Review

Beliefs, Attitudes and Behaviors of Healthcare Professionals Regarding Seasonal Influenza Vaccination: An Umbrella Review

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Abstract

Background: Seasonal influenza remains a major public health challenge worldwide, causing significant morbidity each year and imposing substantial burdens on individuals, healthcare systems and national economies. Vaccination is considered the most effective available strategy for prevention; however, uptake rates vary considerably across countries, with many failing to achieve the recommended coverage levels. The aim of this review is to examine the beliefs, attitudes and behaviors of healthcare professionals worldwide regarding seasonal influenza vaccination. Methods: This is an umbrella review, according to the PRISMA Statement 2020, searching PubMed, Cochrane Library and Google Scholar. The following search terms were used: beliefs, attitudes, behaviors, influenza vaccination, flu vaccine, health professionals, primary health care. Selection criteria were the following: 1) Reviews, 2) Published after 1/1/2000, 3) English language 4) Healthcare professionals as target-population. Results: Twenty-five studies met the selection criteria and were included in this review. Twelve out of 25 studies were systematic reviews. Globally, vaccination uptake among healthcare professionals remains below recommended national and international targets. North America demonstrates the highest vaccination coverage, while the lowest coverage is reported in Africa and South America. Overall, low- and middle-income countries show significantly lower vaccination behavior compared with high-income countries. Attitudes and beliefs appear to shape vaccination behavior in high-income countries. The main driver of acceptance is perceived protection of oneself and family, whereas hesitancy is mainly driven by concerns about side effects and vaccine safety. Across studies, non-physician healthcare professionals consistently demonstrated lower influenza vaccine acceptance compared with physicians while pediatricians and general practitioners were found to receive the influenza vaccine more frequently. In addition, younger physicians and those with fewer years of professional experience showed higher vaccination coverage and a greater likelihood of recommending influenza vaccination to patients. Conclusions: Vaccination coverage, worldwide, is lower than what is recommended by the World Health Organization. Healthcare professionals, working in hospital settings, tend to be vaccinated at a higher rate and are more likely to recommend the vaccine to their patients. The recommendations that health professionals give are influenced by whether they accept influenza vaccines themselves. Beliefs and attitudes seem to influence behavior in countries where structural barriers, such as limited access to primary healthcare and socio-economic status are absent.

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1. Introduction

Influenza is a transmissible disease which is responsible for seasonal epidemics around the world. It poses a considerable burden to many populations, but older people and children are at higher risk of severe infection. The most effective protective intervention against influenza viruses is seasonal vaccination. Vaccination is responsible for the reduction of severe cases. It also limits the transmission of influenza inside the community as it is more difficult for one person to be infected by others and vice-versa [1]. The World Health Organization states that if vaccination was utilized to the maximum capacity 3,5 - 5 million deaths from transmissible diseases like influenza could be prevented [2]. Another important benefit of vaccination is that it is cost-efficient and thus can be a viable and sustainable strategy of primary prevention for the management of transmissible diseases in developing countries [3].

Particularly, in the case of influenza, global data indicate that vaccination coverage in the general population is lower than expected. In many developing countries, the percentage of the general population which is vaccinating regularly is less than 2%. This is true for China as well. [4]. In developed countries in Europe and America, the percentages of vaccination coverage are slightly higher than 50% but still lower than the recommended. In Greece, the vaccination percentages are presenting an increase in the last years but are still insufficient with recent data showing vaccination coverage to be lower than 30% [5]. Almost half of the elderly get vaccinated regularly. Taking into consideration the fact that they are in greater danger, it is reasonable that this percentage is considered low [6].

But why are flu vaccines so important? Vaccination is vital for influenza as it can reduce the risk of transmission up to 40-60% Influenza targets mainly school-aged children usually during autumn and winter [7]. Its symptoms and severity as well as hospitalizations and deaths present variance and heterogeneity [8]. Influenza epidemics have caused 3 - 5 million cases and 290,000-650,000 deaths related to respiratory conditions worldwide. Most of the deaths occur to people older than the age of 65 years-old [4]. It is also important to highlight that almost all deaths in children younger than the age of 5 years-old occur in low and middle-income countries [9].

Health systems around the world face influenza epidemics each year. For example, in the United States of America it is estimated that 30% of the population could be infected due to the many variants of influenza viruses. It is also estimated that, in case of a future influenza pandemic, 90 million people could be infected in the United States of America only. Available data from previous battles against influenza in combination with the annual USA national action plan for prevention and treatment indicate that nearly 40 million people will need outpatient care, 1 to 10 million will need hospitalization, up to 1,5 million will need intensive care unit admissions, over half a million will need mechanical ventilation support and up to 2 million deaths are expected [10]. The example of the USA is representative of all developed countries around the world. In developing countries, unfortunately, the situation regarding influenza is even worse. Due to the lack of infrastructure in terms of hospitals and intensive care units, more people, especially children and older adults, are dying. Moreover, due to the limited number of healthcare professionals, outpatient care, prevention and vaccination aren't properly covered [11].

Influenza constitutes a recurring threat and therefore requires the continuous allocation of financial resources so that each healthcare system can respond in the best possible way. The economic burden on individuals aged 18-64 due to influenza appears to generate indirect costs of up to 90%. This includes absenteeism from work, caregiving time and reduced productivity due to illness. It may also generate direct costs, which are attributed at an estimated rate of 75% to hospitalizations. Expenses related to influenza increase with age and with the presence of possible underlying health conditions. The cost of hospitalization for high-risk groups is approximately 2.5 times higher compared to the general population [12]. The economic impact of influenza can be observed in other sectors of the social structure, beyond the healthcare system. On average, 2 to 4 workdays may be

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lost due to influenza, a fact that affects both income and productivity. Even when these workdays are not lost, the quality of work is reduced when it is performed either under illness or under the perception of illness, further decreasing productivity. When that is applied to healthcare personnel, it is expected that the existing health-related consequences become even more significant [13]. Thus, influenza affects economy, the labor market, healthcare systems and the entire structure of community.

As seasonal influenza vaccination is the most effective means of protection available, it is very important to highlight that healthcare professionals play a critical role in the vaccination acceptance of the general population. If the vaccination acceptance among healthcare professionals is low, it is expected that the acceptance in the general population will be also low [5]. Despite the proven contribution of influenza vaccination, coverage remain moderate, even among healthcare professionals. Some of the reasons that may lead healthcare professionals to neither recommend influenza vaccines nor get vaccinated themselves include inadequate access to education regarding the influenza virus and its mechanisms, misconceptions about the benefits and risks of vaccination, the preference for natural immunity, and the absence of underlying chronic health conditions [14]. In contrast, the presence of chronic conditions, the perceived fear of illness and transmission to family members, as well as mandatory vaccination policies, act as reinforcing factors among healthcare professionals. Primary healthcare and educational campaigns can also aid vaccination coverage within the population of healthcare professionals [15].

For this reason, as shown in literature, beliefs, attitudes and behaviors of health professionals depend on various factors and are shaped according to specific conditions. It is important to make efforts to identify factors that influence them, with the aim of designing and implementing educational interventions for health professionals. Taking all the above into consideration, the present review aims to highlight the attitudes, beliefs, and behaviors that health professionals currently have towards influenza vaccination. In addition, the review seeks to discuss the differences that exist in attitudes, beliefs, and behaviors across different continents and among different groups of health professionals.

Although a substantial body of systematic and narrative reviews has examined influenza vaccination uptake among healthcare professionals, the available evidence remains fragmented across regions, professional subgroups, and conceptual frameworks. Individual reviews typically focus on specific countries, income settings, or professional categories, limiting the ability to derive a coherent global interpretation of beliefs, attitudes, and behaviors. Moreover, the relative contribution of behavioral determinants versus structural and policy-related factors remains inconsistently reported across reviews. To address these gaps, the present umbrella review synthesizes evidence from existing reviews to provide a comprehensive, global-level overview of healthcare professionals' beliefs, attitudes, and behaviors regarding seasonal influenza vaccination. By integrating findings across regions, professional groups, and methodological approaches, this review aims to identify consistent patterns, highlight contextual differences, and delineate evidence gaps relevant to infection prevention strategies and vaccination policy design.

2. Materials and Methods

This umbrella review follows the PRISMA 2020 statement. A literature search was conducted in three databases: PubMed, Cochrane Library, and Google Scholar. The search was performed in December 2025 using specific keywords combined with Boolean operators and asterisks, to ensure comprehensive retrieval of relevant studies. The search query used is the following: (belief* OR attitud* OR behav*) AND ("influenza vaccin*" OR "flu vaccin*") AND (health OR healthcare OR "health care").

Based on the search results, articles that met specific criteria were selected to better address the objectives of the present review. These criteria are as follows:

1) Articles must be reviews.

2) Articles must have been published after the following date: 01/01/2000.

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3) The language of the full text of articles must be English.

4) Article should focus on a population of healthcare professionals and record the beliefs, attitudes, and behaviors towards influenza vaccination.

Two reviewers independently screened titles, abstracts and full texts for eligibility and extracted data from included reviews. Any disagreements were resolved by consensus.

For Google Scholar, the search was conducted using the same query terms, screening the first 200 results sorted by relevance. Reference lists of eligible reviews were also hand-searched to identify additional relevant studies.

Reviews were selected because they summarize data from original studies and can provide a more comprehensive picture of the situation. The starting date for the search was set as 01/01/2000, as this date allows for a complete and thorough depiction of the situation. Articles with full text available in English were selected because English is the internationally recognized language and is the language required for publication in major scientific journals.

Although the review targeted healthcare professionals, this population is described heterogeneously across the literature using multiple terms (e.g., healthcare workers, HCWs, health workers). To avoid missing eligible reviews due to terminological variability, automated exclusions were minimized and eligibility was confirmed through manual assessment.

Finally, the inclusion of reviews focusing on healthcare professionals and describing their beliefs, attitudes, and behaviors towards influenza vaccination ensured that the articles selected were directly aligned with the aims of this review, thereby enhancing comparability and interpretability of the findings. This approach enables the collection of comparable articles and further facilitates the analysis of the data to be gathered.

To calculate the risk of bias, systematic reviews were assessed for quality using the AMSTAR 2 checklist. The quality assessment was not conducted for reviews as they are considered lower quality than systematic reviews anyway. Narrative (non-systematic) reviews were included for descriptive synthesis only, with the aim of capturing broader thematic patterns across regions and professional groups. The interpretation of key findings and the formulation of overall conclusions were primarily based on evidence derived from systematic reviews and meta-analyses.

3. Results

3.1. Selection and Characteristics of Included Studies

Following the PRISMA guidelines, a total of 950 records were initially identified (Figure 1). After removal of duplicates and initial screening of abstracts, 55 studies remained for further assessment. Following full-text screening, 25 studies fulfilling the selection criteria were finally included in this review. A substantial proportion of records were excluded at the full-text stage after verification that the target population did not meet the predefined inclusion criteria. The high number of exclusions observed during the PRISMA flow diagram reflects the methodological decision to apply a sensitive search strategy.

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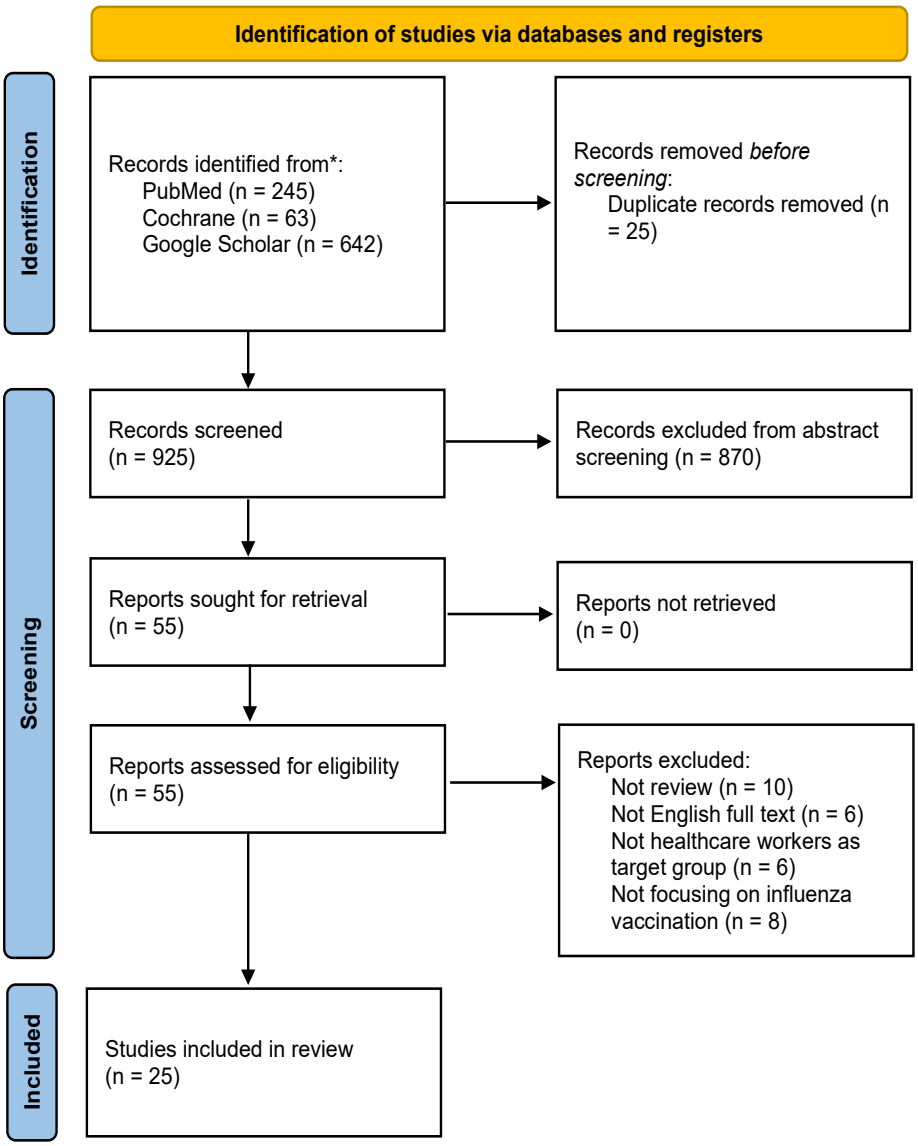

Figure 1. Prisma Flow Chart.

Regarding risk of bias, out of the 12 systematic reviews assessed for quality using the AMSTAR 2 checklist, 1 was ranked as high quality, 4 as moderate quality, 5 as low quality and 2 as very low quality. The 13 reviews were considered by default of lower quality than systematic reviews.

In the following pages, a detailed table with the characteristics of the 25 studies included in this review, is presented (Table 1). Authors, publication date, region, health profession, aim, materials and methods and beliefs, attitudes and behaviors regarding seasonal influenza vaccination were collected for each study and are presented in Table 1.

Table 1. Characteristics of included studies.

Authors	Publication date	Region	Health profession	Aim	Materials and methods	Beliefs, attitudes and behaviors
Aguilar-Díaz et al. [16]	2011	Worldwide	Health professionals	Identification of factors influencing healthcare workers' influenza vaccination acceptance	A review of PubMed, OVID, and Google Scholar, resulting in the inclusion of 30 studies	Vaccination coverage among healthcare professionals is low. Factors that act as barriers and increase non-acceptance include perceptions of vaccine effectiveness and safety. Factors that enhance acceptance include perceptions of personal and family safety

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Authors	Publication date	Region	Health profession	Aim	Materials and methods	Beliefs, attitudes and behaviors
Alalag et al. [17]	2022	Middle East	Health professionals	An investigation of the factors influencing influenza vaccination coverage	Systematic review of PubMed and Google Scholar resulting in the inclusion of 34 studies	Vaccination coverage among healthcare professionals is higher than that of the general population but remains low relative to the desired levels. The increased risk in healthcare professionals' work environment appears to play some role. Barriers seem to include misconceptions about vaccine safety and effectiveness
Alfouzan et al. [18]	2022	Middle East	Health professionals	A review of the barriers and motivators influencing healthcare professionals' uptake of the seasonal influenza vaccine	A systematic review of PubMed, Web of Science, Google Scholar, EMBASE, Scopus, and the Directory of Open Access Journals, resulting in the final inclusion of 20 studies	Vaccination coverage among healthcare professionals is relatively low, below 50%. This may be due to many varied factors, such as perceived safety and perceived effectiveness. Free availability of vaccines and vaccination within healthcare facilities, combined with educational campaigns to change healthcare professionals' attitudes, can increase vaccination coverage
Bellia et al. [19]	2013	Worldwide	Health professionals	An investigation of the factors that influence healthcare professionals' decisions to undergo influenza vaccination	Review of 250 publications in the Web of Science database	The main factors driving healthcare professionals to receive the influenza vaccine are perceived severity of the disease and perceived vulnerability. Some of the reasons for non-compliance are related to the perception that it is a mild illness and, therefore, vaccination is unnecessary
Bish et al. [20]	2011	Worldwide	Health professionals	An investigation of the factors that determine influenza vaccination coverage	Systematic review of Web of Science resulting in the inclusion of 37 studies	Perceived threat from previous experiences with influenza epidemics or pandemics and perceived effectiveness of the vaccine play an important role in the decision to receive influenza vaccine. Inhibitory factors include the perceived severity of influenza and the perceived safety of the vaccines
Dang & Sharma [21]	2020	India	Health professionals	Highlighting vaccination coverage and healthcare professionals' perceptions regarding vaccine effectiveness	Review of 21 publications of PubMed.	Data on vaccination coverage among healthcare professionals in India are limited. However, the increasing incidence of influenza among unvaccinated healthcare professionals indicates low vaccination coverage. The main factors influencing the decision appear to be lack of awareness about availability, doubts about effectiveness, fear of side effects, and perceived risk from the disease
Dardas et al. [22]	2023	Worldwide	Health professionals	An investigation of the factors that influence healthcare professionals' decisions to receive influenza vaccination	Systematic review of: Database of Abstracts of Reviews of Effects (DARE), Cochrane Database of Systematic Reviews (CDSR), PubMed, CINAHL, PsycINFO, Scopus, Web of	Vaccination coverage among healthcare professionals appears to be positively influenced by the perception that influenza vaccines provide protection for themselves and their families, and negatively influenced by concerns about the safety of influenza vaccines

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Authors	Publication date	Region	Health profession	Aim	Materials and methods	Beliefs, attitudes and behaviors
					Science, EMBASE. Inclusion of 368 studies	
Dini et al. [23]	2017	Worldwide	Health professionals	Investigation of the factors influencing healthcare professionals' decisions to receive the influenza vaccine	Systematic review in 27 databases. Inclusion of 28 studies	Vaccination coverage among healthcare professionals seems to be more often positively influenced by the perception that influenza vaccines will help protect themselves and their families, and negatively influenced by concerns about the safety of influenza vaccines
Diomidous & Isaakidou [24]	2020	Greece, Europe and USA	Health professionals	Investigation of factors influencing healthcare professionals' acceptance of the influenza vaccine	Review of PubMed, Medscape, Scopus, Google Scholar. Inclusion of 10 studies	Influenza vaccination coverage among healthcare professionals is low. Healthcare professionals working in health centers and community centers have higher vaccination coverage compared to those working in hospitals. A sense of responsibility toward colleagues and patients appears to positively influence healthcare professionals' attitudes toward vaccination
Fan et al. [25]	2023	Worldwide	Health professionals	Assessment of influenza vaccination coverage among healthcare professionals and identification of the factors that determine it	Systematic review of PubMed, EMBASE, CNKI, CBM, Wanfang, and VIP. Meta-analysis conducted. Inclusion of 92 studies	Global vaccination coverage among healthcare professionals is estimated at approximately 40%. The most frequently reported reasons for vaccination are self-protection and protecting family, while the reasons for non-vaccination are perceived ineffectiveness and concerns about potential adverse effects
Glenton et al. [26]	2021	Worldwide	Health professionals	Investigation of healthcare professionals' perceptions of influenza vaccination and their impact on patients over 50 years of age	Systematic review of MEDLINE, CINAHL, Scopus, Epistemonikos, and grey literature. Inclusion of 11 studies	It appears that whether patients get vaccinated is significantly influenced by healthcare professionals. By having healthcare professionals as role models, patients are affected not only by communication and guidance but also by the actual behaviors of healthcare professionals regarding influenza vaccination
Guillari et al. [27]	2021	Worldwide	Health professionals	Investigation of healthcare professionals' perceptions of influenza vaccination	Review of PubMed and CINAHL. Inclusion of 22 studies	A key factor driving healthcare professionals to get vaccinated is the perception of protecting themselves, their family, and their community. Factors that prevent them from vaccination include fear of illness caused by the vaccines, the perception that they are not at risk, and the belief that their immune system is strong
Hall et al. [28]	2022	Worldwide	Health professionals	Investigation of healthcare professionals' attitudes toward influenza vaccination	Systematic review of CINAHL, PsycINFO, Medline, LILACS, Embase, and Scopus. Inclusion of 75 studies	Vaccination coverage among healthcare professionals is lower than the desired levels globally. The decision may be influenced by perceived susceptibility to influenza, perceptions of vaccine effectiveness and safety, and a history of previous influenza infection
Herzog et al. [29]	2013	Developed countries	Health professionals	Investigation of the impact of healthcare professionals' beliefs, attitudes,	Systematic review of PubMed, EMBASE, CINAHL, and	It appears to be a connection between healthcare professionals' beliefs, attitudes, and behaviors and their recommendations for vaccination to the general population. Low vaccination

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Authors	Publication date	Region	Health profession	Aim	Materials and methods	Beliefs, attitudes and behaviors
				and behaviors regarding vaccination on their recommendations	CENTRAL. Inclusion of 15 studies	coverage among healthcare professionals may, to some extent, also shape the vaccination coverage of the general population
Hollmeyer et al. [30]	2009	Worldwide	Health professionals	Investigation of factors influencing healthcare professionals' acceptance of the influenza vaccine	Review of PubMed. Inclusion of 25 studies	The perception of personal protection and protection of one's family were key factors promoting acceptance of influenza vaccines. Misconceptions and incorrect knowledge regarding vaccine effectiveness and safety were major barriers leading to non-acceptance
JĘdrzejek & Mastalerz-Migas [31]	2022	Worldwide	Health professionals	Highlighting the impact of influenza on healthcare professionals and emphasizing the protective effect of influenza vaccination	Review of PubMed. Inclusion of 12 studies	Global influenza vaccination coverage among healthcare professionals is estimated to range from 2% to 44%, while the recommended rate is 90%. This is partly due to gaps in the global literature regarding the clarity of the benefits of influenza vaccination for healthcare professionals. Interventions aimed at changing healthcare professionals' attitudes may contribute to improving coverage
Lorenc et al. [32]	2017	Worldwide	Health professionals	Investigation of healthcare professionals' perceptions of influenza vaccination	Systematic review of MEDLINE, EMBASE, and CINAHL. Inclusion of 25 studies	Healthcare professionals get vaccinated to protect themselves and their patients. Reasons that deter vaccination include doubts about the effectiveness and safety of vaccines and the perception that influenza is not a serious illness
Nowak et al. [33]	2015	USA	Health professionals	Investigation of healthcare professionals' perceptions regarding influenza vaccination	Review of 29 unpublished studies supported by the CDC	Vaccination coverage among healthcare professionals is higher compared to the general population but does not reach the desired levels. There are still many misconceptions among healthcare professionals regarding the effectiveness, safety, and accessibility of vaccines, as well as the severity of influenza
Prematunge et al. [34]	2012	Worldwide	Health professionals	Investigation of factors influencing healthcare professionals' acceptance of influenza vaccination.	Systematic review of MEDLINE, PubMed, EMBASE, PsycINFO, CINAHL, AMED, Cochrane Library, ProQuest, and grey literature sources. Inclusion of 20 studies	Vaccination coverage shows a huge variation, spanning almost the entire percentage range. The main reasons contributing to acceptance are perceived effectiveness and safety, as well as a history of severe influenza illness
Seale & Macintyre [35]	2011	Australia	Health professionals	Investigation of influenza vaccination coverage among healthcare professionals within the Australian healthcare system	Review of MEDLINE and EMBASE. Inclusion of 10 studies	Vaccination coverage among healthcare professionals ranges approximately from 15% to 60% and does not reach the desired levels. Coverage is higher in facilities where health promotion interventions for influenza vaccination were implemented. These programs shape healthcare professionals' beliefs, attitudes, and behaviors
Sheldenkar et al. [36]	2019	Asia	Health professionals	Investigation of influenza vaccination	Systematic review of PubMed and	Vaccination coverage among healthcare professionals is the highest recorded in the Asian population, approaching

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Authors	Publication date	Region	Health profession	Aim	Materials and methods	Beliefs, attitudes and behaviors
				coverage among healthcare professionals in Asia and the determinants influencing it	LISTA EBSCO. Inclusion of 83 studies, of which 32 referred to healthcare professionals	40%. The main factor contributing to acceptance is perceived effectiveness, while the primary barrier is perceptions regarding vaccine safety
Silva et al. [37]	2023	Worldwide	Health professionals	Application of the Health Belief Model to interpret influenza vaccination coverage among healthcare professionals	Review of PubMed. Inclusion of 11 studies	The dimensions of the Health Belief Model that appear to be related to healthcare professionals' vaccination behavior are perceived susceptibility, perceived severity of the disease, perceived benefits, and perceived barriers
Sydnor & Perl [38]	2014	Worldwide	Health professionals	Highlighting the significance of healthcare professionals' attitudes and behaviors regarding vaccination	Review of 62 studies in PubMed and EMBASE	Influenza vaccination coverage among healthcare professionals is low. Some of the barriers leading to non-acceptance of vaccination include the perception that influenza is not a serious illness, concerns about vaccine effectiveness and safety, and a lack of awareness about vaccination recommendations
To et al. [39]	2016	Worldwide	Health professionals	Highlighting influenza vaccination coverage among healthcare professionals and the factors that determine it	Review of 74 studies in PubMed	Vaccination coverage varies significantly by region as well as across different facilities within the same region. Although the benefits of vaccination are evident, coverage is low where it is not mandatory. The main factors hindering healthcare professionals' vaccination appear to be perceptions regarding the benefits, risks, and effectiveness of vaccines
Waszkiewicz et al. [40]	2025	Worldwide	Pharmacists	Pharmacists' knowledge, attitudes, and beliefs regarding influenza and pneumococcal vaccinations	Review of Medeline, Embase and Cochrane library. Inclusion of 24 studies	Pharmacists have unsatisfactory knowledge about influenza and pneumococcal vaccinations. Shortcomings in attitudes and beliefs about vaccination safety were also present, along with deficiencies of promotion of vaccinations.

3.2. Materials and Methods Used for Data Collection in Included Studies

In this paragraph, a record of the methodological tools, the main design elements, and the theoretical models employed by the 25 studies included in the present review is listed to have a better understanding of the design each study followed. Twelve of the 25 studies included are systematic reviews (Figure 2). In complete accordance, all twelve systematic reviews followed the guidelines of the PRISMA 2020 statement. Most studies conducted structured searches in major scientific databases, with MEDLINE being the most frequently used source. More specifically, 20 studies retrieved data from this database. Only two studies incorporated in their search sources that are part of the so-called 'grey literature' [26,34]. All studies attempted to document the beliefs, attitudes, and behaviors of healthcare professionals, as well as the factors that shape these. However, only two studies relied on a specific belief model to achieve this aim (17,37). The model employed by both is the Health Belief Model.

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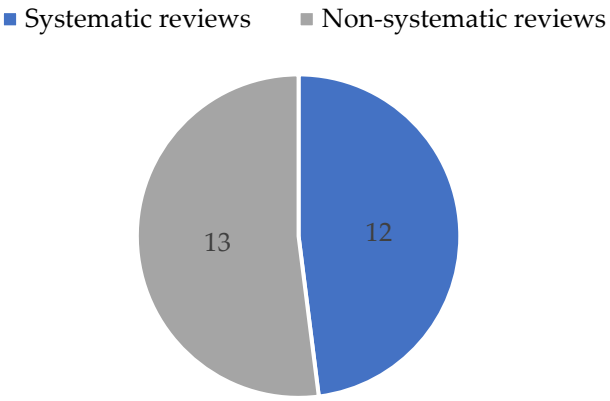

Figure 2. Distribution of included reviews by design.

3.3. Knowledge, Attitudes, Beliefs and Behaviors of Healthcare Professionals Around the World

The percentage of healthcare professionals across all continents who accept influenza vaccination shows marked variation (Figure 3). Across the included reviews, reported uptake ranges from approximately 2-44% in several settings without mandates, with pooled estimates around 40% globally, while coverage can exceed 90% where mandatory policies are implemented [25,31,39]. The vaccination behavior of healthcare professionals appears to influence their recommendations, as it is observed that their advice regarding vaccination of the general population often aligns with whether they themselves accept influenza vaccination or not. Regardless of what the exact vaccination coverage rates are, in all continents these rates are significantly lower than the recommended, desirable levels.

Regarding the beliefs and attitudes of healthcare professionals, it appears that they influence the formation of both the intention to vaccinate and the final vaccination behavior. The strength of this influence seems to be greater in developed countries and weaker in developing countries due to the lack of access to healthcare services in developing countries. Beliefs about protecting oneself and one's family from the influenza virus were the most reported factors positively influencing vaccine acceptance (Table 2). Additionally, attitudes supporting the effectiveness of the vaccine in preventing influenza transmission were also factors leading to acceptance. The two main barriers leading to non-acceptance were perceptions that influenza vaccines cause adverse side effects, making them unsafe, and beliefs that influenza vaccines are ineffective and unnecessary (Table 2).

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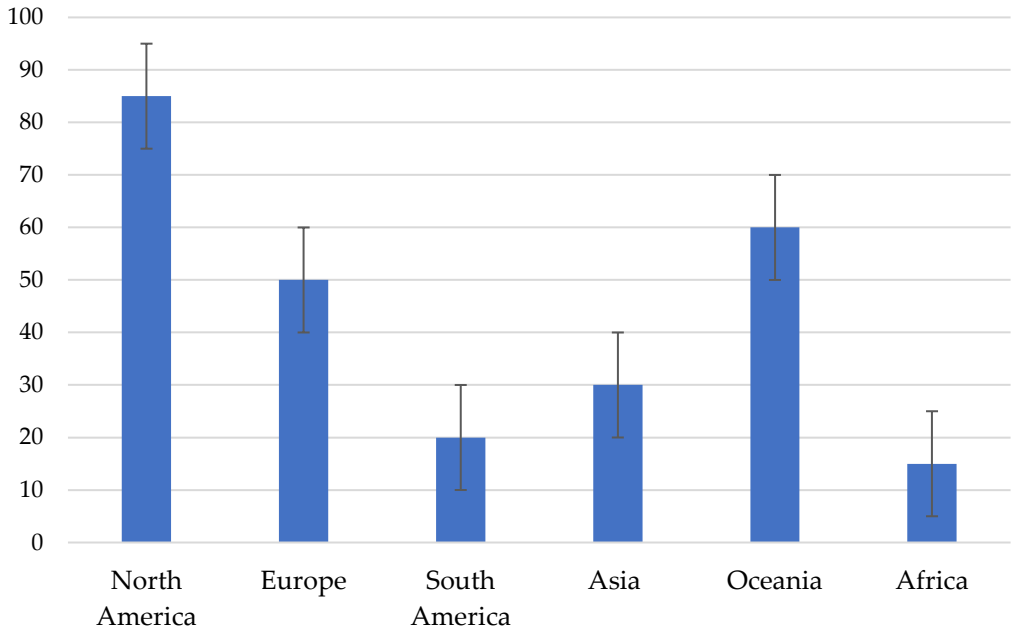

Figure 3. Percentage of vaccination coverage in each continent.

Table 2. Attitudes and beliefs which influence vaccine acceptance the most.

Beliefs and attitudes associated with increased vaccine acceptance	Beliefs and attitudes associated with vaccine hesitancy
Protection of self and family	Lack of safety and side effects
Effectiveness in preventing transmission	Ineffectiveness and unnecessity
Safety of administration	No risk of severe illness
Fear of severe illness	Not a priority in daily schedules
Role model for general population	Vaccines are not easily accessible

3.4. Differences Identified Among Healthcare Professionals

The "intention to" vaccinate and influenza vaccination coverage appear to be higher among healthcare professionals working in clinical practice compared to those performing non-clinical roles (Figure 3). Apart from general practitioners, healthcare professionals working in primary healthcare settings have lower vaccination intention and coverage than the expected. Regarding the age and experience of healthcare professionals, it seems that younger professionals with fewer years of work experience demonstrated a higher likelihood of intending to be vaccinated and, ultimately, to get vaccinated, as well as to recommend vaccination to their patients, compared to those of more advanced age and greater work experienced. Medical professionals have higher vaccination intention, vaccination coverage, and frequency of recommending vaccines to patients, compared to other healthcare professionals. Lastly, among medical specialists, the highest levels of vaccination intention and behavior are observed in pediatricians and general practitioners.

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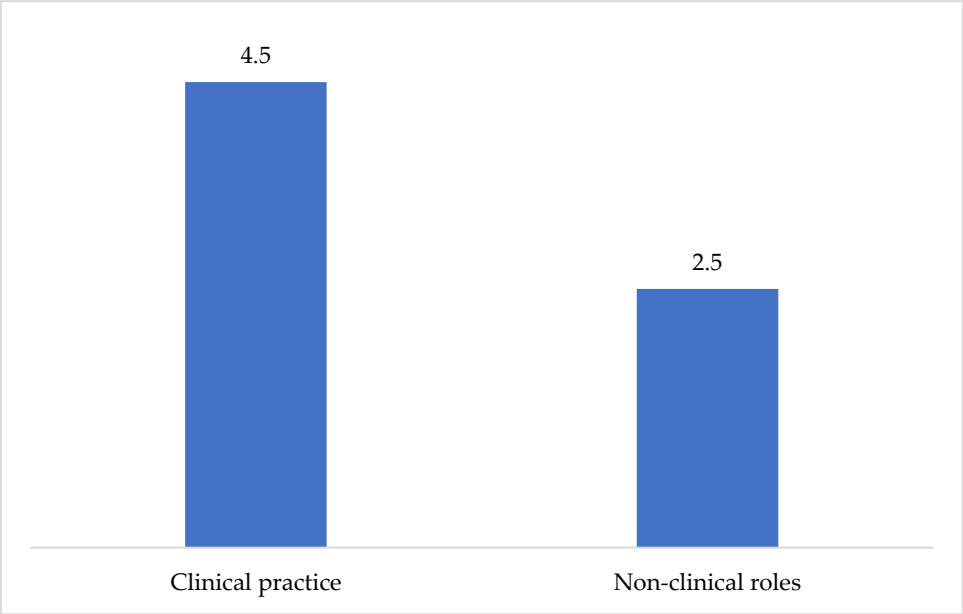

Figure 4. Vaccine acceptance in healthcare professionals in clinical practice and non-clinical roles.

4. Discussion

This umbrella review attempted to capture the prevailing situation regarding the knowledge, beliefs, attitudes, and behaviors of professionals in health care concerning the acceptance or refusal of the influenza vaccination. Through the review, a limited availability of data was observed from many low- or middle-income countries in the continents of South America and Africa, as well as some low- or middle-income countries in Asia. This is also evident in other research efforts in the available literature and may be due to insufficient record-keeping observed in most countries of these continents, and the limited resources for the epidemiological investigation of influenza, because these resources are allocated to other, more significant and life-threatening health issues that exist in each respective region [41,42].

Regarding the vaccination behavior of healthcare professionals, the highest vaccination coverage is observed in North America. This finding is also consistent with other studies [43,44]. One of the key factors contributing to higher vaccination coverage in this region is the implementation of mandatory vaccination policies for healthcare professionals in several U.S. states and in Canada. This measure raises issues, such as the resurgence of anti-vaccination movements, the emergence of ethical dilemmas related to the right to freely choose whether to undergo a medical intervention, and the spread of conspiracy theories, yet it is undoubtedly one of the key factors that maintains influenza vaccination coverage among healthcare professionals at high levels [39,45]. Policy and implementation considerations are summarized in Section 4.1.

In contrast, the lowest influenza vaccination coverage among healthcare professionals is observed primarily in African countries and, subsequently, in South American countries, as is also shown by other researchers [46–48]. These countries are, mostly, low- or middle-income countries. The availability of resources to meet health needs is limited and primary healthcare services are underdeveloped. Moreover, limited healthcare workforce and urgent health needs essential for survival, leads to substantial gaps in the recording of influenza cases and vaccinations, as well as significant difficulties regarding the cost coverage of vaccines, their availability, and access. As a result, the epidemiological data available for these regions are limited. Though, low vaccination coverage is recorded, which further complicates the public health situation in these areas [49–51].

Influenza vaccination coverage among healthcare professionals in Europe and Oceania is similar. Lower than North America's, but comparatively higher than Africa's and South America's [52–55]. In Europe, as in Oceania, there are no laws mandating influenza vaccination. For this reason,

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the guidelines concerning the desired vaccination levels for healthcare professionals serve as recommendations rather than obligations. This provides flexibility and freedom of choice; however, it comes at a cost in terms of achieving high levels of vaccination coverage [56–58].

Regarding Asia, influenza vaccination coverage among healthcare professionals shows the greatest variability, as it consists of both low- or middle-income and high-income countries [56,59]. Vaccination coverage is higher than South America's but lower compared to Oceania's and Europe's. The Middle East region has the higher vaccination coverage when compared to other countries of Asia. This finding is also reflected in other research efforts [60–62].

Overall, the vaccination behavior of healthcare professionals for influenza is considerably lower than the recommended. This is true in all regions. In areas where income is lower, vaccination behavior is even more limited [63,64]. It seems that socioeconomic conditions are important in covering health needs. The inability to cover the cost of healthcare services and the deficiencies in primary healthcare limit access to primary healthcare services. Instead, the emphasis is placed on urgent issues necessary for human survival. As a result, priorities are shaped in such a way that certain public health needs—such as influenza vaccination—are overlooked, even among healthcare professionals [65–68].

Several studies attempt to document knowledge, beliefs, and attitudes to approach the factors shaping behavior [69–71]. In low- or middle-income regions, a divergence is observed between attitudes, beliefs and actual behavior, reducing their usefulness in both predicting and shaping behavior [69,72]. Limited vaccine availability, cost, and lack of access may all contribute to low vaccination coverage. For this reason, although knowledge, attitudes, beliefs, and intention to vaccinate support vaccination behavior, the functional barriers mentioned earlier are responsible for preventing attitudes and beliefs from being reflected in behavior as well as in recommendations to the general population [69,73,74].

Regarding the beliefs and attitudes most frequently have a positive impact on the acceptance of influenza vaccination, healthcare professionals report that they get vaccinated and recommend vaccination against influenza because they believe it enhances protection for themselves and their families [64,75]. They also report the belief that vaccines are an effective method for preventing influenza and infections in general [76,77]. Overall, a sense of immediate risk to oneself and to close family members leads to quicker compliance with the guidelines [75]. Moreover, confidence in vaccine effectiveness is strongly associated with both personal uptake and the likelihood of recommending vaccination to patients. [77].

As for the attitudes and beliefs that act as barriers and lead healthcare professionals to refuse influenza vaccination, the perception of risk prevents individuals from undergoing that intervention, regardless of their level of knowledge about its mechanisms of action [78,79]. Another barrier often mentioned is the belief that influenza vaccines are ineffective in preventing the transmission of the influenza virus, and therefore, do not need to be administered. In contrast to beliefs and attitudes supporting effectiveness, when an intervention is perceived as ineffective, the following question naturally arises: "Why should I undergo or recommend this intervention?" Consequently, healthcare professionals who do not consider influenza vaccines effective do not believe it is necessary to receive or recommend them [80,81].

With regard to the differences observed among various healthcare professionals, those who are actively engaged in clinical practice and come into daily contact with patients tend to think more about protecting themselves and their patients [82]. In contrast, healthcare professionals in administrative roles have much less frequent contact with patients. For this reason, having a reduced exposure with patients, it is reasonable that they exhibit comparatively lower vaccination intention and behavior [83].

Regarding the different specialties among primary healthcare professionals, it was observed that vaccine acceptance is higher among medical professionals compared with other health professionals. One explanation is the variation in knowledge between physicians and nurses or other professionals concerning the mechanisms of action of influenza vaccines [84]. Physicians, having received the most

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specialized training among healthcare professionals, are better able to understand how influenza vaccines work, the process of immunization, the duration of protection, and the need for booster doses. As a result, they are more likely to accept, receive, and recommend influenza vaccination [85].

Another factor contributing to higher vaccination intention and coverage among healthcare physicians is their role as examples of healthy and protective behaviors in the eyes of the public. General population relies on physicians when making health-related decisions [86]. Physicians can influence healthcare users through their own behavior. For this reason, by considering both physicians' specialized knowledge about influenza vaccines and their responsibility as healthcare role models, the comparatively higher rates of vaccination intention, coverage, and recommendation observed among physicians can be explained [87–89]. The highest rates of vaccination coverage and frequency of vaccine recommendation are observed in the specialties of pediatrics and general medicine [82,90].

- Communication and role modelling: Vaccinated healthcare professionals are more likely to recommend vaccination to patients, reinforcing their role as trusted role models and amplifying impact at the population level [26,29,38].
- Targeted education: Interventions addressing misconceptions about safety and effectiveness can increase uptake, particularly among nurses and non-physician staff, where acceptance is typically lower than physicians by ~10-30 percentage points [18,77,82].
- Convenient access: On-site and free-of-charge vaccination within healthcare facilities improves uptake, especially in primary care and outpatient settings with lower baseline coverage [35,52].
- Mandates and governance: Mandatory vaccination policies are consistently associated with the highest coverage, often exceeding 90%, compared with voluntary programs where coverage commonly remains below 60% [39,44,45].

The findings of this umbrella review support several actionable strategies to increase influenza vaccination coverage among healthcare professionals and strengthen downstream effects on patient uptake.

4.1. Implications for Public Health Policy and Practice

Key strengths of this umbrella review include the comprehensive literature search, the inclusion of high-level evidence from systematic reviews and meta-analyses, and the global synthesis of behavioral determinants across regions and professional groups.

A further methodological consideration relates to potential overlap of primary studies across the included reviews. A formal overlap assessment was not conducted; therefore, some degree of double-counting of primary studies cannot be excluded.

It should be noted that the present review was conducted under the influence of certain key limitations. A significant limitation of this review is the methodological variations in the sample of studies that were included. The sample consists of both systematic and non-systematic reviews. The strict and restrictive nature of systematic reviews, the application of specific eligibility criteria, and the use of internationally accepted guideline tools for their implementation contribute to identifying the most relevant and robust evidence. All the above, place the design of systematic reviews at the top of the evidence hierarchy for review articles. However, in our study most of the systematic reviews included were classified as of moderate or low quality. Simple literature reviews may be conducted under the influence of certain criteria, but they are more inclusive and aim to outline a very broad framework of the subject of study. Taking all the above into account, the strength of the evidence was probably affected.

Remaining on the topic of the methodological design of the studies, another limitation arises from the heterogeneity of the studies included in the reviews examined by the present umbrella review. Different research designs offer different levels of strength to the findings they report. As a result, when a review includes all types of research designs without restrictions, some of the findings may become weaker. The present review examined reviews that contain all types of primary research designs. For this reason, it is also impacted in terms of the strength of certain findings.

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The final major limitation identified relates to the variation and inconsistency in how beliefs, attitudes, and intention towards influenza vaccination are recorded and assessed. Vaccination behavior is reflected through vaccination coverage and the recommendations made by health professionals. However, knowledge, beliefs, attitudes, and intention are factors that depend on many variables. This makes their estimation and description difficult. The studies included in the reviews examined by this review approached the recording and determination of these elements in different ways. As a result, a "blend" of data is produced, collected and analyzed in various and heterogeneous ways. Due to the differences in data collection and analysis procedures, it becomes more difficult to compare these data. When the ability to make comparisons is limited because of data heterogeneity, the results that emerge are weakened.

The present umbrella review identified certain gaps, with the aim of being taken into consideration in future research efforts, so that the approach and the overall understanding of primary healthcare professionals' beliefs, attitudes, and behaviors regarding influenza vaccination can be continuously improved.

The main gap identified is the significant absence of data from low- and middle-income regions, highlighting the need for increased research activity in these settings to support more reliable and comprehensive conclusions.

Finally, a key point that is not described in the literature is the focus of research efforts in relation to the differences within the population of primary healthcare professionals. Most studies examine health professionals in general as the reference population. However, under the "umbrella" of health professionals, there are many distinct subgroups, such as physicians, nurses, community health workers and pharmacists. It is undeniable that developing research efforts that study and record the attitudes and beliefs of each specific subgroup within the broader health professional population would greatly facilitate the drawing of clearer conclusions.

5. Conclusions

Considering all the data presented in this umbrella review, influenza vaccination behavior of health professionals in different regions of the world is considerably lower than the recommended levels. North America has the highest levels of vaccination coverage probably due to mandatory influenza vaccination policies. The weakest vaccination behavior is found in African countries. Overall, low- and middle-income countries show significantly lower vaccination behavior compared with high-income countries. Insufficient resources for meeting basic health needs, combined with limited access to influenza vaccines, contribute to the low vaccination coverage. Regarding the differences among healthcare professionals, those in clinical practice, within hospital settings, and younger with less work experience show higher levels of intention to vaccinate, vaccination coverage, and encouragement of patients to get vaccinated. Pediatricians and general practitioners receive the influenza vaccine more frequently. Apart from general practitioners and pediatricians, other primary healthcare professionals show insufficient vaccination levels.

Acceptance can be influenced by knowledge, attitudes and beliefs. Protection that vaccines offer to healthcare professionals, and their families strongly impacts vaccine acceptance. In contrast, beliefs concerning adverse effects and vaccine safety act as barriers to vaccine uptake and recommendation. The recommendations that health professionals give are influenced by whether they accept influenza vaccines themselves. The general population is influenced by healthcare professionals, due to the more frequent contact and trust-based relationship that develops between them. Healthcare professionals are viewed as role models for health-related topics. For this reason, enhancing influenza vaccination uptake among healthcare professionals could substantially strengthen public confidence and improve vaccination behavior in the wider community.

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