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# Barriers and drivers of positive COVID-19 vaccination behaviours among healthcare workers in Europe and Central Asia: a qualitative cross-country synthesis

Vaccination uptake is essential to controlling the ongoing COVID-19 pandemic. Healthcare workers (HCWs) play a critical role in receiving, recommending and delivering COVID-19 vaccination. Understanding the specific influences on each behaviour enables the development of targeted and tailored interventions to improve vaccination uptake. This paper presents a qualitative synthesis of HCWs' individual and context barriers and drivers to these three vaccination behaviours across 10 countries in Europe and Central Asia. Qualitative data from interviews and focus group discussions with 378 HCWs between December 2020 and March 2022 were synthesised and organised by four COM (capability, physical and social opportunity, motivation) factors. Differences by stage of COVID-19 vaccine roll-out (in preparation, early and late delivery) were explored. *Receiving vaccination* related to all four factors. *Recommending vaccination* mostly related to capability and motivation. HCWs were generally well-informed by official sources and viewed vaccination as the way to end the pandemic, acknowledging their important role in this. Colleagues, family and friends were positive influences on personal vaccination decisions. However, knowledge gaps were evident, particularly amongst nurses who relied on (social) media. Concerns about safety and effectiveness, often connected to knowledge gaps, were heightened by the accelerated timeline for COVID-19 vaccine development and approval. This impeded some HCWs' motivation to receive and recommend vaccination even in the later roll-out countries. *Delivering vaccination* was facilitated by support from public health organisations, teamwork and service re-organisation, more evident amongst later roll-out countries. Ongoing high workloads, stress and burnout hindered delivery. Complex and inter-related factors affecting HCWs' vaccination behaviours were identified. These insights should inform the design of multifaceted interventions (e.g., communication skills training, management support for HCWs' mental health, and engaging them in decision-making for service redesign); not only for COVID-19 vaccination as it is integrated into routine services but for routine immunization as a whole.

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## Introduction

Effective vaccination programmes play a critical role in protecting against the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), named coronavirus disease 2019 (COVID-19). High population coverage, acceptance, demand and uptake are essential, especially among priority groups (WHO, 2020). Globally, healthcare workers (HCWs) represent a key priority group. They are vulnerable to infection exposure from patients and their vaccination behaviours significantly affect public vaccine reactions and decisions (Habersaat et al., 2020; Ames et al., 2017). Despite the increased availability of online health information, HCWs are still regarded as a trustworthy information source, promoting vaccination in low-resource settings and among other groups hesitant to vaccinate (Paterson et al., 2016; Rozek et al., 2021; Solís Arce et al., 2021). Insights on barriers and drivers to HCWs' COVID-19 vaccination uptake, and to recommending and delivering vaccination to patients, can support effective policy and intervention development to promote these positive vaccination behaviours.

To date, research on factors influencing HCW acceptance and willingness to support COVID-19 vaccination is predominantly survey-based and focused on them receiving COVID-19 vaccination, with little attention paid to their recommending and delivering vaccination. Theory-based qualitative studies on barriers and drivers to HCW behaviours are lacking. Both qualitative and quantitative studies are important in developing evidence and theory-informed targeted and tailored interventions to promote positive vaccination behaviours (WHO Regional Office for Europe, 2019).

Published quantitative survey-based studies on HCW COVID-19 vaccine acceptance have mostly been conducted in the United States, Middle Eastern and Western European countries, and have explored willingness to receive COVID-19 vaccination against (i) sociodemographic variables, (ii) knowledge, attitudes and perceived risk, and (iii) trust in government and policies (Barry et al., 2021; Gagneux-Brunon et al., 2021; Elkhayat et al., 2021; Shaw et al., 2021; Maraqa et al., 2021; Kwok et al., 2021; Luma et al., 2022; Rosental and Shmueli, 2021; Tomljenovic et al., 2021; Bell et al., 2022; Green-McKenzie et al., 2021; Qattan et al., 2021; Qunaibi et al., 2021; Chapman et al., 2022). This literature consistently identifies greater vaccine acceptance for men, persons with higher education and income, white people and doctors (as opposed to nurses and allied healthcare professionals). Other factors linked to vaccine acceptance have included: perceiving the vaccine as beneficial to health, belief that family and friends would like them to get vaccinated, and having trust in the vaccine (Chapman et al., 2022). Findings indicate HCW concerns about vaccine efficacy, effectiveness and long-term safety (and the lack of reliable information on this) are common barriers to COVID-19 vaccine acceptance, and HCW willingness to be vaccinated is driven by fear and perceived susceptibility to COVID-19 and being in close contact with or caring for people with suspected or confirmed COVID-19 (Galanis et al., 2020; Li et al., 2021; Biswas et al., 2021; Bianchi et al., 2022).

Limited qualitative studies exploring HCW's willingness to receive COVID-19 vaccination have been conducted in Australia, Hong Kong, Turkey and the UK and US (Cáceres et al., 2022; Yilmaz et al., 2022; Elwy et al., 2021; Manby et al., 2022; Sema Aci et al., 2021; Thorneloe et al., 2021; Kaufman et al., 2022; Ng et al., 2022; Bolsewicz et al., 2021). This research highlights key HCW barriers as fear and uncertainty about vaccine safety (side-effects), scepticism about speedy vaccine development and lack of trust and confidence in health authorities and their ability to communicate reliable information to the public and deliver the vaccine roll-out (Sema Aci et al., 2021; Manby et al., 2022; Yilmaz et al., 2022; Thorneloe et al., 2021; Elwy et al., 2021; Cáceres et al.,

2022; Bolsewicz et al., 2021; Ng et al., 2022). Drivers of COVID-19 vaccination are identified as having a high perceived risk of COVID-19, having support from others (colleagues, friends) to get vaccinated and being able to do it during working hours (Thorneloe et al., 2021).

Studies exploring HCWs' experiences of recommending COVID-19 vaccination are sparse. One US survey reported that the majority of HCWs (81.5%) would recommend COVID-19 vaccination. Moreover, they felt more confident informing patients about different types of vaccines and addressing concerns about safety and value than responding to hesitancy or refusal on personal or religious grounds (Day et al., 2021). We found no qualitative research on HCW views on recommending COVID-19 vaccination nor any published research on HCWs delivering COVID-19 vaccination.

During the COVID-19 pandemic, the Vaccine-preventable Diseases and Immunization (VPI) Programme at the WHO European Regional Office, has been supporting countries to conduct rapid qualitative studies on barriers and drivers to positive COVID-19 vaccination behaviours for HCWs and other priority groups. Insights have been translated into national strategies to achieve good vaccination uptake. This paper presents a synthesis of key findings from 10 countries in Europe and Central Asia. The aims were to

- i. Explore HCW's individual and context barriers and drivers for three vaccination behaviours: receiving, recommending and delivering COVID-19 vaccination.
- ii. Compare and contrast similarities and differences by stage of COVID-19 vaccine roll-out when the study took place (in preparation, early versus late delivery).

## Methods

Ten cross-sectional qualitative studies were conducted between December 2020 and March 2022. In each country, study teams consisted of representatives from the WHO VPI Programme, the WHO Country Office (CO), relevant national health bodies and a local research company with relevant qualitative social science expertise and previous experience working with the WHO VPI programme.

**Theoretical framework.** Studies were designed using the Capability, Opportunity, and Motivation for Behaviour Change (COM-B) framework (Michie et al., 2011) modified for vaccination behaviours (Habersaat et al., 2020). This framework understands performance of vaccination behaviours is influenced by four inter-linked factors capability (knowledge, skills), physical opportunity (information, access, health systems), social opportunity (support, norms) and motivation (attitudes, confidence, trust). The modified COM-B framework guided data collection, analysis and interpretation, ensuring the exploration of each factor's influence on HCWs' vaccination behaviours.

**Setting.** Studies were conducted in 10 self-selecting countries: Armenia, Azerbaijan, Estonia, Federation of Bosnia and Herzegovina (FBiH) in Bosnia and Herzegovina, Georgia, Kyrgyzstan, North Macedonia, Romania, Russian Federation and Ukraine. During the pandemic, the WHO VPI Programme regularly met with national health authorities across the region to discuss the COVID-19 vaccine roll-out including the availability of support for conducting qualitative research. Countries could opt in for this research support at any time of their vaccine roll-out. Some countries were interested in understanding barriers/drivers before or early in the vaccine roll-out to inform implementation

strategies. For others, they initially focused their efforts on roll-out and later conducted research to understand and address challenges in vaccination coverage. The countries are all middle-income countries (The World Bank, 2022) and in Southern or Eastern Europe (World Atlas, 2023) and Central Asia, with the exception of Estonia, which is located in northern Europe and high income.

**Participants and recruitment.** HCWs were identified and recruited through purposive convenience sampling. Target groups were based on national priorities for achieving good COVID-19 vaccination coverage, and HCWs were invited to participate from any type of health facility involved in vaccine roll-out purposively selected from National Health Institutes' databases. The focus was on HCWs with clinical duties who were responsible for discussing with and/or delivering COVID-19 to their patients irrespective of the time they spent on this. Discussing vaccination referred to any conversations that HCWs had with their patients including whether they recommended vaccination or not. Delivering vaccination refers to any task relating to vaccine supply, storage, scheduling appointments and administering the vaccine.

Table 1 presents the country setting and participant details ( $N = 378$  in total). Studies in FBiH, Georgia, and Romania were conducted during preparation for the COVID-19 vaccine roll-out (December 2020). Studies in Estonia, North Macedonia, the Russian Federation and Ukraine occurred in the early months of vaccine roll-out (January–May 2021) when the focus was on HCWs and high-risk patient groups (except for the Russian Federation which made the vaccine available to the general population at this early stage). Studies in Armenia, Azerbaijan and Kyrgyzstan happened at later stages of the vaccine roll-out (December 2021–March 2022) when most countries were vaccinating the general population.

Reflecting the health workforce in the participating countries, most participants were female (89.2%), and doctors (51.3%) or nurses (46.3%). Most were working in urban locations (77.2%), and primary care health facilities (65.3%) or hospitals (19.3). A smaller proportion were working in research centres (5.0%), community outpatient clinics (4.0%), vaccination centres (3.4%), and nursing care homes (2.9%). Most had been fully or partially vaccinated (65.6%).

**Data collection.** Data collection was conducted in compliance with national COVID-19 regulations at the time of research, hence 76% of data was collected virtually (Table 1). Both focus group discussions (FGDs) and in-depth individual interviews (IDIs) were used, with six countries conducting only FGDs, one only IDIs and three using both. All face-to-face data collection occurred in health facilities.

A template discussion guide (Table 2) was developed in English, then translated and adapted for the country context, reflecting study settings, target HCW groups and the COVID-19 vaccine roll-out stage. The guide was organized by the COM factors and explored individual and context barriers and drivers to the three HCW vaccination behaviours. Guides were used flexibly to enable participants to discuss any other pertinent issues. All FGDs and IDIs were facilitated in national languages by local research companies and audio recorded.

### Data analysis

*Within-country analysis.* Analysis was conducted by in-country researchers (research companies, WHO CO consultants, and national health authority staff) and supervised by a WHO VPI team representative. Other study team members e.g. Ministry of

Health were involved in the final interpretation to ensure consideration of the national and health systems context.

In a fast-evolving situation such as a pandemic, rapid qualitative methods are appropriate to ensure data are collected and analysed in time so that findings can inform targeted interventions (Vindrola-Padros et al., 2020). During the conduct of these studies, the WHO VPI team developed a rapid research and intervention tool (WHO Regional Office for Europe, 2022b). Instead of producing verbatim transcripts, this tool employs a Rapid Assessment Procedure (RAP) where data from audio recordings are directly organised into Microsoft Excel RAP sheets for analysis (Vindrola-Padros et al., 2020; Vindrola-Padros and Vindrola-Padros, 2018). Just two transcripts, translated into English are required for training and quality checking purposes.

One RAP sheet was developed for each target group (doctors, nurses, etc.) and structured to facilitate within-group comparisons as relevant to each country e.g., vaccinated versus unvaccinated, primary care versus hospital-based, urban versus rural. These were based on discussion guides and organised by the three vaccination behaviours and four COM factors. Research companies in FBiH, Georgia and Romania piloted the English RAP sheets and made adjustments in discussion with the WHO VPI team. The resulting “template” RAP sheets were translated into the national languages of the study countries, with minor context-specific adaptations (see example RAP sheet in supplementary material 1).

In each country, a WHO VPI team representative provided training and feedback on using RAP sheets. The researchers worked in pairs to complete the sheets, summarising participant responses and noting quotations. They then came together as a team to review the completed RAP sheets to identify themes in the data and to perform within-country comparisons (e.g. by professional role, location, etc.). The final step was to produce summary tables of barriers and drivers in English, organised by the COM factors, for each vaccination behaviour (see example summary table in Supplementary Material 2).

*Cross-country synthesis.* A final cross-country synthesis, reviewing observations from all HCW data ( $N = 378$ ), was conducted. A triangulation matrix for each COM factor was populated from the summary tables of the 10 countries. This enabled us to learn about the common barriers and drivers that might be useful for other countries (as a starting point for understanding vaccination coverage) and for any future emergency vaccination rollout. It also facilitated the identification of differences by the COVID-19 vaccination roll-out stage (i.e., preparation, early or late delivery). This final synthesis was conducted by one researcher, checked by a second researcher, and then reviewed.

### Results

Our findings below relate to mass COVID-19 vaccine roll-out with limited time in a novel pandemic situation, at both established and new vaccination venues. Findings are organised by COM factors, with the individual-level factors (motivation and capability) presented prior to context factors (physical and social opportunity). Any differences in HCWs' views and experiences by stage of vaccine preparation/roll-out are specified. Illustrative quotations are provided in Tables 3–6.

**Motivation.** Motivation is influenced by capability and opportunity factors. It relates to attitudes and risk perceptions (protection from infection, vaccine safety and effectiveness, trust in rapid vaccine development) as well as the professional role and responsibility towards performing a vaccination behaviour.

**Table 1 Study, setting and participant details for each country N (%).**

Country	Studies conducted during preparation of COVID-19 roll out				Studies conducted early in the COVID-19 roll out				Studies conducted later in the COVID-19 roll out				Total N = 378 (%)	
	Federation of Bosnia & Herzegovina	Georgia	Romania	Estonia	North Macedonia	Ukraine	Russian Federation	Armenia	Azerbaijan	Kyrgyzstan	Armenia	Azerbaijan		Kyrgyzstan
	Dec 2020	Dec 2020	Dec 2020	Jan 2021	May 2021	March 2021	March-April 2021	Dec 2021/Jan 2022	Dec 2021	March 2022	Dec 2021/Jan 2022	Dec 2021		March 2022
Date of data collection	Preparing	Preparing	Preparing	Delivering	Delivering	Delivering	Delivering	Delivering	Delivering	Delivering	Delivering	Delivering	Delivering	
Vaccine roll-out status (Healthcare workers)	Preparing	Preparing	Preparing	Delivering to high-risk	Delivering to high-risk	Delivering to high-risk	Delivering to general population	Delivering to general population	Delivering to general population	Delivering to general population	Delivering to general population	Delivering to general population	Delivering to general population	
Vaccine roll-out status (high risk only or general population)	Preparing	Preparing	Preparing	Delivering to high-risk	Delivering to high-risk	Delivering to high-risk	Delivering to general population	Delivering to general population	Delivering to general population	Delivering to general population	Delivering to general population	Delivering to general population	Delivering to general population	
Vaccination status	0 (0)	0 (0)	0 (0)	14 (56)	13 (50)	17 (61)	28 (78)	78 (94)	32 (70)	56 (90)	78 (94)	32 (70)	56 (90)	
Fully vaccinated	0 (0)	0 (0)	0 (0)	10 (40)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Partially vaccinated	14 (100)	36 (100)	22 (100)	1 (4)	13 (50)	11 (39)	8 (22)	5 (6)	14 (30)	6 (10)	5 (6)	14 (30)	6 (10)	
Unvaccinated	14 (100)	0 (0)	2 (29)	0 (0)	3 (43)	0 (0)	0 (0)	5 (19)	0 (0)	0 (0)	5 (19)	0 (0)	0 (0)	
Data collection method	0 (0)	4 (100)	5 (71)	4 (100)	4 (57)	6 (100)	6 (100)	21 (81)	8 (100)	12 (100)	21 (81)	8 (100)	12 (100)	
IDI	14 (100)	0 (0)	2 (29)	4 (100)	4 (57)	6 (100)	6 (100)	21 (81)	8 (100)	12 (100)	21 (81)	8 (100)	12 (100)	
FGD	0 (0)	4 (100)	5 (71)	4 (100)	4 (57)	6 (100)	6 (100)	21 (81)	8 (100)	12 (100)	21 (81)	8 (100)	12 (100)	
Data collection delivery	14 (100)	4 (100)	7 (100)	4 (100)	7 (100)	6 (100)	6 (100)	28 (74)	6 (75)	6 (100)	28 (74)	6 (75)	6 (100)	
Online	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10 (26)	2 (25)	6 (100)	10 (26)	2 (25)	6 (100)	
Face-to-face	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	18 (64)	14 (30)	0 (0)	18 (64)	14 (30)	0 (0)	
Healthcare facility	7 (50)	17 (47)	22 (100)	22 (88)	8 (31)	18 (64)	36 (100)	41 (49)	14 (30)	62 (100)	41 (49)	14 (30)	62 (100)	
Primary care	7 (50)	9 (25)	0 (0)	2 (8)	11 (42)	0 (0)	0 (0)	27 (33)	17 (37)	0 (0)	27 (33)	17 (37)	0 (0)	
Hospital	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	15 (18)	0 (0)	0 (0)	15 (18)	0 (0)	0 (0)	
Community	0 (0)	4 (11)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	15 (33)	0 (0)	0 (0)	15 (33)	0 (0)	
outpatient	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)	10 (36)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Research	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Nursing/care	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
home	0 (0)	6 (17)	0 (0)	0 (0)	7 (27)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Vaccination centre	0 (0)	8 (22)	10 (45)	4 (16)	1 (4)	4 (14)	0 (0)	32 (39)	0 (0)	21 (34)	32 (39)	0 (0)	21 (34)	
Rural	6 (43)	28 (78)	12 (55)	21 (84)	25 (96)	24 (86)	36 (100)	51 (61)	46 (100)	41 (66)	51 (61)	46 (100)	41 (66)	
Urban	8 (57)	15 (42)	12 (55)	13 (52)	14 (54)	18 (64)	19 (53)	44 (0)	20 (44)	31 (50)	44 (0)	20 (44)	31 (50)	
Professional role	8 (57)	6 (43)	10 (45)	12 (48)	12 (46)	10 (36)	17 (47)	39 (0)	25 (54)	31 (50)	39 (0)	25 (54)	31 (50)	
Doctor	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)	1 (2)	0 (0)	
Nurse	0 (0)	8 (22)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Lab Assistant	0 (0)	35 (97)	16 (73)	22 (88)	20 (77)	24 (86)	32 (89)	79 (95)	41 (89)	59 (95)	79 (95)	41 (89)	59 (95)	
Public health specialist	9 (64)	1 (3)	6 (27)	3 (12)	6 (23)	4 (14)	4 (11)	4 (5)	5 (11)	3 (5)	4 (5)	5 (11)	3 (5)	
Gender	5 (36)	49.6 (9.6)	42.23 (9.3)	44.8	41.5 (9.3)	42.8 (12.7)	Missing data	42.89	40.1 (9.5)	48.9 (10.6)	42.89	40.1 (9.5)	48.9 (10.6)	
Female	39.7 (9.6)	24-67	24-56	28-69	30-58	24-70	(12.79)	21-74	23-64	25-68	(12.79)	23-64	25-68	
Male	27-57	22.2 (10.2)	16.9 (10.7)	20.4	17.9 (9.3)	18.3 (12.2)	13.6 (8.9)	17.32	15.9 (8.7)	24.4 (12.3)	17.32	15.9 (8.7)	24.4 (12.3)	
Age (years), M (SD) range	13.8 (10.14)	2-40	0.02-32	(12.4)	2-32	4-43	1-31	(13.21)	2-39	3.5-50	(13.21)	2-39	3.5-50	
Time since qualified (years) M (SD) range	1-30													



**Table 2 Topics explored in the focus group discussions and interviews.**

- Experience of the COVID-19 pandemic—biggest challenges, support that helped
- Being vaccinated as a healthcare worker
- Vaccinated healthcare workers*
  - Reasons for having the vaccine
  - Information sought/ needed to make a decision
  - Trainings or lectures on safety and efficacy
- Unvaccinated healthcare workers*
  - Reasons for not having the vaccine
  - Information sought/ needed to make a decision
  - Trainings or lectures on safety and efficacy
  - Who should recommend the vaccine to persuade individuals
  - Willingness to get vaccinated/or have the booster done
- For all healthcare workers*
  - Evidence of vaccine safety
  - Choice of vaccine source
  - Evidence of vaccine effectiveness
  - Attitude towards COVID-19 vaccine—changes and influences
  - Reasons for/ for not having booster dose
  - Acceptance of other vaccines for healthcare workers—flu vaccine and hepatitis B
  - Conditions for coming to work—receiving the vaccine or showing negative PCR
  - Trust in national decision-makers
  - What is needed from public health experts and health facility management
- Recommending a COVID-19 vaccine
- Role in recommending the COVID-19 vaccine*
  - Vaccine recommendations to patients who have not vaccinated
  - Vaccine priority groups
  - Booster dose recommendation to unvaccinated groups
  - Booster dose priority groups
  - Support to help recommend the vaccine or booster dose
  - Discussions/workshops on vaccine safety and efficacy
  - Public declaration of vaccine
  - Patients' reaction regarding COVID-19 vaccine
  - Reasons for patient's vaccine/booster dose hesitancy
  - Vaccine refusal groups/individuals
- Conversations with patients*
  - Vaccine recommendations to patients who have not vaccinated
  - Vaccine priority groups
- Delivering a COVID-19 vaccine to your patients
  - Views on the way population vaccination is organised and suggestions for improvement.
  - Views on expanding the range of health professionals who would administer the vaccine (pharmacists, dentists)
  - Thoughts on increasing motivation among citizens—close and accessible vaccination points (e.g. shopping malls), or field/mobile vaccination sites

Suggestions to improve this process

*Attitudes and risk perceptions.* Most HCWs expressed generally positive attitudes towards receiving, recommending and delivering COVID-19 vaccination (Quote M1, Table 3). It was seen as a way to beat the pandemic that had significantly affected daily life and a sense of normality. However, even in later roll-out countries, a minority were still deliberating and waiting for more evidence on vaccination safety and effectiveness before deciding for themselves or advising patients. Their hesitancy was linked to several attitudes and risk perceptions about COVID-19 infection and vaccination described below, often rooted in knowledge gaps (see *Knowledge of COVID-19 vaccination and vaccines and Knowledge of vaccine safety and effectiveness*).

*Protection from infection:* Some HCWs believed they were at low risk of contracting COVID-19 having sufficient, or even enhanced, protection from infection (Quote M2, Table 3). A few also worried there was a higher risk of adverse events from immunization (AEFIs) post-infection (Quote M3, Table 3). Both these beliefs led some to postpone their own vaccination (Quote M4, Table 3). Relatedly, HCWs in FiBH, North Macedonia and the Russian Federation spoke of themselves or colleagues having

antibody testing to identify the presence or absence of virus antibodies (Quote M5, Table 3). A few then refused vaccination believing they had sufficient immunity.

*Vaccine safety and effectiveness:* Views on vaccine effectiveness were mixed within all countries. As increased evidence from other countries (e.g. the UK) confirmed that vaccination resulted in fewer hospitalisations, deaths and milder illness, most HCWs were confident that vaccination would protect themselves and others against COVID-19 (Quote M6, Table 3), especially after two doses. At the same time, several HCWs in Estonia, FiBH, Kyrgyzstan, North Macedonia, Romania, the Russian Federation and Ukraine believed the long-term effectiveness of the vaccine was unknown (Quote M7, Table 3) and varied between vaccine brands and for virus variants.

While HCWs generally believed serious AEFIs were rare, they were cautious about recommending the vaccine without evidence on effectiveness and safety (see *Need for authoritative sources and credible information*). Some vaccinated HCWs had personally experienced unpleasant flu-like post-vaccination symptoms, and one nurse witnessed a patient experiencing a serious adverse event from COVID-19 vaccination.

**Table 3 Illustrative quotes for Motivation.**

Quote ID	Illustrative quote
Attitudes and risk perceptions	
M1	<i>I think, from my point of view, I am always in favour of vaccination, it prevented a mass of these diseases, in fact, I cannot say prevented, but helped they occur in a much milder form than it would otherwise be the case, ranging from tuberculosis itself to measles, etc.</i> Doctor, FBiH
Protection from infection	
M2	<i>I have not received it [COVID-19 vaccination] because I was infected before. I think that an idea of total protection by a vaccine is not true. If previously infected, then a body will have enough immunity against a virus without vaccination.</i> Doctor, Azerbaijan
M3	<i>I was infected with Corona virus 10 months ago and I still have antibodies. I have some doubts at the moment because I don't know how I would react [to the vaccination] with this number of antibodies. Everything we've been through, the psychological fear from what might happen as a reaction from the vaccination, I am not ready to deal with it.</i> Nurse, North Macedonia
M4	<i>I am not vaccinated, I was infected and now I have antibodies. In December they were 5.1, I got tested again 2 weeks ago and they increased to 5.5. I guess from natural immunity and from infection. Now I want to say something about the antibodies, in my opinion, many people test their level of antibodies in the private laboratories. I personally don't think about vaccination now because I have antibodies.</i> Nurse, North Macedonia
M5	<i>The majority of us have been sick. Probably 95% of our polyclinic, among my colleagues, they all got sick. Therefore, everyone checks for antibodies and if they have it: "Here I have antibodies, I cannot be vaccinated".</i> Nurse, Russian Federation
Vaccine safety and effectiveness	
M6	<i>Perhaps 600,000,000 vaccines have been given worldwide. So, we have experiences, here are England and Israel where, literally, their way of life has changed. They no longer have hospitalizations, deaths, severe cases. That is the purpose of the vaccine. There will be new cases, people will get sick, but the infection will be less severe.</i> Doctor, North Macedonia
M7	<i>It seems to me that people are afraid of the fact that the vaccines are so new, that there is little experience. There is no knowledge of what happens in one, two or three years. These are main topics for discussion. And actually, as medical workers we do not have any good answers, I mean that, for example, in four years a person will have such and such immunity in place.</i> Doctor, Estonia
M8	<i>When it comes to the production of vaccines itself, I know from some reliable media sources that things that are classified in the US and Germany as safety level 4, they have the highest degree of safety, but in China the things are kept down on safety level 2, which means that this requires control. I believe that the EU and the US care about these control standards also when it comes to the production of this vaccine.</i> Doctor, FBiH
Trust in rapid development	
M9	<i>I'm a bit reluctant. So that's the question: I think they got it [COVID vaccine] released too quickly, that it hasn't been tested sufficiently. It is tested, they know the short-term effects, but nobody knows the long-term effects. It has only been used for about a month or tested for six months, let's say, but we don't know after one year, two. From what I've heard it is also very allergic, it can develop allergies. We don't know.</i> Nurse, Romania
Professional role and responsibility	
M10	<i>I will get the vaccine with pleasure. I get all the vaccinations. I even took my children to get a hepatitis vaccine when it was first brought here. I start vaccinations with my own children. When patients see that you are getting vaccinated, when they see a doctor receiving a flu shot, they become more trusting. I think something like this needs to be done.</i> Doctor, Georgia
M11	<i>It's an idea, but I don't know yet if it's a good one. Maybe it has an effect, because it creates a segregation between good and bad and from this perspective we should evaluate how sensible it is, because it has advantages and disadvantages.</i> Nurse, Romania

Concerns about vaccine provenance also influenced HCWs' vaccine safety perceptions and decision-making about their own vaccination and whether they recommended it. Vaccines produced and approved in the United States and Europe, compared to vaccines developed in the Russian Federation and Asian countries, were seen as safer and better quality by HCWs in Estonia, FBiH, and Georgia (M8 Quote, Table 3). Unvaccinated doctors in Kyrgyzstan preferred the Russian vaccine to the Chinese vaccine, believing it was better quality. HCWs in Azerbaijan and Ukraine trusted Western pharmaceutical companies (e.g. Pfizer) to develop safe and more effective vaccines as they had a reputation to uphold. In contrast, some doctors and public health specialists in Georgia and most HCWs in North Macedonia felt vaccine country of origin was irrelevant given international vaccine approval standards.

**Trust in rapid vaccine development:** The fast-track development and approval of COVID-19 vaccines caused doubt and concern among many participants. For HCWs in Azerbaijan and Estonia, FBiH, Georgia, North Macedonia, Romania, Russia and Ukraine such anxieties provoked doubts on the long-term safety and effectiveness of COVID-19 vaccines (Quote M9, Table 3). Yet despite these concerns, there was a genuine belief and trust in the value of vaccination in protecting HCWs and others and ending the pandemic to return to normalcy, leading HCWs to receive and recommend COVID-19 vaccination.

**Professional role and responsibility.** Most HCWs in Armenia, Estonia, FBiH, Georgia, Kyrgyzstan, North Macedonia and the Russian Federation viewed getting vaccinated as a personal and professional responsibility to be a role model for others and to protect the community (Quote M10, Table 3). Some HCWs felt wearing a badge indicating they were vaccinated would instil confidence and prompt vaccine uptake. Conversely, other HCWs (most HCWs in Romania and Ukraine, unvaccinated nurses in Armenia, and a minority in Estonia, FBiH and North Macedonia) were reluctant to disclose their own vaccination status, seeing this as discriminatory and confidential information that would not affect patients' decisions. Others felt it might constitute coercion through creating a dichotomy between good and bad behaviour (Quote M11, Table 3). In Ukraine, there was more support for a badge stating support for vaccination rather than indicating own vaccination status.

**Capability.** Capability findings relate to HCWs' knowledge of COVID-19 vaccination and vaccines, knowledge of COVID-19 vaccination safety and effectiveness, skills and confidence in communicating with patients, need for authoritative sources and credible information and guidance and training to tailor conversations with patients.

**Knowledge of COVID-19 vaccination and vaccines.** Most HCWs had a good understanding of COVID-19 vaccine availability and knew vaccination protects against the severity of the disease

**Table 4 Illustrative quotes for Capability.**

Quote ID	Illustrative quote
Knowledge of COVID-19 vaccination and vaccines	
C1	<i>We really understand this vaccine well, we get vaccines from childhood. After COVID-19 vaccination people still get sick but in a less serious way and a person won't die.</i> Nurse, Kyrgyzstan
C2	<i>Pfizer and Moderna, one has the second dose on the 21st day, the other one on the 28th day. AstraZeneca will probably get approved and perhaps Sputnik too, these two are again quite similar, but which are vaccines of a completely different type.</i> Doctor, Estonia
Knowledge of COVID-19 vaccination safety and effectiveness	
C3	<i>The serious side effects have truthfully been so rare. If we take into account the fact that the trial groups have consisted of more or less 40,000 people, then we know that serious side effects were extremely rare. And the fact how the clinical trials are conducted, no concessions made for these trials. Everything that had to be done was done.</i> Doctor, Estonia
C4	<i>I have received information that if you have had COVID, if you have antibodies, you should not get this vaccine at all. So, the vaccine itself produces antibodies that help the body to be resistant to the virus. And now I am in a dilemma, I personally have recovered from COVID I have antibodies, but I am in a dilemma whether to be vaccinated or not. So far, I have not been vaccinated and I will think about it until I get enough information.</i> Nurse, North Macedonia
Skills and confidence in communicating with patients	
C5	<i>The old population over the age of 70 and the youngest population up to 25 years. The oldest population is very scared because they have diabetes, they are hypertensive, they have other comorbidities and they think that if they receive the vaccine they will die. And the youngest population are most afraid of being affected by infertility because they say that it causes problems. I think the middle-age population agrees to be vaccinated.</i> Nurse, Romania
C6	<i>I want to say that in order for us to inform people, you need to inform us, anything about it. Yes, we have a little more information now, but every night you sit down and go to Google to read what it is. But, in order to convince, one needs to have a lot of information, one needs to tell the patient all the pros and cons and why it is better, then maybe they will agree.</i> Nurse, Ukraine
C7	<i>We know our patients and we know how to approach each of them. Because, you know, the connection we have with the patients is unique.</i> Doctor, North Macedonia
C8	<i>Well, I just encouraged and explained exactly that, well, what are the risks of COVID, what are the risks of a vaccine, and also pointed out that a very large number of the world's top scientists, pharmacologists, virologists have worked with these vaccines and the permits from European Medicines Agency in European Union do not come very easily, even those urgently granted permissions that there is still a long process behind it. Maybe just to trust this great array of scientists, who are behind this.</i> Nurse, Estonia
C9	<i>I think we have to talk to the patient. We have to listen to his/her fears, his/her way of thinking, what's unclear for that person, what frightens him/her. We can clarify all issues that person has so that he/she can make the right decision—whether to get vaccinated or not.</i> Doctor, FBiH
C10	<i>I do not recommend it to pregnant women. It is recommended to inject after pregnancy. This includes breastfeeding mothers, also I do not recommend COVID-19 vaccination to oncological patients.</i> Doctor, Azerbaijan
C11	<i>We do not recommend to those who have an exacerbation of chronic diseases, severe allergic reactions, in all other cases it is recommended.</i> Doctor, Armenia
Need for authoritative sources and credible information	
C12	<i>[I want to see] scientific studies conducted worldwide and the rich experience of other countries. By the time the vaccine gets to FBiH, we will at least have gained some experiences regarding vaccination, since a number of developed countries that are now delivering vaccines to their populations will then be able to identify the side effects and everything else that comes up after vaccination.</i> Nurse, FBiH
C13	<i>I believe that it's good that we have a Family Doctors' Association that kept us posted all the time, there was plenty of information, of course, but we always got an email with the latest, most up-to-date info. This was good, there was always something that you could find support from, and, well, guidelines with info on how to act were all available, and this was reassuring.</i> Doctor, Estonia
C14	<i>I only know what we see on the news, on TV, on Facebook. I have visited an official website, I don't read everything, but no, I haven't received anything official.</i> Nurse, Romania
C15	<i>There are quite a few people who spread all sorts of myths on social media for example that the vaccine causes sterility, that it leads to leukaemia, that it's too early, let's wait a little longer to see what happens to others and so on; Well, "waiting" means 200 deaths every day. So, from my point of view, this is a solution that is not at all acceptable.</i> Doctor, Romania
Need for guidance and training to tailor conversations with patients about COVID-19 vaccination	
C16	<i>In the early stages of the pandemic, there was a need for instructions, brochures and other educational/informative papers. It would be helpful when recommending vaccination to people in high-risk groups.</i> Doctor, Azerbaijan
C17	<i>Trainings regarding immunization is definitely one of those tools that are needed by those who vaccinate. There are separate modules for counselling, so they discuss in detail how one should counsel. I think this is extremely useful.</i> Doctor, Estonia

(Quote C1, Table 4). In receiving and recommending vaccination, HCWs typically knew vaccination was safer than contracting the virus, although not all HCWs understood vaccination provides added protection to prior infection (including in countries at later roll-out stages). Most HCWs demonstrated awareness of companies producing COVID-19 vaccines; Pfizer, Astra Zeneca and Sputnik were most mentioned (Quote C2, Table 4). HCWs also understood the importance of correct storage and handling of vaccines to ensure cold chain maintenance (see *Vaccine supply and storage*).

*Knowledge of COVID-19 vaccination safety and effectiveness.* When discussing receiving and recommending vaccination, the

majority of HCWs understood the risk of serious AEFIs being rare for COVID-19 vaccination (Quote C3, Table 4). Relatedly, Estonian HCWs (mainly doctors) observed that the messenger RNA (mRNA) vaccines were not a new technology but were being delivered globally for the first time. There was also some awareness that vaccines must meet international approval standards. For example, around half the participants from North Macedonia (mostly doctors) mentioned the European Medicines Agency (EMA) and US Food and Drugs Administration (FDA) vaccine approval procedures.

Some HCWs (mostly nurses) in Armenia, Azerbaijan, Georgia, FBiH, Romania, North Macedonia and Ukraine stated that they lacked knowledge of COVID-19 vaccine safety and necessity,

which influenced their willingness to get vaccinated and to recommend it to others (see *Skills and confidence in communicating to patients*). As an example, unvaccinated nurses in Armenia had misperceptions that COVID-19 vaccines would lead to breast cancer recurrence.

Several HCWs mentioned that previous COVID-19 infections produced sufficient natural immunity to preclude or delay the need for vaccination, the latter often being discussed with reference to national public health guidance to postpone following infection. Others declared that vaccination post-infection could produce adverse reactions (Quote C4, Table 4). They spoke of postponing their own vaccination appointment until antibodies subsided.

*Skills and confidence in communicating with patients.* HCWs described vaccine hesitancy and refusal among their patients, saying some of these were susceptible to misinformation and conspiracy theories. Different population groups were mentioned in different countries, including young people, specific religious or ethnic groups as well as patients with chronic health conditions. Various reasons for hesitancy were also cited, including concerns about infertility, perceived conspiracies, perceptions of chronic health conditions as contraindications or not considering COVID-19 a serious threat (Quote C5, Table 4).

In terms of recommending vaccination, some HCWs (particularly nurses) from Armenia, Azerbaijan, Georgia, FBiH, Romania, the Russian Federation and Ukraine, with poorer knowledge about COVID-19 vaccination, did not feel confident in communicating on COVID-19 vaccine. They expressed unease in promoting COVID-19 vaccination without sufficient information on its safety and efficacy and wanted evidence-based information from other countries (Quote C6, Table 4). By contrast, doctors were generally more confident in recommending vaccination because they felt they had built good patient rapport prior to the pandemic (Quote C7, Table 4).

Engaging hesitant or refusing patients was seen as time-consuming and difficult, particularly with those refusing (Quote C8, Table 4). HCWs in Armenia, Azerbaijan, Estonia, FBiH and North Macedonia reported engaging hesitant patients by building trust through open dialogue, explaining vaccination risks and benefits and responding to any patient questions or concerns on testing and safety (Quote C9, Table 4). Disclosing one's vaccination status to encourage and reassure hesitant patients (e.g. by wearing a badge) was an approach used or suggested by HCWs in all countries. HCWs in Armenia, Estonia, FBiH, North Macedonia and Romania felt shifting refusing patients' vaccination views was difficult and authoritative approaches could entrench resistance. Some Armenian doctors and public health specialists in Georgia mentioned using COVID-19 mortality rates to motivate patients to vaccinate. Similarly, Romanian and Ukrainian HCWs responded to hesitant or refusing patients by emphasising the importance of vaccination in eradicating infectious diseases in the community and globally.

Although most HCWs claimed they recommended vaccination, some seemed selective in whom they recommended it to. A minority of Estonian HCWs reported recommending only to older populations and not to those with anti-vax views or housebound elderly populations. Some HCWs in FBiH (particularly doctors) reported planning to target high-risk groups. HCWs in early and later roll-out countries (Armenia, Azerbaijan, Kyrgyzstan, Russian Federation and Ukraine) expressed caution when recommending to certain groups due to concerns about AEFIs. This included pregnant women, those with acute infections, chronic non-communicable health conditions (cancer, diabetes, immunodeficiency), chronic infectious diseases, and those who had experienced an allergic reaction to the first dose

(Quotes C10 and C11, Table 4). Nurses in Armenia mentioned they would refer people with chronic health conditions to the doctor first for an examination.

*Need for authoritative sources and credible information.* Willingness to recommend the COVID-19 vaccine appeared related to having clear and comprehensive technical information from reputable sources to address patients' misconceptions and allay their fears about the safety of the new vaccines (Quote C12, Table 4). Both doctors and nurses wanted trustworthy scientific information so they could be expert sources for patients. Specifically, they requested information on different vaccine types, including details about country of origin, manufacturer, ingredients, and effectiveness. They also asked for safety-related information about vaccination side effects, possible AEFIs such as the risk of thrombosis, contraindications, the number and timing of doses, the post-vaccination antibody test, how long antibodies last, potential risks to pregnant women or those planning pregnancy, women who were breastfeeding and impact on patients with chronic health conditions. Nurses in Azerbaijan and Estonia emphasized the need for vaccination information in the local language.

There were notable differences in sources of information accessed by different HCWs when deciding whether to get vaccinated. In Estonia, Kyrgyzstan, North Macedonia, and the Russian Federation, doctors reported having good access to information and resources on COVID-19 vaccination from a variety of 'official' sources such as the WHO, the United States Centers for Disease Control and Prevention, national health authorities and professional societies (Quote C13, Table 4). Conversely, nurses (from Armenia, Azerbaijan, FBiH, Georgia, Kyrgyzstan, North Macedonia, Romania and Ukraine) reported relying on television, the internet, mass/social media and electronic news media for vaccine information due to a perceived lack of official national health authority information. Overall nurses seemed less exposed to scientific, authoritative information and relied more on opinions within their networks when deciding whether to be vaccinated (e.g. family doctors, colleagues or patients).

HCWs working in Armenia, Azerbaijan, FBiH, Georgia, Kyrgyzstan, North Macedonia, Romania and the Russian Federation were aware of COVID-19 vaccination misinformation and conspiracy theories on social media (Quote C14, Table 4). Of concern, some nurses from Azerbaijan and Kyrgyzstan (both later countries) reported that their own vaccination decisions had been influenced by anti-vaccination media/social media messages about vaccination side effects (Quote C15, Table 4). To improve vaccination delivery, a few Russian-speaking nurses in Estonia wanted clear and simple instructions for each different vaccine, and posters and brochures for health workers and patients. A few Estonian-speaking nurses were unhappy with vaccination guidelines from the GP association because they were based on health facilities with more space than they had.

*Need for guidance and training.* Irrespective of countries' vaccine preparation/roll-out stage, most HCWs reported having received training on COVID-19 protocols and preparations. HCWs in Armenia, Azerbaijan, Estonia, Georgia and North Macedonia reported attending online webinars and workshops delivered by different state and health/scientific organisations, and professional societies and drawing on scientific evidence, such as articles published in *The Lancet*. Contrastingly, primary-level HCWs in FBiH, doctors and nurses in Romania (both countries in preparation), and some nurses in Kyrgyzstan reported not having any formal COVID-19 training. HCWs consistently requested additional COVID-19 vaccination support and training, including



**Table 5 Illustrative quotes for Physical Opportunity.**

Quote ID	Illustrative quote
<b>Efficiency of vaccination services</b>	
P1	<i>We got vaccinated at the Centre on duty in the same way. I will say it for sure. It was more convenient for us to go and get vaccinated.</i> Doctor, Estonia
P2	<i>I would like to get vaccinated in my own workplace, polyclinic, during work hours because if something happens to me [in case of side effects] doctors would be nearby.</i> Nurse, Kyrgyzstan
P3	<i>Immunization of children and adults is carried out all the time. I think we are ready for that [COVID vaccination] too. It will be conducted the same way as the one that is distributed against the flu. There shouldn't be any rocket science there. It's nothing specific. Nothing more specific than these other vaccines.</i> Nurse, FBIH
P4	<i>At first, there were some difficulties but not now. There was difficulty in managing a large number of people. Mobile vaccination teams have reduced our workload and stress.</i> Doctor, Azerbaijan
P5	<i>Everyone is providing vaccination in their facilities. Our queuing is at a proper level, it is separate days for adults, so they don't have to wait, they book an appointment via a phone call or through the online system and they come at the set time to get vaccinated. They are very satisfied. We did not have a queuing problem.</i> Nurse, Armenia
P6	<i>They set up satellite vaccination centres at the start as it was too busy. Now there are temporary vaccination centres in shopping centres. These should be stopped now, and we should just do vaccination in polyclinics because less people are coming.</i> Doctor, Kyrgyzstan
<b>Vaccine supply and storage</b>	
P7	<i>I suppose we can't yet administer locally this vaccine that needs to be kept at -70 degrees. We are literally not able to keep that vaccine at that temperature.</i> Doctor, Romania
P8	<i>If we talk about mass vaccination, then I would say it is well organized. The teams are well trained, they know the cold chain, which is the most important for vaccination. The vaccine is well stored, the fridges are under control, the temperature and so on. Monitoring is done constantly.</i> Nurse, North Macedonia
<b>Staff workload</b>	
P9	<i>So, the problems are many, we have reached a degree of frustration, a degree of fatigue both mental and physical. We work on weekends, we work in the evening, we receive messages in the evening from CORONOPHONE, after 9:30 p.m., the patients call immediately, we try to be with the patients, we try to respect the law as much as possible - as much as we understand and as much as possible. These are hard times.</i> Doctor, Romania
P10	<i>I am the only at the moment in the outpatient clinic, and plus I am a [mobile vaccination] brigade doctor. It happened I was put in the [mobile] brigade, and in fact for the last two months my schedule is from 8:30 a.m. to 8:00 p.m. Plus, in the evening, at night, my nurse and I enter information [in the electronic medical system]. It is very difficult. If we work in this mode in the future, it will be completely unrealistic. We can see by ourselves that we are not getting enough sleep, we are overworked, plus our usual patients stay with us.</i> Doctor, Ukraine

technical training on storing, preparing and delivering COVID-19 vaccines, as well as patient communication training to help them in their role to recommend the COVID-19 vaccination (Quote C16, Table 4). Training was requested on building trust with and respond to patients' concerns on vaccine safety and efficacy informed by myths and conspiracy theories.

**Physical opportunity.** Physical opportunity reflects the physical vaccination context, including the efficiency of vaccination services, vaccine storage and supply, and staff workload.

*Efficiency of vaccination services.* At the time of the research, FBIH, Georgia and Romania were preparing for vaccination delivery. Estonia, North Macedonia, and Ukraine had started vaccinating HCWs and 'high-risk' groups like residents in nursing homes and hospital patients. Armenia, Azerbaijan, Kyrgyzstan and the Russian Federation were vaccinating the general population.

Most vaccinated HCWs had received the vaccine at their workplace, sometimes while on duty. A few HCWs in Azerbaijan and Estonia reported going to another hospital or clinic because the vaccine was not being delivered at their workplace. The majority indicated preferring to be vaccinated at their workplace during work hours, preferably at the start of the working day. This was for convenience, and to be closely monitored post-vaccination in case of AEFIs (Quotes P1 and P2, Table 5). It was considered feasible as other HCW vaccination programmes (e.g. influenza) adopt a similar approach.

Amongst the countries preparing for vaccine roll-out, a few doctors in Romania expressed concern there would not be enough time for vaccination during working hours and suggested an electronic booking system to efficiently coordinate appointments. Georgian HCWs expressed doubts about whether

facilities, especially in rural areas, would be able to deliver the vaccine due to the perceived lack of equipment (computers, internet connection, instruments) required to set-up and record vaccinations using an online system. Conversely, FBIH HCWs were more confident their facilities were ready to deliver the vaccines, given their experience delivering childhood vaccinations and influenza vaccines (Quote P3, Table 5).

There were also contrasting views and experiences regarding the organisation of vaccination delivery among countries already rolling out. Estonian HCWs reported the first dose of all nursing home residents and hospital patients was completed without issue. In North Macedonia at the start of roll-out, HCWs at hospitals (often adapted into COVID centres) and family doctors at primary care centres had different views. The former felt vaccination centres were well-organised, while the latter, who were responsible for priority groups' vaccination, described the system as disorganized, complicated, and burdensome.

Across the countries rolling out, doctors and nurses recalled long queues at vaccination clinics in the early stages and the need for crowd control by government agencies like the police. HCWs (in Armenia, Azerbaijan, Kyrgyzstan, North Macedonia and Ukraine) spoke of mobile vaccination sites helping to overcome these challenging periods of high vaccination demand (Quote P4, Table 5). Doctors in Armenia and Azerbaijan (both later roll-out countries) further reported that adherence to social distancing rules at these mobile sites had been challenging. Many HCWs (especially in Armenia and Azerbaijan,) highlighted the benefits of online reservation systems and SMS reminders enabling more flexible scheduling and re-booking (Quote P5, Table 5). In Kyrgyzstan and the Russian Federation, HCWs reported that primary care health facilities and shopping malls were used to deliver vaccinations, and these had generally been well-organised. Some Kyrgyzstan doctors felt primary care health facilities (not

shopping malls or parks) should be used to deliver vaccinations because of safety reasons and lower patient demand (Quote P6, Table 5).

**Vaccine supply and storage.** In preparation for vaccination delivery, many Georgian and Romanian HCWs highlighted logistical and resource concerns relating to vaccine supply and storage (Quote P7, Table 5). These included ensuring adequate availability of vaccines, reorganizing facility space for delivery and observation, and procuring refrigerators. In contrast, FBiH HCWs were more confident in their facilities' preparedness and were only concerned they did not have suitable equipment for vaccine storage. Countries that were already rolling out did not mention vaccine storage, apart from some doctors in North Macedonia who believed vaccines were being stored correctly (Quote P8, Table 5).

Concerns about potential vaccine shortages were also evident in some countries in both early and late roll-out (mainly doctors in Armenia, Estonia and North Macedonia). By contrast, nurses in Azerbaijan and HCWs in the Russian Federation indicated sufficient supply.

**Staff workload.** HCWs unanimously spoke of experiencing high levels of stress and burnout during the pandemic, exacerbated by pressure to deliver mass population vaccination (Quote P9, Table 5). Several HCWs in preparation countries and one early roll-out country (Georgia, Romania and Russian-speaking doctors from Estonia) expressed concerns that vaccine introduction would increase their workload beyond their current duties, commenting that using different vaccines, administering two doses and not wasting doses added to the complexity of their work. There was a shared understanding that beyond administering the vaccine, vaccination delivery would require much more, including recording patients' arrival, checking medical records, and discussing patients' concerns. The logistics of managing patient bookings and attendance were also discussed, especially in terms of closely monitoring patients' post-vaccination for AEFIs, making sure there was enough physical space between patients, and re-booking those who did not attend.

HCWs in some early and later roll-out countries. (Armenia, Azerbaijan, Ukraine) confirmed the significant increase in workload associated with vaccination delivery, describing extended working hours (administration, scheduling appointments), rescheduled shifts and an expectation to perform their normal responsibilities alongside these duties (Quote P10, Table 5). Some HCWs in the Russian Federation perceived they did not have enough time to have a detailed conversation with patients about the COVID-19 vaccination. As well as mobile vaccination units (mentioned above), specialist vaccination doctors were seen as solutions in Armenia. Alternative perspectives on workload included HCWs in the Russian Federation who stated it be easier to participate in the vaccination roll-out than be a frontline worker. Also doctors in Estonia and North Macedonia seemed less concerned with the staff workload implications predominantly because they believed there would be enough staff to deliver the vaccine that they felt was in short supply early in the vaccine roll-out.

**Social opportunity.** Social opportunity relates to the social context for vaccination behaviours including support mechanisms for HCWs, and social cues, norms and values.

**Support mechanisms for HCWs during the pandemic.** When discussing general support received during the pandemic (not specific to vaccination), HCWs in some preparation and early

vaccine rollout countries (Estonia, FBiH and North Macedonia) reported being engaged in planning and decision-making in their health facilities' response to the pandemic. Across all countries, HCWs described learning "on the job" about the COVID-19 virus. They found positives in new ways of working, learning new skills e.g. using IT systems to manage patient demand for vaccination and in-service re-organisation. Teamwork was consistently described as more efficient with an increased sense of solidarity and communication (Quote S1, Table 6). HCWs in North Macedonia further reported improved collaboration between different levels of care (primary and secondary).

Receiving information, guidance, and training from several official sources made HCWs feel supported in the rapidly changing pandemic situation, as reported particularly by HCWs in early roll-out countries (Estonia—mainly doctors, North Macedonia, the Russian Federation) (see the section "Capability" subsection "The need for authoritative sources and credible information"). Nurses in Georgia were kept up-to-date during the pandemic by colleagues (doctors and managers), however, they expressed a need for better communication between facilities and more support with reorganising their workloads to manage the pandemic workload and prepare for roll-out. Doctors in Romania explained that they did not feel listened to by authorities and were unsure how to keep themselves and their patients safe due to the lack of clinical guidelines.

**Social cues, norms and values.** When deciding on whether to receive vaccination, most HCWs were influenced by official sources, colleagues, friends and family (Quotes S2 and S3, Table 6). HCWs from Armenia, Azerbaijan, Kyrgyzstan and Romania spoke of and, in some cases, were affected by anti-vaccination propaganda on social media relating to serious vaccine side effects, e.g. death after two years or infertility, and the pandemic as a pretext to implant microchips in people (Quote S4, Table 6). Such information influenced the vaccination decisions of a few nurses from Azerbaijan and Kyrgyzstan (both later roll-out countries).

Some HCWs (mainly mentioned in Estonia and North Macedonia, both early roll-out countries) knew of vaccine-hesitant or refusing colleagues (Quote S5, Table 6). They believed such colleagues' decisions stemmed from factors including concerns about vaccine-induced infertility, the temporary nature of official vaccine approvals, conflicting safety and effectiveness information for different vaccines, reliance on antibodies from previous COVID infection or antibody testing, having existing health conditions and previous adverse reactions to other vaccinations, denial of pandemic severity or thinking it was a hoax. HCWs suggested such colleagues would benefit from seeing senior colleagues and trusted peers receiving and recommending vaccination.

## Discussion

This paper explores HCW behaviours, experiences and perceptions during an important public health challenge: the mass population roll-out of new vaccines during a global pandemic in a limited time. Our synthesis of qualitative studies across 10 European and Central Asian countries, at different stages of vaccination preparation and roll-out, identified multiple, interlinked barriers and drivers for HCWs to receive, recommend and deliver COVID-19 vaccination. All four COM (Capability, Social and Physical Opportunity, and Motivation) factors influenced HCWs receiving vaccination while recommending vaccination was influenced by capability and motivation factors. Delivering vaccination was linked to social and physical opportunity. These nuanced findings highlight the need for national health

**Table 6 Illustrative quotes for Social Opportunity.**

Quote ID	Illustrative quote
S1	<i>I can't help but carry on being astonished by my team. We think as one organism. Also, when it comes to patients, I can't remember any dissonance. Yes, years ago there may have been issues, but, but everyone has pulled together during the pandemic, so it has been rather pleasant.</i> Doctor, Estonia
S2	<i>My decision is based on information from the World Health Organization, from the CDC Atlanta, the Centers for Disease Prevention, the website of the Medicines Agency. My information definitely comes from reliable sources.</i> Doctor, Romania
S3	<i>Colleagues who have already got vaccinated may convince healthcare workers deciding about vaccination. "Which one [vaccine] is the best. I asked my colleague what is the safety and it seems like everything is acceptable.</i> Nurse, Kyrgyzstan
S4	<i>It's all about media and social media influence. Now a full range of information is available to the general population including healthcare workers. It includes both information and misinformation. Just as I said at the beginning, these conspiracy theories are also made available to people and they are sceptical. Conspiracy theories, that someone is out there trying to bring us under control. Information has been circulated through the media that someone wants to control us, to implant micro-chips in us.</i> Nurse, FBiH
S5	<i>Half of our center has been vaccinated. Half are thinking. The first objection was this - a person has previously had an allergic reaction to the flu vaccine. Moreover, a very serious reaction, anaphylactic shock. And, of course, this person, when she said that she would not go for the vaccine, I understand her. And no one will either convince or force her.</i> Doctor, Estonia

authorities to understand the multiple influences on their HCWs' vaccination behaviours by gathering insights and using these to implement multi-faceted, tailored and targeted strategies at the individual, system and policy levels (WHO Regional Office for Europe, 2021; WHO Regional Office for Europe, 2022a).

We observed many commonalities across countries, with some key differences between preparation, early and later stage countries mainly in terms of physical opportunity improving as vaccination programmes progressed, but also some social opportunity differences. We expected capability and motivation factors to improve over time, but this was not evident. Instead, we observed differences between doctors' and nurses' capabilities, social opportunity and motivation despite this not being a focus of our synthesis. We discuss the individual (capability, motivation) and context (social and physical opportunity) influences on the three vaccination behaviours below, highlighting barriers and implications for strategies to improve COVID-19 vaccination coverage.

As we might expect, HCWs were generally aware of and well-informed by official sources about COVID-19 vaccines and vaccination. They were typically positive, saw vaccination as key to ending the pandemic, and recognised their role in this process. However, capability and motivation barriers were evident. Some HCWs demonstrated incorrect or insufficient knowledge and nurses from several countries reported a lack of official resources necessitated relying on media and social media. Concerning misconceptions included assumptions that prior infection obviates vaccination, vaccination post-infection is dangerous, and chronic health conditions and pregnancy are necessary contraindications to vaccination. These knowledge gaps resulted in vaccine hesitancy that persisted in late roll-out countries, with the first two gaps most affecting HCWs receiving vaccination.

The third misconception produced reluctance to recommend vaccination to specific patient groups who are at higher risk of severe disease from COVID-19. It appeared to skew the risk assessment for some HCWs, with a focus on assumed greater risks of AEFIs due to health conditions while ignoring the known increased risk of severe disease, hospitalisation and death from COVID-19 if unvaccinated. This is especially concerning given both the need for these specific groups to reduce their risk of severe infection and that HCWs are a trusted source of information and influence patients' vaccination decisions (World Health Organization, 2020; Ames et al., 2017). More general concerns about safety and effectiveness, heightened by the accelerated COVID-19 vaccine development and approval timeline, also impeded HCWs' motivation to receive and recommend vaccination even in later roll-out countries. In terms of

vaccination communication, doctors were typically more confident than nurses in recommending vaccination, although they also viewed conversations with hesitant and refusing patients as challenging.

Knowledge gaps, vaccine safety concerns and communication challenges are not new for HCWs. Routine vaccination studies (e.g. childhood vaccinations, HPV, influenza) have identified knowledge deficits and concerns amongst HCWs related to safety (contraindications, AEFIs) and effectiveness (Karafillakis et al., 2016; Musa et al., 2020; Trifunović et al., 2022). Vaccine safety concerns are particularly common for new vaccines, as shown with the HPV vaccine (Malue Nielsen et al., 2019; Paterson et al., 2016), and HCWs (especially nurses and midwives) often receive little training on vaccination communication and lack strategies for discussing routine vaccination with those who have concerns or refuse (Morales et al., 2020; Berry et al., 2017; Kaufman et al., 2019). Our findings on HCWs' assumptions about COVID-19 infection and their concerns about safety and effectiveness, often associated with the accelerated timeline for COVID-19 vaccine development and approval, also mirror findings elsewhere (e.g. Di Gennaro et al., 2021; Gagneux-Brunon et al., 2021; Elwy et al., 2021; Sema Aci et al., 2021; Ng et al., 2022)). However, those studies focused only on HCWs receiving COVID-19 vaccination. Our findings indicate these concerns further impact HCWs' recommending behaviours, especially the worrying new finding that some HCWs are not recommending COVID-19 vaccination to patients with chronic health conditions or pregnant women for fear of AEFIs, even in later roll-out countries.

Key social and physical opportunity drivers to receiving vaccination were respectively the positive influence of colleagues, family and friends, and being vaccinated at work during working hours. Conversely, the rapid spread of misinformation on COVID-19 vaccination through social networks affected some HCWs' personal vaccination decisions, particularly nurses. HCWs described some positive developments during the pandemic related to new ways of working and being engaged in the planning of work. They also mentioned multiple challenges related to delivering vaccination, specifically: managing vaccination sites and patient appointments, vaccine shortage concerns, burnout and frustration from increased staff workload and stress, working overtime to carry out routine work, and alongside vaccination delivery. It was reassuring that in the later roll-out countries, official training and guidance, service re-organisation and improved teamwork were in place to support delivery, although increased workload persisted.

Aside from extensive research on stress and burnout (Sharifi et al., 2021), there is little published on HCWs delivering



COVID-19 vaccination, and research literature on routine immunization often lacks descriptions of contextual challenges to delivery (Sun et al. 2021; Ghahramani et al., 2021; Karafillakis et al., 2016; Musa et al., 2020). Qualitative work exploring midwives' communication about maternal and childhood vaccination to expectant parents identified key 'opportunity' enablers to vaccination delivery, including extra appointment time, health-care facilities that endorsed vaccination, development and implementation of resources and training, supportive colleagues and clinic space, and vaccines stored on site (Kaufman et al., 2019). Our findings provide key information on social and physical opportunity barriers to such behaviour. The significant influence of anti-vax material on HCWs' personal COVID-19 vaccination decisions has been reported elsewhere (Manby et al., 2022), though we observed nurses were particularly affected.

The capability, motivation and social opportunity barriers highlight a need for training HCWs on technical knowledge and skills for communicating with patients who question the vaccine. Whilst HCWs' accounts indicated that most countries were providing technical training and protocols, no communication skills training for COVID-19 vaccination conversations appeared to be in place at the time of data collection. Both trainings should be available to all HCWs, not just doctors. Indeed, nurses reported less access to scientific sources, were more affected by misinformation and lacked confidence in vaccination conversations. Our insights provide direction on how to tailor training to the specific needs of different HCW groups working in different contexts, both in terms of content and preferences for delivery. With knowledge, and confidence in the vaccines and in their own ability to respond to patient concerns, HCWs should be more willing to receive COVID-19 vaccination and feel confident in recommending it.

The physical opportunity barriers to delivering vaccination indicated an urgent need to address HCWs' excessive workloads and to implement efficient digital systems for monitoring vaccine supply, scheduling patient appointments and recording vaccinations. We found little evidence that HCWs felt supported in managing their pandemic workload or that they were consulted in reorganising health facility systems to accommodate the COVID-19 vaccine roll-out. Support from management might include looking after HCWs' mental health and well-being, ensuring clarity in their responsibilities within the overall vaccination effort and engaging them as respected partners in decision-making about service re-design. Once again, our insights offer details on the precise requests from different HCW groups in different contexts to enable them to deliver COVID-19 vaccination alongside their routine work in these challenging times. The findings regarding knowledge gaps among HCWs affecting their willingness to recommend vaccination, fears of AEFIs, lacking the communication skills to respond to vaccine concerns, and feeling insufficiently supported to carry out vaccination services remain relevant not only as countries move to integrate COVID-19 vaccination into routine services but in the role HCWs play in building vaccine confidence for other vaccines, including HPV and other childhood vaccines.

**Strengths and limitations.** The key strength of this work is the focus on three COVID-19 vaccination behaviours that are important duties of HCWs. We discovered they have different barriers and drivers that must be addressed with a combination of strategies. Previous research has focused almost exclusively on HCWs receiving COVID-19 vaccination. Applying the modified COM-B framework enabled a holistic and systematic examination of individual and context barriers and drivers, avoiding "blind spots" (Habersaat et al., 2020). The participating countries

(within Europe and Central Asia) are almost absent in the (COVID-19) vaccination literature. This multi-country work provides important insights that health authorities can draw upon in their ongoing COVID-19 vaccine roll-out. The commonalities provide a useful starting point that can be investigated to identify each country's specific challenges. Finally, a strength of the original 10 studies was their rapid qualitative approach to data analysis (Vindrola-Padros et al., 2020), producing timely knowledge to inform recommendations for tailored and targeted strategies to improve COVID-19 vaccination uptake. This methodology has since been published as part of a rapid research and intervention tool (WHO Regional Office for Europe, 2022b).

We acknowledge some limitations to this work. Firstly, a contextual adaptation of the discussion guides for each country, as well as differing levels of detail collected across the FGDs and IDIs, resulted in quality and content variation for some topics in the synthesis. Our approach was to include data where they were available. Such challenges of multi-country qualitative research are reported elsewhere (Chapple and Ziebland, 2018).

Secondly, the included countries were self-selecting, and we were reliant on their sampling decisions for HCWs. There is potential for self-selection bias of countries and of HCWs who may have had a greater interest in COVID-19 vaccination. Nine of the 10 countries are middle-income and located in eastern or southern Europe or central Asia. We are confident in the "inferential generalisability" (Ritchie et al., 2014) of the findings in similar countries. Furthermore, given the parallels with the global literature on HCWs receiving and recommending vaccinations, we believe that the barriers and drivers identified here can provide a useful starting point for other countries understanding their vaccination coverage. The sample of 378 HCWs represented a mix of vaccinated and unvaccinated HCWs across professional roles, healthcare settings, and urban/rural locations, spanning a range of ages and years of experience. We have no reason to believe these HCWs are markedly different to others from these countries in terms of their diverse COVID-19 vaccination views and experiences. This fact, and the rigour of the primary studies and cross-country synthesis give us confidence in the "representational generalisability" (Ritchie et al., 2014) of our findings, to other HCWs within these countries.

Finally, having countries conduct this qualitative work at different stages of their vaccine roll-out afforded us an opportunity to look for temporal differences in barriers/drivers over. A better study design would have been longitudinal with several data collection points in each country; however, this was rapid real-world, action-focused work. The rigour of our synthesis means we are confident in our observations keeping in mind our above-described conclusions on inferential generalisability.

## Conclusion

This qualitative synthesis spanning 10 countries in the WHO European Region provides important insights into the barriers and drivers experienced by HCWs in relation to receiving, recommending and delivering COVID-19 vaccination during different phases of vaccine rollout. It reveals complex and inter-related capability, physical and social opportunity, and motivation barriers and drivers that differ for the three behaviours; so providing important insights for multifaced, targeted and tailored interventions to increase COVID-19 vaccination coverage. Furthermore, it adds to the growing literature on vaccine acceptance and demand, focusing on less-observed HCW behaviours and geographical areas. It adds value beyond the COVID-19 pandemic by illustrating the complex factors affecting vaccination behaviours more generally. As countries move to integrate



COVID-19 vaccination into routine services, these findings highlight the impact of the immunization programme and the importance of health workers in achieving high vaccination coverage, including HPV and other childhood vaccines.

### Data availability

The RAP sheets from the primary studies are not available as participants were not asked to consent to this. The summary tables are available from the corresponding author on reasonable request.

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## Author contributions

CJ, BC, KBH, SMN and SW co-conceived and co-designed the 10 primary in-country studies. BC, CJ and SW supervised the data collection and data analysis for the primary studies. CJ, BC, SMN, SSL and SW co-conceived the cross-country synthesis and interpreted synthesis findings. SS and CJ conducted the cross-country synthesis and drafted the manuscript. AA, DA, AKA, IB, DC, SC, SCL, JH, LH, AIL, AIS, SI, NJ, IK, Eke, EKj, AM, MO, BP, HS, AIS, AV, EY and RGZ co-designed and/or conducted their country's primary study and interpreted their data in the cross-synthesis. All authors reviewed, revised and approved the manuscript agreeing to be accountable for this work. CJ is the corresponding author.

## Competing interests

The authors declare no competing interests.

## Ethical approval

The 10 primary studies were conducted in line with the principles of the Helsinki Declaration (World Medical Association, 2009). Each study secured ethical approval from relevant in-country institutional Ethics Committees and was screened and considered exempt from review by the WHO AdHoc COVID-19 Research Ethics Review Committee.

## Informed consent

Written informed consent was provided by all participants of the 10 primary studies to audio record and use anonymized contributions for research.


## Additional information

**Supplementary information** The online version contains supplementary material available at <https://doi.org/10.1057/s41599-023-02443-x>.

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