



Advancing Vaccination Strategies for Older Adults: Insights of the Adult Immunization Board Meeting

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Abstract

As Europe's population ages, optimizing vaccination strategies for older adults is an increasing public health priority. Vaccine-preventable infections pose significant risks, including increased morbidity and mortality, reduced quality of life, and substantial healthcare costs. Prevention, particularly adult vaccination, plays a vital role in mitigating these outcomes and supporting healthy ageing. While childhood immunization remains essential, a life-course approach including routine older adult vaccination is needed. Coverage among older adults across Europe remains suboptimal owing to factors such as heterogeneous (sub)national policies, health literacy issues, financial barriers, access issues, and persistent structural and societal barriers. To meet these challenges, the Adult Immunization Board (AIB) convened a technical meeting in May 2025, to discuss strategies for improving vaccination in older adults. The meeting explored how older adults are defined in immunization policies (for the meeting, an operational threshold of ≥ 50 years was used, while acknowledging that many national age-based programs commonly start around 60–65 years) and reviewed current adult vaccines and programmatic implementation across six vaccines. Discussions highlighted the need for a life-course approach with coordinated (inter) national policies, clear adult vaccination schedules, dedicated infrastructure and programs, stronger surveillance, and structured follow-up. Key recommendations included shifting from fragmented efforts to cohesive, system-wide approaches. This approach requires addressing organizational challenges with programmatic strategies such as integrating adult vaccination into routine healthcare, providing co-administration guidance, and adapting successful pediatric models for adult programs. This summary presents insights shared during the AIB meeting, highlighting gaps and promising solutions for advancing older adult immunization in Europe. Vaccination must be recognized as an investment in healthy ageing, which is also able to generate a return in economic terms, as part of a holistic health package for older adults, not as an optional add-on to treatment. With older adults now outnumbering children under 5 years globally, it is time to invest equally in their vaccination.

Key Points

Vaccination in older adults remains suboptimal across Europe owing to fragmented policies, limited awareness, and organizational barriers.

A coordinated, life-course approach—with clear schedules, stronger infrastructure, and tailored communication—can improve coverage and support healthy ageing.

Vaccination should be viewed as a core investment in ageing well, reducing disease burden, and helping maintain independence and quality of life.

1 Introduction

Europe is undergoing a demographic transition, with adults aged 65 years and older expected to comprise over 30% of the population by 2050 [1]. This demographic shift will have far-reaching public health consequences, including the context of older adult immunization. Vaccine-preventable infections (VPIs) such as seasonal influenza, coronavirus disease 2019 (COVID-19), pneumococcal disease, pertussis, herpes zoster, and respiratory syncytial virus (RSV) disease disproportionately affect this age group, often resulting in more severe illness, complications, and higher rates of hospitalization and mortality [2–4].

Although the benefits of vaccination in older adults are well established, structural and societal barriers such as fragmented delivery systems, lack of tailored communication,

limited access to vaccination services, inconsistent health-care provider recommendations, and vaccine hesitancy can all hinder uptake among older adults. As a result, VPIs continue to be notified among older populations, leading to preventable morbidity and mortality and greater strains on healthcare systems. Addressing these challenges requires a renewed focus on adult immunization strategies specifically designed to meet the needs of aging populations in Europe.

To confront these issues, the Adult Immunization Board (AIB), an independent multidisciplinary advisory board of European experts committed to the reduction of mortality and morbidity from VPIs in European adults, convened a 2-day technical meeting in May 2025. AIB technical meetings serve as a platform for in-depth discussion with subject-matter experts on specific topics related to adult immunization and share information across disciplines and borders. The goal is to develop evidence-based guidance on fundamental technical issues and to support the monitoring and advancement of adult immunization programs across Europe at both national and subnational levels.

This technical meeting aimed to provide essential insights and strategies to improve vaccination offer, acceptance, and coverage among older adults. Specifically, discussions aimed to:

- Clarify the definition of older adults in the context of vaccination by considering factors such as chronological/biological age, comorbidities, and biological markers.
- Review and discuss vaccines and vaccination programs targeting older adults across Europe.
- Address the unique challenges and opportunities in conducting vaccination studies, and especially clinical trials, involving older adults.
- Explore the mechanisms and factors affecting the efficacy, effectiveness, safety, and durability of vaccine responses in older adults and discuss strategies (such as adjuvants and higher doses) to enhance immune responses. Discuss specific characteristics of different vaccines for older adults.
- Discuss the implementation of vaccination in older adults at the policymaker, organizational, and population levels. Identify strategies, including best practices and successes, to increase vaccination coverage in both community and other care settings, and address communication and logistical challenges to ensure program sustainability and equity.

The meeting focused specifically on six vaccines, including vaccines for influenza, COVID-19, pneumococcal disease, herpes zoster, respiratory syncytial virus (RSV), and tetanus, diphtheria, and pertussis (Tdap) vaccines. Speakers for the meeting were subject-matter experts, identified through their contributions to the field by a PubMed

Medline, backward citation chaining, and gray literature search. Speakers came from different disciplines, geographical settings, and institutions. This review synthesizes the key findings and expert perspectives shared at the meeting, offering an up-to-date overview of the barriers and potential solutions for improving vaccination among older adults in Europe. The presentations, discussions, and key takeaways are summarized in this manuscript with the complete report and all presentations available at <http://www.adultimmunizationboard.org>.

1.1 Defining Older Adults in the Context of Vaccination

Defining “older adults” is fundamental in shaping effective vaccination strategies tailored to their needs. Efforts to refine the definition increasingly consider not only chronological age but also biological aging and person-centered approaches that reflect the complexity of the ageing process and move beyond fixed-age thresholds to capture the diversity of older populations [5, 6].

Globally, the United Nations (UN) Decade of Healthy Ageing (2021–2030) and the World Health Organization (WHO) Public Health Framework for Healthy Ageing continue to promote a broader understanding of ageing. This understanding focuses on “healthy ageing,” which emphasizes the ability of older adults to maintain functional capacity throughout life enabled by creating environments and health systems supportive of well-being in older age [6, 7]. This approach shifts the focus from chronological to a more person-centered understanding based on an individual’s health status, resilience, and needs [8]. Vaccination of older adults plays a key role in this framework by helping to prevent infections and disease-related functional decline and supporting autonomy in later life.

At the European level, the WHO European Strategy “Ageing is Living: Promoting a Lifetime of Health and Well-being (2026–2030)” reinforces the concept of healthy ageing through a life-course approach prioritizing preventive measures for physical, social, and mental well-being, while ensuring support and services are available throughout the life course [9]. Its four action areas, prevention, inclusive environments, person-centered care, and tackling ageism highlight clear opportunities to align older adult vaccination policies with broader healthy ageing goals (Table 1) (see full meeting report for details, available at <https://www.adultimmunizationboard.org/>).

Addressing the definition of “older adults” within broader health policy frameworks is crucial; however, it is equally important to define this group clinically given the biological complexity of ageing and its implications for immune function and vaccine effectiveness. Organismal aging involves numerous physiological changes. Immunosenescence

marked by chronic low-grade inflammation (inflammaging) and reduced immune function remain a key driver of biological ageing, increasing vulnerability to age-related diseases, and is a known correlate with reduced vaccine effectiveness [5, 10]. However, biological ageing varies widely across individuals, with some older adults developing adaptive mechanisms through “immune remodeling,” a process shaped by lifelong exposures, and individual “immunobiography” helping to preserve individual immune function [11, 12]. This individual-level heterogeneity highlights the limitations of relying solely on chronological age to guide vaccination strategies and reinforces the need for more nuanced approaches, which better reflects an individual’s physiological and immunological capacity on the basis of biological age, comorbidities, and risk of developing severe forms of VPI.

Suggested biomarkers of biological age have included epigenetic clocks (e.g., Horvath’s clock) and plasma N-glycan profiles [13–15]. In addition, emerging concepts such as immune entropy, referring to the diversity and regulation of immune responses as potential indicators of biological ageing, are also being explored [16]. Nevertheless, no single indicator fully captures the complexity of biological ageing, and continued research is needed to validate these tools and explore how they can be operationalized to inform more effective vaccination approaches for older adults. For the purposes of the AIB meeting, we used ≥ 50 years as a meeting-specific operational threshold to support an inclusive discussion across midlife and older ages, recognizing heterogeneity driven by comorbidities and biological ageing. This was not intended to represent a uniform European Union/European Economic Area (EU/EEA) definition, and many national age-based programs commonly start around 60–65 years. Finally, chronological age is an imperfect proxy for risk; throughout the manuscript, the term older adults is

used where discussions relate to age-based policies and program eligibility, while recognizing that risk-based strategies (e.g., comorbidities, frailty, immunocompromise) remain essential across adulthood.

2 Vaccines and Vaccination Programs Targeting Older Adults in Europe

Nearly all WHO/Europe countries have adopted age-based vaccination recommendations for older adults. While WHO/Europe reports a high proportion of countries with such policies in 2023 [17], disparities remain in recommendations, funding, delivery, and coverage. For example, heterogeneity exists across the WHO European Region by pathogens covered (Table 2). On the basis of WHO/United Nations Children’s Fund (UNICEF) electronic Joint Reporting Form on Immunization (eJRF) data (last update: end of 2023), 94% and 92% of countries reported policies for COVID-19 and influenza, respectively, but only 30% for pneumococcal disease, 13% for herpes zoster, and 9% for RSV [17]. These figures were presented in a European context, while the remainder of this section focused on EU/EEA recommendations, coverage, and financing.

To examine how European Union/European Economic Area (EU/EEA) countries are addressing vaccination for older adults, differences in national recommendations, coverage levels, and financing were presented and discussed. In addition, scientific advances and practical considerations related to vaccine implementation among older adults were reviewed. Collectively, these insights reflect the varying stages of progress toward a coherent, life-course immunization strategy for ageing populations in Europe.

Table 1 Four core action areas of WHO European Strategy on Ageing is Living: Promoting Lifelong Health and Well-Being (2026–2030) and their integration with older adult vaccination strategies

Action area	Explanation	Examples of integration with older adult vaccination strategies
Commitment on prevention across all ages	Strengthening prevention: eliminating barriers to good health at all stages of life	How can countries lay a strong foundation for life-course vaccination, a tool for lifelong disease prevention?
Creating environments where everyone can thrive at any age	Creating safe, inclusive age-friendly environments that are accessible to support healthy ageing	Can local pharmacies and community centers be used as successful sites for information and vaccination?
Transforming our care systems	Ensuring person-centered care across the full continuum from prevention to treatment to rehab to end of life	How can we create continuous opportunities for immunization, and shift from a disease-centered model to one that puts prevention and people first?
Challenging ageism	How to tackle and address ageism and change the negative narrative on ageing	How can we change societal attitudes and improve vaccine uptake among older persons and their healthcare providers?

2.1 Seasonal Influenza

All EU/EEA countries reported seasonal influenza recommendations for older adults for the 2023–2024 season (Table 3). However, the lower age limit varies across countries, ranging from 50 to 65 years, as reported in the 2023–2024 European Centre for Disease Prevention and Control (ECDC) survey, with some countries applying broader adult recommendations [18]. A decline in the vaccine coverage rates for older adults was observed in 2023–2024 compared with the previous two seasons, with decreases ranging from 3% to 10% among the 17 countries reporting data across all three seasons [18]. The median EU/EEA vaccination coverage rate for older adults in 2023–2024 was 45.7%, compared with 59% in the 2020–2021 season. Although these figures should be interpreted with caution, they suggest a possible decline in seasonal influenza vaccination uptake among older adults, following years of plateaued uptake prior to the COVID-19 pandemic. This trend warrants rigorous monitoring and validation, and there is a pressing need for further research to evaluate the effectiveness of various interventions aimed at increasing influenza vaccination uptake among older adults [19]. In almost all EU/EEA countries, the influenza vaccine and administration of the vaccine are free of charge for older adults [18].

Numerous factors influence seasonal influenza vaccine effectiveness, including individual factors such as immunosenescence, pathogen-specific factors such as antigenic drift, and vaccine-specific factors such as mismatches between vaccine and circulating strains. To address these challenges, a variety of approaches have emerged, including new vaccine platforms, alternate administration routes, and even the longer-term goal of universal or “broadly protective” influenza vaccines. The most utilized approach today

is the use of enhanced vaccines, including adjuvanted trivalent influenza vaccine (aTIV; 15 µg hemagglutinin [HA] per strain, as for standard dose), recombinant influenza vaccine (RIV; 45 µg HA per strain), and high-dose (HD; 60 µg HA per strain) formulations. Enhanced influenza vaccines have demonstrated notable advantages, including a stronger antibody response [20], a broader antibody response against heterologous strains (especially A/H3N2) [21], and a longer duration of protection against influenza throughout the season [22]. Among older adults specifically, clinical trials and observational studies have demonstrated that HD influenza vaccines induce significantly higher antibody responses and provide better protection against both laboratory-confirmed influenza illness and laboratory-confirmed influenza hospitalizations compared with standard-dose formulations [23–26]. Similarly, adjuvanted (ADJ) influenza vaccines have been shown to be more effective than non-adjuvanted in preventing laboratory-confirmed severe acute respiratory infection among older adults [27]. However, a recent systematic review and meta-analysis demonstrated that while enhanced vaccines, including HD, ADJ, and RIV, offer higher protection against influenza hospitalizations in older adults compared with the standard-dose formulations, no consistent differences in effectiveness were observed between the enhanced vaccine types. This suggests that the specific type of enhanced vaccine administered may be less important than ensuring that an enhanced formulation of any kind is used [28], while recognizing that comparative effectiveness can differ between enhanced vaccine types and may vary by season and setting. During the 2023–2024 season, influenza vaccination as a whole prevented 9.8 million flu-related illnesses, 4.8 million medical visits, 120,000 hospitalizations and 7900 deaths in the USA [29]. Although, specific to the USA, this figure highlights that, regardless of

Table 2 Status of immunization policies for older adults in the WHO European Region (including non-EU/EEA countries) by pathogen (contextual overview; last update end of 2023; data source: WHO/

UNICEF electronic Joint Reporting Form on Immunization [eJRF]), adapted from [17]

Status of immunization policies for older adults in WHO European Region by pathogen				
Pathogen	Number of reporting countries in Europe			
	Total (<i>n</i> = 53)	Country-income group		
		HIC (<i>n</i> = 36)	UMIC (<i>n</i> = 14)	LMIC (<i>n</i> = 3)
Seasonal influenza (%)	49 (92%)	35 (97%)	12 (86%)	2 (67%)
COVID-19 (%)	50 (94%)	34 (94%)	13 (93%)	3 (100%)
Pneumococcal disease (%)	16 (30%)	15 (42%)	1 (7%)	0 (0%)
Herpes zoster (%)	7 (13%)	7 (19%)	0 (0%)	0 (0%)
RSV (%)	5 (9%)	5 (14%)	0 (0%)	0 (0%)

WHO European Region includes countries beyond the EU/EEA

This table is provided for contextual comparison; EU/EEA-specific recommendations are detailed in Table 3

HIC high-income countries, *UMIC* upper-middle income countries, *LMIC* low-middle-income countries

Table 3 Age-based vaccination recommendations in older adults, EU/EEA countries

Category	≥ 50 years	≥ 55 years	≥ 60 years	≥ 65 years	≥ 75 years	No current recommendations
<i>Age-based recommendations</i>						
Seasonal influenza ¹	–	13% (<i>n</i> = 4)	23% (<i>n</i> = 7)	63% (<i>n</i> = 19)	–	–
COVID-19 ²	–	–	67% (<i>n</i> = 14)	33% (<i>n</i> = 7)	–	–
Pneumococcal ³	7% (<i>n</i> = 2)	–	23% (<i>n</i> = 7)	40% (<i>n</i> = 12)	–	30% (<i>n</i> = 9)
RSV ⁴	–	–	3% (<i>n</i> = 1)	–	20% (<i>n</i> = 6)	77% (<i>n</i> = 23)
Herpes zoster ⁵	13% (<i>n</i> = 4)	–	20% (<i>n</i> = 6)	23% (<i>n</i> = 7)	–	43% (<i>n</i> = 13)
Tdap ⁶	Tdap booster vaccines are recommended throughout life (mostly, every 10 years)					

Adapted from: ¹ECDC [18]; ²ECDC [31] source missing data from nine countries; ³Pneumonia Atlas [37]; ⁴Belgian Superior Health Council [47]; ⁵Duque et al. 2025 [43]; ⁶ECDC [82]

Data reflect age-based vaccine recommendations. While there are also risk-based recommendations that depend on an individual's specific health conditions or other risk factors, these are not the focus of this report. In some cases, age-based and risk-based recommendations may overlap, when both age and underlying risk factors justify vaccination. However, such risk-specific guidance falls outside the scope of this report

formulation, enhanced or not, any influenza vaccine is better than none, especially for older adults who remain more susceptible to seasonal influenza-associated morbidity and mortality. The WHO Strategic Advisory Group of Experts (SAGE) recommends the use of all currently available inactivated and recombinant seasonal influenza vaccines for older adults [30].

2.2 COVID-19

As of March 2025, all EU/EEA countries recommend an annual booster of COVID-19 vaccination for older adults. The exact lower age limit varies across countries, ranging from 60 to 65 years [31]. However, these lower age limits remain subject to change in response to COVID-19; for example, in Finland the minimum age limit will be set at 75 years for the 2025–2026 season. Median COVID-19 vaccination coverage in the EU/EEA during the 2024–2025 season was 8.7% (range < 0.1–52.8%) and 8.5% (range 0.9–83.5%) for adults aged ≥ 60 years and ≥ 80 years, respectively, with high variation in coverage observed between countries [31]. This is despite the fact that in almost all EU/EEA countries, the COVID-19 vaccine and its administration are free of charge. Since most EU countries participated in the EU Commission-led negotiations on Joint Procurement of COVID-19 vaccines with multiple manufacturers, they continue to have access to country-specific quotas of vaccines ordered, secured, and purchased for national programs via this arrangement until early 2026. Vaccine uptake of COVID-19 booster doses remains a challenge owing to risk perception, vaccination fatigue, safety concerns, and communication barriers [32, 33]. Promoting continued vaccination through education and simplifying

logistics (e.g., co-administration with influenza vaccines) is recommended.

The messenger RNA (mRNA) vaccine platform, central to most COVID-19 booster campaigns in EU/EEA countries, has proven highly effective in reducing severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, hospitalization, and mortality in older adults [34, 35].

2.3 Pneumococcal Disease

Current WHO guidance recommends the introduction of pneumococcal conjugate vaccines (PCV) into national childhood immunization programs with measures to sustain high coverage in children prioritized over initiating pneumococcal vaccination programs for older adults. In countries with well-established childhood PCV programs, adult vaccination should be considered on the basis of local disease burden and cost-effectiveness [36]. In EU/EEA, 30% of countries have no age-based recommendations for pneumococcal vaccination in older adults (Table 3). Among those that do, most (40%) recommend it for adults aged ≥ 65 years, with funding policies varying widely [37]. In many EU/EEA countries, older adults pay out of pocket for pneumococcal vaccination, with a single-dose PCV regimen costing > 60 € (different between countries) [38]. These funding gaps indicate a broader disconnect between public health objectives and individual access, and present an underlying equity issue, potentially hindering vaccine uptake among older adults. Existing European vaccine coverage data reflect this, demonstrating disparities in pneumococcal vaccination across the life course. For example, average European pneumococcal vaccine coverage for children is 88%, while the average coverage in adults is just 18% among high-risk groups and 24% in older adults [37].

Despite the success of PCV vaccines in reducing invasive pneumococcal disease (IPD) and non-bacteremic pneumococcal pneumonia, a substantial proportion of adult cases continue to be caused by serotypes not included in “older” vaccines, driving the development of newer higher-valency vaccines (e.g., PCV20, PCV21) [39]. These newer vaccines cover additional serotypes responsible for significant disease burden, including those associated with antibiotic resistance, outbreaks, and high case fatality rates (notably, serotypes 8, 12F, and 22F).

Both PCV20 and PCV21 have demonstrated favorable safety profiles and durability in adults. Clinical trials have shown that PCV20 elicits robust immune responses to all 20 vaccine serotypes across age groups, with immunogenicity comparable to that of PCV13 and PPSV23 [40]. Similarly, PCV21 has demonstrated strong IgG and functional immune responses across all 21 vaccine serotypes in adults aged ≥ 50 years [41]. PCV21 has also demonstrated noninferiority to PCV20 for the 10 shared serotypes and superiority for the 11 unique serotypes (except for serotype 15C) [42].

For countries to implement effective pneumococcal vaccination strategies, it is crucial to understand the local epidemiology of circulating serotypes in older adults. This information can be used to inform future vaccine strategies, such as expanding serotype coverage in PCVs for pediatric and/or adult populations. As vaccine valency increases, ongoing monitoring and evaluation in older adult populations will be essential to identify effectiveness to specific serotypes as more continue to be added.

2.4 Herpes Zoster

Despite the considerable impact of herpes zoster (HZ) on functional decline and long-term morbidity in older adults, 43% of EU/EEA countries lack national recommendation for HZ vaccination in older adults (Table 3) [43]. The recent WHO position paper released in July 2025 on the use of the recombinant HZ vaccine emphasizes that vaccination should be considered in the context of a life-course approach to immunization. It also highlights the importance of establishing vaccination programs for older adults as a means to contribute to healthy ageing [44]. However, many EU/EEA countries have not included the vaccine in their vaccination program for older adults, and hence, in most EU/EEA countries, HZ vaccines are only available at the request of the people/healthcare providers and, in most cases, at their own expense [43]. The cost of the recombinant HZ vaccine may vary depending on the region; however, it is administered as a two-dose series, with the price per dose typically exceeding 100 € [45].

An identified research priority regarding HZ vaccination for older adults is understanding the duration of protection in relation to age at administration and potential need for

booster doses following the primary series [44]. After the withdrawal of the market authorization for the live attenuated vaccine Zostavax (Merck), the adjuvanted recombinant zoster vaccine (RZV), Shingrix[®], is the recommended HZ vaccine in Europe [43], requiring a two-dose schedule administered 2–6 months apart. Recent long-term follow-up data confirm that Shingrix[®] maintains high efficacy against HZ for over 10 years. At year 11, vaccine efficacy remained at 82.0% (95% confidence interval [CI] 63.0–92.2) and 72.0% (95% CI 33.4–89.8) in adults aged ≥ 50 years and ≥ 70 years, respectively [46]. Cellular immunity also remains stable, with minimal decline observed up to 11 years post-vaccination; this evidence suggests that protection of older adults is of long duration.

2.5 Respiratory Syncytial Virus (RSV)

As a relatively new vaccination, recommendations for RSV vaccination in older adults are still emerging. There are currently no WHO recommendations on use of the RSV vaccine in older adults. Nevertheless, seven EU/EEA countries have age-based recommendations for RSV vaccination in older adults (last update December 2024) [47]. In most of these countries, the recommendation applies to individuals aged ≥ 75 years, although Austria recommends RSV vaccination starting at age 60 years [48]. However, as with pneumococcal and HZ vaccines, many older adults are currently required to pay for RSV vaccination. The current price of the RSV vaccines is around 200 € [49]. This landscape is expected to change as more data become available on the duration of vaccine-induced immunity and the effectiveness of current RSV vaccines in preventing severe disease among older adults in Europe.

As of May 2025, three single-dose RSV vaccines (Arexvy[®] Abrysvo[®], and mRESVIA[®]) have received marketing authorization in Europe for use in older adults. Arexvy[®] was authorized first for adults aged ≥ 60 years, in August 2024, this authorization was then extended to include adults aged 50–59 years at increased risk [50]. Abrysvo[®] was authorized for use in adults in adults aged ≥ 60 years and during pregnancy to provide passive protection for infants [51]. In April 2025, the European Commission extended the indication to include adults aged 18–59 years, following a positive opinion from the Committee for Medicinal Products for Human Use (CHMP) [52]. mRESVIA[®] received EU marketing authorization in August 2024 for adults aged ≥ 60 years, and in September 2025, the European Commission extended the indication to include adults aged 18–59 years at increased risk [53].

These vaccines have demonstrated efficacy against RSV-associated outcomes, including lower respiratory tract infection (LRTI) [54–56]. Both Arexvy[®] and Abrysvo[®] have also demonstrated real-world effectiveness in preventing

RSV hospitalizations [57, 58]. Evidence on the duration of vaccine-induced immunity against RSV-related outcomes remains limited. Ongoing clinical trials are evaluating the long-term immune persistence and potential need for revaccination across all currently licensed RSV vaccines, including Arexvy®, mRESVIA®, and Abrysvo®, each showing sustained immune responses beyond the first year following vaccination [59–61].

Revaccination with RSV vaccines is expected to be necessary; however, the optimal timing for booster doses remains unknown. It also remains unclear whether revaccination schedules will be standardized across all currently licensed RSV vaccines, a scenario that would simplify administration for healthcare providers. Although the optimal revaccination schedule remains unknown (probably not yearly), aligning RSV vaccine administration with other routinely recommended seasonal vaccines for older adults could enhance uptake. RSV revaccination should be recommended, and to further promote vaccine coverage among older adults, several strategies were identified as potentially beneficial. These include coadministration with other vaccines recommended in older people, establishing a centralized vaccine registry to track doses delivered, and developing decision aids to help healthcare providers assess vaccination needs, particularly for patients under 75 years of age, where vaccination is more often based on risk factors rather than universal age-based recommendations.

2.6 Tetanus, Diphtheria, and Acellular Pertussis (Tdap)

While most EU/EEA countries recommend booster doses of Td or Tdap throughout adulthood, these recommendations are rarely emphasized for older adult populations. As with pneumococcal vaccination, the WHO's position paper emphasizes that high coverage of routine infant immunization should be established before extending vaccination to adolescents and adults [62]. However, given the increased risk of pertussis-related complications in older adults [62, 63], the inclusion of Tdap boosters in a comprehensive adult immunization schedule warrants serious consideration. In adults, pertussis immunity wanes over time, and infection is frequently under-recognized, yet adults can contribute to transmission, including to infants, who are at highest risk of severe outcomes. Integrating a pertussis-containing booster within routine decennial tetanus/diphtheria boosting provides a pragmatic life-course opportunity to reduce pertussis circulation while maintaining protection against tetanus and diphtheria. Therefore, the discussion on Tdap vaccination is focused on pertussis, given the significant burden of pertussis among older adults in Europe, particularly among those with comorbidities or weakened immune systems [64]. Pertussis incidence also increased substantially across Europe in 2024, the exact reason for which

remains unknown. Currently, booster vaccination is recommended for adults aged ≥ 18 years across EU/EEA countries; however, booster recommendations for older adults vary by national guidelines, ranging from every 5 years (e.g., Austria) to every 10 years (most EU countries). Given the increased risk of hospitalization from pertussis among older adults, booster vaccination should be considered, especially for individuals with underlying cardiorespiratory or immunological conditions. Even older adults without comorbidities may act as sources of transmission to infants and young children within families, especially where maternal vaccination coverage is suboptimal, highlighting the importance of including them in booster vaccination programs.

3 Challenges and Opportunities in Conducting Vaccination Studies Among Older Adults: Generating Evidence to Inform Policy

3.1 Challenges and Opportunities of Randomized Control Trials in Older Adults

Randomized controlled trials (RCTs) are considered the gold standard for any clinical research aiming to determine causality. However, older adults, particularly those aged over 75 years, remain underrepresented, despite being the fastest growing demographic in the EU and being at highest risk for severe morbidity and mortality from many VPIs. Their exclusion limits assessment of vaccine performance, optimal dosing, and safety in a population with distinct physiology and comorbidities. Conducting RCTs in older adults presents unique challenges, including difficulty identifying and enrolling eligible participants; barriers to obtaining informed consent; increased (and possibly biased) loss to follow-up; and challenges in selecting and measuring relevant outcomes.

Adaptive trial designs using pragmatic approaches [65], as well as observational (real-world) studies have been proposed as important complimentary approaches to improving the quality and relevance of data on vaccination among older adults.

3.2 The Use of Pragmatic Trials Targeting Older Adults

Pragmatic randomized controlled trials (pRCTs) are designed to evaluate interventions under real-world conditions, while still using randomization to reduce bias. Unlike traditional explanatory RCTs, which test efficacy under highly controlled conditions and often exclude frail or comorbid individuals, pRCTs recruit broader and more

representative populations and embed randomization into routine care or national registries. In Denmark, several pRCTs embedded in national registries have focused on older adults. For example, the DANFLU-1 study enrolled approximately 12,500 adults aged 65–79 years who were randomized to receive either HD or standard-dose (SD) seasonal influenza vaccine. With a follow-up rate of 99.97% and baseline characteristics closely reflecting the general Danish population, the study demonstrated the feasibility and scalability of pRCTs for generating robust, generalizable evidence in older adults [66, 67]. Building on this design, the DANFLU-2 and GALFLU trial in Galicia, Spain, enrolled older adults ≥ 65 years to HD versus standard-dose influenza vaccination and assessed hospitalizations using national data [25, 68]. Similarly, the DAN-RSV trial randomized approximately 130,000 older adults and evaluated the RSV vaccine effectiveness in older adults using national registry infrastructure already successfully applied in the DANFLU studies. Among adults 60 years of age or older, the RSVpreF vaccine reduced the incidence of hospitalization for RSV-related respiratory tract disease as compared with no vaccine (0.11 events versus 0.66 events per 1000 participant-years; vaccine effectiveness, 83.3%; 95% CI 42.9–96.9; $P = 0.007$ for minimum effectiveness of $> 20\%$) [69, 70].

In addition to vaccine effectiveness studies, Denmark has extended the use of pragmatic registry-based RCTs to address vaccine uptake. The NUDGE FLU trial conducted during the 2022–2023 influenza season was a nationwide, registry-based, cluster-randomized implementation study [71]. It enrolled 964,870 individuals who were randomized to receive no letter (usual care) or one of nine different electronic letters designed using behavioral “nudging” techniques to encourage influenza vaccination. The highest uptake was observed among those receiving a letter highlighting cardiovascular benefits (81.0% versus 80.1% in usual care; difference 0.89 percentage points [99.55% CI 0.29–1.48]; $P < 0.0001$), with the greatest effect seen in individuals who had not been vaccinated the previous season.

3.3 Use of Real-World Data to Complement Experimental Studies

Observational studies or real-world evidence play a critical role in complementing RCTs, particularly for older adults who are underrepresented in vaccine RCTs. While RCTs offer strong internal validity, observational studies offer key advantages by capturing real-world effectiveness, including diverse populations, and enabling evaluation of long-term outcomes and rare events. However, they are more susceptible to biases, and inconsistent effect estimates compared with RCTs have been observed in vaccine research [28].

These limitations have prompted discussion over whether building pRCT infrastructure in Europe would be more effective than relying solely on observational data. However, given the central role observational research has played in informing vaccine recommendations [72, 73] a proposed solution is to enhance observational methods and selectively integrate only the highest-quality data alongside RCT findings [74]. This approach aligns with the European Medicines Agency (EMA) OPTIMAL Framework, which promotes rigorous real-world evidence generation through structured processes and strict data standards [75]. These strategies aim to balance the internal validity of trials with the external relevance of observational studies, particularly for older adults who are often underrepresented in traditional RCTs owing to restrictive eligibility criteria and operational barriers. This does not imply avoiding RCTs or accepting lower standards for older adults; rather, it underscores the need to improve older-adult inclusion and to use complementary study designs when appropriate.

Regardless of whether evidence is generated via RCTs, pRCTs, or observational studies, the ability to translate this evidence into practice depends on having sufficient infrastructure to promote vaccine uptake at the policy, organizational, and population levels. Timely policy development and effective implementation mechanisms are critical to ensure that evidence-based recommendations lead to improved health outcomes, particularly among older adults. Bridging the gap between research and real-world impact requires not only generating reliable evidence but also investing in systems capable of acting on it.

4 Implementation of Vaccination in Older Adults at the Policymaker, Organizational, and Population Levels

Implementation of vaccination programs for older adults was explored at policymaker, organizational, and population levels. Within each level, strategies can be identified, including best practices and successful approaches, to increase vaccination coverage among older adults. In older adults, the primary public health objective is to prevent severe outcomes and, particularly, hospitalizations, intensive care unit (ICU) admissions and deaths, alongside reductions in complications, functional decline, and healthcare utilization.

4.1 The Policymaker Level: Vaccine Impact Assessment and Economic Value of Vaccination in Older Adults

Assessing the impact of vaccinating older adults at the policymaker level requires the consideration of both health and socioeconomic impacts. While cost-effectiveness analysis

Table 4 Challenges and programmatic considerations in expanding immunization policies beyond childhood and adolescence (input from discussions and presentation of Niyazi Cakmak (WHO-EURO))

Challenge	Required programmatic considerations		Existing approaches from childhood and adolescence vaccination
Limited stakeholder collaboration, with organizational heterogeneity	Vaccinating older adults should not rest solely on general practitioners. A broader, multisectoral and inclusive governance is needed, with additional stakeholders and structures		Childhood vaccination programs in Europe benefit from strong, multisectoral collaboration involving stakeholders beyond the health sector. For example, next to well-baby clinics that support immunization of infants, education systems support school-based delivery, and civil society organizations lead outreach to underserved groups
Many National Immunization Technical Advisory Groups (NITAGs) currently have limited experience in addressing the specific needs of (older) adult vaccination	Strengthening NITAG expertise will support evidence-based decision-making and help integrate older adult vaccination into broader immunization strategies		Most European NITAGs consist of childhood vaccine experts and guide vaccination policy by providing independent, evidence-based recommendations through structured frameworks
Limited disease burden and vaccine effectiveness data in older adults to inform vaccination policies	Strengthen adult disease surveillance systems and reporting to generate reliable sources that inform policy and demonstrate vaccine impact. Where local data are limited, evidence from similar countries can help guide action		Most European countries have mandatory surveillance for childhood vaccine-preventable diseases. In contrast, monitoring of diseases targeted by vaccines for older adults such as influenza, pneumococcal disease, and herpes zoster is often fragmented, inconsistent, and weakly integrated into health systems. Clear adult vaccination coverage targets are also often lacking, limiting accountability for program performance
High price of vaccines and financing limitations (adding high per-dose-cost vaccines to already financially loaded programs and stretched immunization schedules)	Improve access to vaccines (particularly the ones for adults/older adults) at affordable prices		Childhood vaccinations in European countries are largely publicly funded or free at point-of-care, maintaining high uptake. (Sub)national procurement systems help negotiate vaccine prices and stabilize access across Member States
Difficulty in identifying eligible individuals, particularly for risk-based vaccination, owing to fragmented data systems and services	Invest in electronic immunization registry (that is interoperable with other registries) that enables the identification of eligible individuals and monitors coverage for all ages and/or target groups		Most countries automatically invite children to scheduled immunizations and send reminders, achieving high coverage and adherence
Underdeveloped health service platforms for adults and older adults, with limited integration into broader care pathways	Adult vaccination lacks clear schedules and integration into existing infrastructure/services, including primary care, chronic disease care, older adults care, and community-based delivery settings. Creating a standardized, structured approach (such as well-baby visits) would help ensure older adults are systematically offered vaccines. Simplifying access and embedding vaccination into regular healthcare encounters can greatly increase uptake		Childhood immunization is routinely delivered via integrated well-baby clinics or school-based or primary care services, often supplemented by outreach programs for underserved communities
Insufficient training and support for healthcare providers, despite their key role in adult immunization	Empower HCP by providing easy-to-access training (e.g., aligned with immunization knowledge and standards for vaccinators), guidelines, and communication tools to promote and deliver adult vaccines confidently. Engage community leaders and build partnerships with specialist networks for engagement of HCP		For childhood vaccination, healthcare workers across the EU benefit from structured training, guidelines, and communication resources

Table 4 (continued)

Challenge	Required programmatic considerations	Existing approaches from childhood and adolescence vaccination
Inadequate awareness, vaccine acceptance, and demand among the targeted group	Develop targeted campaigns using behavioral and social science to boost vaccine awareness, demand, and acceptance. Monitor vaccine safety to maintain public trust. Evidence-based official recommendations must be more visible and accessible than misinformation	In Europe, strong efforts support vaccine awareness and acceptance for childhood immunization. While campaigns promote life-course vaccination, childhood immunization remains the primary focus in practice. Initiatives engage health professionals, schools, civil society, and media, using multilingual, evidence-based messaging to build trust and counter misinformation
Lack of comprehensive technical guidance to support life-course immunization	Develop structured, evidence-based technical guidance tailored to adult and older adult vaccination. This should supplement existing vaccination policy with robust data on disease burden, vaccine effectiveness, delivery models, and programmatic considerations	Childhood vaccination programs benefit from well-established technical guidelines and implementation frameworks that guide policy, logistics, and monitoring, supported by longstanding evidence and global best practices

remains a standard tool for evaluating health gains per unit cost, it often overlooks broader societal and fiscal impacts where fiscal health modeling and benefit–cost analysis can capture additional impacts such as effects on tax revenue, healthcare and social spending, productivity, and quality of life. Although vaccines in older adults are widely recognized as cost-effective from a health system perspective, the full socioeconomic value is often underappreciated owing the broad direct and indirect consequences of VPIs and the lack of data, particularly on their longer-term impact on public budgets [76]. More data are needed on healthcare costs, social care use, caregiver burden, quality of life, and fiscal impacts to generate robust evidence on the socioeconomic value of vaccinating older adults.

4.2 The Organizational Level: Challenges in Reaching Older Adults and Opportunities

National immunization programs were designed over 50 years ago, focusing on childhood vaccination. As a result, they often are not equipped to meet the programmatic demands of expanding coverage to older populations. Although the life-course approach to immunization has been conceptually recognized for decades, its effective implementation remains unclear and inconsistently applied, highlighting a crucial difference between theoretical endorsement and practical execution.

The success of vaccination programs for older adults depends on effective organizational structures, systems, and processes. However, barriers, including low health literacy, low risk perception, vaccine hesitancy, misinformation, socioeconomic and geographic constraints, and difficulties navigating health systems can limit uptake [77–79]. Broader challenges stem from political, social, financial, and health system factors such as provider capacity. Across EU/EEA countries, scope-of-practice and authorization frameworks vary regarding who can administer vaccines (e.g., physicians, nurses, pharmacists, and other trained providers), which can shape delivery models and constrain access and uptake in adult immunization programs, communication barriers, governance gaps, inconsistent vaccine policies within and across countries, and limited incentives to support coordinated life-course immunization strategies. Table 4 outlines current organizational challenges and suggests programmatic responses, drawing from effective childhood immunization practices across Europe to guide the expansion of vaccination across the life course.

4.2.1 Vaccine Coadministration among Older Adults

Vaccine coadministration is a routine and well-established practice for childhood and travel vaccination programs but remains less common for universal adult vaccination, despite

	50 years	55 years	60 years	65 years	70 years	≥75 years
Vaccine						
Td/Tdap	Every 10 years (for all adults)					
Herpes Zoster	2 doses					
COVID-19			Every year (Aug-Sept)			
Influenza			Every year (Oct-Nov)			
Pneumococcal			1 dose			
RSV						1 dose (Sept-Oct)

Fig. 1 Example for potential recommended vaccinations for adults 50+ years. Light blue indicates one-time vaccines eligible from the anchor age ($\geq$) onward; dark blue indicates seasonal/annual vaccination; white indicates no routine age-based recommendation. Tdap to be repeated every 10 years; HZ vaccine (two doses) and pneumococcal conjugate vaccines should be given once in life, booster doses still to be defined. Influenza and COVID vaccines are offered annually starting at 60 years (indicated with /y); RSV is offered at 75 years, need for RSV booster doses still to be defined. While seasonal vaccines (currently influenza, COVID-19, and RSV) are usually offered in the last months of the year as part of a campaign-oriented approach, timing and frequency may vary by country and season, and

the figure is illustrative rather than prescriptive. Annual COVID-19 vaccination is shown as a baseline approach, while more frequent dosing (e.g., twice yearly) may be used in some settings/populations. The influenza timing reflects the typical concentration of delivery during the main seasonal campaign period (often 1–2 months), although vaccination can be offered outside this period according to national guidance. RSV is shown as seasonal in line with typical winter circulation, while some programs vaccinate year-round or opportunistically for eligible groups. The ages shown are intended as anchor ages to review and offer eligible adult vaccines from midlife onward (starting at 50 years), with only seasonal/booster vaccines repeated according to national guidance

a growing body of evidence supporting its safety and effectiveness. While detailed guidance on the co-administration of adult vaccines is available in some settings (e.g., the USA and parts of Europe, including the UK), national recommendations remain limited and may differ and include vaccine-specific scheduling considerations (e.g., separation of certain vaccines in older adults) [80]. The exception to this being for COVID-19 and seasonal influenza, where coadministration has been widely recommended in most EU/EEA countries since the 2021–2022 season [81, 82]. While coadministration has been recommended throughout this meeting, one concern raised was the effect co-administration may have on vaccine uptake for certain diseases. Specifically, linking influenza and COVID-19 vaccination may have unintentionally reduced influenza vaccine acceptance among individuals hesitant about COVID-19 vaccines. This underscores the need for careful evidence-based messaging and interventions, and targeted strategies to address vaccine hesitancy.

4.3 The Population Level: Communicating the Importance of Vaccination for Healthy Ageing

Communicating effectively with older adults about vaccination requires addressing age-related communication challenges, as well as individual motivations for vaccination. Healthcare providers remain the most trusted source of information, though caregivers, family members, and community organizations also play key roles. Tailored messaging using personalized plain language and motivational framing can improve understanding and acceptance, and various tools

have been developed to support this for healthcare providers [83]. Moreover, communication strategies should highlight not only the prevention of infectious diseases but also the broader health benefits of vaccination, including its role in reducing complications and exacerbations of chronic conditions such as cardiovascular and respiratory diseases, thereby contributing to overall healthy ageing [84]. These tools aim to enhance provider confidence, strengthen communication, and ultimately improve vaccine uptake among older adults.

5 How Would a European-Level Immunization Schedule for Older Adults Look?

A dedicated break-out session of the technical meeting explored what a European-level immunization schedule for older adults would look like. It was recommended that such a schedule should be age-stratified, seasonally timed, and informed by disease burden and vaccine characteristics. It should also allow for co-administration where appropriate and include clear guidance for healthcare providers (HCPs). Figure 1 shows an example for a vaccination plan for older adults (> 50 years). Currently, boosters for RSV, HZ, and pneumococcal conjugate vaccines are not recommended, pending further data on need and optimal timing. As more evidence emerges on the effectiveness and duration of immunity, the recommended starting age may also change. Administering Tdap every 10 years offers an important opportunity to promote a life-course approach to vaccination by integrating adult immunization into routine care [85].

6 Conclusions

The 2025 AIB Technical Meeting emphasized that effective immunization strategies must be rooted in clear, standardized policies, improved surveillance, and a life-course approach to vaccination. This includes clear (sub)national schedules, integrated healthcare delivery, and targeted education for both healthcare professionals and the public.

Key challenges identified include fragmented and inconsistently implemented guidelines, inadequate infrastructure compared with childhood vaccination, low vaccine literacy, unadapted messages, and barriers to access. While national adaptations to demographics and cost-effectiveness are expected, excessive heterogeneity in adult vaccination policies across Europe can create confusion, inequities in access, and missed opportunities for coordination.

The success of pediatric vaccination provides a proven model. Applying similar principles such as structured delivery systems, provider training, public awareness campaigns, and shared stakeholder responsibility can ensure that older adults receive the same systematic and equitable protection. By preventing disease, lifelong vaccination can help optimize intrinsic capacity (for example, reducing the risk of cardiovascular diseases such as stroke and myocardial infarction, as well as the incidence of dementia) and maintain functional independence, thereby increasing the likelihood of older persons reaching advanced ages with autonomy and quality of life. Lifelong vaccination also contributes to the long-term sustainability of healthcare systems. Only through such an integrated, standardized approach can Europe truly realize the full potential of vaccination across the life course and ensure that no one is left behind.

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Declarations

Conflict of Interest M.D.R. reports having collaborated on research projects related to the epidemiology of influenza, RSV, and SARS-CoV-2, funded by, or having provided consultancy services to, or received research or travel grants from, AstraZeneca, GSK, CSL Seqirus, Moderna, MSD, Pfizer, and Sanofi. S.M. has been an advisory board member/conference speaker/researcher and/or received educational grants from Sanofi, GSK, Pfizer, Moderna, Viartis, and Merck. M.C. has received advisory board, consulting/advisory, and lecture honoraria from: AbbVie, Abbott, Alexion, Amgen, Angelini, Astellas,

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