pop-up vaccination teams/clinics	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Finland, Germany, Greece, Iceland, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovenia, Spain, Sweden.
Targeted communication strategies	Austria, Belgium, Cyprus, Czechia, Denmark, Estonia, Finland, Germany, Greece, Hungary, Latvia, Liechtenstein, Lithuania, Malta, the Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden.
Outreach initiatives	Austria, Belgium, Cyprus, Czechia, Estonia, Finland, Germany, Greece, Iceland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Spain, Sweden.
Intersectoral partnerships for community-based interventions	Austria, Bulgaria, Czechia, Denmark, Finland, Germany, Greece, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Spain, Sweden.
Community participation in service delivery	Austria, Cyprus, Czechia, Denmark, Finland, Germany, Greece, Latvia, Lithuania, Malta, the Netherlands, Portugal, Slovenia, Spain, Sweden.
Social media campaigns	Austria, Belgium, Croatia, Cyprus, Czechia, Denmark, Estonia, Germany, Hungary, Ireland, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovenia, Spain, Sweden.
Working with community or faith leaders	Austria, Belgium, Cyprus, Denmark, Germany, Greece, Malta, The Netherlands, Portugal, Sweden.
Incentive schemes (e.g. vouchers or lottery)	Austria, Cyprus, Estonia, Greece, Poland, Romania.
Mandatory vaccination	Germany (for certain groups), Hungary, Latvia.

For further details of information and examples of specific strategies or good practices that countries have found to be effective in increasing vaccination uptake, please see the previous ECDC vaccine deployment report [7].

Limitations of the information collected in this report

The information presented in this report is not exhaustive. Some countries did not respond to the vaccine questions collected via the ISAA report and there were different response rates to the questions from week to week. Countries will continue to adapt strategies and plans as the vaccination roll-out continues, and this report provides an overview of progress at the current time.

Conclusions

As of 10 April 2022, since the start of the COVID-19 vaccine deployment in December 2020, the cumulative uptake of full vaccination with the primary vaccination series in the total EU/EEA population has reached 72.5% (range: 29.6–86.2%) and over 52.9% (range: 8.9–70.7%) for an additional vaccine dose (pooled data from 30 reporting countries). Among adults (aged 18 years and older) in the EU/EEA, the cumulative vaccine uptake reached 83.3% (range: 35.2–94.7%) for the complete primary course and 63.9% (range: 10.8–88.4%) for an additional vaccine dose (pooled data from 30 reporting countries). Nevertheless, vaccination uptake continues to differ among EU/EEA countries, with two countries still reporting less than 50% of the total population having completed a primary vaccination course.

All 30 EU/EEA countries are recommending primary vaccination for those aged 12 years and over and 28 countries have also started vaccinating all children over five years of age. All EU/EEA countries are recommending additional primary doses to immunocompromised individuals and a number of countries are also recommending a first booster dose (four doses) to immunocompromised individuals. All countries have also introduced booster doses for the general population, with around half of the countries recommending booster doses to adults over 18 years and the other half currently recommending boosters for younger age groups under 18 years. Seven countries have also started recommending a second booster dose (four doses) to various vulnerable groups in the general population, such as LTCF residents and the elderly with different age cut-offs. With the increased circulation of the Omicron VOC, a number of countries have made changes to their vaccination strategies. Most countries have reduced the interval for administering the booster dose after completion of the primary vaccination course, and enhanced risk communication initiatives.

Although full primary vaccination uptake in the total EU/EEA population has substantially increased, there are still differences in vaccination uptake among countries and at sub-national level, where pockets (geographical areas or population groups) of low uptake persist. This also includes countries that have achieved high levels of vaccination coverage overall.

There is emerging evidence that vaccine effectiveness decreases over time and that current vaccines may be less effective against the Delta VOC, and less so against the Omicron VOC. Therefore, vaccination of all eligible individuals who are currently unvaccinated is a priority, as is the protection of all eligible vaccinated individuals at risk of severe COVID-19 or at high risk of exposure to the virus due to their activities or living conditions by means of a booster dose. In addition, due to the current Omicron VOC wave, all other eligible vaccinated adults should also consider getting a booster shot (at least three months after the completion of the primary vaccination course), in accordance with national recommendations, to reduce their individual risk of infection and disease [46,47].

It will be especially important to continuously monitor vaccine uptake and associated social determinants to understand where and in which population groups and communities the immunity gap persists. A successful COVID-19 vaccination programme can only be built on an understanding of, and a proper response to individuals' and communities' beliefs, concerns and expectations regarding the vaccine and the disease. The '5Cs' model – Confidence, Constraints, Complacency, Calculation, and Collective responsibility – is one framework that can be used for understanding these concerns and designing strategies to facilitate COVID-19 vaccination acceptance and uptake [48]. Countries are putting in place a number of measures and strategies to increase vaccination in the population, especially among population groups with low uptake.

Contributing ECDC experts (in alphabetical order)

Jordi Borrell Pique, Nathalie Nicolay, Kate Olsson, Lucia Pastore Celentano, Giovanni Ravasi, Fafa Yip.

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Disclaimer

All data published in this report are correct to the best of our knowledge at the time of publication.

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