Advancing vaccination strategies for older adults: insights into epidemiology, immunity and implementation

Meeting Report

AIB Technical Meeting, May 7 – 8, Warsaw, Poland

University of Antwerp and University of Florence

The Adult Immunization Board (AIB) (www.adultimmunizationboard.org) is an independent multidisciplinary advisory board created in November 2022. The purpose of the AIB is to contribute to the reduction of mortality and morbidity from vaccine-preventable infections and diseases in European adults by providing evidence-based guidance on fundamental technical and strategic issues while monitoring the progress of adult immunization programmes at regional, national, and European levels. The work of the AIB aligns with the WHO's Immunization Agenda 2030 (IA2030), a global strategy aiming to ensure that people of all ages, everywhere, can fully benefit from vaccines throughout life.

The AIB comprises a group of prominent experts from various fields of adult immunization and representing different European regions. Board members come from a broad array of adult immunization stakeholders (academia, public health, and international organisations) but act in their personal capacity for the board. The AIB is supported by an unrestricted grant from Vaccines Europe (www.vaccineseurope.eu) and applies the ethical rules of its hosting universities, the University of Antwerp and the University of Florence, to guarantee strict operational and scientific independence throughout its activities. The AIB and its board members pledge to work independently, transparently, and collaboratively.

The AIB leverages the long-standing experience of the Viral Hepatitis Prevention Board (VHPB, created in 1992; www.vhpb.org) and the HPV Prevention and Control Board (HPV Board, created in 2015; www.hpvboard.org). In line with the modus operandi of the VHPB and HPV Board, the AIB organises two live meetings per year: a technical meeting to discuss specific technical aspects on adult immunization with subject-matter experts, and a country meeting to discuss country and region-specific issues on adult immunization together with local experts. In May 2025, the AIB convened for their third technical meeting which aimed to provide essential insights and strategies to improve vaccine effectiveness, immunity durability, and uptake among older adults. All meeting slides and reports are available on the AIB website (www.adultimmunizationboard.org).

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Abbreviations list

ACIP	Advisory Committee on Immunization Practices
AIB	Adult Immunization Board
AMR	Antimicrobial Resistance
CDC	Centre for Disease Control
DALY	Disability-adjusted life year
ECDC	European Centre for Disease Control
EEA	European Economic Area
EMA	European Medicines Agency
EU	European Union
FDA	US Food and Drug Administration
GP	General Practitioner
HCWs	Healthcare Workers
HZ	Herpes Zoster
ICD-10	International Classification of Disease 10th edition
IPD	Invasive Pneumococcal Disease
LMIC	Low-and middle-income countries
LRTD	Lower-respiratory tract disease
LRTI	Lower-respiratory tract infection
QALY	Quality-adjusted life year
NCD	Noncommunicable Disease
NITAG	National immunization technical advisory group
NIP	National Immunization program
PCV13	13-valent Pneumococcal conjugate vaccine
PCV20	20-valent Pneumococcal conjugate vaccine
PCV21	21-valent Pneumococcal conjugate vaccine
PPSV23	Pneumococcal polysaccharide vaccine
RCT	Randomised control trial
RSV	Respiratory syncytial virus
RZV	Recombinant zoster vaccine
SAGE	Strategic Advisory Group of Experts
Tdap	Tetanus diphtheria and acellular pertussis
US	United States
UN	United Nations
VE	Vaccine effectiveness
WHO	World Health Organization

Meeting Definitions

Adult immunization	Adult immunization refers to the administration of vaccines (active immunization) or antibodies (passive immunization) to individuals who are 18 years of age or older in order to protect them against various infectious diseases, before or after exposition. *Source: AIB secretariat*
Older adults	The United Nations defines "older adults" as persons 60 years of age or older, although this age limit may vary from country to country. For the purposes of this meeting, we have defined "older adults" as those aged 50 and over to ensure the broadest possible inclusion. *Source: AIB secretariat*
Vaccines targeting older adults	This meeting will focus on the following 6 vaccine preventable diseases (VPD): Influenza, shingles, pneumococcal, COVID-19, RSV, Tdap. *Source: AIB adult vaccines tracker.*

Meeting Report

1. Introduction

With Europe's rapidly ageing population and the significant rise in the proportion of older adults, there is an increasingly urgent need to protect this population group through tailored vaccination efforts as part of comprehensive lifelong immunization programs in Europe.

The Adult Immunization Board (AIB) convened a technical meeting in May 2025 with the aim of providing essential insights and strategies to improve vaccine effectiveness, immunity durability, and vaccine uptake among older adults. The outcomes of these discussions will support National Immunization Programs by sharing the latest information and best practices to boost vaccination coverage, tailor strategies, and ensure sustained protection against vaccine-preventable diseases for this growing segment of the population.

The specific meeting objectives were the following:

- Clarify the definition of older adults in the context of vaccination by considering factors such as chronological age, comorbidities, and biological markers like immunosenescence and frailty
- 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, with older adults.
- Explore the mechanisms and factors affecting the efficacy, effectiveness, safety and durability (including boosters) of vaccine responses in older adults and discuss strategies (like adjuvants and higher doses) to enhance immune responses. Discuss specific characteristics of different vaccines for older adults.
- Discuss 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.

This report summarises the presentations, discussions, and lessons learnt during the two-day meeting. Meeting slides are available on the AIB website (www.adultimmunizationboard.org).

2. Defining Older Adults in the Context of Vaccination

How we define older adults forms the foundation of vaccination strategies targeting them. Various studies and initiatives have been examined to better define what it means to be an older adult, considering chronological age, biological age and adopting more current terminology around the process of ageing. These evolving understandings should help inform programmatic approaches to adult vaccination in Europe, leading to more responsive and inclusive approaches.

2.1 Vaccination and Healthy Ageing: Framing Disease Prevention in Europe's Aging Population

2.1.1 Healthy Ageing Policy: Ageing as Living

Europe is undergoing a major demographic shift, with the population aged 80 years and over expected to triple by 2050. In response, a broad coalition of government officials, policy experts, academics, civil society, and professional organizations is driving a data-informed approach to policy innovation and exploring best practices to address the challenges of an aging population.

At the global level, the UN Decade of Healthy Ageing (2021-2030) (1) aims to improve the lives of older people, their families, and communities through broader societal actions. These include how we design our communities, deliver care and promote social connection. Within this framework "Healthy ageing' is defined as the process of developing and maintaining the functional ability that enables well-being in older age (2). WHO's Public Health Framework for Healthy Ageing reinforces this by emphasizing the importance of maximizing functional ability in older age through building and maintaining intrinsic capacity and by enabling someone with a decrement in functional capacity to do what matters most to them (3). Vaccination of older adults plays a key role in this approach by helping prevent functional decline and maintain capacity in older adults.

At the European-Level, upcoming initiatives like the WHO European Strategy on "Ageing is Living: Promoting a Lifetime of Health and Well-being (2026-2030)" build on the existing foundations of promoting healthy ageing in Europe (4). These emphasize a life-course approach to healthy ageing, prioritizing preventive measures for physical, social, and mental well-being, along with ensuring support and services are available throughout the life course. The European upcoming strategy focuses on four identified public health priorities of healthy ageing, although vaccination of older adults has not yet been explicitly mentioned within this strategy, examples were given of how each priority can be applied within the context of vaccination of older adults (Table 1).

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	Explanation	Integration with Older Adult Vaccination Strategies
Commitment on Prevention Across All Ages	Strengthening prevention of NCDs: eliminating barriers to good health at all stages of life	How can we integrate vaccination into routine health checks for NCD management?
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 centres be used as successful sites for vaccination?
Transforming our Care Systems	Ensuring person centred care across the full continuum from preventative to treatment to rehab to end of life.	How can we train HCWs to address vaccine hesitancy among older adults?
Challenging Ageism	How to tackle and address ageism and change the negative narrative on ageing.	Change societal attitudes and improve vaccine confidence among older persons.

2.1.2 Programmatic Considerations in Operationalizing Older Adult Vaccination

In the context of vaccination, the *'life course approach'* emphasizes immunization as a lifelong strategy to prevent vaccine-preventable diseases and promote health at every stage of life. This approach recognises immunization as a vital tool for sustained disease prevention and requires the implementation of age-appropriate vaccination schedules and delivery strategies tailored to an individual's lifestyle, risk factors, and life stage.

To effectively implement a life course approach to immunization, vaccination schedules and programmatic strategies must be tailored to an individual's life stage, lifestyle, and specific vulnerabilities or risks to vaccine-preventable diseases. Despite growing emphasis on this approach, a global review of universal vaccination recommendations in 2021 revealed significant age-based disparities. While over 80% of countries had universal vaccine recommendations for pregnant individuals and early childhood, only 63% extended such recommendations to older adult populations (5). This gap is especially pronounced in low- and middle-income countries (LMICs), where just 4% of countries had universal vaccine recommendations for older adults, largely due to challenges in implementing adult immunization programs caused by capacity constraints and resource limitations.

While Europe leads globally in universal vaccine recommendations for older adults, with 98% of countries having such recommendations in place for older adults as of 2021, there remains considerable heterogeneity within the region for specific vaccine preventable diseases **(Table 2).** For example, although 94% and 92% of European countries have immunization policies for older adults targeting COVID-19 and seasonal influenza, respectively, only 30% have policies for pneumococcal disease, and just 13% for herpes zoster (6).

Table 2: Status of immunization policies for older adults in WHO European Region by Pathogen (6)

European Member States reporting adult immunization (%)				
Antigen	**Total (n=53)**	**HIC (n=36)**	**UMIC (n=14)**	**LMIC (n=3)**
COVID-19 (%)	50 (94%)	34 (94%)	13 (93%)	3 (100%)
Seasonal Influenza (%)	49 (92%)	35 (97%)	12 (86%	2 (67%)
Pneumococcal Disease (%)	16 (30%)	15 (42%)	1 (7%)	0 (0%)
Herpes Zoster (%)	7 (13%)	7 (19%)	0 (0%)	0 (0%)

Abbreviations; HIC, High Income Countries; UMIC, Upper-middle income countries; LMIC, low-middle-income countries

When considering immunization policies among older adults a fundamental limitation is that national immunization programs many of which were established over 50 years ago with a primary focus on childhood vaccination are often not equipped to meet the programmatic demands of expanding coverage to older populations. While the life course approach to immunization has been conceptually defined for decades, there remains a lack of clarity and consistency in what comprehensive life course implementation entails in practice an important distinction from merely endorsing the approach in principle. Moreover, extending immunization beyond childhood and adolescence presents several specific challenges, were discussed each requiring tailored programmatic strategies and considerations as described in Table 3.

Table 3: Challenges and Programmatic Considerations in Expanding Immunization Policies beyond Childhood & Adolescence

Challenge	Required programmatic considerations
Limited disease burden and effectiveness data informing vaccination policies (at least not as robust as childhood diseases & vaccines)	Consolidating adult disease surveillance (robust data to inform policies and measure vaccination impact)
High price of vaccines and financing limitations (adding high per-dose cost vaccines to already financially loaded programmes & stretched immunization schedules).	Improving access to vaccines (particularly the ones for adults/elderly) at affordable prices
Lack of established health care services for adults & elderly (compared childcare services) and limited immunization service delivery platforms to reach targeted individuals (limited integration to care for adults/elderly)	Diversifying immunization service platforms and integrating vaccination services into antenatal, adult/elderly care and non-clinical settings
Difficulty in identifying the eligibles, particularly for risk-group vaccinations (in absence of interoperability between immunization information systems and other registries)	Investing in electronic immunization registry (that is interoperable with other registries) that enables monitoring coverage for all ages and/or target groups
Need for further efforts to empower health care workers (as they play the key role)	Engaging community leaders and building partnerships with specialist networks for increased public demand and facilitating engagement of healthcare professionals
Inadequate vaccine acceptance and demand among the targeted group (tailored efforts required to build vaccine confidence and public trust)	Developing tailored communication strategies (informed by behavioural insights) to increase vaccine acceptance and demand for immunization. Adjusting immunization safety systems to monitor safety of vaccines (to build and sustain public trust).
Need to collaborate with additional stakeholders & structures (organizational heterogeneity)	Engaging community leaders and building partnerships with specialist networks for increased public demand and facilitating engagement of healthcare professionals.

In addition, it remains critical to broaden the composition of NITAGs and strengthen collaboration across sectors. Developing comprehensive technical guidance on programmatic considerations is also essential to accelerate the operationalization of the life course approach to immunization. This guidance should supplement existing evidence on vaccination policies for adults and older adults, including data on disease burden and vaccine effectiveness.

2.2. Defining older adults in the context of vaccination by considering factors such as biological markers like immunosenescence and frailty

Organismal aging is accompanied by numerous physiological changes, including a decline in immune function compared to younger individuals. These age-related changes in immunity are closely associated with increased susceptibility to chronic diseases and reduced vaccine effectiveness (7, 8). However, the rate of biological aging varies widely between populations and

individuals, for example studies on centenarians have shown that many develop compensatory mechanisms to manage the harmful effects of age-related physiological changes. (9, 10) This heterogeneity is a major characteristic of the ageing process and underscores the need to explore factors beyond chronological age when assessing the health status of older adults since chronological age is not necessarily correlated with biological age or immune health. Evaluating immune responses in older adults requires a broader perspective that accounts for biological age.

Immunosenescence marked by chronic low-grade inflammation (inflammaging) and declining immune function is a key driver of biological aging, increasing vulnerability to age-related diseases, frailty, and is a known correlate with poor vaccine efficacy (8). Yet, some individuals age healthily, avoiding these effects through "immune remodelling", a process shaped by lifelong exposures and individual *immunobiography* (9) This adaptive reshaping of the immune system can mitigate inflammaging and preserve immune responsiveness, supporting healthier aging and improved vaccine responses. As such, the state of the immune system whether deteriorating via immunosenescence and inflammaging or adapting through remodelling plays a crucial role in determining biological age beyond chronological age.

Despite growing understanding of these mechanisms, measuring biological age remains complex. No single biomarker is known to fully capture it, and various molecular and clinical indicators have been proposed, including:

- Epigenetic Clocks - such as DNA methylation-based estimators of biological age (e.g., Horvath's Clock (11), which through assessing the DNA methylation levels of semi-supercentenarians demonstrated that the offspring of semi-supercentenarians have a lower epigenetic age than age-matched controls (12));
- Clinical biomarkers such as Plasma N-glycan profiles (13)

Although biological age is an important factor in evaluating vaccine effectiveness in older adults, longitudinal and epidemiological studies are needed to better understand relevant biological markers and the impact of biological aging on vaccination outcomes. In particular, research should explore how these markers can be operationalized to improve vaccine effectiveness in this population.

3. Vaccines and Vaccination Programs Targeting Older Adults in Europe

The discussion highlighted the range of vaccines recommended for older adults, along with the varied implementation strategies and national guidelines, underscoring the diverse approaches and stages countries are at in adopting a life course vaccination framework.

3.1 Overview of Vaccine Recommendations for Older Adults Across the EU for Vaccine Preventable Respiratory Diseases

3.1.1 Seasonal Influenza

According to the WHO's Strategic Advisory Group of Experts (SAGE), all currently available inactivated and recombinant seasonal influenza vaccines have shown clear benefits compared to no vaccination and should therefore be recommended for older adults (14). While UN defines older adults as 60 years and over, four EU/EEA countries recommend seasonal influenza vaccination for

adults aged 18 years and over (Austria, Bulgaria, Poland, Lithuania). Malta recommends vaccination beginning at age 55. However, in these countries, funding coverage for the younger age groups remains limited (15). For example, in Poland, the influenza vaccine is partially subsidized covering 50% of the cost for adults under the age of 65.

The coadministration of the seasonal influenza vaccine with any dose of a COVID-19 vaccine is considered acceptable by the WHO (16) and may improve programme efficiency, especially given the significant risk of severe illness associated with both influenza and SARS-CoV-2 in older adults. However, limited or partial funding remains a recurring issue across countries (Table 4). This raises concerns about equity as when individuals must pay out of pocket, they are less likely to be vaccinated an obstacle not visible in coverage statistics.

3.1.2 COVID-19

All EU/EEA countries recommend an annual booster of COVID-19 vaccination for older adults per the UN definition of 60 years and older (Table 4); however, the exact age cutoff varies across countries and is not presented in this report. WHO recommends that countries consider co-administration of COVID-19 vaccines (including variant-containing vaccines) with seasonal influenza vaccines or other respiratory vaccines, whenever epidemiologically justified.

3.1.3 Pneumococcal Disease

Currently, WHO recommends that the introduction of PCV into national childhood immunization programmes and measures to sustain high coverage in children should be prioritized over initiating a pneumococcal vaccination programme for older adults (17). However, for countries that have well-established childhood pneumococcal immunization programme, decisions about initiating such a programme in adults, using either PPV23 or PCV13, should consider the local disease burden and cost effectiveness considerations.

Currently, 30% of EU/EEA countries have no age-based recommendation for pneumococcal vaccination in older adults. Only two countries, Bulgaria and Poland, recommend the vaccine for adults aged 50 and over, while the majority (approximately 40%) recommend it for those aged 65 and above (Table 4) (18). Among countries with age-based pneumococcal vaccination recommendations for older adults, funding arrangements are inconsistently defined. Notably, 43% of these countries provide no reimbursement (18). These funding gaps reflect a broader disconnect between high-level public health objectives and actual individual access. Disparities in funding represent a fundamental equity issue, as lack of financial support can significantly hinder vaccine uptake among older adults.

3.1.4 Respiratory Syncytial Virus (RSV)

As a relatively new vaccine, national recommendations for RSV vaccination in older adults are still being drafted or have only recently been introduced in several EU countries. Due to its recent introduction, there is currently no WHO SAGE recommendation for use of the RSV vaccine in this age group. Nevertheless, seven EU/EEA countries have already recommended RSV vaccination for older adults (19). In most of these countries, the recommendation applies to individuals aged 75 years and over. Austria recommends vaccination starting at age 60 (20). This landscape is expected to evolve as additional data emerge on the vaccine's duration of immunity and its effectiveness in preventing severe RSV disease among older adults in Europe.

3.1.5 Herpes Zoster

Herpes zoster (HZ) vaccination remains poorly prioritized for older adults, with 63% of EU/EEA countries lacking a national recommendation (Table 4) (21) despite the considerable impact of HZ

on functional decline and long-term morbidity in this population. The WHO advises that countries considering the introduction of an HZ vaccination programme carefully evaluate the optimal age and dosing schedule, considering the age-specific disease burden, vaccine effectiveness, duration of protection, and cost-effectiveness (22). Currently, WHO has not issued a recommendation for the routine use of the recombinant HZ vaccine, though such guidance is expected by 2025.

3.1.6 Tetanus, diphtheria, and acellular pertussis (Tdap)

No EU/EEA country currently has a universal, age-based recommendation for Tdap vaccination specifically targeting older adults. While most EU/EEA countries recommend booster doses throughout adulthood typically every 10 to 20 years these recommendations are rarely emphasized for the older adult population.

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 (23). However, as discussed in this meeting given the increased risk of pertussis-related complications in older adults, the inclusion of Tdap in a comprehensive adult immunization schedule warrants serious consideration.

3.1.7 Vaccine Policy Alignment and Divergence in Europe

Standardizing and simplifying vaccine schedules, definitions (such as "at risk"), and policies across European countries can significantly improve access, uptake, and health system efficiency. Currently, no EU country fully harmonizes schedules for all five major respiratory vaccines, and only 41% have any coadministration policies primarily for COVID-19 and influenza (REF). RSV and pertussis vaccine policies remain fragmented and are typically limited to narrow high-risk groups.

Achieving equitable vaccine access for older adults requires not only better system integration but also consistent terminology, as differing definitions across countries lead to confusion and inconsistent eligibility. Health policy decisions are largely managed at the national level, creating operational challenges for cross-border EU alignment; a shift toward greater EU-level coordination could help address this. While full harmonization may be difficult, a more realistic path forward is standardization ensuring that key vaccines are routinely offered at specific ages across all countries. Promoting the broader public health value and economic return of vaccination can further support stronger policy alignment and investment.

Table 4. Age-based recommendations for vaccination in older adults, EU/EEA countries

Category	Influenza[1]	COVID-19[2]	Pneumococcal[3]	RSV[4]	Herpes Zoster[5]	Tdap[6]
Universal Age-Based Recommendations						
≥50 Years	–	-	7% (n=2)	–	7% (n=2)	No specific age-based recommendations. Booster recommended every 10 years.
≥55 Years	13% (n=4)	-	-	–	–	
≥60 Years	23% (n=7)	100% (n=30)	23% (n=7)	3% (n=1)	10% (n=3)	
≥65 Years	63% (n=19)		40% (n=12)	-	20% (n=6)	
≥75 Years	–			20% (n=6)	–	
No current recommendations	–		30% (n=9)	77% (n=23)	63% (n=19)	
Funding						
Funded fully	73% (n=22)		57% (n=12)	Not reported	Not reported	Not reported
Funded for at-risk groups	10% (n=3)		-	Not reported	Not reported	Not reported
Limited / partial funding	10% (n=3)			Not reported	Not reported	Not reported
No funding / unclear funding	7% (n=2)		43% (n=9)	Not reported	Not reported	Not reported

Adapted from; [1] ECDC (15); [2] WHO (24); [3] Pneumonia Atlas (18); [4] Superior Health Council (19); [5] ECDC (21); [6] ECDC (25)

3.2 Perspectives from three different EU countries on their country's respective vaccination recommendations and strategic plans for older adults

To explore vaccination recommendations and strategic planning for older adults in Europe, three country-specific case studies were presented from the perspective of both geriatricians and general practitioners. These examples addressed key aspects such as recommended vaccines for older adults, eligibility criteria, access points, and major challenges observed in each country. The discussion also included future perspectives, including potential new vaccines, evolving target groups or age ranges, and areas for improvement in implementation strategies.

3.2.1 Portugal

Table 5: Vaccine Recommendations, Funding and Coverage - Portugal

	COVID	Influenza	Tdap	Pneumococcal	RSV	Herpes Zoster	Others
Are these vaccines recommended specifically for all older adults in the National/Regional Vaccination Program (NVP)?	YES	YES	YES	YES	NO	NO	N/A
At what age are these vaccines recommended in the NVP?	60+ (18+ at risk)	60+ (18+ at risk)	Lifelong	65+ (18+ at risk)	No	No	N/A
What is the recommended frequency of vaccination for older adults as per the NVP?	Annual	Annual	65+:10- 10y 18+: 20-20y	PCV20 -> PSV23 (single dose)	No	No	N/A
Do the recommendations in the NVP differ from those provided by the National Immunization Technical Advisory Group (NITAG)?	NO	NO	NO	NO	N/A	N/A	N/A
Which specific vaccine(s) are recommended for older adults in the NVP	Comirnaty	Influvac Vaxigrip Efluelda	Boostrix	PCV20 PPSV23	N/A	N/A	N/A
Is vaccination publicly funded for older adults? If partially reimbursed, what is the out-of-pocket cost?	Free	Free	Free	PCV20: 31-40.7€ PSV23: 12.9-17.0€	N/A	N/A	N/A
What is the full price of the vaccine without reimbursement?	N/A	SD: €14.10 HD: €50	N/A	PCV20:64.60 €PPSV: 26,99€	€197,50	€176.90	N/A
Who is authorized to administer the vaccine?	MD, RN, pharmacists	MD, RN, pharmacists	MD, RN	MD, RN, pharmacists	MD, RN, pharmacists	MD, RN, pharmacists	N/A
What is the cost of a HCP's visit (for vaccination)	€0	€0	€0	€0-5	€0-5	€0-5	N/A
What is the vaccination coverage rate in the target group (older adults)	65+: 50%	65+: 74%	>95%	Unknown	Unknown	Unknown	N/A
Target coverage?	75%	75%	100%	N/A	N/A	N/A	N/A
Are healthcare providers (HCPs) also recommended for vaccination in the NVP?	Yes	Yes	Yes	No	No	No	No
Are vaccines for HCPs reimbursed? If partially, what is their out-of-pocket cost	Free	Free	Free	PCV20: €31-40.7 PSV23: €12.9- 17	€197,50	€176,90	N/A

In Portugal's National Immunization Program (NIP), four out of the six vaccines diseases assessed in this meeting are recommended for older adults: COVID-19, influenza, Tdap, and pneumococcal disease. COVID-19 and influenza vaccines are recommended for adults aged 60 and older, while the pneumococcal vaccine is recommended for those aged 65 and above. In addition to age-based recommendations, risk-based recommendations for COVID-19, influenza, and pneumococcal vaccination apply to adults aged 18 and older. Currently, RSV and herpes zoster vaccines are not recommended for older adults in Portugal.

In terms of access, eligible older adults can receive COVID-19, influenza, and pneumococcal vaccines at both primary care clinics and pharmacies and COVID-19 and influenza vaccines are available without a medical prescription. Similarly, Tdap vaccination does not require a medical consultation or prescription; however, it must be administered by a registered nurse or physician.

Immunization of older adults in Portugal faces several key challenges. Increasing vaccine uptake among healthcare professionals is critical—not only because they are personally at risk and potential vectors of transmission, but also because they serve as trusted role models for vaccination. Coverage in the general population also needs improvement, particularly among individuals aged 65 and over, where national targets aim to exceed 75% for both COVID-19 and influenza vaccines. Public communication strategies must be strengthened through more impactful vaccination campaigns, and monitoring systems should deliver timely, transparent updates on vaccination coverage. Equally important is the urgent need to rebuild public trust in vaccines, healthcare institutions, and scientific guidance, especially considering recent declines in influenza vaccination rates.

In the short term, Portugal plans to expand its National Immunization Programme (NIP) by introducing new vaccines, including those for respiratory syncytial virus (RSV), herpes zoster (HZ), and the 21-valent pneumococcal conjugate vaccine (PCV21). The eligibility age for vaccination against COVID-19, influenza, pneumococcal disease, RSV, and HZ may also be lowered to 50 years. A key long-term strategic objective is the implementation of the 95-95-95 framework by 2030 ensuring that 95% of individuals aged 65 and older, 95% of people with chronic conditions or other risk factors for influenza, and 95% of healthcare professionals in direct patient contact are vaccinated against influenza (26).

3.2.2 Poland

Table 6: Vaccine Recommendations, Funding and Coverage - Poland

	COVID	Influenza	Tdap	Pneumococcal	RSV	Herpes Zoster
Are these vaccines recommended specifically for all older adults in the National/Regional Vaccination Program (NVP)?	Yes	Yes	No	Yes	Yes	Yes
At what age are these vaccines recommended in the NVP?	65+	65+	-	Risk based	65+	Risk based
What is the recommended frequency of vaccination for older adults as per the NVP?						
Do the recommendations in the NVP differ from those provided by the National Immunization Technical Advisory Group (NITAG)?						
Which specific vaccine(s) are recommended for older adults in the NVP						
Is vaccination publicly funded for older adults? If partially reimbursed, what is the out-of-pocket cost?	Free	Free	No		Free	
What is the full price of the vaccine without reimbursement?						
Who is authorized to administer the vaccine?	MD, RN, pharmacists	MD, RN, pharmacists	MD, RN, pharmacists	MD, RN, pharmacists	MD, RN, pharmacists	MD, RN, pharmacists
What is the cost of a HCP's visit (for vaccination)						
What is the vaccination coverage rate in the target group (older adults)						
Target coverage?						
Are healthcare providers (HCPs) also recommended for vaccination in the NVP?						
Are vaccines for HCPs reimbursed? If partially, what is their out-of-pocket cost						

In Poland, influenza (standard dose), COVID-19, and RSV vaccines are fully funded for all individuals aged 65 and older. Pneumococcal and herpes zoster vaccines are available on a risk-based basis for older adults, while Tdap vaccination is not publicly funded. Since 2021, pharmacists have been authorized to administer 26 adult vaccines, significantly improving access and convenience for the population. However, coverage is still low.

One key challenge is the complex decision-making process regarding which vaccines receive public funding for example, high-dose influenza vaccines are not currently available free of charge. Enhancing vaccine accessibility and clarity in policy decisions remains a critical need. Vaccination has been identified as a priority under Poland's EU presidency, linked to broader goals of European health and security. The Polish Academy of Sciences has also called on the Ministry of Health to improve vaccine accessibility and strengthen public understanding of immunization policy.

3.2.2 Denmark

Table 7: Vaccine Recommendations, Funding and Coverage - Portugal

	COVID	Influenza	Tdap	Pneumococcal	RSV	Herpes Zoster	Others
Are these vaccines recommended specifically for all older adults in the National/Regional Vaccination Program (NVP)?	Yes	Yes	Yes	Yes, (if chronic disease)	Yes	Yes, (if immunosuppressed)	N/A
At what age are these vaccines recommended in the NVP?	65+	65+	Lifelong	65+	60+	Adults	N/A
What is the recommended frequency of vaccination for older adults as per the NVP?	Annually	Annually	10 yr	Single dose	Single dose	Single dose	N/A
Do the recommendations in the NVP differ from those provided by the National Immunization Technical Advisory Group (NITAG)?	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Which specific vaccine(s) are recommended for older adults in the NVP	Comirnaty	Vaxigrip-Tetra	Generic	Prevenar 20®	Arexvy®	Shingrix	N/A
Is vaccination publicly funded for older adults? If partially reimbursed, what is the out-of-pocket cost?	Fully	Fully	Fully	Fully	Fully	Fully	N/A
What is the full price of the vaccine without reimbursement?	€134	€34	€47	€134	€256	€216	N/A
Who is authorized to administer the vaccine?	MDs and RNs	MDs and RNs	MD's	MD's	MD's	MD's	
What is the cost of a HCP's visit (for vaccination)	€23	€23	€23	€23	€23	€23	
What is the vaccination coverage rate in the target group (older adults)	75%	76%	Unknown	Unknown	Unknown	Unknown	
Target coverage?	>90%	>90%	Unknown	Unknown	Unknown	Unknown	
Are healthcare providers (HCPs) also recommended for vaccination in the NVP?	No	Yes	No	No	No	No	HBV
Are vaccines for HCPs reimbursed? If partially, what is their out-of-pocket cost	NA	Yes	NA	NA	NA	NA	Yes

In Denmark's NIP, four of the six vaccine-preventable diseases reviewed during this meeting are recommended for all older adults. Pneumococcal vaccination is recommended for individuals over 65 only if they have a chronic condition, while herpes zoster vaccination is recommended for all immunosuppressed adults, regardless of age.

Denmark's healthcare system is highly digitalized. When a vaccine is publicly subsidized, a national digital campaign is launched to notify eligible individuals that it is time to get vaccinated. There is increasing recognition that fixed age thresholds are becoming less relevant in guiding vaccination policy as Denmark has the technical capacity to link age and comorbidity data, enabling more personalized recommendations. However, a key challenge remains determining how to effectively implement targeted strategies that identify and reach those who would benefit most from vaccination.

4. Challenges and opportunities in conducting vaccination studies, and especially clinical trials, with older adults.

Randomised controlled trials (RCTs) are widely regarded as the gold standard in clinical research, offering a robust method for comparing therapies in clearly defined populations and establishing causal relationships. However, despite the introduction of guidance in 1994 promoting the inclusion of individuals over 65 years in clinical trials (27), progress has been limited. In particular, those over 75 years remain significantly underrepresented, even though they represent the fastest-growing demographic group in the EU.

This lack of representation poses significant challenges. As previously discussed, older adults often have distinct pharmacokinetics and multiple comorbidities, which can influence how they respond to vaccines. Their exclusion from clinical research limits our understanding of vaccine efficacy and safety in this population. Importantly, older adults are at the highest risk of severe illness and mortality from many vaccine-preventable diseases yet their underrepresentation in trials hinders accurate evaluation of vaccine effectiveness, optimal dosing strategies, and potential adverse events in this vulnerable group.

Conducting vaccine trials in frail and older adults presents several unique challenges, including:

- Identifying frail participants in large populations
- Recruiting participants and obtaining informed consent
- Ensuring unbiased follow- up
- Determining and capturing relevant outcomes

The discussion highlighted the importance of including frail and older adults in vaccine trials despite recruitment challenges. Adaptive trial designs using pragmatic approaches, as well as observational methods were identified as crucial strategies to improve the quality and relevance of data for older adults.

4.1 The Use of Pragmatic Trials Targeting Frail and Older Adults

Pragmatic randomised trials that integrate treatment allocation with existing data-collection platforms, such as national registries, offer a way to draw causal conclusions from representative real-world populations without the recruitment challenges of traditional RCTs, especially among older adults. In Denmark, nationwide administrative registries facilitate this by combining randomisation with comprehensive baseline and follow-up data collection.

Several recent pragmatic trials in Denmark have specifically targeted older adults. The DANFLU-1 feasibility study (28) tested the integration of an individually randomised trial into routine seasonal influenza vaccination. Approximately 12,500 adults aged 65–79 were randomized to receive either a high-dose (HD) or standard-dose (SD) influenza vaccine, with a follow-up rate of 99.97%. Baseline characteristics closely matched the general Danish population, demonstrating the feasibility and scalability of this approach. A hospital frailty risk score, derived from ICD-10 codes, showed that HD vaccination was associated with reduced all-cause mortality but only among those with low frailty (29). Building on this infrastructure, the DANFLU-2 study aims to evaluate whether HD influenza vaccination reduces hospital admissions for flu, pneumonia, and cardiovascular disease compared to SD vaccination (30). The trial plans to invite up to 1 million Danes aged 65 and older each season. Participants will be randomized 1:1, with follow-up, safety monitoring, and outcome assessment conducted centrally through registry linkages. The protocol also includes pre-specified analyses to evaluate the role of frailty in modifying vaccine effectiveness and recruitment patterns. The DAN-RSV study is another pragmatic, registry-based, open-label trial, evaluating the effectiveness of a bivalent RSV prefusion F vaccine in older adults. A total of 130,000 participants will be randomized 1:1 to receive either the vaccine or no vaccine. Using national registries, the study will assess RSV vaccine effectiveness on RSV-related and all-cause cardiorespiratory outcomes, alongside continuous safety monitoring and data collection (31).

In addition to vaccine effectiveness studies, Denmark has extended the use of pragmatic registry-based RCTs to address vaccine uptake. The NUDGE FLU trial (32) conducted during the 2022–23 influenza season, was a nationwide, registry-based, cluster-randomized implementation study. It enrolled 964,870 individuals who were randomized to receive either usual care or one of nine different electronic letters designed using behavioural “nudging” techniques to encourage influenza vaccination. The highest uptake was observed among those receiving a letter highlighting cardiovascular benefits (81.00% vs. 80.12% 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.

4.2 Use of real-world data to complement experimental studies

Real-world data can play a critical role in complementing RCTs, particularly in addressing evidence gaps in vaccine research among older adults, where clinical trial data are often limited. However, while RCTs offer high internal validity by ensuring that observed effects are directly attributable to the intervention, observational studies lack this level of control and are susceptible to various biases. These include selection bias such as the healthy vaccinee effect and confounding by indication. Importantly, treatment effects frequently differ between RCTs and observational studies. As a result, treatment effects often differ between RCTs and observational studies, leading to potential discrepancies in their findings.

For example, a network meta-analysis comparing RCTs and observational studies on high-dose influenza vaccines in older adults found differing estimates of relative vaccine effectiveness (rVE) (33). In RCTs, the pooled rVE was 20% (95% CI: -54 to 59) for adjuvanted (ADJ) vaccines and 25% (95% CI: -19 to 53) for high-dose (HD) vaccines, relative to standard dose (SD) vaccines. In contrast, observational studies showed modest but more consistent rVE estimates (10–19%) for ADJ, HD, and recombinant influenza vaccines (RIV) compared with SD, with no significant differences observed among the enhanced formulations.

Observational studies can still play a crucial role in shaping vaccine policy. For instance, in 2014, the Advisory Committee on Immunization Practices (ACIP) recommended the live attenuated influenza vaccine (LAIV) over the trivalent inactivated vaccine (TIV), based on findings from RCTs

(34). However, subsequent observational studies conducted by the CDC revealed reduced effectiveness of LAIV in real-world studies (35, 36) leading ACIP to withdraw its recommendation (36). Similarly, until the 2021/2022 season the ACIP did not preferentially recommend any specific influenza vaccine for older adults (37). However, a large 2017–18 FDA retrospective cohort study of 13 million individuals demonstrated consistent benefits of all three enhanced vaccines in preventing flu hospitalizations (38-40). This prompter ACIP to issue specific recommendations that adults aged 65 and over should receive: high dose, recombinant or adjuvanted vaccines over standard dose vaccines (37).

When addressing the challenges of conducting vaccination studies particularly clinical trials among older adults in Europe, there was debate about whether building a pragmatic RCT infrastructure across the EU would be more effective than depending on observational data, which can be affected by bias and uncertainty in vaccine effectiveness. One discussed approach was to enhance observational methods to selectively integrate only the highest-quality observational data alongside RCT findings.

5. Mechanisms and factors affecting the efficacy, effectiveness, safety and durability (including boosters) of vaccine responses in older adults and strategies to enhance immune responses.

5.1 Immunological mechanisms of vaccine-induced immune response in the older adults

The complex immune mechanisms needed to induce an efficient vaccine response often break down in older adults because of age-related changes to the immune system as discussed previously in Section 2.2. Functional defects and altered frequencies of innate and adaptive immune cells impair local responses at the site of vaccine injection, hamper the generation of primary responses to neoantigens, prevent the effective induction of memory lymphocytes, and decrease the effect of vaccination. As a result, older adults often exhibit weaker antibody responses that wane more rapidly, making long-term protection from vaccination less reliable in this population. Meta-analyses of influenza vaccine seroconversion consistently show lower response rates in older adults compared to younger individuals (41).

To enhance vaccine effectiveness in older adults, several strategies have proven beneficial. High-dose formulations, have been shown to improve influenza vaccine efficacy (42), while adjuvanted vaccines have significantly increased antibody responses to COVID-19 (43) and RSV (44), and have demonstrated stronger immune responses and broader protection against influenza in this population (45). Additional strategies were also discussed which included alternative delivery methods, and schedules tailored to the aging immune system are being explored. These approaches aim to enhance immune response, durability, and protection in older adults.

5.2 Comorbidities and vaccination response in older adults

Comorbidities can impair immune function and may further weaken the immune response to vaccination in older adults. Although some studies have explored the effects of individual comorbidities such as reduced humoral responses to SARS-CoV-2 vaccines in kidney transplant recipients (43) and to PCV10 in individuals with type 2 diabetes (44), large, systematic investigations remain limited. For some comorbidities it is also challenging to distinguish whether the weakened immune response is due to the disease itself or the treatments involved. This is

particularly relevant given that more than 95% of older adults use at least one medication, highlighting the importance of considering both comorbidities and treatment factors in vaccine response studies.

As discussed earlier in the meeting, individual immune system remodeling over the lifespan leads to significant variation in immune status across individuals. Rather than focusing solely on specific diagnoses of comorbidities, assessing overall immunological status was proposed as providing a more comprehensive understanding of vaccine responsiveness. Two novel approaches to capture this include “immunotyping” and “immune entropy”. Immunotypes categorize individuals based on shared immune profile patterns, while immune entropy measures the overall disruption in the immune system by quantifying how much an individual’s immune profile deviates from that of a healthy young reference group. (45) These tools may help identify individuals at risk of poor vaccine response across a wide age range. Immune entropy, which increases with age and reflects greater immune dysregulation, is influenced by factors such as lifelong immune exposures, cytomegalovirus (CMV) seropositivity, and sex all of which may therefore affect vaccine efficacy.

How these concepts can be operationalized in clinical practice and public health to improve vaccine effectiveness among older adults remains a subject of ongoing debate and research.

6. Specific characteristics of different vaccines for older adults

To set the stage for discussing specific characteristics of different vaccines for older adults an overview was provided for each vaccine under discussion in the meeting as presented in Table 8.

Table 8: Overview of Assessed Vaccines in the Context of Older Adults

Vaccine information	Vaccine					
	Herpes Zoster	Pneumococcal	Tdap	RSV	Influenza	COVID-19
Vaccines on the market	Adjuvanted recombinant zoster vaccine (Shingrix)	PPV23, PCV13, PCV15, PCV20, PCV21	Boostrix, Boostrix-Polio, Covaxis, Repevax	Abrysvo Arexvy mRESVIA		
Vaccine immunogenicity in older adults	Humoral Immunogenicity at 11 years post vaccination 5+ higher than pre-vaccination	Confirmed	Unknown, but reduced compared to younger adults	Immune responses were similar across age groups		
Vaccine efficacy/effectiveness in older adults	Overall efficacy 87.7%. Decreases slightly with age and time after vaccination	Confirmed	Unknown, but reduced compared to younger adults	Efficacy from 88.9% to 83.7% according to different primary outcomes		
Vaccine safety in older adults	No safety issues	Confirmed	No safety concerns, well tolerated	Good safety profile, warning for GBS		
Long lasting protection in older adults	Protection in older adults >70 similar to younger older adults. 11 years after vaccination, efficacy over 70%	4 years for PCV13. To be confirmed for PCV20 and PCV21.	Limited data	Persist over >2 seasons in all subgroups age		
Vaccine co-administration in older adults	Flu, pneumococcal, Tdap, mRNA COVID	Confirmed for PCV13, PCV20 and PCV21	Shingrix			
Other relevant information in the context of older adults	Importance of a two-dose schedule	What is elderly? See October 2024 ACIP recommendations		No data on effectiveness on other relevant outcomes such as cardiovascular events. Not data on effectiveness over 2 seasons, nor effectiveness of revaccination		

6.1 Herpes Zoster: Duration in Older Adults

The incidence of Herpes Zoster (HZ) increases significantly among adults over the age of 50 (46) largely due to a decline in cellular immunity, allowing the latent varicella zoster virus, if present to reactivate. The condition is therefore closely linked to immunosenescence, highlighting the close relationship between cellular immunity and HZ. Consequently, the duration of immunogenicity and clinical protection is a key consideration in the context of older adults.

The adjuvanted recombinant zoster vaccine (RZV), Shingrix (GSK) is the most widely recommended HZ vaccine in Europe (47) requiring a 2-dose schedule administered 2-6 months apart. Inclusion of the AS01 adjuvant system used in RZV has been shown to increase the size and duration of the immune response (48). The Shingrix vaccine, consisting of recombinant varicella-zoster glycoprotein E (gE) and the $AS01_B$ adjuvant system, and administered as a 2-dose schedule, had previously demonstrated ≥90% efficacy against HZ in all age groups ≥50 years, which was maintained over a 3.2- and 3.7-year follow-up period in 2 pivotal phase 3 trials among 7000 participants (ZOE-50 and ZOE-70, respectively) (49, 50). Since then, final analysis of the ZOE-50/70 efficacy studies has demonstrated high efficacy against HZ persisting beyond 10 years with annual VE at Y11 of 82.00% (95% CI 63.03–92.22) in ≥50 year olds and 72.00% (33.41–89.77) in ≥70 year olds (51). Vaccine efficacy appears to be consistent across age groups, with no significant difference in anti-gE antibody levels between adults aged 50–59 and those over 70, indicating sustained clinical benefit (52). Cellular immunity also remains stable, with minimal decline observed up to 12 years post-vaccination.

6.2. Pneumococcal disease: future vaccines

Streptococcus pneumonia is the leading cause of community-acquired pneumonia (CAP) (53) and the risk of mortality attributable to Streptococcus pneumonia is known to increase with age. The 13-valent pneumococcal conjugate vaccine (PCV13) has been shown to be effective in preventing vaccine-type CAP in adults aged 65 years and older. Notably, the Community-Acquired Pneumonia Immunization Trial in Adults (CAPiTA) demonstrated a vaccine efficacy of 46% for preventing a first episode of vaccine-type CAP, 45% for nonbacteremic, noninvasive vaccine-type CAP, and 75% for vaccine-type invasive pneumococcal disease (54). However, the focus of this discussion is on the newer PCV20 and PCV21 vaccines, which cover additional serotypes not included in currently licensed pneumococcal vaccines, as outlined below.

Table 9. Serotypes included in each adult pneumococcal conjugate vaccine

Pneumococcal conjugate vaccine	Serotypes covered
PCV13	4, 6B, 9V, 14, 18C, 19F, 23F, 1, 5, 7F, 3, 6A, 19A
PCV15	All the above (PCV13) plus 22F and 33F
PCV20	All the above (PCV15) plus 8, 10A, 11A, 12F, and 15B
PCV21	7F, 3, 6A, 19A, 22F, 33F, 8, 10A, 11A, 12F, 15B, 9N, 15A, 16F, 17F, 20, 23A, 23B, 24F, 31, 35B

The additional serotypes included in the PCV20 vaccine are significant because they contribute substantially to the global burden of invasive pneumococcal disease. These serotypes are associated with antibiotic resistance, meningitis, and higher case fatality rates. Notably, serotypes 8 and 12F have also been linked to multiple outbreaks. Although herd immunity from pediatric pneumococcal vaccination programs has reduced adult disease, it does not eliminate the need for direct adult protection. PCV20 provides targeted protection against serotypes that remain relevant

to adult public health. In adults aged ≥65 years, approximately 22% of IPD cases are caused by serotypes not covered by current childhood PCV vaccines (REF).

Although, data on the real-world effectiveness of PCV20 is more limited clinical trials have demonstrated that PCV20 was safe and well tolerated, with immunogenicity comparable to that of PCV13 or PPSV23 with PCV20 inducing robust responses to all 20 vaccine serotypes across age groups (55). Additionally, coadministration studies with the quadrivalent influenza vaccine and COVID-19 vaccine have demonstrated that PCV20 maintains its efficacy when given concurrently (56, 57).

PCV21, approved by the EMA on March 24, 2025, was developed to address differences in serotype prevalence between adults and children, the remaining disease burden in adults, and to complement existing paediatric vaccination strategies. The PCV21 vaccine covers 79.3% of serotypes responsible for adult disease, compared to 66.8% coverage by PCV20. While long-term data on the duration of immunity for PCV20 and PCV21 in older adults is not yet available, insights may be able to be extrapolated from PCV13 studies. PCV21 has demonstrated a favorable safety profile and strong IgG and functional immune responses across all vaccine serotypes in adults aged 50 years and older, regardless of prior pneumococcal vaccination history (58). In terms of immunogenicity, PCV21 has also demonstrated non-inferiority to PCV20 for the ten shared serotypes and superior for the unique serotypes included in PCV21, except for serotype 15C (59). Concomitant administration studies have also shown no difference in vaccine efficacy of PCV21 when administered with influenza and COVID-19 vaccines.

For countries to implement effective IPD vaccination strategies, it is essential to understand the local epidemiology of circulating serotypes, particularly regarding re-emerging serotypes like 19F, 9V and 4, seen in France, Canada and the USA, respectively. Looking ahead, future vaccine strategies may include expanding serotype coverage in PCVs for both paediatric and adult populations, increasing adult vaccine uptake, developing adult-specific conjugate vaccines with serotypes not included in paediatric formulations, and advancing protein-based pneumococcal vaccines.

6.3 Tdap: boosters in older adults and differences between countries

For tetanus-diphtheria and acellular pertussis (Tdap) vaccination the discussion was framed around pertussis given the significant burden of pertussis among older adults in Europe, particularly among those with comorbidities or weakened immune systems. Older adults can also be a reservoir for transmitting the *Bordatella Pertussis* bacteria to young children (59). Pertussis rates have also increased substantially in Germany and across Europe in 2024, the exact cause of which is unknown. Currently, pertussis vaccination is recommended generally in EU countries among adults aged >18 years. However, age-specific recommendations for older adults across EU countries are lacking. Furthermore, like the variability in national guidelines, recommendations from major professional bodies either support general pertussis vaccination every 10 years or do not address it.

Given the increased risk of hospitalization from pertussis among older adults (60), it was recommended that booster vaccination against pertussis be considered for this population particularly for individuals with underlying cardiorespiratory or immunological conditions. A vaccination algorithm was presented to support this approach, including a specific section addressing individuals aged 65 and older. Even older adults without comorbidities may serve as vectors for transmission within families, especially when maternal vaccination rates are low highlighting the importance of vaccinating grandparents. For those aged 65+ with comorbidities,

clinicians should assess the need for revaccination. If there is no documented pertussis booster within the past 10 years, vaccination should be offered.

6.4 RSV: Need for revaccination? When and how to organize it?

Three single-dose vaccines are currently licensed for RSV (Table 10). Arexvy® Abrysvo® and mRESVIA have demonstrated good effectiveness against RSV-related LRTD (61) and LRTI (62, 63), respectively in the US, among older adults. However, results from EU populations are pending.

For vaccine efficacy, all three vaccines have demonstrated some degree of protection against RSV-associated outcomes and are well tolerated with an acceptable safety profile (Table 10).

Table 10. Efficacy of licensed RSV vaccines among older adults

	GSK Arexvy®	Pfizer Abrysvo®	Moderna mRESVIA®
Vaccine efficacy after one dose	VE against RSV-LRTD over 2 seasons was 67.2% (97.5% CI: 48.2–80.0) (vs in S1=82.6% (57.9-94.1%). VE against severe RSV-LRTD: 78.8% (vs in S1=94.1% (62.4 to 99.9%). In line by age (60-69= 65.4%: 70-79=74.9%), by presence of ≥1 comorbidity (66.7%) by frailty (pre-frail 73.3%) (61) VE against RSV-LRTD over 3 seasons was 62.9% (97.5% CI:46.7–74.8), VE against severe RSV-LRTD:67.4% (42.4–82.7%).VE clinically relevant in groups (64)	VE against RSV LRTI ≥3 symptoms: S1 88,9% (53.6-98.7%) S2 77.8% (51.4-91.1%), Stable in 60-69y between 2 seasons, in >70 y not evaluable. In ≥1 comorbidity: S1= 81.8 (16.7-98%) S2=69.6 (26.7-89%) (62)	VE against RSV LRTD 2 symptoms: S1: 78.7% (62.8-87.9%) +S2: 62.5% (47.7-73.1%) +S3: 50.5% (37.5%-60.7%) VE against severe RSV: S1: 86.7% (41.9-97%) +S2: 74.6% (50-86.9%) +S3: 56.7% (33.1-72.6%) Data in line in S3 among different age groups, comorbidities and frailty (63)
Safety	Well tolerated acceptable safety profile. No cases of GBS or ADEM were reported up to study end.	Well tolerated acceptable safety profile. 2 cases of variants of GBS reported. IRR significant(O/E)	No reports of GBS, ADEM, acute myocarditis and/or pericarditis

Real-world data on the duration of vaccine effectiveness against RSV-related outcomes remain limited. However, ongoing clinical trials have provided evidence on the long-term immune responses of currently licensed RSV vaccines. For Arexvy®, an ongoing Phase 3 study in adults aged ≥60 years is evaluating immune persistence for up to three years following RSVPreF3 OA vaccination. Initial results indicate that a single dose of Arexvy® elicits both cell-mediated and RSV-A and RSV-B-specific humoral immune responses. While these responses decline over time, they remain above pre-vaccination levels for at least one year (65). Similarly, in an ongoing trial of mRESVIA®, RSV-A neutralizing antibodies have been found to persist up to 24 months post-vaccination. Revaccination at the 24-month mark induced immune responses comparable to those observed after the primary dose (63). For Abrysvo®, a clinical trial assessing antibody persistence and the safety and immunogenicity of revaccination found that administering a second dose 12 months after the initial vaccination produced robust increases in RSV-A and RSV-B geometric mean titers (GMTs). Although these increases were less pronounced than those observed after the

primary dose, they still exceeded baseline levels. (66) The safety profile following revaccination was consistent with that observed after the first dose and considered acceptable (66).

It was discussed that while revaccination with RSV vaccines is expected to be necessary, the optimal timing for booster doses has not yet been determined. It is also unclear whether revaccination schedules will be standardized across all three currently licensed vaccines, a scenario that would simplify administration for healthcare providers. Although annual revaccination is unlikely to be recommended, aligning RSV vaccine administration with other vaccines commonly given to older adults could enhance uptake.

To further promote vaccine uptake among older adults should RSV revaccination be recommended, the following strategies were identified as beneficial:

- Establishing a centralised vaccine registry, which is currently lacking in many countries
- Developing decision aids to help healthcare workers assess vaccination needs, particularly for patients under 75 years of age

6.5 Influenza: High dose and adjuvanted vaccines

Several factors are known to impact standard influenza vaccine effectiveness including patient factors such as immunosenescence, viral factors such as antigenic drift and vaccine factors such as vaccine mismatch.

While there are a variety of emerging approaches to improve influenza vaccine effectiveness such as new vaccine platforms, alternate administration routes and even the longer-term goal of universal or “supra seasonal” influenza vaccines, currently the most utilized approach is that of differentiated vaccines including adjuvanted and higher dose vaccines designed to boost immune response. The advantages of which have been documented to include, a stronger antibody response (67), a broader antibody response against heterologous strains especially A/H3N2 (68), and a longer response, providing protection against influenza throughout the season (69).

A large RCT of 30,000 participants aged 65 years and over demonstrated that a high-dose, trivalent, inactivated influenza vaccine (IIV3-HD) induced significantly higher antibody responses and provided better protection against laboratory-confirmed influenza illness than the standard dose (42). Similar results were observed in a retrospective cohort study which found that HD-QIV was associated with lower influenza-related hospitalization rates compared to. SD-QIV (70).

However, it was discussed that since during the 2022-2023 season, influenza vaccination as a whole prevented 6 million flu-related illnesses, 2.9 million medical visits, 65,000 hospitalizations and 3700 deaths (71), any influenza vaccine is better than none.

6.6 COVID-19: Different platforms (e.g. mRNA)

It is well known that the burden of COVID-19 mortality and morbidity is highest among older adults. Since the initial mRNA vaccine developed in December 2020, five further maintained mRNA vaccines have been developed against the ongoing emergence of variants throughout the pandemic and have shown efficacy against SARS-CoV-2 infection, hospitalization and death among older adults (72, 73).

Despite this, COVID-19 vaccine uptake among older adults in EU countries remains low, for example in France, 2023-2024 and 2024-2025 uptake among adults aged 65 years and older

was only 30.2% and 20.8%, respectively. Although WHO continue to recommend vaccinating older adults, communicating the benefits of receiving the COVID-19 vaccination remains a challenge.

7. Implementing vaccination in the older adults on multiple levels

The implementation of vaccination programs for older adults was examined at the policymaker, organizational, and population levels. Strategies were identified including best practices and successful approaches to increase vaccination coverage among older adults. The discussion also addressed communication and logistical challenges to promote program sustainability and ensure equitable access.

7.1: The policymakers level: Vaccine impact assessment and economic value of vaccination in aging adults

At the policymaker level, assessing the impact and value of vaccinating older adults requires focusing on both the economic and societal benefits of vaccination programs. Common approaches include cost-effectiveness analysis and return on investment calculations.

Several frameworks exist to capture the broad societal value of vaccines, with the BRAVE framework being a notable example presented (74). This framework offers a comprehensive consideration of the narrow and broad effects of vaccines on both health and economic outcomes as outlined below.

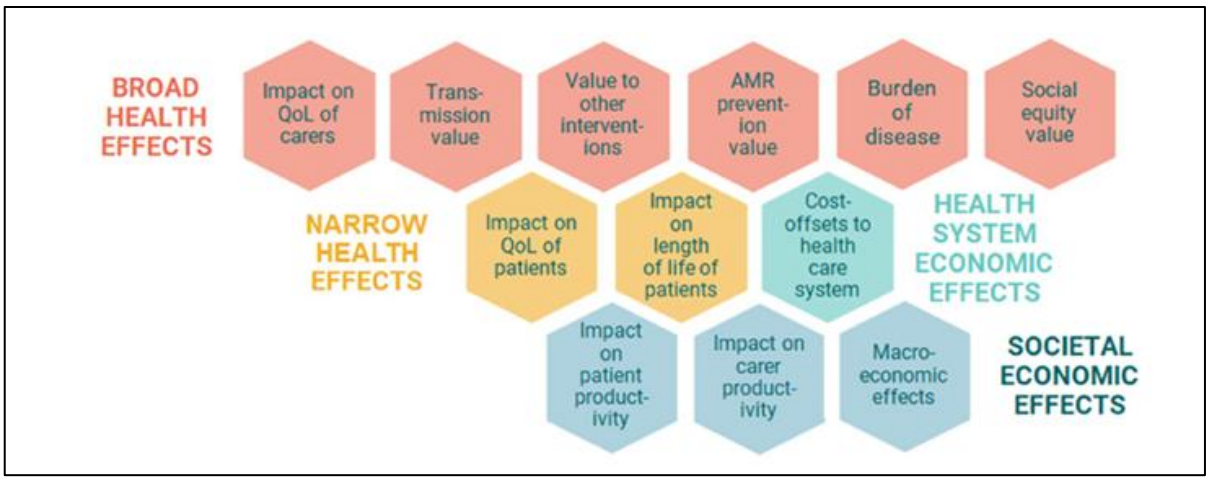

Figure 1: BRAVE framework for assessing broader benefits of vaccination (adapted from Bell et al. (74))

This framework has been applied to quantify the health and socioeconomic benefits of adult immunization programs against influenza, pneumococcal disease, herpes zoster, and respiratory syncytial virus across ten countries (including Australia, Brazil, France, Germany, Italy, Japan, Poland, South Africa, Thailand, and the USA). These programs delivered returns up to 19 times their initial societal investment, translating to approximately $4,637 in net benefits per fully vaccinated individual (75).

When choosing an exact economic evaluation method, the approach depends on the involved stakeholder's perspective:

- Ministries of Health typically focus on maximizing health outcomes within limited budgets, using outcome-focused evaluations such as cost-effectiveness analysis (CEA), which measures health benefits per dollar (e.g., QALYs or DALYs).
- Ministries of Finance and broader government bodies may prefer finance-focused evaluations like fiscal health modelling or benefit-cost analysis, which estimate the return on investment from public sector or societal perspectives, respectively.
    - *Fiscal health modelling* estimates public sector returns (e.g., increased tax revenue from healthier populations, reduced government healthcare and social welfare spending).
    - *Benefit-cost analysis* estimates societal returns (e.g., increased productivity, reduced disease burden, improved quality of life).

While strong evidence supports vaccines as highly cost-effective from a health system perspective, more research is needed on their broader societal benefits and impacts on short-, medium-, and long-term public budgets. For Health Technology Assessment (HTA) policymakers to fully appreciate vaccine value, three elements were discussed as essential:

1. Evidence — high-quality empirical data on vaccine benefits in older adults
2. Willingness — motivation to integrate this evidence into HTA and decision-making
3. Ability — technical capacity and tools to incorporate broader value into policy decisions

7.2: The organizational level: challenges in reaching older adults and opportunities (e.g. coadministration)

At the organizational level, the focus is on the structures, processes, and systems that support vaccination delivery. This includes resource allocation, staff training, policy development, and stakeholder communication factors known to significantly influence vaccination coverage, the incidence of vaccine-preventable diseases, and overall disease burden.

Current Organizational Barriers to Vaccinating Older Adults include:

1. Awareness barriers (e.g. health literacy and risk perception, personal attitudes and motivation, trust and distrust factors, external influence and misinformation)
2. Socioeconomic barriers (e.g. demographic and social context, economic status and education, const and caregiver support, social and geographic isolation)
3. Logistical barriers (e.g. Availability and Accessibility of Infrastructure, supply chain and distribution issues, vaccination records and vaccination formats)
4. Accessibility barriers (e.g. Physical and Geographic Barriers, Healthcare System Resource Constraints and System navigation difficulties)

Facilitators to vaccinating older adults include the following often interconnected factors

1. Sociodemographic factors (higher socioeconomic status and levels of education)
2. Knowledge and risk perception (literacy about vaccine preventable diseases, perceived severity of and susceptibility to the disease, motivation for self-protection)
3. Social influences (social, religious and cultural norms, sense of collective responsibility)
4. Healthcare system influences (recommendations from healthcare providers, accessibility of vaccination)

The organizational challenges in implementing vaccination programs for older adults are interconnected dynamic and include political and social factors, healthcare provider challenges, healthcare system infrastructure problems; public health and communication issues, policy and governance gaps; financial and incentive issues, and international disparities in vaccine guidelines between countries and regions.

Strategies and opportunities to overcome these challenges were presented which included:

1. Integration of vaccination into routine care: Incorporating immunization into primary care visits and pre-visit planning has been shown to improve vaccination coverage among older adults in the U.S (76)
2. Vaccination campaigns: Initiatives like Portugal's NHS offering free influenza vaccination paired with annual updates via media, SMS, and healthcare facilities have successfully increased vaccine uptake across expanding eligible groups.
3. Community pharmacy-based vaccination: Since 2008, 78% of community pharmacies in Portugal have offered vaccination services, accounting for 54.4% of all seasonal influenza vaccinations in 2024/2025.
4. Vaccine co-administration: Where safety and efficacy are established, co-administration improves cost-effectiveness, reduces healthcare visits, and ensures timely protection. However, uptake remains low in some countries due to concerns about side effects, lack of awareness, and perceived vaccine overload.
5. Mobile Vaccination Teams: Used to overcome barriers like geographic isolation, limited mobility, or lack of caregiver support, mobile teams have boosted vaccine uptake in several countries. However, their cost-effectiveness outside pandemic settings may be limited.

7.3: The population level: communicating the importance of vaccination for healthy aging

For the population level the discussion emphasized the importance of understanding the target audience when communicating with older adults about vaccination. Effective communication can be challenging due to age-associated issues, such as sensory loss, decline in memory and slower processing of information. Additionally, older adults often have diverse and personal reasons for choosing to get vaccinated.

While healthcare providers (beyond just physicians) remain the most trusted and influential source of vaccine information, other effective channels include family members, caregivers, community organizations, and print materials. Tailored messaging and motivational framing, such as addressing individual concerns or motivations, were identified as particularly effective strategies. Using plain language and a personalized approach is essential.

Because most older adults are more likely to get vaccinated when recommended by a healthcare provider various tools have been developed to support these conversations. These include resources such as online guidance to support health care providers (77) and *Personalized Year-Round Vaccination Plans*, to help schedule all vaccines recommended by ACIP throughout the year (78). These tools aim to enhance provider confidence, strengthen patient communication, and ultimately improve vaccine uptake among older adults.

8. Concluding Recommendations

To conclude the meeting, the following questions were addressed and discussed, focusing on how vaccination strategies for older adults can be improved across Europe.

8.1 What would an optimal European-level immunization schedule for older adults look like?

An ideal European immunization schedule for older adults should be age-stratified, seasonally timed, and aligned with disease burden and vaccine characteristics. It should also allow for co-administration where appropriate and include clear guidance for HCPs.

Table 11: Proposed Vaccine Recommendations

Vaccine	Recommendation
Influenza	60 years and older ideally administered Oct-Nov
COVID-19	60 years and older administered Aug-Sept due to differing COVID-19 seasonality relative to Influenza
Herpes Zoster	50 years and older since HZ burden is increasing in those aged 50 and above. Two doses at least 2 months apart
Tdap	Booster offered every 10 years with a booster offered as a coadministration with the first HZ dose to boost coverage.
Pneumococcal Disease	60 years and older, either PCV20 or higher offered in the off season to avoid the vaccine high demand and pressure typically seen in the fall.
RSV	70 years and older and 60-69 in those with severe comorbidities only, as specified and defined by respective NITAGs.

Additional Considerations: Co-administration should be encouraged where evidence supports it, and clear guidance must be provided to healthcare professionals. No boosters are recommended for HZ or pneumococcal conjugate vaccines at this time For RSV boosters, additional data is needed for this and may be available in the next couple of years. Offering Tdap boosters every 10 years presents a valuable opportunity to reinforce a life-course approach to vaccination, integrating adult immunization into routine healthcare.

The rationale for using age 70 as the starting point for RSV vaccination is based on UK data showing a significant disease burden in this age group (79). Vaccination at this age can substantially reduce that burden. As more data on the duration of immunity become available, it may support lowering the recommended starting age in the future.

Table 12: Suggested Calendar of Vaccine Administration

Month	Recommended Vaccines for Older Adults
April	Pneumococcal
May	HZ dose 1, Tdap booster
June	Travel vaccines as required
July	HZ dose 2
Aug	COVID-19
Sept	COVID-19, RSV
Oct	Influenza, RSV
Nov	Influenza

8.2 How can we improve the generation and use of evidence to improve vaccination strategies for older adults at the international level

Improving vaccination strategies for older adults begins with better data on disease burden, vaccine impact (both direct and indirect), and population differences at local, national, and international levels. Enhanced surveillance systems and proactive responses to vaccine misinformation are essential, along with stronger promotion of the value of vaccination for healthy ageing, for example improved independence, and reduced risks of AMR, CVD, and dementia.

Effective use of evidence depends on high-quality, transparent data to engage healthcare professionals and scientific societies, inform policy, and support clearer communication. Personalized trust is key: strategies must reflect individual needs through tailored messaging, improved vaccine literacy, caregiver empowerment, and accessible services. Where local data is limited, evidence from similar countries can help guide action.

8.3 What are the key programmatic priorities for older adult vaccination at the country level from HCP perspective, in what ways does adult vaccination fit into the UN decade of health ageing.

Education and Awareness: Healthcare professionals must stay up to date on adult vaccination guidelines via easy to access information. Public education is equally vital, evidence-based science and official recommendations must be more visible and accessible than misinformation, which currently dominates many information channels.

Integrated Programmatic Structure: Unlike pediatric vaccination, adult vaccination lacks integration into routine care structures. Creating a standardized, structured approach (like 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

Shared Responsibility Across Stakeholders: Vaccinating older adults should not rest solely on general practitioners. A broader, multi-stakeholder approach is needed, engaging workplace employers, other medical specialists, and public health institutions. Everyone has a role in creating supportive environments where adult vaccination is routinely offered and encouraged.

Highlighting Societal Impact: Public campaigns should emphasize the broader consequences of low vaccination rates among older adults, such as decreased productivity, increased healthcare costs, and higher caregiver burdens. Framing adult vaccination as a societal issue, not just an individual health matter, can drive broader support and action.

Clear Guidelines and Recommendations: The core issue is often not ageism, but the absence of clear national schedules and recommendations for adult vaccines. Without structured guidance, it becomes challenging to routinely vaccinate older adults. Countries lacking these frameworks should consider the wider societal benefits of older adult vaccination as a rationale for developing comprehensive, evidence-based vaccination policies.

9. Meeting Conclusion

The AIB Technical meeting of 2025 provides updated information on improving vaccine effectiveness, immunity durability, and vaccine uptake among older adults. A central theme discussed was how vaccinating older adults is not just a medical necessity, it is public health, economic, and ethical imperative. While the importance of vaccination in this population is clear,

realizing its full potential requires coordinated shifts at policy, organizational, and societal levels. Prevention through vaccination must be recognised and reimbursed as an investment in healthy ageing, not merely as an optional add-on to treatment. Adopting a life course approach to vaccination, aligned with WHO's vision of healthy ageing as living but calls for specific, actionable policies within member states. This means moving beyond a narrow disease-based model toward one that values functional ability, independence, and well-being.

Throughout this meeting, the European data presented highlighting variability in vaccine recommendations and coverage underscores the need to look beyond statistics to the underlying policies shaping them. Vaccination in older adults offers wide-ranging benefits: preventing illness, reducing hospitalizations and deaths, mitigating the impact of comorbidities, and preserving both physical and cognitive function. These effects also extend beyond the individual to yield broader economic and societal gains.

A recurring theme throughout the meeting was the significant heterogeneity in key areas such as age definitions (chronological versus biological), immune responses, vaccine recommendations, evidence generation methods (real-world evidence versus randomized controlled trials), reported outcomes, and communication strategies. While tailored messaging remains essential, it must be underpinned by greater standardization—both within individual countries and across the EU—to harmonize vaccine schedules, improve clarity, and ultimately boost vaccine uptake. Equally important is empowering healthcare providers through ongoing education and communication training. Embedding these skills into medical curricula will foster trust, address vaccine hesitancy, and strengthen acceptance among older adults.

In sum, the path forward requires strategic, harmonized action across sectors to ensure that older adults in Europe are not left behind.

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