



Faculty of Health Sciences - Department of Community Medicine

Title

The effects of COVID-19 vaccination strategies on vaccine uptake in the Nordic Countries. A scoping review.

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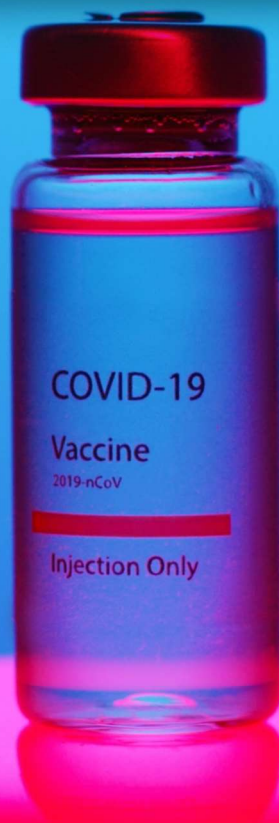


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1 Abstract

1.1 Introduction

The declaration of COVID-19 as a pandemic in 2020 by WHO helped in organizing efforts against the disease, including the manufacture of numerous vaccines. WHO recommended that all countries should vaccinate over 70% of their citizens. However, vaccination coverage is a goal that faces a lot of challenges, including vaccination hesitancy among others. This scoping review addresses vaccination policies and strategies in the Nordic Countries. It maps the literature available in the Nordic Countries addressing vaccination strategies and interventions, and the resulting coverage and other outcomes.

1.2 Methods

The review followed the methodology guidance of the Joanna Briggs Institute and adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) checklist. I conducted a database search to identify relevant studies on basis of the inclusion criteria that was based on the research question. I conducted two screening phases on the publications against the inclusion and exclusion criteria before eventually including the select the studies in this review. I did not conduct critical appraisal on the studies included since it was not required as per PRISMA-ScR guidelines. Finally, the data charting process involved extracting the relevant data from the included studies onto tables that I tailored for the purpose of this review. I synthesized the results by extracting the data from the included studies and collating and classifying the studies based on countries, focus, and interventions.

1.3 Results

The review included 13 studies focusing on vaccination willingness, uptake, and coverage as outcomes to the various vaccination strategies, campaigns, policies and approaches followed in the Nordic Countries. The studies were of both qualitative and quantitative designs. Five Nordic countries were included in these studies. The majority of the studies included showed vaccination uptake above the 70% recommendation by WHO in the Nordic Countries.

1.4 Conclusion

The findings emphasized the importance of effective vaccination rollout organization and communication. Trust proved to strongly influence the vaccination uptake and willingness in the Nordic Countries. Moreover, prioritization strategies had a powerful impact on vaccination coverage. This scoping review serves as a guide for future research and highlights the importance investigating vaccination policies and effects on vaccine uptake and perceptions.

2 Introduction

2.1 Background

The first COVID-19 case was discovered in a province in China in late December 2019. Since then, it has spread rapidly across the world. As of February 1st, 2020, it had been detected in 24 countries. And then by the beginning of March, the number of the countries with detected COVID-19 cases grew to 58. On March 11th, 2020, World Health Organization (WHO) declared COVID-19 a pandemic after infections had grown 13-fold outside China, and it had hit 114 countries by then. By the end of December the same year, over 79 million cases were identified, and 1.7 million COVID-19 deaths were reported (WHO, 2023a).

On the bright side, on December 11th, 2020, the first vaccine approval was granted to Pfizer-BioNTech as a COVID-19 vaccine available for individuals of the age 16 years and older. And in May, 2021, the approval was extended to include the ages 12 to 15 years (FDA, 2021). Shortly after the approval of the first vaccine, the UK approved COVID-19 Vaccine AstraZeneca for adults of age 18 years and older on December 30th, 2020 (Gov.Uk, 2020). Numerous vaccines surfaced thereafter. However, that was not nearly the end to the pandemic, as it continued to spread, and the fatalities kept rising. By the end of December 2021, the reported cases of infection exceeded 278 million, and the fatalities were just under 5.4 million. And those numbers climbed up to surpass 649 million confirmed cases and 6.6 million deaths due to COVID-19 by the end of December 2022 (WHO, 2023a). The answer to the question, “why did not the vaccines put an end to this pandemic?”, is not a single or simple answer. Multiple research papers have been published explaining the various obstacles hindering the desired effect of COVID-19 vaccines, that is, elimination or complete eradication of the disease.

WHO encouraged vaccinating against COVID-19. Vaccination was presented as one of the most essential measures to curb the spread of infections as well as to minimize the rise of the global COVID-19 fatality rate. WHO recommended that all countries should reach a vaccination coverage above 70% of their populations, it also recommended a complete 100% vaccination of healthcare workers, and vulnerable groups, including individuals aged 60 and above, as well as those with underlying health conditions that increase their susceptibility to infection or worsen their prognosis in case of infection (WHO).

Even though the governments and healthcare authorities of most countries strive to maintain vaccination levels above the threshold recommended by the WHO, there are numerous challenges in achieving the desired vaccination coverage. If we divide these challenges into two categories, we have supply challenges on one hand, and demand challenges on the other. Supply challenges may arise from limited access, inadequate healthcare system preparedness, equity limitations, difficulties with scaling up vaccine production, among others. This scoping review will look into the demand aspect of vaccination, focusing on challenges related to vaccination acceptance and willingness. WHO defines vaccine hesitancy as a “delay in acceptance or refusal of safe vaccines despite availability of vaccination services” (WHO, 2015). Vaccine hesitancy is brought about by multiple reasons and factors, such as fears, concerns, misinformation, mistrust, and others.

Even with high vaccine supply, low demand still hinders the overall vaccine coverage. And that jeopardizes the overall wellbeing of a population. WHO defines the term ‘herd immunity’ as “the indirect protection from an infectious disease that happens when a population is immune either through vaccination or immunity developed through previous infection” (WHO, 2020a). Researchers estimate a 71% to 74% vaccination coverage is needed to provide herd immunity against COVID-19, so that the impact of the disease would be significantly weaker (Neumann-Böhme et al., 2020). Mass vaccinations can be described within the framework of ‘public goods’, which generate positive externalities for the society (Olsen, 2017). In such analogy, individuals within the community who are not able to receive vaccines due to limitations in access, or contraindications to specific types of vaccines are substantially protected by a surrounding majority of vaccinated individuals in the community. Hence, a high vaccination coverage is essential.

2.2 Introduction

Governments and health authorities worldwide have implemented policies to address low vaccination uptake. This is typically pursued through one of two approaches, and in some cases, combination of these approaches is implemented. This can involve either direct actions aimed at increasing vaccine uptake, such as providing incentives for vaccination or employing coercive measures such as mandates and imposing fines, as referred to as ‘the carrot and the stick’ (Savulescu et al., 2021). Or indirectly, by addressing vaccine hesitancy through education, encouragement, facilitation and other strategies (Savulescu et al., 2021). Research has been conducted to examine the correlation between different vaccination policy

approaches and the resulting uptake or coverage. However, the ethical implications and public health concerns of policies still raise questions. Some of these questions, for the most part, remain unanswered, such as whether COVID-19 vaccination should be voluntary or mandatory. Additionally, questions arise about the extent of the effects on the outcomes of each of the policies implemented to increase COVID-19 vaccination uptake.

2.2.1 Rationale

This scoping review will focus on COVID-19 vaccination programs, policies, and interventions aimed at increasing vaccination uptake in the Nordic Countries. The healthcare systems of the Nordic Countries are often considered to be exemplary models. In the context of infection prevention and control measures, during a WHO virtual press conference in April 2020, Dr. Michael Ryan described the Swedish policies as a future model to reach a new normal. This comment was after the appearance of multiple clusters of disease in care facilities (WHO, 2020b). Nevertheless, the perception of its healthcare system and policies remained positive. The Nordic Countries throughout this review are defined as the sovereign states of Denmark, Finland, Iceland, Norway, Sweden, the Faroe Islands, Greenland and Åland (Council).

Scoping reviews are conducted for multiple reasons. They serve to identify gaps in research, summarize the existing evidence, to help guide future research, and to address knowledge gaps (Peters et al., 2021). I conducted a literature search for primary and secondary studies focusing on vaccination policies and coverage, and found that there was more research required in this area of research. Such area of research is essential so that in case of future epidemics or pandemics, research would provide conclusive answers and evidence to guide the utilization of approaches tailored to specific conditions or populations. And to foresee challenges and opportunities within the field of vaccine policy and communication. A scoping review by Andreas et al. (2022) was conducted with a similar approach to my current review. However, I did not identify reviews on this topic in the Nordic countries. The focus on this region allows me to compare healthcare systems that are relatively similar compared to the global level. When compared to other regions globally, the healthcare systems across the five Nordic Countries share similarities in values and priorities among other aspects. Moreover, regional similarities in terms of climate zones, as well as relatively similar demographics and standard of living, are all factors that allow for an in-depth scoping review. These factors

altogether support a synthesis of a reliable comprehensive evidence map in the Nordic Countries.

2.2.2 Research question

What is the scope and characteristics of the existing research on COVID-19 vaccination strategies in the Nordic countries?

2.2.3 Objectives

1. To map the existing research on COVID-19 vaccination programs, policies, strategies, and interventions in the Nordic Countries.
2. To categorize the identified research based on target population, types of strategies and interventions utilized, and study outcomes.

3 Methods

The scoping review follows the methodology guidance for conducting a Joanna Briggs Institute scoping review (Peters et al., 2021). Reporting of the results of the review conforms with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews checklist PRISMA-ScR (Tricco et al., 2018). There is no critical appraisal of the studies included in this review, as scoping reviews map the existing scientific evidence regardless of study quality (Tricco et al., 2016).

3.1 Protocol

Earlier this year, I wrote a protocol for this scoping review. Although it was not published, it is available in this document (see Appendix 1). The content of the protocol was last modified on February 24th, 2023, and no further updates to the data or information have been made since then. I made some editing and refinements in early June 2023, but the content itself remained unchanged.

3.2 Eligibility criteria

The focus of the study is on vaccination policies and interventions in the Nordic countries, examining quantitative outcomes such as vaccination coverage and uptake, as well as qualitative outcomes like perceptions and others. Table 1 below presents the inclusion and exclusion criteria I considered when selecting publications for this review. All the included studies should be published.

Table 1. Inclusion/ exclusion criteria

	Inclusion criteria	Exclusion criteria
Study design	<ul style="list-style-type: none">- Randomized controlled trials and other controlled designs- Qualitative studies- Observational studies, cross-sectional, case-control and cohort study designs- Modelling studies, involving a synthetic-control model	<ul style="list-style-type: none">- Quantitative studies with sample of less than 50 participants

Population	<ul style="list-style-type: none"> - Residents of a Nordic country - General population - Eligible for COVID-19 vaccination <ul style="list-style-type: none"> o Absence of contraindications 	Studies on populations outside the Nordic countries
Setting	<ul style="list-style-type: none"> - COVID-19 pandemic - vaccination programs 	–
Intervention	<ul style="list-style-type: none"> - COVID-19 vaccination program - Interventions to increase COVID-19 vaccine uptake: <ul style="list-style-type: none"> o Education, awareness campaigns and other communication interventions o Policies, such as mandatory vaccination and COVID certificates o Incentives, monetary and others 	<ul style="list-style-type: none"> - Studies on vaccines for diseases other than COVID-19 - Interventions that target the uptake of vaccines other than COVID-19 vaccines
Outcomes	<ul style="list-style-type: none"> - Vaccination coverage - Vaccination uptake - Impressions and experiences 	<ul style="list-style-type: none"> - Economic evaluation - Vaccine efficacy
Publication year	Published from 2020 to April 2023	<ul style="list-style-type: none"> - Studies published before year 2020
Publication type	<ul style="list-style-type: none"> - Publications available in full text: <ul style="list-style-type: none"> o Journal articles o Reports o Book chapters - Studies with partially unpublished results 	<ul style="list-style-type: none"> - Policy documents - Editorials - Grey literature
Language	English	–

3.3 Information sources

Between March 13th and 17th, 2023, I searched 4 databases for relevant literature. The databases searched were Embase, Medline, L.OVE platform database, and Web of Science.

3.4 Search strategy

The search strategy for this scoping review was developed and refined through iterative testing to ensure a systematic and comprehensive approach to the literature search.

First, I conducted a literature search to determine the topic and research question of the review. Then, I performed a systematic search on multiple databases before writing the protocol for this scoping review, which helped identifying relevant studies and refining the inclusion and exclusion criteria. That search included four databases, namely, Embase, Medline, Epistemonikos, and Google Scholar. Later, I conducted an initial search for the current scoping review on multiple databases before seeking assistance from a search specialist for my final search.

Finally, I consulted a search specialist, that is, the chief librarian at the Department of Community Medicine, UiT The Arctic University of Norway, who provided valuable insights on utilizing advanced search techniques as well as guidance in selecting the appropriate databases.

I then executed a final comprehensive search on the four abovementioned databases to gather the relevant publications for the later steps in the scoping review. I conducted the search with a combination of controlled vocabulary such as Medical Subject Headings (MeSH terms), and keywords in the fields of title, keywords and abstract (kw., ti., ab.). The search strategy was tailored to each database's syntax and search functions. However, the following description applies to the four databases mentioned. Throughout the search process, I used an iterative approach to refine and optimize the search strategy based on the results obtained in order to enhance the precision and comprehensiveness of the search. The search included three boxes, the first for disease, setting or intervention, the second box for outcome, and the third box for the country or population. The boxes were combined together with Boolean operator "AND". And each box combined within with Boolean operator "OR". Truncation was used when appropriate, such as in Norw* that would include both "Norway" and "Norwegian". While this would not apply in case of "Denmark" and "Danish", so they were listed separately. Furthermore, occasional usage of the function "ADJ" in databases or "NEAR" in others for inclusion of multi-word terms that might be separated by a limited number of words, such as seen in figure 1 below. The following figure is presented to provide transparency and reproducibility as recommended by the PRISMA guidelines for reporting the search strategy of the scoping review. Figure 1 shows details of the search strategy from Web of Science, I

chose this database as an example due to its concise presentation, which makes it easier to grasp and navigate.

Web Of Science

```
covid* NEAR/3 vaccin* OR covid* NEAR/3 immunizat* OR  
coronavirus NEAR/3 vaccin* OR sars NEAR/3 vaccin*
```

AND

```
coverag* OR refus* OR hesita* OR delay* OR accept*  
OR confiden*
```

AND

```
scandinavi* OR nordic OR swed* OR norw* OR iceland*  
OR finland OR finnish OR denmark* OR Danish
```

Figure 1. Search strategy on Web of Science

There was no apparent necessity for applying search limitations. With the use of multiple keywords, nearly all the papers identified were in English. And since the search was “covid” specific, it proved to be very unlikely that the search would yield publications from before 2020, especially with the current substantial amount of research on COVID-19.

3.5 Selection of sources of evidence

I downloaded the reference lists from the four databases and added them into a single file on Endnote reference manager version 20.5 and commenced with duplicate removal. I then opted for uploading the reference list to Rayyan, the online screening tool for systematic reviews, but this attempt did not meet success due to a “bug” on the online tool. So, I proceeded with manual duplicate detection simultaneously along with the first phase of screening. That is, screening titles and abstracts of identified publications. Most of this step was done on printed out lists of titles and abstracts.

After completing the first screening phase, I created a data charting table on Microsoft Excel that was used in the second screening phase, that is, full text screening, and it was later in the data charting process. The headings of the table were as follows: Author(s), population, intervention, interest, context/control, outcome, study design, and decision. These inputs were the information I looked for when conducting the second phase of screening. All the publications which passed the first screening phase moved forwards to the second phase. There were a few publications that had no full text available, that will be mentioned in the results section. All the publications that qualified for the second phase of screening are listed on the excel sheet data charting table with their relevant information. The decisions made for these papers were classified into three categories: exclude, include and a third category labelled as “further assessment”. The “further assessment” included publications that I was unsure of, which in a case of a research team present, they could be resolved by consensus between two reviewers or even with a third reviewer as per JBI guidance for scoping reviews (Peters et al., 2021). Instead, in my case I read through the publications in this category once again, inspecting them in detail against the inclusion criteria to make my final decision.

3.6 Data charting process

I utilized the data charting table that contained the publications from the second screening phase. This table already contained important information such as author(s), population, intervention, interest, context/control, outcome, and study design. I moved the included publications down the table for processing. To facilitate a comprehensive reading and data extraction process, I grouped the selected publications into a dedicated folder. Then I printed them out and carefully read through them extracting relevant data based on the predefined categories from the data charting table. I then created data presentation tables for presenting the findings in an organized and structured manner, ensuring they are easy to read and understand, these tables are found in (Appendix 2). It holds all the relevant information I extracted from the selected publications.

3.7 Critical appraisal

Unlike a systematic review, which provides a comprehensive appraisal of relevant research and evidence, the main aims of scoping reviews include mapping the available research and evidence, as well as identify gaps in research, which do not necessarily require critical appraisal (Peters et al., 2021). Therefore, I did not conduct critical appraisal for the identified studies.

3.8 Synthesis of results

I extracted the relevant information from each of the selected publications into data extraction tables I tailored for the purpose of this scoping review. The data extraction tables are enclosed with this review (Appendix B). The data that were extracted include: Title, author(s), publication details, study aim(s), study design, country, sample characteristics, intervention/strategy, outcomes, data collection, and main results.

Furthermore, in this review, I provide several data presentation tables classifying and collating the selected studies on basis of interventions, countries, focus, and outcomes.

4 Results

4.1 Selection of sources of evidence

The search yielded a total of 416 hits from four databases, as shown in table 2 below:

Table 2. database search results

Database	Number of publications
Embase	79
Medline	68
L.ove platform	181
Web of science	88
Total	416

I downloaded the reference lists and ran them on Endnote reference manager version 20.5, which was first used to detect duplicates. Using Endnote, I detected 198 duplicates, of which I removed 122. I attempted to utilize the online screening tool “Rayyan”, which is a useful tool for screening and has a duplicate detection function. The goal was to improve efficiency in the duplicate detection and removal process and assist with the first phase of screening. However, I encountered a "bug" on the online tool. I reached out to the support team and received a message over a week later stating that they were working on resolving the issue. But I had already proceeded the duplicate detection manually and further removed 75 duplicates.

The first screening phase included 197 records, I screened the titles and abstracts of these records against the inclusion/exclusion criteria, and excluded 115 publications. This left 82 publications for the second phase of screening, which was assessment of full text. However, two publications did not have a full-text available, one was not in English and there was one editorial that was withdrawn. This left 78 full-text publications to be screened. The main reasons for publication exclusion in this phase were: no focus on interventions or only focusing on context instead (38 publications), sampling a sub-group of the population to evaluate specific targeted interventions or no sample stratification by country (12

publications), a different context or outcome examined (10 publications), and other reasons (5 publications).

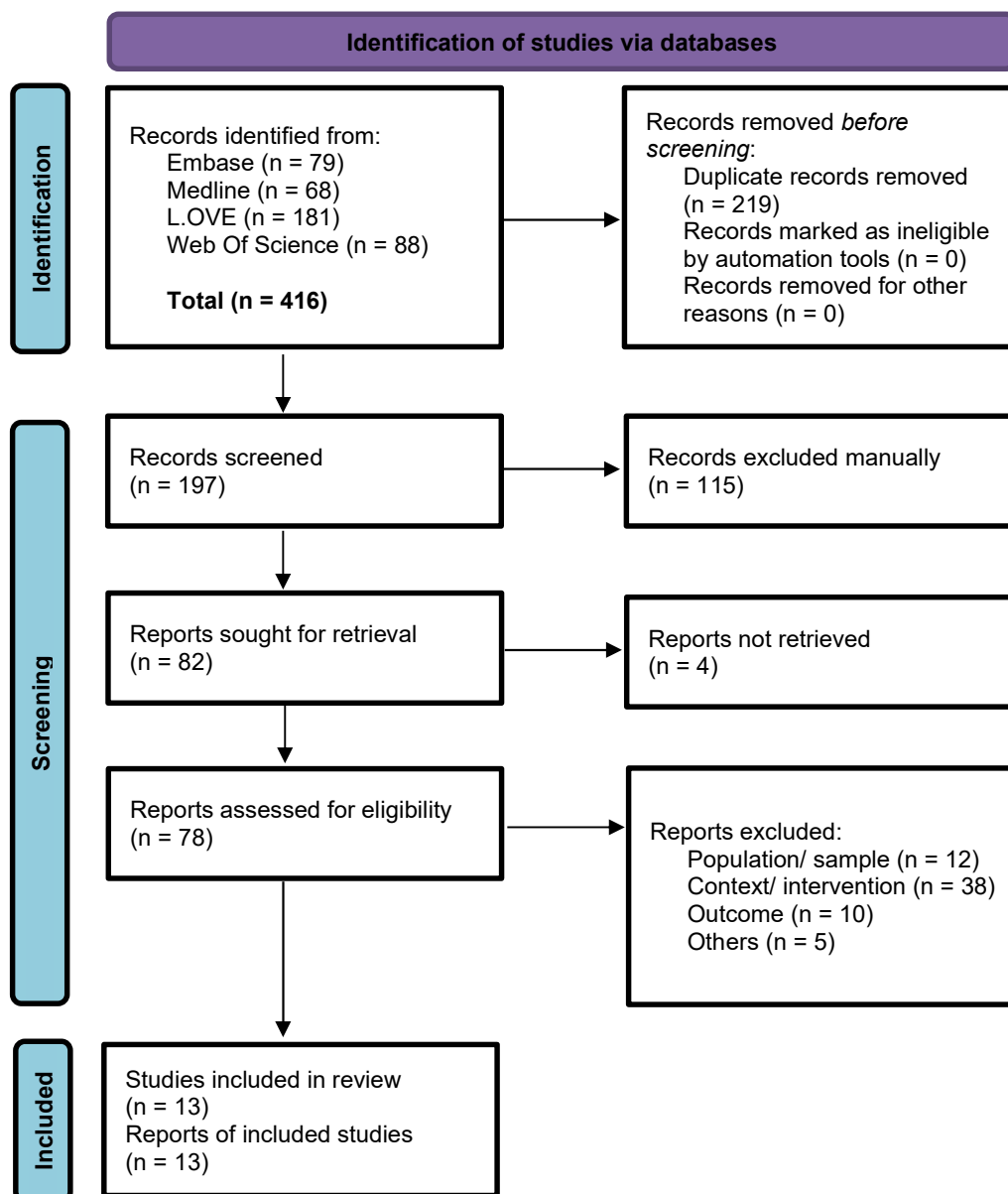


Figure 2. PRISMA flow diagram of the selection of studies

4.2 Characteristics of sources of evidence

The present scoping review includes 13 studies that either focus on or including one or more of the Nordic countries. These studies are of multiple designs, interventions, strategies, and outcomes. The following (table 3) presents the 13 included studies, listed in alphabetical order based on the author's surname. Some studies include multiple countries, outcomes, interventions, or strategies, as will be presented in the data presentation tables in Appendix 2. That said, table 3 below presents an overall description of included studies, only showing the elements on interest for this review.

Table 3. Description of the included studies

Authors	Study design	Country	Intervention/ strategy	Outcome variables
Brailovskaia et al., 2021	Cross-sectional	Sweden	- Communication strategies - Social media information	Vaccination willingness
Cadeddu et al., 2022	Qualitative Desk research	Denmark Sweden	- Vaccination requirement - Age-based vaccine prioritization - Organizational structure - Vaccine characteristics	Vaccination coverage
Charrier et al., 2022	Qualitative observational study	Finland Norway Iceland	- Vaccination requirement - COVID certificates	Vaccination coverage
Falkenbach & Willison, 2022	Inductive analysis	Denmark	- Age-based vaccine prioritization - COVID certificates - Trust	Vaccination coverage

Hammer et al., 2021	Repeated cross-sectional	Finland	- Expert recommendations - Addressing Vaccine hesitancy	Vaccine acceptance
Jørgensen et al., 2022	Conjoint analysis	Denmark	- Vaccine delivery systems - Expert recommendations - Vaccine characteristics	Vaccine acceptance
Mills & Rüttenauer, 2021	Case control based on a synthetic control model	Denmark	COVID certificates	Vaccination uptake
Missel et al., 2021	Qualitative case-study	Denmark	- Trust - Addressing vaccine hesitancy	Attitudes and perceptions
Nilsson et al., 2022	Population-based cohort study	Denmark	- High-risk targeting	Vaccination uptake
Reilev et al., 2022	Repeated cross-sectional	Denmark	Age-based vaccine prioritization	- Vaccination uptake - Vaccination coverage
Rotevatn et al., 2023	Cross-sectional	Denmark Finland Iceland Norway Sweden	Age-based vaccine prioritization	Vaccination uptake
Skjesol & Tritter, 2022	Qualitative documentary analysis	Norway	- Vaccination requirement - Organizational structure - Vaccine characteristics	Vaccination uptake

Warren & Lofstedt, 2022	Qualitative documentary analysis	Sweden	<ul style="list-style-type: none"> - Communication strategies - Age-based vaccine prioritization - Organizational structure - Vaccine delivery systems 	Vaccination uptake
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4.2.1 Geographic representation of included studies:

The publications identified in this review address a variety of interventions implemented across multiple countries. Each of the studies included at least one of the Nordic countries in its population. Eight of the studies featured Denmark, five included Sweden, Finland and Norway were present in three studies each, and Iceland was included in only one of the publications. It is worth mentioning Noteworthy is that not all of the studies solely focused on individual countries; rather, three of the included studies encompassed multiple countries. The following chart (figure 3) shows the number of publications each country was part of.

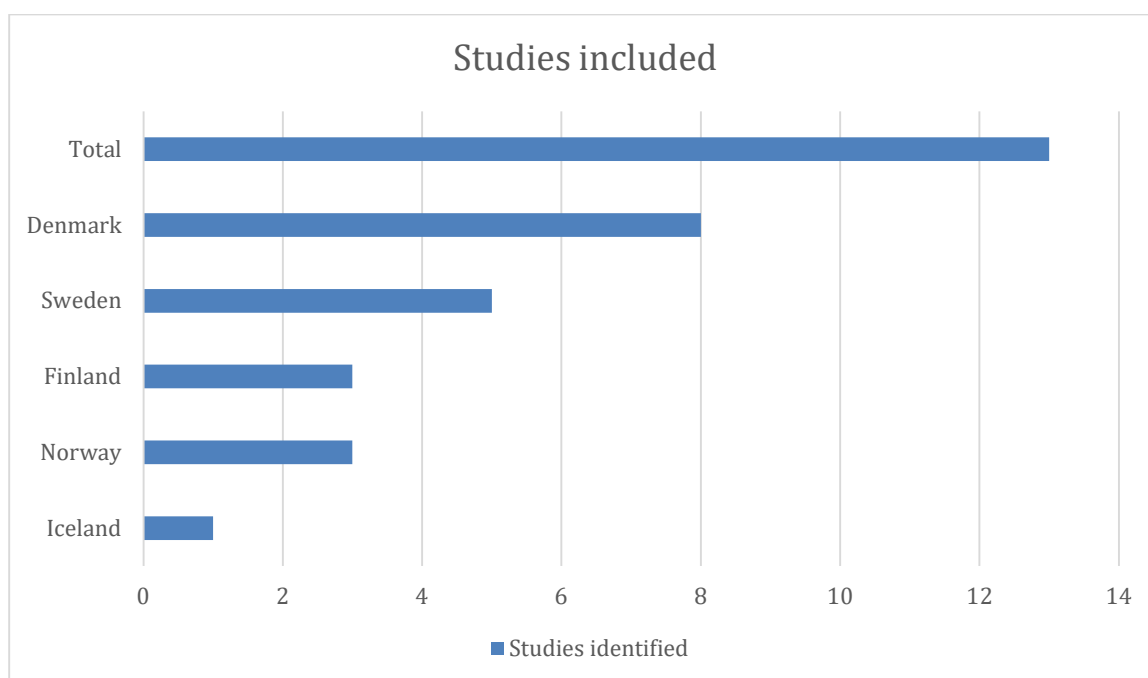


Figure 3. Number of studies per country

4.2.2 Populations in the included studies

The study samples varied in size and selection criteria. The studies included selected a range of samples sizes as low as 25 participants in one qualitative study, to large samples.

Moreover, a considerable portion of the studies examined the interventions and outcomes on a national general population level. The following (table 4) provides an overview of the populations examined in the included studies. The table presents the countries on which each of the studies focused, and the populations or samples selected for each. It is important to note that some studies will appear multiple times in the table since they featured multiple populations from the multiple countries.

Table 4. Populations in selected studies

Country	Study	Population
Denmark	(Cadeddu et al., 2022)	General population
	(Falkenbach & Willison, 2022)	General population
	(Jørgensen et al., 2022)	Representative sample ≥ 18 years old (n=3,099)
	(Mills & Rüttenauer, 2021)	General population
	(Missel et al., 2021)	Representative sample (n=25)
	(Nilsson et al., 2022)	General population ≥ 15 years old (n=4,935,344)
	(Reilev et al., 2022)	General population ≥ 5 years old (n=5,562,008)
	(Rotevatn et al., 2023)	Students in the Nordic countries (sample not specified)
Finland	(Charrier et al., 2022)	General population

	(Hammer et al., 2021)	Representative sample (18-79 years old) (n=4151)
	(Rotevatn et al., 2023)	Students in the Nordic countries (sample not specified)
Iceland	(Rotevatn et al., 2023)	Students in the Nordic countries (sample not specified)
Norway	(Charrier et al., 2022)	General population
	(Rotevatn et al., 2023)	Students in the Nordic countries (sample not specified)
	(Skjesol & Tritter, 2022)	General population
Sweden	(Brailovskaia et al., 2021)	Representative sample (n=9,264)
	(Cadeddu et al., 2022)	General population
	(Charrier et al., 2022)	General population
	(Rotevatn et al., 2023)	Students in the Nordic countries (sample not specified)
	(Warren & Lofstedt, 2022)	General population

4.2.3 Objectives and study characteristics

The studies included cover a range of objectives related to COVID-19 vaccination policies and practices. They aim to examine vaccination willingness, uptake, and coverage across the Nordic Countries. The objectives range between identifying predictors of willingness, analyzing factors influencing vaccination rates, evaluating COVID-19 certificates impact on uptake, exploring public attitudes and others.

Covering a wide range of objectives, the included studies employed various of study designs as will be shown below in Table 5. Eight of the studies employed quantitative designs, while five utilized qualitative designs. Eight of the studies were published in year 2022, four in 2021, and one was published in the beginning of 2023.

Table 5 shows objectives of the studies, authors, along with the publication year and study design.

Table 5. Study objectives, design, and publication year

Author, (year)	study design	Objective(s)
Brailovskaia et al., (2021)	Cross-Sectional	<ul style="list-style-type: none"> - To compare COVID-19 vaccination willingness in 9 countries. - To identify predictors of vaccination willingness.
Cadeddu et al., (2022)	Qualitative desk research	<ul style="list-style-type: none"> - To assess COVID-19 vaccination campaign planning and organization up to August 2021. - To evaluate the correlation of planning and organization tactics with vaccination coverage up to August 2021.
Charrier et al., (2022)	Qualitative observational study	<ul style="list-style-type: none"> - To explore childhood vaccination strategies and their resulting vaccination coverage before the COVID-19 pandemic. - To describe the relationship between COVID-19 vaccination strategies and coverage.
Falkenbach & Willison, (2022)	Inductive analysis	<ul style="list-style-type: none"> - To explore the factors contributing to vaccination rate differences between high-income, liberal democracies.

		<ul style="list-style-type: none"> - To reach an explanation relating limited supply and the national impact of COVID-19, with socio-political factors, that eventually might affect vaccine uptake.
Hammer et al., (2021)	Repeated cross-sectional	<ul style="list-style-type: none"> - To provide overview of COVID-19 vaccination willingness and hesitancy factors in Finland.
Jørgensen et al., (2022)	Conjoint experiment	<ol style="list-style-type: none"> 1. To determine types of vaccines which yield better vaccination willingness. 2. To explore interventions that lead to higher vaccination acceptance. 3. To study how vaccine characteristics affect vaccination acceptance.
Mills & Rüttenauer, (2021)	Case control based on a synthetic control model	<ul style="list-style-type: none"> - To evaluate the effect of COVID-19 certificates on vaccine uptake.
Missel et al., (2021)	Qualitative case-study	<ul style="list-style-type: none"> - To evaluate the attitudes of Danes towards the COVID-19 vaccination program in place.
Nilsson et al., (2022)	Population-based cohort study	<ul style="list-style-type: none"> - To compare COVID-19 vaccination rates in high-risk groups to the vaccination rates of the general population of Denmark.
Reilev et al., (2022)	Repeated cross-sectional study	<ul style="list-style-type: none"> - Study COVID-19 vaccine uptake and characteristics of vaccinated individuals in Denmark, considering the prioritization of high-risk individuals.
Rotevatn et al., (2023)	Cross-sectional study	<ul style="list-style-type: none"> - To explore COVID-19 infections patterns and vaccination coverage in students under 12 during the fall semester 2021.
Skjesol & Tritter, (2022)	Qualitative documentary analysis	<ul style="list-style-type: none"> - To describe Norwegian national vaccination program implementation and changes. - To explore influence of vaccination policy on public perception changes.
Warren & Lofstedt, (2022)	Qualitative documentary analysis	<ul style="list-style-type: none"> - To appraise the communication strategies and COVID-19 vaccination management in five European countries.

- | | |
|--|--|
| | - To explore the effectiveness of vaccine rollout prioritization policies in the selected countries. |
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4.3 Results of individual sources of evidence

4.3.1 Key concepts and definitions

The studies included in this review explored various approaches that have been employed to promote vaccination willingness, uptake, and coverage. Ranging between communication and media channels, mandatory policies for specific population groups, tailored vaccination campaigns such as targeting and prioritization, as well as important qualitative aspects such as public trust. Below are definitions of the concepts that will be used throughout the scoping review to describe the strategies, policies, interventions, or approaches addressed by the studies and what they mean in the context of this review.

Communication and media

This involves the broadcast of COVID-19 information through various channels, such as television reports. It includes communicating updates, guidelines, risk and rollout information through to the public (Brailovskaia et al., 2021; Warren & Lofstedt, 2022).

Vaccination requirement

This refers to the implementation of mandatory or voluntary policies for the general population or specific groups within the population (Charrier et al., 2022).

Age-based vaccine prioritization

The included studies handle age-based vaccine prioritization as the allocation of COVID-19 vaccines based on age groups. An act which commonly prioritizes older age groups first, then proceeds in descending order.

High-risk targeting

This refers to prioritizing specific vulnerable groups, that are at a higher risk of contracting COVID-19 or are more likely to develop worse prognosis than the general population in case of COVID-19 infection (Nilsson et al., 2022).

Organizational structure

It provides an explanation of the management and distribution of responsibilities in the COVID-19 national vaccination campaign within a country. It can refer to centralized or decentralized approaches.

COVID certificates

They are documents to provide proof of COVID-19 vaccination status or test results. They were implemented in several countries including Europe, which used the EU Digital COVID certificate (Falkenbach & Willison, 2022).

Vaccine delivery systems

The term involves a wide range of approaches within a vaccination campaign. However, within this review it would be used to encompass the vaccination sites, and convenience of vaccination.

Expert recommendations

They are the advice on COVID-19 vaccinations provided by health authorities, the government, or healthcare workers.

Vaccine characteristics

The usage of this term in the current review refers to specific attributes of vaccines, including type of vaccine, efficacy, side effects, testing period, and how authorities addressed issues and choices related to different vaccines. The focus in this review is on examining the impact of these characteristics on vaccination outcomes, rather than vaccine effectiveness.

Trust

It can be defined as confidence in the government, authorities, institutions, healthcare system, or surrounding community. Governmental trust was described as the confidence citizens have that the government will favour the wellbeing of residents in a fair manner. While not being

an intervention, it was perceived to have a significant influence on adherence to recommendations (Falkenbach & Willison, 2022).

Addressing vaccine hesitancy

It involves approaches to mitigate the concerns of vaccinations and increase acceptance of COVID-19 vaccination.

4.3.2 Interventions, strategies, and concepts in included studies

Five of the studies addressed Age-based vaccine prioritization. Vaccination requirement, organizational structure, COVID certificates, and vaccine characteristics were examined in three studies each. Two studies addressed vaccine delivery systems, two addressed expert recommendations, and two showcased communication and media, trust, and vaccine hesitancy were addressed in two studies each. Lastly, high-risk targeting was examined in only one of the studies included.

Table 6 below presents the list of vaccination strategies and interventions, with the studies that each of the interventions, strategies or concepts was featured in. Several studies addressed more than one approach, so the publications can be repeated in the table.

Table 6. interventions, strategies addressed in studies

Intervention	Study
Communication and media	Brailovskaia et al., 2021
	Warren & Lofstedt, 2022
Vaccination requirement	Cadeddu et al., 2022
	Charrier et al., 2022
	Skjesol & Tritter, 2022
Age-based vaccine prioritization	Cadeddu et al., 2022
	Falkenbach & Willison, 2022
	Reilev et al., 2022

	Rotevatn et al., 2023 Warren & Lofstedt, 2022
High-risk targeting	Nilsson et al., 2022
Organizational structure	Cadeddu et al., 2022 Skjesol & Tritter, 2022 Warren & Lofstedt, 2022
COVID certificates	Charrier et al., 2022 Falkenbach & Willison, 2022 Mills & Rüttenauer, 2021
Vaccine delivery systems	Jørgensen et al., 2022 Warren & Lofstedt, 2022
Expert recommendations	Hammer et al., 2021 Jørgensen et al., 2022
Vaccine characteristics	Cadeddu et al., 2022 Jørgensen et al., 2022 Skjesol & Tritter, 2022
Trust	Falkenbach & Willison, 2022 Missel et al., 2021
Addressing vaccine hesitancy	Hammer et al., 2021 Missel et al., 2021

4.3.3 Results of the studies

The table presented below (table7) collates the included publications categorized by country, showing the interventions examined in each study. Additionally, it includes information about the country-specific results reported by each study. Some publications presented their results in non-numerical charts, so the results were described in text within the table, and so is the case for some of the qualitative outcomes.

Table 7. Studies interventions and results by countries

Country	Study	Intervention	Results
Denmark	(Cadeddu et al., 2022)	Vaccination requirement	Vaccination coverage = 71% (August 2021)
		Age-based vaccine prioritization	
		Organizational structure	
		Vaccine characteristics	
	(Falkenbach & Willison, 2022)	Age-based vaccine prioritization	Vaccination coverage (>12 years old) = 72% (March 2022)
		COVID certificates	
		Trust	
	(Jørgensen et al., 2022)	Vaccine delivery systems	Vaccine acceptance is highest with: <ul style="list-style-type: none"> - High vaccine efficacy - Longer testing period - Vaccination at doctor's office - Recommendation by health authorities
		Expert recommendations	
Vaccine characteristics			

	(Mills & Rüttenauer, 2021)	COVID certificates	Increased vaccine uptake with enforcement of COVID-19 certificate
	(Missel et al., 2021)	Trust	Vaccination attitudes and acceptance show correlation with: <ul style="list-style-type: none"> ■ Health concerns ■ Collective health and societal duty ■ Institutional trust
		Addressing vaccine hesitancy	
	(Nilsson et al., 2022)	High-risk targeting	General population vaccination coverage = 86.7%. Vaccination coverage in high-risk groups IRR*≤0.4
	(Reilev et al., 2022)	Age-based vaccine prioritization	Vaccination coverage = 88% (1 st dose), 86% (2 nd dose), 64% (3 rd dose)
	(Rotevatn et al., 2023)	Age-based vaccine prioritization	Vaccine uptake 16-17 year old close to 86% 12-15 year old - n/a** (figure available in publication)
Finland	(Charrier et al., 2022)	Vaccination requirement	Vaccination coverage = 81% (1 st dose), 76% (2 nd dose). (February 2022)
		COVID certificates	
	(Hammer et al., 2021)	Expert recommendations	Vaccination acceptance = 64%
Addressing vaccine hesitancy		Vaccination refusal = 20% (December 2020)	
	(Rotevatn et al., 2023)	Age-based vaccine prioritization	-n/a (figure available in publication)

Iceland	(Rotevatn et al., 2023)	Age-based vaccine prioritization	Vaccine uptake 16-17 year old close to 90% 12-15 year old - n/a (figure available in publication)
Norway	(Charrier et al., 2022)	Vaccination requirement	vaccination coverage = 73% and 79% (1 st dose), 73% (2 nd dose). (February 2022)
		COVID certificates	
	(Rotevatn et al., 2023)	Age-based vaccine prioritization	Vaccine uptake -n/a (figure available in publication)
	(Skjesol & Tritter, 2022)	Vaccination requirement	vaccination coverage >18 years old = 93.1% (1 st dose), 90.6% (2 nd dose), 65.3% (3 rd dose)
Organizational structure			
Vaccine characteristics			
Sweden	(Brailovskaia et al., 2021)	Communication and media	Higher vaccination willingness with use of television reports as COVID-19 information source.
	(Cadeddu et al., 2022)	Vaccination requirement	Vaccination coverage = 40% (July 2021)
		Age-based vaccine prioritization	
		Organizational structure	
		Vaccine characteristics	
(Charrier et al., 2022)	Vaccination requirement	vaccination coverage = 77% (1 st dose), 74% (2 nd dose). (February 2022)	
	COVID certificates		
(Rotevatn et al., 2023)	Age-based vaccine prioritization	Vaccine uptake -n/a (figure available in publication)	

	(Warren & Lofstedt, 2022)	Communication and media	Vaccination coverage = 82.3% (1 st dose), 71.5% (2 nd dose). (September 2021)
		Age-based vaccine prioritization	
		Organizational structure	
		Vaccine delivery systems	

*IRR: incidence rate ratio.

** n/a: not applicable

4.4 Study findings by intervention

Communication and media

Two studies addressed the importance of communication strategies in the context of COVID-19 vaccination, particularly in Sweden. Brailovskaia et al. (2021) established in their cross-sectional study that the broadcast of COVID-19 information via television reports was associated with higher vaccination willingness. They also identified predictive patterns of vaccination willingness with governmental communication, adherence to COVID-19 measures, the use of social media as well as demographic, psychological and physical factors (Brailovskaia et al., 2021). Another study by Warren & Lofstedt (2022) found high demand for vaccination in Sweden; however, supply turned out to be the limiting factor for vaccine uptake. The study also described individual cases of community initiatives to help mitigate low vaccination coverage, which in turn did not meet a response from officials (Warren & Lofstedt, 2022).

Vaccination requirement

Denmark implemented a voluntary COVID-19 vaccination campaign. A limited option to choose between two vaccine types was available in certain regions of the country. Denmark achieved a vaccination coverage of 71% by August of 2021 (Cadeddu et al., 2022), and in

February 2022, 88% of the Danish population had received the first dose of the COVID-19 vaccine, 86% received two doses and 64% received three doses (Reilev et al., 2022).

Like Denmark, Sweden and Norway implemented voluntary vaccination policies. Sweden implemented infection and prevention control measures through imposing restrictions such as required vaccination certificate for larger gatherings and certain venues. Sweden's efforts achieved a vaccination coverage of 74% and 77% fully and partially vaccinated, respectively (Charrier et al., 2022). Similarly, Norway had a voluntary vaccination policy, which also achieved vaccination coverage of 73% and 79% fully and partially vaccinated, respectively as of February 2022 (Charrier et al., 2022). While another publication estimated the vaccination coverage among residents over 18 years of age to be 93.1%, 90.6% and 65.3% for one, two and three doses, respectively, by March 24th, 2022 (Skjesol & Tritter, 2022).

In Finland, on the other hand, while it followed a voluntary vaccination policy for the general population, COVID-19 vaccination was a mandate for healthcare workers and those working with the elderly and high-risk individuals. Resulting in vaccination coverage of 76% and 81% fully and partially vaccinated, respectively, by February 2022 (Charrier et al., 2022).

Age-based vaccine prioritization

Caregivers of homecare residents and healthcare workers were prioritized in both Denmark and Sweden, with the initial focus on individuals over 50 years of age, all before vaccinating the general population (Cadeddu et al., 2022).

In Sweden, despite having a prioritization policy in place, supply was the limiting factor throughout most of the vaccination rollout timeline as will be discussed next under (Organizational structure) (Warren & Lofstedt, 2022). Authorities made adaptations to the limited supply, including extending the interval between the two doses in most cities. By September 2021, 82.3% and 71.5% of the adult population in Sweden had received the first dose, and the second, respectively. Whereas for adolescents born between 2003 and 2005, the coverage was 56.4% and 7.1% for first and second dose, respectively (Warren & Lofstedt, 2022).

Denmark took the lead among the Nordics to start vaccinating 16-17 year-olds, followed by Iceland, Finland, Sweden, and finally Norway (Rotevatn et al., 2023). Consequently, Denmark and Iceland's adult vaccination coverage reached a respective 86% and 90%.

Furthermore, vaccination of 12-15 year-olds was first commenced in Iceland, then later taken up by Denmark, Finland, Norway, and finally Sweden. Iceland, Denmark and Finland availed vaccines for both age groups during the study period. However, in Norway, the second dose was not made available during the study period. While Sweden only availed the vaccination of the older adolescent group, the younger adolescent group vaccination started after the study period (Rotevatn et al., 2023).

In March 2022, Denmark achieved a full COVID-19 vaccination coverage of 72% of residents over 12 years of age (Falkenbach & Willison, 2022). That was a vaccination coverage of 48% for children from 5 to 11 years old and 98% for older adults aged 65 to 74 years by January 2022. The median age of vaccinated individuals in Denmark initially ranged between 61 and 70 years before June 2021, and then declined to 10 to 35 years throughout the later stages of the vaccination rollout (Reilev et al., 2022). Norway and Sweden had the lowest overall vaccination coverage of both groups adolescents (Rotevatn et al., 2023).

High-risk targeting

A cohort study by Nilsson et al. (2022) found that the lowest vaccination rates in Denmark were among two high-risk groups, namely those experiencing homelessness and those in prison (vaccination incidence rate ratio IRR between 0.4 and 0.5). Second to lowest were groups with psychiatric problems and substance abuse (IRR 0.7 – 0.8). The highest vaccination rates among the high-risk groups were found among residents with recent onset of severe psychiatric problems, residents in supported psychiatric housing, and individuals with chronic medical conditions (Nilsson et al., 2022). Comparing these rates with the general population of Denmark of 88%, 86%, and 64% for one, two and three doses respectively (Reilev et al., 2022).

Organizational structure

Denmark implemented a centralized COVID-19 vaccination campaign, while Sweden followed an organization approach on a decentralized level, delegating the management of the vaccination rollout to its 21 regions (Cadeddu et al., 2022). But due to upsizing limitations in several vaccination manufacturers, Sweden faced challenges in vaccine supply. Utilizing the decentralized structure to tailor their needs under the limited vaccine supply, some regions prioritized healthcare workers over individuals aged 65 years and above during phase 1 of the rollout. Moreover, most regions stratified phase 4 (18-59 years old) into subgroups of based

on descending order of age. When the vaccine supply was abundant, Gotland region availed vaccination appointments to individuals aged 18 years and above, regardless of the national prioritization policy (Warren & Lofstedt, 2022).

By mid-July 2021, Sweden had not fully vaccinated 40% of its population, while Denmark had reached 71% by the end of August 2021 (Cadeddu et al., 2022). In Norway, vaccines were redistributed based on municipal infection rates instead of population size. It is worth mentioning that Hammerfest was still vaccinating high-risk individuals in 2022, while in June of the previous year 2021, Oslo had already started vaccinating residents aged 18 to 25 years (Skjesol & Tritter, 2022).

COVID certificates

Denmark utilized the EU Digital COVID certificate (Falkenbach & Willison, 2022; Mills & Rüttenauer, 2021). The synthetic control model by (Mills & Rüttenauer, 2021) demonstrated a rise in vaccination uptake starting 20 days before and up to 40 days after the implementation in the countries enforcing COVID certificates. This effect was more pronounced in younger age groups. Sweden only required a vaccination certificate only for attending larger indoor gatherings as well as some venues (Charrier et al., 2022). This rise in vaccination uptake attributed to COVID-19 certificates was more observed in countries with initially low vaccine uptake (Mills & Rüttenauer, 2021).

Vaccine delivery systems

In Denmark, less acceptance was observed with vaccination in pharmacies and regional hospitals when compared to vaccinating at one's own doctor's office (Jørgensen et al., 2022). While in Sweden, mobile vaccination units were put in use at a later stage of the vaccination campaign, although the study did not provide an assessment of this intervention efficiency (Warren & Lofstedt, 2022). Vaccination time or appointments had no significant impact on vaccination acceptance in Denmark (Warren & Lofstedt, 2022).

Expert recommendations

COVID-19 vaccine recommendations in Denmark yielded higher acceptance when were dispensed by health authorities, than when recommended by own doctor or by the government, and vaccine recommendation by researchers yielded the least acceptance (Jørgensen et al., 2022). While in Finland, the recommendation from a healthcare worker and

the convenience of vaccination both showed an increase in vaccine acceptance in individuals below 50 years of age (Hammer et al., 2021).

Vaccine characteristics

Vaxzevria; previously COVID-19 Vaccine AstraZeneca; was suspended in Denmark and Sweden after the emergence of serious adverse effects. While Sweden resumed its use specifically for the elderly above 65 years old (Cadeddu et al., 2022). On a similar note, Norway suspended the use of Janssen vaccine in the national immunization program, and completely suspended the use of AstraZeneca vaccine (Skjesol & Tritter, 2022).

The longer the vaccine testing period was, and the higher efficacy of vaccines were correlated with higher vaccine acceptance in Denmark (Jørgensen et al., 2022).

Trust

Falkennach & Willison (2022) addressed governmental trust, the study found that over 90% of citizens trust the Danish health authorities and over 70% trust the government. This high level of trust was perceived to be one of the main contributors to the high adherence to infection prevention and control measures, including the high vaccination uptake in Denmark (Missel et al., 2021). Overall; they added; governmental and institutional trust proved to have a greater effect on vaccination uptake than did socio-economic and socio-political factors and the severity of COVID-19 impact within a country (Falkenbach & Willison, 2022).

Addressing vaccine hesitancy

In Finland, vaccination safety perception varied between 68% and 30% in vaccine accepting and refusing individuals respectively. However, agreement with the statement that the vaccination is a good way to prevent COVID-19 varied between 81% and 44% among vaccination accepters and refusers (Hammer et al., 2021).

The impact of social surrounding on COVID-19 vaccination attitudes is limited. While the influence of health concerns and welfare of the surrounding community; on the other hand; is more pronounced (Missel et al., 2021). Ultimately, vaccination perceptions were polarized between refusers and hesitants on the one hand, perceiving the restrictions as unfair and unjust. On the other hand, vaccine acceptors argued that restrictions are necessary for the

overall wellbeing of society, emphasizing the concept of ‘social contract’ (Falkenbach & Willison, 2022; Missel et al., 2021).

5 Discussion

5.1 Main findings

This scoping review examined a range of interventions and policies implemented to promote COVID-19 vaccination. The review offers valuable insights into diverse vaccination strategies, policies, and interventions and their correlation with vaccine uptake, acceptance, and vaccination coverage.

Effective communication and media strategies play a crucial role in promoting vaccination willingness and uptake. Studies have highlighted the importance of utilizing various communication channels to broadcast information about COVID-19, vaccination rollout plans, and expectations. The findings of a study conducted in nine western countries by Brailovskaia et al. (2021) revealed that the use of governmental television reports as a source of COVID-19 information was associated with higher vaccination willingness in Sweden and other countries included in the study. These findings emphasize the important role of media and communication in providing clear and accurate information accessible to the general population. Additionally, the findings of a study conducted by Warren & Lofstedt (2022) emphasize the significance of open communication and cooperation with the community to promote vaccination uptake, particularly in communities with specific sociodemographic attributes and immigrant backgrounds. The authors mentioned a case of a community initiative in Malmo, Sweden that was not endorsed by authorities, highlighting the importance of community involvement in vaccination efforts, and the missed opportunities in case the authorities were not ready for such initiatives.

The Nordic countries have implemented different approaches of vaccination policies. Yet they all share the common feature of adopting voluntary COVID-19 vaccination policies to varying degrees. In Denmark, for instance, there was the limited choice between two types of vaccines made available in certain regions, which can be seen as a reflection of the high value placed on trust in the Danish model. Finland, Norway, and Sweden also implemented voluntary vaccination policies to varying degrees. The vaccination for the general population was voluntary, with prioritization based on risk level, age, or profession.

In the case of Finland, vaccination was made mandatory for healthcare workers and for those working with the elderly and high-risk groups, aiming to protect these vulnerable populations. Sweden, on the other hand, introduced a vaccination certificate requirement for larger

gatherings and specific venues. While this measure aimed to control the infection transmission, it can also be perceived as a way to encourage higher vaccination uptake through nudging. These approaches have achieved considerable vaccination coverage within these counties without the need of imposing mandatory vaccination policies on the general population.

Denmark implemented a prioritization strategy for caregivers of homecare residents and healthcare workers, followed by individuals over 50 years of age, before vaccinating the general population. One downfall was demonstrated in a population-based cohort study conducted by Nilsson et al. (2022), which revealed a significant disparity in vaccination coverage among high-risk and vulnerable groups, such as those experiencing homelessness, imprisonment, psychiatric problems, substance abuse, or chronic conditions. These findings shed the light on opportunities to tailor more efficient prioritization strategies in future vaccination campaigns.

Overall, the prioritization and high-risk targeting strategies implemented in the Nordic countries proved to be effective. Nonetheless, there are no clear indicators on their efficacy. Moreover, uneven distribution of vaccination coverage was observed in several cases. For example, a study by Reilev et al. (2022) in Denmark exhibited a vaccination coverage of 98% among older adults aged 65 to 74 years, compared to only 48% among children aged 5 to 11 years, indicating a lower prioritization for the latter group. A similar pattern was observed in Norway and Sweden, as reported by Rotevatn et al. (2023), where adolescent groups had the lowest vaccination coverage among the Nordic countries. This can be attributed to the efficiency of prioritization strategies which by nature target groups of predominantly older individuals. However, other factors such as decentralization shortcomings in Norway and vaccine supply challenges in Sweden can provide an explanation to the beforementioned findings, which will be discussed shortly. It is worth mentioning that in Sweden, when there was a shortage of vaccines, authorities made adaptations by extending the interval between the two doses in most cities to prioritize and ensure broader coverage of the first dose of vaccination.

The vaccination campaign in Sweden faced challenges in vaccine supply due to manufacturing limitations. Despite these challenges, the decentralized structure of the campaign offered advantages in terms of providing the flexibility and the ability to adapt vaccination campaigns for specific groups based on the local situation. Some regions started

adapting the national vaccination rollout strategies based on prioritization to suit the specifics of their local communities. A good example is when vaccination appointments were offered to individuals aged 18 and older, irrespective of the prioritization policy, during a period of vaccine abundance. Additionally, most regions in Sweden stratified phase 4 of vaccination into several subgroups based on descending age order rather than offering the vaccine equally to the entire 18-59 year-old group.

Similarly, Norway also implemented a decentralized vaccination campaign, which is often associated with being dynamic and adaptive. However, a documentary analysis by Skjesol & Tritter (2022) revealed instances of distribution and collaboration failures in Norway. The example of vaccinating prioritized groups in Hammerfest while Oslo had started vaccinating individuals over 18 years old the previous year highlighted such shortcomings. All which hindered planning and resulted in a lower vaccination coverage for the general population than initially planned. However, it can be argued that this decentralized behavior favored public safety and overall population health. Moreover, the results exceed some estimates to reach the threshold for achieving herd immunity (Brailovskaia et al., 2021). In contrast, Denmark achieved relatively high vaccination coverage for the general population through a centralized vaccination campaign.

COVID certificates were utilized in Denmark and Sweden, and their implementation was observed to have a positive effect on vaccination uptake. The impact of COVID certificates was particularly noticeable in specific age groups and in countries with lower vaccination rates. Hence, this can be a useful targeted intervention to increase vaccine uptake in certain groups or populations.

The results of a study in Denmark revealed that individuals showed higher willingness to be vaccinated at their own doctor's office compared to pharmacies and hospitals. Moreover, vaccine recommendations from one's own doctor or from the government were associated with lower acceptance rates compared to recommendation from health authorities. Interestingly, recommendations from researchers had even less impact on vaccination acceptance (Jørgensen et al., 2022). This could be due to population bias against non-medical sources of recommendations or due to the gap between science and the colloquial understanding in society. Trust was further discussed in the inductive analysis conducted by Falkenbach & Willison (2022), which found that over 90% of Danish citizens trusted the Danish health authorities and over 70% trusted the government. This highlights the

importance of trust and convenience in the context of vaccination. It also calls for further investigation into the factors contributing to the difference in levels of trust in the government and health authorities in Denmark. Comparable findings were observed in Finland, where recommendations from healthcare workers and the convenience of vaccination process was associated with increased acceptance among individuals below 50 years of age.

Although the study by Warren & Lofstedt (2022) did not assess the approaches taken by Sweden to utilize mobile vaccination units, such strategies have the potential to enhance vaccination access and convenience. Furthermore, in Denmark, the timing of vaccinations or availability of appointments did not have a significant effect on vaccination uptake. However, different effect might have been observed in countries with low vaccination rates or with limited vaccine availability.

In Denmark and Norway, the complete suspension of the use of AstraZeneca vaccine, as well as the suspension of Janssen usage in Norway's national immunization program, contributed to higher institutional and governmental trust. These actions reflected the authorities' responsiveness to safety concerns and their commitment to public health and maintaining confidence in the vaccination campaign.

Vaccine safety perceptions in Finland were inherently higher among acceptors than refusers. Surprisingly, it was found that nearly half of the vaccine refusers agreed with the statement that vaccination was a good way to prevent COVID-19 (Hammer et al., 2021).

The influence of social surroundings on COVID-19 vaccination attitudes was found to be limited. While socio-economic and socio-political factors, as well as the severity of COVID-19 impact within a country, were found to have no significant effect on vaccination uptake. Whereas health concerns and the welfare of the surrounding community were identified as significant factors influencing vaccination decisions (Missel et al., 2021)

The discussion regarding the polarizing theme surrounding the perception of vaccination interventions was taken further. Vaccine refusers and hesitant often viewed restrictions as unfair, while vaccine accepters argued in favor of the collective responsibility to public safety. This ongoing debate raises questions about individual autonomy and calls for further research.

5.2 Strengths and limitations

Strengths

This review has several strengths that enhance its significance and potential value. It fills a knowledge gap by focusing on COVID-19 vaccinations in the Nordic countries, where no existing scoping studies or systematic reviews have been identified at the time of writing this review. The scoping review design is comprehensive and inclusive, allowing the inclusion of various study types, such as controlled designs, cohort studies, and other observational studies, quantitative and qualitative designs. This flexibility enables collating and examining diverse outcomes related to vaccination strategies and interventions, such as vaccination acceptance, uptake, coverage, as well as perceptions and attitudes in this review. The inclusion of qualitative studies sets this review apart, as it addresses a gap in the existing literature. The scoping review included a comprehensive analysis of 13 of the identified studies in the Nordic Countries addressing the topic at hand, with a diverse range of sample sizes. Adhering to the PRISMA-ScR checklist ensures methodological rigor, transparency, and reproducibility. The focus on the Nordic countries provides a representative overview that can potentially be generalizable to populations with similar demographics and healthcare systems.

Limitations

One limitation is the restriction to English-language publications, which in the case of this review led to excluding one publication from the second screening phase due to language since I do not have the language proficiency to read scientific papers in languages other than English in this context. Although studies published in the Nordic countries are typically available in English, the language exclusion criterium might have still restricted the comprehensiveness of the review. Another language-related limitation was that I predominantly used the American English spelling versions of the terms during the search process, instead of searching with American and British spelling versions, which meant that the search results were influenced. Consequently, this might have ultimately affected the studies included in this scoping review.

All the studies included in this review were published, therefore there is a possibility of that I might have been missed relevant unpublished research papers or grey literature. On the other

hand, there was no critical appraisal required for the studies included in this review. Therefore, it is important to acknowledge that any of these studies might have inherent biases.

Another limitation is the absence of a research team for conducting this review. This project is conducted as a master's thesis without the involvement of a dedicated research team, certain steps that are typically performed collaboratively in a systematic review were carried out by me, as a single researcher. One of these challenges was manifested in the full-text screening step, when I was unsure about inclusion of certain publications, so I created a separate category for further assessment and had to go through the full texts again to be certain about my decision of inclusion or exclusion. With a research team present, that situation is usually resolved simultaneously by consensus between the reviewers without delay. Nevertheless, support was provided to me by multiple academics and colleagues when appropriate, without compromising or influencing the integrity of the scoping review as an individual project. This will be acknowledged below.

6 Conclusion

This scoping review on COVID-19 vaccination interventions revealed key findings, identifying, and mapping the research on this topic in the Nordic Countries. It has explored various aspects of COVID-19 vaccination interventions in the Nordic countries. The scoping review encompassed multiple studies analyzing vaccination policies, practices, and outcomes in Denmark, Sweden, Finland, Norway, and Iceland. The key findings indicate the significance of effective communication strategies, including the use of diverse channels and governmental reports, in promoting vaccination willingness. The Nordic countries implemented voluntary vaccination campaigns, with age-based prioritization observed in Denmark and Sweden. Disparities in vaccination coverage across age groups highlight the need for tailored strategies. Centralized and decentralized organizational approaches were adopted, each with its advantages and challenges. The use of COVID certificates in Denmark and Sweden positively influenced vaccination uptake, particularly among specific age groups and countries with lower rates. Trust in authorities, convenience, vaccine safety perceptions, and healthcare recommendations played important roles in shaping vaccination acceptance. The scoping review also revealed a polarizing debate on vaccination interventions, emphasizing the need for further research on vaccine hesitancy and understanding individual autonomy versus collective responsibility. These insights have implications for future policy development, interventions, and global public health, underscoring the importance of ongoing monitoring and research in optimizing vaccination strategies in the face of emerging challenges and infectious diseases.

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6.2 Research recommendation

1. To conduct systematic reviews focusing on COVID-19 vaccinations in the Nordic countries, with a particular emphasis on COVID-19 vaccination strategies and interventions specific to this region.
2. To conduct primary and secondary studies that explore qualitative variables such as trust, as well as outcomes like experiences, perceptions, and impressions related to vaccination and vaccine uptake.
3. To explore the development of alternative strategies or interventions, aside from mandatory vaccination, to promote and encourage vaccination uptake on the global level.

These research recommendations highlight areas where further investigation is needed to address the gaps and limitations identified in the existing review. Further research in this field will be useful in case of any potential epidemics and pandemics, regardless of COVID-19 current status.

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Appendix

Appendix 1

Background

In late December 2019, COVID-19 was first detected in the city of Wuhan, China. And since then, it has spread rapidly across the world. In early February, it had spread to over 25 countries (Wu et al., 2020). On March 11th, 2020, the World Health Organization 'WHO' declared the coronavirus as a pandemic (Siddiqui et al., 2022). Vaccines developed by different pharmaceutical companies and research centres started surfacing after obtaining FDA approvals in December 2020, and others later in February 2021 (Siddiqui et al., 2022). But the vaccines did not put an end to the pandemic as it continued to spread, and the fatalities kept rising. By November 2021, COVID-19 had infected over 242.3 million humans and yielded a total fatality of 4.9 million (Singh et al., 2021). As of the time of writing this protocol, total confirmed cases exceeded 670 million infections globally, and these figures are less than the actual total cases as confirmed cases rely on positive testing (ourwoldindata, 2023).

Immunization plays a large role in public health. There are a lot of vaccination programs for a host of communicable diseases. Vaccination is defined as process of introducing the human immune system to a new disease, through administering dead or weak germs into the body. In order to initiate an immune response to create antibodies for germs, such as viruses or bacteria (WHO, 2023b). New vaccines are being developed on a daily basis. However, the availability of a vaccine is one among many factors affecting the prevalence of a disease. There are multiple determinants of the effectiveness and efficacy of a vaccine. Which are mainly not influenced by the layout of a vaccination program, which in turn affects vaccination coverage; an important indicator of the success of vaccination programs (WHO, 2014). Vaccination coverage measured by the portion of vaccinated individuals in an eligible population (CDC, 2016).

Mass vaccination programs provide immunization and protection of the public against many contagious diseases. Some examples of which include diphtheria, tetanus, rubella, measles, influenza, and HPV (WHO, 2014). The manner of protection for the public can describe mass vaccination programs as public goods with attributed positive externalities, since even

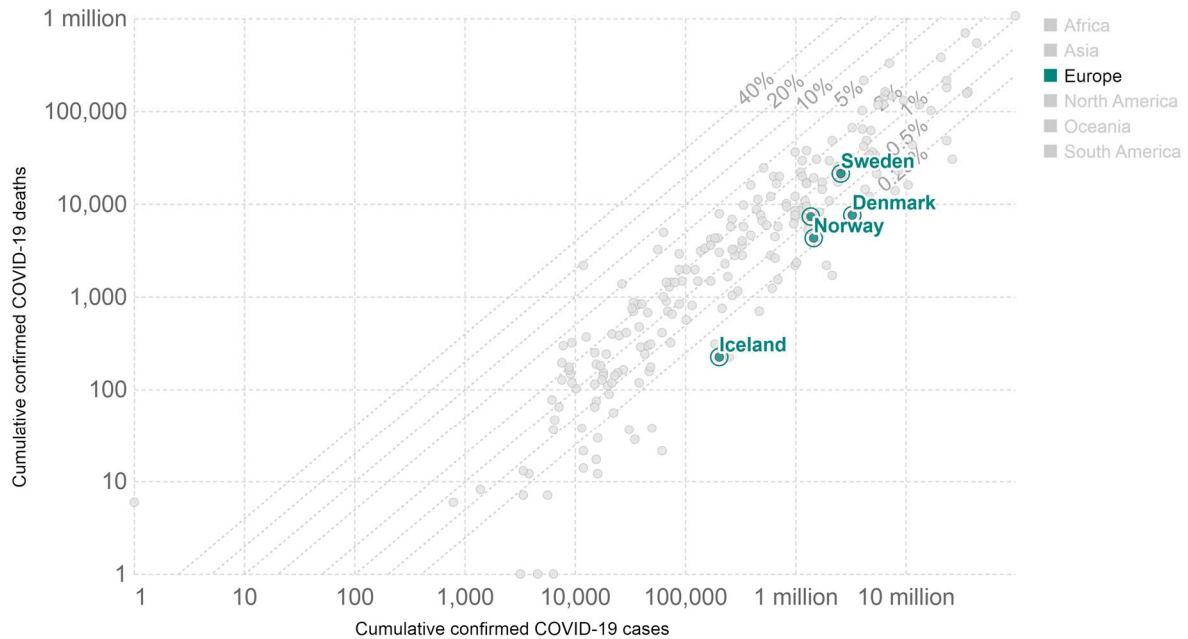
individuals who do not receive the vaccination are yet substantially protected due to the vaccination of their surrounding community (Olsen, 2017). This progressively fills the gap in immunization programs coverage created by subpar access as well as by the individuals with health conditions preventing them from taking a vaccine.

Public health systems work to fill the shortcomings and disparities in access and coverage, this stands for the supply side. On the other hand, the demand for vaccination is occasionally decreased due to vaccine hesitancy and refusal. Vaccination acceptance describes the collective perception of vaccines, whether the general public accepts it, questions it, which translated to vaccine hesitancy or refuses vaccination which is referred to as vaccine refusal (Crawshaw et al., 2022). Acceptance or refusal are usually represented in rates or portion of the total population. Low vaccination acceptance affects the overall vaccine uptake. There are some questions that often arise with mass vaccination programs, such as should vaccination be mandatory or voluntary? And how different are coverage outcomes from different strategies for implementing vaccination programs? How effective are the interventions designed to increase the vaccination uptake by target populations?

This research project will focus on COVID-19 vaccination programs in the Nordic Countries, and the possible interventions studied or implemented to increase the vaccination coverage in the Nordics. The term COVID-19 vaccination program comprehensively describes the process employed to optimize the delivery of COVID-19 vaccines on the supply side, as well as to improve demand of the vaccine (Crawshaw et al., 2022; WHO, 2023b). I choose to focus on the Nordic Countries as the sovereign states of Denmark, Finland, Iceland, Norway, Sweden, Åland, the Faroe Islands, and Greenland (Norden, 2023) as a model to run my project on. This is because they are considered model countries when it comes to healthcare systems. Moreover, they were relatively less impacted by the pandemic when compared to the global rates. Figure 1 shows the relationship between confirmed COVID-19 cases and deaths. It shows that fatality rate in the Nordic Countries falls below 1% of the confirmed cases.

Cumulative confirmed COVID-19 deaths vs. cases, Nov 20, 2022

Limited testing and challenges in the attribution of cause of death mean the cases and deaths counts may not be accurate. The gray lines show the corresponding case-fatality rates (the ratio between confirmed deaths and confirmed cases).



Source: Johns Hopkins University CSSE COVID-19 Data

OurWorldInData.org/coronavirus • CC BY

Figure 1. (ourworldindata, 2023)

Intervention and outcomes

Studies included should address COVID-19 vaccination programs in the Nordic Countries as intervention. Vaccination uptake and resulting vaccination coverage are primary outcomes, experiences, and impressions of the population on vaccination strategies will stand as secondary outcome.

Research question

What is the scope and characteristics of existing research on COVID-19 vaccination strategies in the Nordic Countries?

Objectives

1. To map existing research on COVID-19 vaccination programs strategies and interventions.
2. To categorize the abovementioned research on basis of target population, types of strategies and interventions utilized, and study outcomes.

Rationale

It is certain that total elimination of communicable diseases is not possible, this paper is set out to attempt to evaluate the relationship between vaccination programs and the vaccination coverage and uptake outcomes. And since COVID-19 is undoubtedly not the last probable pandemic to arise, research in assessing the coverage outcome of vaccination programs should be at hand for whenever an epidemic or pandemic arises. Vaccination strategies should be optimized and depend on scientific literature. A recent scoping review by (Andreas et al., 2022) explored studies addressing the interventions designed to increase COVID-19 vaccine uptake, but no systematic review focused on the Nordic Countries. The scope on Nordic Countries in this project serves a purpose to include relatively similar populations and healthcare systems, when compared to other regions globally. This will minimize socio-economic and demographic differences between the populations in the included studies, differences which usually present as secondary variables. Leading to a more direct model to draw the correlation between vaccination strategies of COVID-19 and their outcomes that can be generalized to the populations in the Nordic Countries.

Materials and methods

Scoping review methodology

This project will consist of a scoping review to identify and analyze the findings of studies addressing COVID-19 vaccination programs in the Nordic Countries. The scoping review will follow the methodology guidance for conducting a Joanna Briggs Institute scoping review (Peters et al., 2020). Reporting of the results of the review will conform with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews checklist PRISMA-ScR (Tricco et al., 2016). There will be no quality assessment or critical appraisal of the studies included in the review, since scoping reviews map the existing scientific evidence regardless of study quality (Tricco et al., 2016).

Tools and instruments

Throughout this review, I will utilize the methodology guidance for conducting a Joanna Briggs Institute scoping review (Peters et al., 2020). And I will use PRISMA-ScR guidelines (Tricco et al., 2018) for the reporting. The review will include tables classifying the studies on basis of interventions and outcomes.

Table 1. Inclusion criteria

Study design	<ul style="list-style-type: none">- Randomized controlled trials (RCTs)- Qualitative studies- Observational studies, cross-sectional, case-control and cohort study designs- Modelling studies, involving a synthetic-control model.
Population	<ul style="list-style-type: none">- Residents of a Nordic Country.- Any Age- Eligible for COVID-19 vaccination.<ul style="list-style-type: none">o Absence of contraindications
Setting	<ul style="list-style-type: none">- COVID-19 pandemic- Mass vaccination programs in place
Intervention	<ul style="list-style-type: none">- COVID-19 vaccination program- Interventions to increase COVID-19 vaccine uptake<ul style="list-style-type: none">o Education, awareness campaigns and other communication interventionso Policies, such as mandatory vaccination and COVID certificateso Incentives, monetary and others.
Outcome	<ul style="list-style-type: none">- Vaccination coverage- Vaccination uptake- Impressions and experiences
Publication year	<ul style="list-style-type: none">- Published from 2020 until present
Publication type	<ul style="list-style-type: none">- Published studies available in full text<ul style="list-style-type: none">o Journal articles

	<ul style="list-style-type: none"> ○ Reports ○ Book chapters
	- Studies with partially unpublished results, which may exhibit publication bias.

Language	- English
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Table 2. Exclusion criteria

Study design	<ul style="list-style-type: none"> - No sample size limitation in qualitative studies. - Quantitative studies with sample of less than 50 subjects.
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Population	- Studies on populations outside the Nordic Countries.
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Intervention	<ul style="list-style-type: none"> - Studies on vaccines for diseases other than COVID-19 - Interventions that target the uptake of vaccines other than COVID-19 vaccines
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Outcome	<ul style="list-style-type: none"> - Studies focusing on economic evaluation - Vaccination efficacy
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Publication year	- Studies published before year 2020
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Publication type	<ul style="list-style-type: none"> - Policy documents - Editorials
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Preliminary search strategy

Literature search will include the following databases: Cochrane Central Register of Controlled Trials (CCTR), Cochrane Database of Systematic Reviews (CDSR), Embase, Medline, Epistemonikos, and the WHO COVID-19 Research Database.

Example of preliminary search strategy on Embase:

Embase <1996 to 2023 Week 05>

- 1 exp vaccination/ or exp coronavirus disease 2019/ or exp vaccine/ or exp SARS-CoV-2 vaccine/ 666261 results
- 2 exp vaccination reaction/ or exp anti-vaccination movement/ or exp vaccination refusal/ or exp vaccination coverage/ or exp vaccine hesitancy/ or exp immunization/ 299346 results
- 3 exp Sweden/ or exp Finland/ or exp Denmark/ or exp Norway/ or exp Iceland/ or exp Greenland/ or exp Faroe Islands/ or exp Scandinavia/ 182008 results
- 4 1 and 2 and 3 2042 results
- 5 limit 4 to (yr="2020 -Current" and covid-19) 237 results

Screening and selection

I will use Endnote reference manager to keep the publication lists. Then import the reference list into Rayyan web tool for systematic reviews to start detecting duplicates and then manually remove them. Afterwards, I start the first phase of screening of titles and abstracts on Rayyan, as this is the primary reason for the web tool. Last but not least, the second phase of screening will involve full-text screening, so I will access full texts and start including or excluding the identified publications based on the inclusion criteria.

Data extraction

I will create tailored data extraction tables as well as data presentation tables specific to my project. The tables will include the title of publication, publication information, author or authors, study objectives (if applicable), study design (if applicable) and country of interest, strategy employed and the main findings.

Strengths and limitations

The study is clearly focused. It will fill a knowledge gap because there are no present scoping studies or systematic reviews in that area of vaccinations focusing on the Nordic Countries. The population is defined as inhabitants of Nordic Countries. Another strength is the nature of the study design with its inherent ability to include as much existing and relevant studies and evidence-based publications in this field as applicable, with a relative flexibility to include versatile relevant outcomes studied. The project will include designs of RCTs, qualitative, observational studies such as cross-sectional, case-control, and possibly cohort studies. The intervention is clearly defined as COVID-19 vaccination, in which I will be investigating the vaccination strategy and application approaches. The outcomes are defined as vaccination uptake and coverage, and experiences and impressions as primary and secondary outcomes respectively. This will set the study apart, because no systematic review or scoping review addressing qualitative outcomes was found in the initial literature search. Moreover, the 'sample size' of the scoping study is represented by the samples of all included studies in the review, which leads to more certainty of conclusions. The results of this scoping review will follow the PRISMA-ScR checklist. Since the project will include studies from the Nordic Countries, it is intended to serve towards offering a representable overview that can be generalizable to the populations of the Nordic Countries. With respect to the differences between the countries, populations, and healthcare systems. Nevertheless, the similarities outweigh the differences in this case. There is a possibility that the results can be applicable to other countries with similar demographics and healthcare systems.

One possible limitation is the language inclusion, there is currently no possibility of inclusion of studies not published in English, due to the nature of the target population as Nordic Countries since I do not have the language proficiency to read scientific papers in the local languages. Nevertheless, studies published in Nordic Countries are usually published in English. Another limitation is the requirement of coordinated teamwork in several steps across the project, such as literature search, screening process, study selection as well as peer reviewing. This project will be run by only me as a master thesis, so a research team is inapplicable in this situation. Nonetheless, in the literature search steps, a librarian at UiT will be consulted possibly on multiple occasions.

Timeline

Week 6 (February 2023)	Finalize protocol <ul style="list-style-type: none"> - State objectives - Specify inclusion/ exclusion criteria - Research question/ objectives/ aim
Week 7-8 (February 2023)	Literature search <ul style="list-style-type: none"> - Initial limited search on some databases. - Consult a librarian at UiT. - Identify keywords and index terms for further search. - Search reference lists of identified reports.
Week 9 & 10 (February/ March 2023)	Screen abstracts/ titles Access & read full texts
Week 11 & 12 (March 2023)	Selection process/ PRISMA flow diagram Data extraction (Key data & research questions/ current evidence)
Week 13 & 14 (March/ April 2023)	Data charting Compile data/ create data tables
Week 15 (April 2023)	Write introduction and results section
Week 16 (April 2023)	Write the discussion and conclusion
Week 17 (April 2023)	Write abstract, revise references & table of contents
Week 18 & 19 (May 2023)	Prepare first draft report of scoping review Send draft to supervisor
Week 20, 21 (May 2023)	Refine the report of Scoping review

	Send final draft to supervisor
Week 22 (May 2023)	Deliver master thesis (deadline is Wednesday, May 31 st 2023)
Supervisor drafts	<p>Week 6 – Protocol</p> <p>Week 16 – Introduction, discussion and conclusion</p> <p>Week 19 – full thesis (first draft)</p> <p>Week 20 – final draft (full thesis)</p>

Dissemination Plan

After submitting my project for the master thesis, I am considering publication in a medical and a scientific journal.

Appendix 2

data presentation tables:

Title	To vaccinate or not to vaccinate!?! Predictors of willingness to receive Covid-19 vaccination in Europe, the U.S., and China
Author(s)	Julia Brailovskaia, Silvia Schneider and Jürgen Margraf
Publication details	Journal article, published on December 1 st , 2021 in ‘PLOS ONE’.
Study aim(s)	<ul style="list-style-type: none"> - To evaluate COVID-19 vaccination willingness of populations in the 9 countries included, and to compare the findings between the countries. - To uncover predictors of vaccination willingness.
Study design	Cross-sectional
Country	China, France, Germany, Poland, Russia, Spain, Sweden , U.K, U.S.
Sample characteristics	N= 9,264. Sweden (n=1,003). Age 18 years and older from general population of each country.
Intervention/ strategy	<p>Use of the government and authorities broadcast and press reports.</p> <p>Government and authorities’ communication.</p> <p>Use of social media as COVID-19 information source.</p>
Outcome	Vaccination willingness.
Data collection	Online survey, with 90.5% response rate in Sweden.
Results	<p>The use of governmental television reports as COVID-19 information source was associated with higher vaccination willingness in most countries in the study, including Sweden.</p> <p>Other predictive patterns were identified in association with governmental communication, adherence to COVID-19 measures,</p>

	demographics, psychological and physical wellbeing, and use of social media.
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(Brailovskaia et al., 2021)

Title **Planning and Organization of the COVID-19 Vaccination Campaign: An Overview of Eight European Countries**

Author(s)	Chiara Cadeddu, Aldo Rosano, Leonardo Villani, Giovanni Battista Coiante, Ilaria Minicucci, Domenico Pascucci and Chiara de Waure
Publication details	Journal article, published in ‘Vaccines’, on September 28 th , 2022.
Study aim(s)	<ul style="list-style-type: none"> - To assess the planning and organization tactics of COVID-19 vaccination campaigns up to August 2021. - To evaluate the planning and organization tactics correlation with vaccination coverage up to August 2021.
Study design	Qualitative Desk research
Country	Sweden, Denmark , Romania, Hungary, Italy, Spain, Germany, and France.
Sample characteristics	<ul style="list-style-type: none"> - No sample was identified.
Intervention/ strategy	<ul style="list-style-type: none"> - Types of vaccine. - Vaccination campaign organization: <ul style="list-style-type: none"> ■ Individual option of vaccine selection. ■ Vaccination workforce personnel. ■ Population group prioritization. ■ Vaccination setting or site. ■ Organization level. ■ Vaccine distribution criteria.
Outcome	Vaccination coverage.
Data collection	<ul style="list-style-type: none"> - Information on planning and organization of the vaccination campaigns; included (national immunization plan, vaccination target groups and choice aspects among others); were acquired

	<p>from international and national reports, and other information sources.</p> <ul style="list-style-type: none"> - Data on vaccination coverage were accessed on Our world in data website.
Results	<ul style="list-style-type: none"> - Sweden initiated a national immunization program in August 2021, and so did Denmark at the end of the same year. - Vaxzevria use was suspended in both Denmark, Sweden as well as other countries in the study due to the emergence of serious adverse effects. The use was later resumed Sweden for the use on elderly above 65 years old. - Denmark had a partial possibility of choice when it came to the vaccine. While Sweden did not have that option. - Both Sweden and Denmark prioritized caregivers of homecare residents, and healthcare workers; both in which the age group over 50 years was first prioritized; all before the general population. - Denmark had a centralized COVID-19 vaccination campaign organization level, while Sweden had a decentralized organization level. - By mid-July 2021, Sweden had not reached a full COVID-19 vaccination coverage of 40%. While Denmark reached 71% in August 2021.

(Cadeddu et al., 2022)

Title **An Overview of Strategies to Improve Vaccination Compliance before and during the COVID-19 Pandemic**

Author(s)	Lorena Charrier, Jacopo Garlasco, Robin Thomas, Paolo Gardois, Marco Bo and Carla Maria Zotti
Publication details	Journal article, published in the International Journal of Environmental Research and Public health, on September 3 rd , 2022.
Study aim(s)	<ul style="list-style-type: none"> - To explore different childhood vaccination strategies and their resulting vaccination coverage before the COVID-19 pandemic. - To describe the relationship between different COVID-19 vaccination strategies and their resulting vaccination coverage.
Study design	Qualitative observational study
Country	Slovenia, Hungary, Italy, France, Germany, United States, Australia, Austria, Canada, Finland , Greece, Netherlands, New Zealand, Norway , Portugal, Spain, Sweden and UK.
Sample characteristics	No sample was identified. The study included data on children in the age of childhood vaccination (measles vaccine), as well as general population to evaluate COVID-19 vaccination.
Intervention/ strategy	<p>Childhood vaccination strategies and COVID-19 vaccination strategies included approaches:</p> <ul style="list-style-type: none"> - Mandatory. - Voluntary. - Voluntary with requirements. - Voluntary with financial incentives.
Outcome	<p>Vaccination coverage for:</p> <ul style="list-style-type: none"> - Childhood vaccination (measles). - COVID-19 vaccination.
Data collection	<ul style="list-style-type: none"> - Data on childhood vaccination was accessed at the European Centre for Disease Prevention and Control, country registries and other agencies. - COVID-19 vaccination strategies data was obtained from press and newspaper websites.

	<ul style="list-style-type: none"> - Data on measles vaccination coverage was accessed at the World Health Organization (WHO), United Nations International Children’s Emergency Fund (UNICEF), Centers for Disease Control and Prevention (CDC), and the World Bank databases. - Data on COVID-19 vaccination coverage was accessed at “Our World in Data”.
Results	<ul style="list-style-type: none"> - Finland, Norway and Sweden had a voluntary vaccination policy for measles and it achieved vaccination coverage between 95-98% at two time points before the COVID-19 pandemic. That was 2015 and 2019. - Finland had mandatory COVID-19 vaccination policy for healthcare workers and those working with the elderly and high-risk individuals, with vaccination coverage of 76% and 81% fully and partially vaccinated respectively in February 2022. - Norway had a voluntary COVID-19 vaccination policy, with vaccination coverage of 73% and 79% fully and partially vaccinated respectively in February 2022. - Sweden had a voluntary COVID-19 vaccination policy with restrictions such as required vaccination certificate for larger gatherings and some venues, which achieved a vaccination coverage of 74% and 77% fully and partially vaccinated respectively in February 2022. - The authors of the study stated that there is no clear correlation between the vaccination policy and the consequent vaccination coverage outcome.

(Charrier et al., 2022)

	<ul style="list-style-type: none"> - Government trust, a common social goal and non-politicization of COVID-19 were noted to be the main contributors to the abovementioned findings, and to higher vaccination uptake. - Worthy of mentioning Denmark opted in using the EU Digital COVID certificate, while Canada only had decentralized provincial measures, and the US did not have any similar measures in place. - Overall, governmental and institutional trust proved to have a greater effect on vaccination uptake than did socio-economic and socio-political factors and the severity of COVID-19 impact within a country.
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(Falkenbach & Willison, 2022)

Title **High but slightly declining COVID-19 vaccine acceptance and reasons for vaccine acceptance, Finland April to December 2020**

Author(s)	Charlotte C. Hammer, Veronica Cristea, Timothee Dub and Jonas Sivelä
Publication details	Journal article, published in Epidemiology and Infection, May, 2021
Study aim(s)	To provide an overview of the willingness to vaccinate and the factors contributing towards COVID-19 vaccination hesitancy and acceptance for residents of Finland.
Study design	Repeated cross-sectional
Country	Finland.
Sample characteristics	<ul style="list-style-type: none"> - Near 1000 participants filled recruited for each of the 4 surveys. Total number of recruits (N= 4151). - Adults of ages 18 – 79 years, with similar demographic distribution to general population.
Intervention/ strategy	<ul style="list-style-type: none"> - Recommendation by healthcare workers. - Convenience of vaccination.
Outcome	Vaccine acceptance.

Data collection	<ul style="list-style-type: none"> - 4 Repeated online surveys between April and December 2020, utilized the WHO Office for Europe COVID-19 Snapshot Monitoring (COSMO) protocol.
Results	<ul style="list-style-type: none"> - The survey had 4 outcomes corresponding to the level of vaccination acceptance or refusal upon receiving a vaccination offer: <ul style="list-style-type: none"> ■ Strongly agree: slightly increased between April and December from 35% to 37%. ■ Agree: declined from 70% to 64% in the same interval. ■ Disagree: increased from 13% to 20%. ■ Strongly disagree: increased a twofold from 5% to 10%. - With the net vaccine acceptance slightly declining from April to December 2020. - Older groups showed a nearly threefold higher vaccine acceptance in December 2020 than younger groups, that was 58% against 21% respectively. - Vaccination safety perception varied between 68% and 30% in vaccine accepting and refusing individuals respectively. - Agreement with the statement that the vaccination is a good was to prevent COVID-19 varied between 81% and 44% among the two abovementioned groups. - Recommendation from a healthcare worker and the convenience of vaccination both showed an increase in vaccine acceptance in individuals below 50 years of age.

(Hammer et al., 2021)

Title **How the Development, Features and Roll-Out of a SARS-COV-2 Vaccine Shape Public Acceptance: A Conjoint Experiment in a Large Representative Sample of Danes**

Author(s)	Frederik Juhl Jørgensen, Alexander Bor and Michael Bang Petersen
Publication details	Reprint from PsyArXiv, June 2021.
Study aim(s)	<ul style="list-style-type: none"> - To determine which types of vaccines inherently yield better vaccination willingness. - To explore whether there are vaccination strategy interventions that leads to higher vaccination acceptance. - To study different vaccine characteristics affects vaccination acceptance.
Study design	Qualitative conjoint analysis
Country	Denmark.
Sample characteristics	3,099 Danes, 18 years of age or older. Representative of the Danish population.
Intervention/ strategy	<ul style="list-style-type: none"> - Vaccine development, testing and approval status. - Effectiveness and side effects characteristics of vaccine - Vaccination strategy efforts to minimize hesitancy and promote vaccination willingness, which included: <ul style="list-style-type: none"> ■ Site of vaccination. ■ Vaccine recommendation. ■ Timeliness of vaccination. ■ Requirement of appointments.
Outcome	Predictions of vaccine acceptance.
Data collection	<ul style="list-style-type: none"> - Data was collected through a survey from Epinion. The survey was carried out twice, each time including over 1,500 individuals.
Results	<ul style="list-style-type: none"> - Vaccines with higher efficacy were showed correlation with vaccine acceptance. - The longer the vaccine testing period, the higher the vaccine acceptance.

Outcome	<ul style="list-style-type: none"> - Weekly rolling average vaccination uptake. - Daily COVID-19 cases identified.
Data collection	<ul style="list-style-type: none"> - Daily data on health indicators, including vaccination doses, cases and deaths was accessed on Our World in Data.
Results	<ul style="list-style-type: none"> - COVID-19 certifications lead to an increased vaccination uptake 20 days before enforcement. - The increased vaccination uptake rate lasted for 40 days after enforcement. - The effect of COVID-19 certificates was more noted in countries that previously had subpar vaccine uptake to start with, while it was less prominent in countries with satisfactory vaccine uptake. - Increased vaccine uptake due to the enforcement of COVID-19 certificate restrictions was more pronounced in younger age groups.

(Mills & Rüttenauer, 2021)

Title **Controlling the Uncontrollable! Danish Citizens’ Attitudes Towards the COVID-19 Vaccination Program – a Qualitative Case Study Employing the Lens of Bourdieu’s Practice Theory**

Author(s)	Malene Missel, Camilla Bernild, Ida Elisabeth Højskov and Selina Berg
Publication details	Journal article, published in Archives of Internal Medicine Research, on June 28 th , 2022.
Study aim(s)	To evaluate the attitudes of Danes towards the COVID-19 vaccination program in place.
Study design	Qualitative case-study
Country	Denmark.
Sample characteristics	25 Danish citizens from multiple regions of Denmark, with multiple sociodemographic backgrounds. With individuals accepting, hesitant or refusing vaccination.
Intervention/ strategy	<ul style="list-style-type: none"> - Voluntary COVID-19 vaccination.

	<ul style="list-style-type: none"> - Vaccine passports.
Outcome	<ul style="list-style-type: none"> - Attitudes and perceptions. - Habitus, it describes the effects of a surrounding society on individual perceptions and reactions. - Capital, which describes the possessions, be it collective or individual tangible and non-tangible resources, such as economic capital, social capital or cultural capital.
Data collection	Data collected via flexible and semi-structured phone interviews with individuals from the sample in March and April 2021.
Results	<ul style="list-style-type: none"> - Social surrounding has limited impact on the COVID-19 vaccination attitudes. - Health concerns had a stronger impact on vaccination attitudes, so did the concern for the surrounding community. - The individual concern for collective health state, and the sense of duty towards societal safety was found to be positively correlated with attitudes towards vaccination. - Institutional trust played a role in vaccine acceptance. - The interventions resulted in a polarizing theme, since vaccine refuser and hesitant individuals felt that the restrictions are unfair in their case, and they had the right to freely decide not to take the vaccine without restrictions imposed on them. While on the other hand, vaccine acceptors felt that the restrictions are necessary and that vaccination is a social duty everyone should abide by.

(Missel et al., 2021)

Title	Vaccination against SARS-CoV-2 infection among vulnerable and marginalised population groups in Denmark: A nationwide population-based study
Author(s)	Sandra Feodor Nilsson, Thomas Munk Laursen, Merete Osler, Carsten Hjorthøj, Michael E. Benros, Steen Ethelberg, Kåre Mølbak and Merete Nordentoft

Publication details	Journal article, published in The Lancet Regional Health – Europe, on March 24 th , 2022.
Study aim(s)	<ul style="list-style-type: none"> - To explore the rates of COVID-19 vaccination in high-risk groups, that is socially deprived, individuals with psychiatric diagnoses or those with medical disorders in comparison to the vaccination rates of the general population of Denmark.
Study design	Population-based cohort study
Country	Denmark.
Sample characteristics	<ul style="list-style-type: none"> - All Danish residents of age 15 and older (n=4,935,344). - While the study focused on individuals who fit under at least one of these criteria: <ul style="list-style-type: none"> ■ Homeless. ■ Imprisoned. ■ Have substance abuse problems. ■ With severe mental illness. ■ Residents in supported psychiatric housing. ■ Psychiatric admitted. ■ With chronic medical conditions.
Intervention/ strategy	Universal vaccine invitation for residents above 15 years of age. Vaccination is free of charge and predominantly administered at public vaccination centers all over Denmark.
Outcome	<ul style="list-style-type: none"> - Uptake of two doses or completion of a single-dose COVID-19 vaccination.
Data collection	<ul style="list-style-type: none"> - Health registers. - Vaccination registers. - Administrative registers.
Results	<p>The cohort study followed the data from December, 2020 until October 15th, 2021, and uncovered the following:</p> <ul style="list-style-type: none"> - 86.7% of the population received two doses of COVID-19 vaccine. - Lowest vaccination rates were found in both groups with homelessness and imprisonment (vaccination incidence rate ratio IRR between 0.4 – 0.5).

	<ul style="list-style-type: none"> - Second to lowest were groups with psychiatric problems and substance abuse (IRR 0.7 – 0.8). - The highest vaccination incidence rates among the high-risk groups were found in residents with recent onset of severe psychiatric problems, residents in supported psychiatric housing and those with chronic medical conditions.
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(Nilsson et al., 2022)

Title **Changing characteristics over time of individuals receiving COVID-19 vaccines in Denmark: A population-based descriptive study of vaccine uptake**

Author(s)	Mette Reilev, Morten Olesen, Helene Kildegaard, Henrik Støvring, Jacob H. Andersen, Jesper Hallas, Lars Christian Lund, Louise Ladebo, Martin T. Ernst, Per Dankier, Peter B. Jensen, Anton Pottegård and Lotte Rasmussen
Publication details	Journal article, published in Scandinavian Journal of Public Health, on July 7 th , 2022.
Study aim(s)	To study the uptake patterns of COVID-19 vaccines and the characteristics of vaccinated individuals throughout the duration of the study (Dec 27 th , 2020 – Jan 29 th , 2022), in light of the differential rollout strategy in place, prioritizing individuals who are at high risk of COVID-19.
Study design	Repeated cross-sectional study
Country	Denmark.
Sample characteristics	Danish residents 5 years of age and older (n=5,562,008). The study observed the proportion of the population who are partially or fully vaccinated against COVID-19 (one, two or three doses).
Intervention/ strategy	Differential rollout of COVID-19 vaccines, which gives higher priority to high-risk individuals:

	<ul style="list-style-type: none"> - Prioritization of nursing home residents. - Prioritization of frontline and healthcare personnels and social workers. - Prioritization of COVID-19 high risk individuals, including 65 year of age and older, those with weakened immune system and obesity, and those with chronic diseases. - A full description of the rollout prioritization program is available online attached with the publication.
Outcome	<ul style="list-style-type: none"> - Daily new vaccination incidents. - Cumulative vaccine coverage.
Data collection	<p>Data on vaccination and other relevant data were retrieved from nationwide healthcare registries. These included:</p> <ul style="list-style-type: none"> - The Danish Vaccination registry. - The Danish National Patient registry. - Prescription Registry. - The Danish Microbiology Database.
Results	<ul style="list-style-type: none"> - At the end of the study observation period, 88% of the Danish population had received a first dose of COVID-19 vaccination, 86% received two doses and 64% received three doses of the vaccine. - Over the duration of study, vaccination coverage was 48% in individuals aged 5-11 years, and 98% in those aged 65-74 years - The median age of vaccinated individuals ranged between 61 to 70 years before June 2021, then on later stages it declined to 10-35 years of age. - The absolute values or relative proportions of the prioritized groups were not discretely stated. Nevertheless, the uptake was initially high at the rollout start and declined over time. These patterns were evident on different levels within all different high-risk categories, the uptake was highest at time of rollout.

(Reilev et al., 2022)

Title **When schools were open for in-person teaching during the COVID-19 pandemic - the nordic experience on control measures and transmission in schools during the delta wave**

Author(s)	Torill Alise Rotevatn, Karin Nygård, Laura Espenhain, Rebecca Legarth, Karina Lauenborg Møller, Emmi Sarvikivi, Otto Helve, Guðrún Aspelund, Annika Ersson, Marie Nordahl, Margrethe Greve-Isdahl, Elisabeth Astrup and Tone Bjordal Johansen.
Publication details	Journal article, published in BMC Public Health, on Jan 9 th , 2023.
Study aim(s)	To explore patterns of COVID-19 infections and vaccination coverage in students under 12 years old throughout the first 12 weeks of the fall semester 2021.
Study design	Cross-sectional study.
Country	The Nordics (Denmark, Finland, Iceland, Norway and Sweden).
Sample characteristics	Students in the Nordic countries.
Intervention/ strategy	COVID-19 infection prevention and control (IPC) measures during in-person learning, including: <ul style="list-style-type: none"> - Testing strategies. - Universal vaccination in younger age groups (12-15 and 16-17 years old).
Outcome	<ul style="list-style-type: none"> - Vaccine uptake. - Infection incidence in students and adults. - Infection clusters in students and adults (Denmark and Norway).
Data collection	Surveillance and registry data from each included country, these included: <ul style="list-style-type: none"> - National databases on COVID-19 infections. - National vaccination registries. - National education registries. Full list of surveillance and registry institutions is presented in Table 1 in the study.

Results	<ul style="list-style-type: none"> - All Nordic countries showed a high vaccine uptake during the study period. - Universal vaccination of 16-17 year-olds started in Denmark, then in Iceland, Finland, Sweden then Norway was the last (11 weeks after Denmark). - Universal vaccination of 12-15 year-olds was first started in Iceland, then in Denmark, Finland, Norway and Sweden (16 week after Iceland). - Vaccination uptake of 16-17 year-olds in Denmark and Iceland nearly reached the uptake of adults in each respective population, that is 86% and 90% of adult populations respectively. - Finland started COVID-19 vaccination with the first dose. However, the complete 2 dose vaccination for both age groups yielded an uptake lower than that of Iceland and Denmark. - Norway started with first dose vaccination of the older adolescent group, then the younger. But the second dose was not made available during the study period. - Sweden only availed the vaccination for the older adolescent group, while the younger adolescent group vaccination started after the study period. - Norway and Sweden had the lowest overall vaccination coverage of both groups adolescents.
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(Rotevatn et al., 2023)

Title	The Norwegian way: COVID-19 vaccination policy and practice
Author(s)	Ingunn Skjesol and Jonathan Q Tritter.
Publication details	Journal article, published in Health Policy and Technology, June 2022.
Study aim(s)	<ul style="list-style-type: none"> - To provide a narrative of the implementation and changes to the Norwegian national vaccination program. - To explore influence of the development of the vaccination policy on the changes in public vaccination perception.

Study design	Qualitative documentary analysis.
Country	Norway.
Sample characteristics	No sample selection. The study handles all residents in Norway.
Intervention/ strategy	<p>The healthcare system in Norway is publicly financed with the largest portion of financing from taxes. It has a decentralized structure that provides healthcare to all residents in Norway. With those features, the vaccination policy is characterized by:</p> <ul style="list-style-type: none"> - Free of charge vaccinations. - Voluntary vaccination. - Equitable distribution. - High-risk individuals' prioritization. - Frontline and healthcare workers prioritization. - Prioritization of residents of administrative zones with relatively high infection rates. <p>The publication describes the adaptive changes throughout the vaccination campaign in regard to vaccine characteristics, supply and demand attributes, infection rates among other factors.</p>
Outcome	<ul style="list-style-type: none"> - Weekly vaccinations: <ul style="list-style-type: none"> ■ Stratified by the type of vaccine. ■ Stratified by age. ■ Stratified by dose (first, second or third). ■ Stratified by country of birth. - Municipal weekly vaccine distribution.
Data collection	<p>Data was accessed from:</p> <ul style="list-style-type: none"> - Norwegian Immunization Registry SYSVAK. - Norwegian Institute of Public Health.
Results	<ul style="list-style-type: none"> - Up until March 24th, 2022, vaccination coverage for residents over 18 years of age was 93.1%, 90.6% and 65.3% for single, two and three doses respectively. - The eventual complete suspension of AstraZeneca vaccine and suspension of Janssen usage in the national immunization program is perceived to result in higher institutional and governmental trust towards the vaccination program.

	<ul style="list-style-type: none"> - Aspects of supply and administration of the immunization program showed examples of resulting distribution and collaborative shortcomings due to the high dynamicity and adaptability of the program. - The researchers investigated coverage in individuals born outside Norway, born to foreign-born parents, and other foreign and immigrant background variables which all had less vaccination coverage when compared with Norwegian-born individuals to Norwegian parents.
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(Skjesol & Tritter, 2022)

Title **COVID-19 vaccine rollout management and communication in Europe: one year on**

Author(s)	George W. Warren and Ragnar Lofstedt
Publication details	Journal article published in the Journal of Risk Research, November 2021.
Study aim(s)	<ul style="list-style-type: none"> - To appraise the communication strategies and management of COVID-19 vaccine rollout timeline in the five European countries included. - To explore the effectiveness of vaccine rollout prioritization policies in those countries.
Study design	Qualitative documentary analysis.
Country	France, Germany, Sweden , Switzerland and England.
Sample characteristics	No sample was selected.
Intervention/ strategy	<ul style="list-style-type: none"> - Communication and management of the vaccine rollout. - Vaccination rollout prioritization, consisted of 4 phases: <ol style="list-style-type: none"> 1. Nursing homes (residents and associated individuals). 2. Individuals aged 65 years and older, and high-risk individuals. 3. Individuals aged 60-64 years, and others with certain chronic medical conditions.

	4. The rest of the population, aged 18-59 years.
Outcome	- Vaccination uptake.
Data collection	The publication reviewed multiple documents, newspaper articles and other media and government reports among other sources of information covering; as stated by the researchers; the duration from January until August 2021. Some mentioned events and influences lie before that duration.
Results	<ul style="list-style-type: none"> - In Sweden, the vaccination rollout management took a decentralized approach as it was left to the 21 regions. - Due to upsizing limitations in several vaccination manufacturers, the vaccine supply in Sweden was cut in half. This created a lot of constraints that were only augmented because of the decentralization strategy. - Since supply was the limiting factor along most of the vaccination rollout timeline, demand was high. The vaccination goal was delayed several times along the rollout. Adaptations to the low supply were made by authorities, including increasing the interval between the two doses in most cities to prioritize and ensure a higher coverage of the first dose. - By September 2021, 82.3% and 71.5% of the adult population in Sweden were vaccinated with first and second dose respectively. Whereas in adolescents born between 2003-2005, the coverage was 56.4% and 7.1% for first and second dose respectively. - Sociodemographic and immigrant background attributes were observed to have a negative effect on vaccination coverage, an example of Rosengård, Malmo had a vaccination coverage of 43.7% for the first dose of COVID-19 vaccine. Local community efforts to reach out to help providing venue for vaccination were not answered by authorities. - Mobile vaccination units were put in use afterwards, but no assessment of efficiency was mentioned in this study. - As per the prioritization strategy, decentralization was much more evident: <ul style="list-style-type: none"> ■ Some regions prioritized healthcare workers over phase 1 (over 65 years).

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| | <ul style="list-style-type: none">■ Most of the regions stratified phase 4 (18-59 years) into subgroups with descending age.■ When there was abundant supply, Gotland region availed appointments for vaccination to starting from 18 years of age and above.■ Eventually, the central priority recommendation was evidently not being followed regionally. |
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(Warren & Lofstedt, 2022)

Appendix 3

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Title
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Rationale
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Objectives
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web	Protocol

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		address); and if available, provide registration information, including the registration number.	
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Eligibility criteria
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Information sources
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Search strategy
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Selection of sources of evidence
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Data charting process
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Data charting process
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	None

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Synthesis of results
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Selection of sources of evidence
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Characteristics of sources of evidence
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	None
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Results of individual sources of evidence
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Study findings by intervention
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Main findings
Limitations	20	Discuss the limitations of the scoping review process.	Strengths and limitations
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and	Conclusion

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		objectives, as well as potential implications and/or next steps.	
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	None

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169:467–473. doi: [10.7326/M18-0850](https://doi.org/10.7326/M18-0850)

