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Vaccination and healthy ageing: How to make life-course vaccination a successful public health strategy

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ABSTRACT

Vaccine guidelines that advocate immunisation in adults aged 2: 60 years and an international policy brief that explores the importance of life-course vaccination have been proposed. The guidelines, policy brief and associated data were considered by experts at two meetings during 2009. This paper amalgamates those discussions and recommends practical strategies that may contribute to the successful implementation of adult vaccination. The challenges posed by changes in the global age distribution may be confronted by preparing for healthy ageing early in life – a ‘life-course’ approach to health. Vaccination can provide cost-effective protection against a host of diseases throughout life, but remains an underused public-health strategy in adults for the promotion of healthy ageing. Without specific vaccination programmes for the adult population aged 2: 50 years (‘50+ vaccine programmes’) infectious diseases will continue to be a cause of substantial morbidity and mortality in late adulthood. The reasons for low vaccination rates among adults (‘what we know’) are identified and the four common determinants for the successful implementation of 50+ vaccination programmes (‘what we should do’) are examined: vaccination programme objectives, the role of healthcare professionals, access to vaccines, and public awareness. To achieve the goal of healthy ageing, nationally customised measures should be instigated to address these determinants in the 50+ age group and to ensure access to vaccination for those who are expected to benefit.

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1. Introduction

A Joint Working Group of the European Union of Geriatric Medicine Society (EUGMS) and the International Association of Geriatrics and Gerontology-European Region (IAGG-ER) recently proposed vaccine guidelines and a consensus statement that advocated immunisation in adults aged 2: 60 years [1,2]. These are complemented by a policy brief from the International Longevity Center [3] that examines the impact of life-course vaccination on an ageing population, and outlines strategies for improving vaccination rates in Europe.

The guidelines, policy brief and associated data were discussed by experts at two meetings held during 2009 that examined

healthy ageing and life-course vaccination [4,5]. This paper contribution amalgamates the discussions at those meetings, with the aims of raising awareness of the value of life-course vaccination policies within the concept of healthy ageing and of identifying the key determinants for the successful implementation of vaccination programmes in late adulthood. The main focus is to complement existing published information and to provide practical examples of ways in which vaccination rates in older adults may be improved. We review the *rationale* for life-course vaccination within the context of healthy ageing and analyse our current understanding of the barriers to vaccination in late adulthood (‘what we know’) before examining ‘what we should do’ to improve vaccination rates.

2. Trends in age distribution

Globally, the distribution of the population by age is changing significantly. Historically, populations have contained more young than old people—a pyramid-shaped age distribution. In the near future, starting with the more ‘developed’ countries, the distribution will become an inverted pyramid, with more old than young

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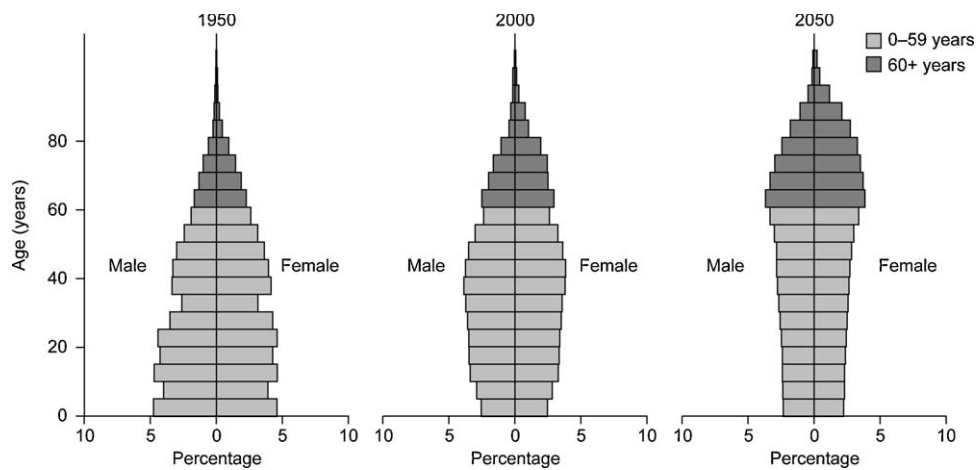


Fig. 1. European population distribution by age.

people [6]. The proportion of adults aged > 60 years is expected to increase from 10% in 2002 to 21% in 2050 [6]. In Europe, in same time period, the increase in the size of the population aged > 60 years is predicted to reach 160% [7]. Similar demographic trends are being observed in 'developing nations' (Fig. 1).

Despite promotion by governments and health providers of healthy lifestyles and preventive medicine throughout life, the long-term maintenance of good health as people age ('healthy ageing') is subject to several confounding factors. In particular, the onset of chronic conditions and age-related physiological changes increases the risk of infection and disease, and potentially increases the financial burden on healthcare systems. The challenges posed by these changes in age distribution may be offset by the promotion of healthy lifestyles and appropriate preventive action, for example, by preparing for healthy ageing early in life – a 'life-course' approach.

3. What is 'healthy ageing'?

Healthy ageing is a concept devised by the World Health Organisation (WHO) that promotes opportunities for optimising physical, social and mental health to enable people of all ages to enjoy a healthy, safe and independent lifestyle, and to take an active part in society [8]. The principles of healthy ageing recognise people's rights to equality of treatment as they grow older. It recognises that factors beyond health and social care can have a major effect on health and well-being. It also acknowledges the changes in expectations between generations regarding health and activity as people age. It is never too late to begin health-promotion interventions that can extend both the length and quality of life. However, there is a growing interest in a life-course approach to health that recognises the impact that early life experiences have on the way in which people age.

4. The importance of a life-course approach to health

The life-course approach to health considers healthcare to be an ongoing process of disease prevention and health promotion. It recognises that a complex interplay of factors (biological, behavioural, psychological, social, and environmental) contribute to health outcomes across the course of life [9–13]. A life-course approach to healthcare encompasses an integrated approach to health and, to be successful, requires significant investments in health promotion and disease prevention, as well as support services and information systems.

Prevention of illness is acknowledged as a critical means of limiting the impact of disease and illness as people get older. Four of the most prominent non-communicable diseases (cardiovascular disease, cancer, chronic obstructive pulmonary disease, and diabetes) are linked by common risk factors related to lifestyle. These include poor diet and nutrition, tobacco use, alcohol consumption, and physical inactivity. The incidence of these diseases can be reduced through health promotion. By contrast, communicable diseases and some other serious conditions can be reduced or prevented using immunisation programmes that are practical and easy to implement. Vaccination is an effective preventive public health strategy that will become a keystone in life-course healthcare. A life-course approach to vaccination will provide a major contribution to healthy ageing through a reduction in the burden and potential suffering caused by vaccine-preventable diseases, benefiting individuals and society.

Ageing is not just related to changes after middle age. It is now known that the process of ageing starts early in life, and after 30 years of age, physiological functions decline at a rate of 0.5–1.3%, annually [14]. As maintenance and repair processes fail, damage accumulates, leading to physiological impairment of tissues and organs. In particular, age-related immunological decline ('immunosenescence') is believed to be a key reason why older people suffer more frequently than younger people from severe infections, with greater disease severity and poorer outcomes [15–17]. Infections of the lower respiratory tract (pneumonia and influenza) are a leading cause of death in late adulthood [18].

The high burden of infectious diseases in late adulthood is surprising considering that many of the diseases can be prevented by vaccination (Table 1) [19]. Globally, vaccination has had a major impact on world health, reducing the childhood incidence of many life-threatening or debilitating infectious diseases in high- and low-income countries [20]. Unfortunately, with the exception of the seasonal influenza vaccine, many adults believe that vaccination is relevant only for children, and awareness of adult vaccines is low [21]. Also, scientific, cultural, temporal, and secular issues affect the development and delivery of vaccines [22]. In the USA, far more adults than children die from vaccine-preventable diseases each year [23]. The reduction in immunity over time, combined with unwillingness by older people to have booster injections, leads to an increased risk of diseases such as diphtheria [24,25] and pertussis [26] in late adulthood. The incidence of tetanus also increases with age, and it continues to be an active disease in adults aged > 50 years throughout Europe [24], particularly in Turkey, the Federation of Russia and in Poland. In the USA, immunity rates to tetanus are lowest among the elderly

Table 1
Incidence of selected vaccine-preventable diseases in the USA.

	Cases per year (average) before vaccines	Cases in 2003	Decrease in cases per year (%)
Diphtheria	175,885	1	99.9
<i>Haemophilus influenzae</i> type B (< 5 years' old)	20,000 (est.)	259	98.8
Measles	503,282	56	99.9
Mumps	152,209	231	99.9
Pertussis	147,271	11,647	92.1
Polio (paralytic)	16,316	0	100.0
Rubella	47,745	7	99.9
Smallpox	48,164	0	100
Tetanus	1314	20	98.5

Source: CDC [69,70].

[27], despite 70% of tetanus cases occurring among individuals over 50 years of age [10]. These data highlight the importance of following-up childhood vaccination with boosters in adulthood.

5. The rationale for a life-course vaccination programme

Vaccines can provide cost-effective protection against a host of diseases throughout life, not only to the individuals who receive the vaccination, but to their communities as well. Despite this, vaccines for adults remain an underused public health strategy in the promotion of healthy ageing [28]. In contrast to childhood immunisation programmes, vaccination in adults is not considered to be a routine health intervention [29,30]. Consequently, vaccination coverage rates in late adulthood in Europe are low, and this group is not well protected against vaccine-preventable diseases. Even for seasonal influenza vaccination (for which many countries organise good vaccination-awareness campaigns), vaccination rates remain suboptimal (Fig. 2).

The WHO target for seasonal influenza vaccination in WHO member states in which national influenza vaccination policies are present is to increase vaccination coverage of all people at high risk. The goals were to attain vaccination coverage of 2: 50% in the population aged > 65 years by 2006, and to reach 75% coverage by 2010 [31]. These recommendations were accepted by the European Parliament in 2005 [32], and the Council for the European Union adapted recommendations for seasonal influenza vaccination in 2009 [33]. However, individual countries can set their own schedules and conditions for vaccination, so it is unsurprising that vaccination rates vary considerably across Europe – from 25%

to > 70%. In 2010, only two countries in Europe (the UK and the Netherlands) are close to reaching the WHO objectives and in many European countries influenza vaccine coverage rates in late adulthood (2: 65 years of age) are below the 2006 target [34]. Data available for individuals younger than 65 years ('the 50+ group') and healthcare professionals (HCPs) show that vaccine coverage rates in these groups lag significantly behind those for individuals aged > 65 years [34].

Consistent with the WHO recommendations, many European countries recommend annual influenza vaccination. However, the age at which vaccination is recommended is not harmonised between countries. Currently, only influenza vaccination is routinely recommended for use in late adulthood, and there are variations between countries in their recommendations for other vaccines (e.g., diphtheria, tetanus and pneumococcus). Specific national recommendations are summarised in Table 2 [35].

Vaccination against important infectious pathogens in late adulthood is a preventive strategy that must continue to be encouraged [36]. In the absence of vaccination programmes in late adulthood, vaccine-preventable diseases will continue to cause considerable morbidity and mortality [37,38]. A life-course vaccination programme will reduce the suffering caused by vaccine-preventable diseases, and will provide a major contribution to the maintenance of healthy ageing.

5.1. Benefits of vaccination in the 50+ age group

In view of the economic, medical and social consequences of vaccine-preventable diseases, there is a need to establish and

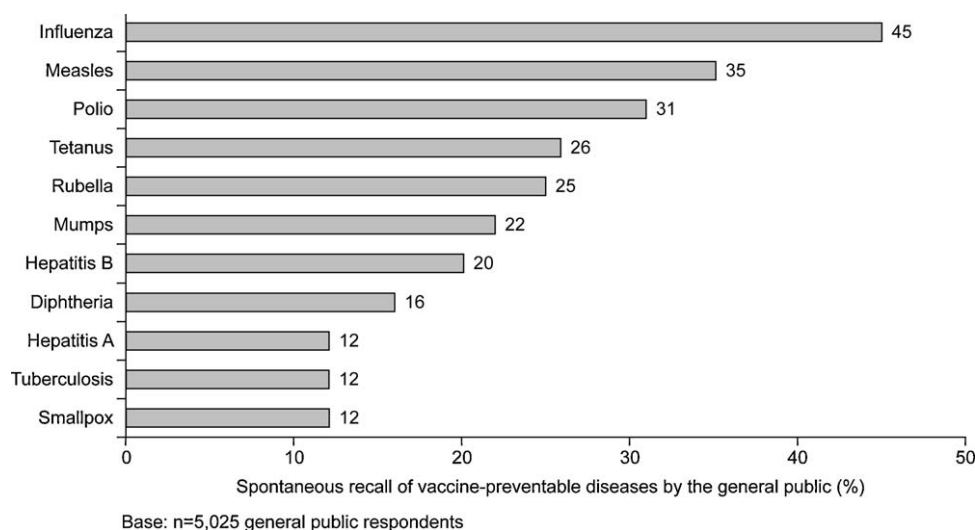


Fig. 2. Overall awareness of vaccine-preventable diseases.

Table 2
Summary of national recommendations for vaccination in the elderly, based on age, in Western European countries [35].

Vaccination	Countries
<i>Influenza (annual)</i>	
From age 50 years	Austria, Belgium
From age 60 years	Germany, Greece, Iceland, The Netherlands, Spain
From age 65 years	Denmark, Finland, France, Ireland, Italy, Luxemburg, Norway, Portugal, Sweden, Switzerland, United Kingdom
<i>Pneumococcus</i>	
From age 60 years	Booster dose recommended Austria: every 5 years (according to risk) Belgium: once, 2: 5 years after first vaccination Germany: every 6 years No booster recommended Greece, Spain
From age 65 years	No booster recommended Ireland, Italy ^a , Norway, Sweden, Switzerland, United Kingdom
<i>Diphtheria^b and tetanus</i>	
Every 10 years throughout adult life	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Norway, Portugal, Switzerland
Varicella zoster (shingles)	
From age 50 years	Austria

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^a Some districts (or regions) only.

^b Low-dose diphtheria.

sustain a vaccine programme in late adulthood. The EUGMS guidelines and the IAGG-ER consensus statement recommend that routine vaccination should be initiated at 60 years of age, if not earlier (Table 3) [1,2]. However, it is well documented that the elderly do not respond as well to vaccinations as young people. Without specific vaccination programmes for the adult population aged > 50 years ('50+ vaccine programmes'), infectious diseases will continue to be a cause of substantial morbidity and mortality in late adulthood. We believe that the vaccine programme should start in middle age, before the onset of immunosenescence, which may cause vaccine responses to be blunted compared with the response in healthy young adults [39,40]. Establishing a routine assessment of vaccination status at 50 years of age will provide an opportunity to improve the delivery of vaccination services to adults. All primary-care physicians should schedule a prevention visit for their 50-year-old patients to assess their vaccination status and provide recommended vaccines. This could be combined with other evidence-based activities for disease prevention for this age group (e.g., modification of risk factors for vascular disease and cancer screening).

Table 3
Proposed EUGMS and IAGG-ER vaccine programme for the elderly [1,2].

<i>By the seventh decade/retirement age (after clinical assessment of vaccine status)</i>
Tdap or Td vaccine
Influenza vaccine
Pneumococcal vaccine
Herpes Zoster vaccine
<i>Each year after retirement age (after assessment of vaccine status)</i>
Influenza vaccine
<i>New medical/injury event (after assessment of vaccine status)</i>
Td or TT vaccine
<i>Multiple hospital stays (after assessment of vaccine status)</i>
Pneumococcal vaccine
<i>By the ninth decade of age/admission into Nursing Home</i>
Tdap or Td vaccine
Influenza vaccine
Pneumococcal vaccine
Herpes Zoster vaccine

EUGMS: European Union of Geriatric Medicine Society; IAGG-ER: International Association of Geriatrics and Gerontology - European Region; Tdap: tetanus and diphtheria toxoids with acellular pertussis vaccine; Td: tetanus and diphtheria toxoids; TT: tetanus toxoid.

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A 50+ vaccination programme has several potential health benefits. It may provide protection against certain comorbidities. Studies in patients at risk for vascular disease suggest that pneumococcal vaccination may reduce the number of episodes of new myocardial infarction [41]. In patients hospitalised for coronary artery disease, the prevalence of cardiovascular death at 1 year was significantly lower in patients receiving vaccination compared with those who were not vaccinated (6% versus 17%, respectively); relative risk 0.34 [95% confidence interval (CI) 0.17–0.71; $P = 0.002$] [42].

The economic effect of vaccine-preventable disease extends beyond healthcare cost. According to one study, workers aged 50–64 years who received an influenza vaccine lost substantially fewer days of work and worked fewer days while ill [43]. Antibacterial vaccines may have a unique role in the global fight against antibiotic resistance by reducing the prescription of antibiotics, thereby contributing to a reduction in healthcare costs.

These factors make it essential for key stakeholders (policy makers, HCPs, and the general public) to understand the benefits of vaccination in the 50+ age group, and how it can contribute to the maintenance of healthy ageing.

6. The life-course vaccination policy brief

Longer life expectancies necessitate a careful adaptation of vaccine guidelines based on a better understanding of the reasons for low vaccine coverage in European adults. A recent policy brief from the International Longevity Center [3] explored the importance of life-course vaccination, identified barriers to the use of vaccines among adults in Europe, and proposed policies and practices that may increase vaccine use. The brief offers a concise review of the scientific evidence and the policies that could encourage a life-course approach, thus improving public health. Four broad policy goals have been identified that can help to improve rates of vaccination and promote healthy ageing (Table 4).

6.1. What we know: drivers and barriers to vaccination uptake

If life-course vaccination is to be adopted, an examination of the reasons for low vaccination rates among adults in light of current knowledge and the understanding ('what we know') is necessary to identify the barriers to improving vaccination coverage in European countries.

Table 4
Policy brief from the International Longevity Center: summary of policy goals [32].

What we know	What we should do
<p><i>Policy goal 1: promote life-course vaccination to promote healthy ageing</i> A life-course vaccine programme contributes to healthy ageing A life-course vaccine programme helps to anticipate age-related immunological decline</p>	<p>Adopt the vaccination schedule designed to promote “a lifetime programme of vaccination” endorsed by the European Union of Geriatric Medicine Society (EUGMS) and the International Association of Geriatrics and Gerontology - European Region (IAGG-ER)</p>
<p><i>Policy goal 2: improve the vaccination rate among healthcare professionals (HCPs) and empower their critical role as vaccination providers</i> Healthcare professional recommendation is crucial</p> <p>The failure of healthcare professionals to be vaccinated against infectious disease may put their patients at risk Physician knowledge of vaccines is inadequate</p>	<p>Provide physicians with incentives to vaccinate Monitor the vaccination rates of healthcare professionals Monitor the impact of increased vaccination rates on population health status Establish and monitor targets to improve vaccination rates among healthcare professionals Provide education and training to improve the understanding and use of vaccines among healthcare professionals Involve physicians’ professional bodies in the decision-making process for vaccination programmes and in explaining physicians’ responsibilities in the implementation of vaccination programmes</p>
<p><i>Policy goal 3: expand opportunities for patients to receive vaccination</i> Well-care visits promote the use of preventive services, including vaccination</p> <p>The cost of vaccines is a major barrier for the patient Information technology can encourage physician–patient conversation/knowledge about health prevention Adult vaccination can be provided in a host of settings</p>	<p>Recommend and reimburse routine well-care visits for people aged 50+ years Reimburse healthcare professionals for providing vaccines to their patients Reduce or eliminate the cost of vaccines for patients Encourage the dissemination and use of electronic medical records with computerised prompts Check the vaccination status of patients and, if appropriate, propose vaccination when patients are in contact with the health system</p>
<p><i>Policy goal 4: develop patient knowledge and improve attitudes and beliefs</i> There is a need to overcome reluctance to accept vaccination</p> <p>It is important to convey the benefits of being vaccinated to patients There is a need to improve patient health literacy</p> <p>Policies should empower patients to monitor their vaccination records</p>	<p>Develop and implement vaccine advocacy programmes to support vaccination policies in adult and older persons</p> <p>Conduct a health literacy campaign to make adults more aware of the benefits of vaccination – not only to themselves but to others Distribute and encourage the use of a permanent immunisation record</p>

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6.1.1. Understanding the concepts of life-course vaccination and healthy ageing

All stakeholders need to understand the benefits of vaccination in late adulthood and to encourage the use of vaccination throughout life. Vaccination uptake is higher in countries in which specific objectives have been defined for the vaccination programme. As discussed above, a life-course vaccine programme will promote healthy ageing [44,43]. It will also contribute to herd immunity by providing protection not only to the individuals who receive the vaccination, but also to others in their communities [26,45]. A particularly interesting retrospective analysis of a mass vaccination programme with inactivated influenza vaccine for Japanese schoolchildren between 1962 and 1987 provides evidence of vaccine-induced herd immunity [46]. Programmes or policies should recognise the negative impact that the development of immunosenescence may have on the success of the programme, and thereby set the age for the initiation of the programme accordingly.

6.1.2. The role of HCPs

Recommendation by HCPs is crucially linked to the vaccination rate. Many studies throughout the world have demonstrated the importance of HCP recommendation [47–52]. Conversely, inadequate advice from HCPs is recognised as an important reason for

not being vaccinated. In an influenza vaccination coverage study conducted in 11 European countries, advice from a family doctor or nurse was a major factor in uptake of seasonal influenza vaccination in the general population and the 50+ age group (53 and 59%, respectively). Such advice is also the most common ‘encouraging factor’ for vaccination against influenza, regardless of vaccination status (Table 5) [34]. Inadequate advice from physicians was also an important reason for not being vaccinated among the non-vaccinated general population and the 50+ age group (31 and 26%, respectively) [34]. These low rates of HCP recommendation may be due to poor understanding by HCPs of the benefits of the vaccine or the disease it prevents, a shortage of HCP time, or a lack of proactive reminding systems for HCPs.

Although HCPs should set an example to their patients (and many countries recognise the need to get their HCPs vaccinated), globally, the vaccination rate among HCPs is low. These low rates exist despite HCPs being at greater risk of contracting and disseminating disease than the general population, and recognition by public health services that vaccination of HCPs is a patient-safety issue. Common reasons why healthcare workers do not get vaccinated include lack of awareness of the availability of the vaccine, lack of time, forgetting to get vaccinated, and a perception of low risk of contracting influenza. Even in European countries (which have some of the most centralised healthcare systems in the world), the vaccination rate for HCPs is < 30% (Fig. 3) [34]. These low rates of influenza vaccination among HCPs suggest a

Table 5
Factors encouraging vaccination against influenza in 11 countries in the general population and in those over 50 years of age, regardless of vaccination status, 2007/08 [34].

	General population vaccinated (%)	50+ years vaccinated (%)
Family doctor/nurse recommendation	55	58
More information on the efficacy of the vaccine	28	24
More information on the tolerance of the vaccine	24	22
Vaccination at work	24	15
Travel to regions with high risk of influenza	24	21
Cheaper/reimbursed/free vaccine	24	22
Better knowledge about the disease	24	20
Other ways of administering the vaccine (orally, injections without needles)	20	18
Pharmacist recommendation	18	17

Adapted from Blank et al. [34].

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need for effective interventions if broader vaccination programmes are to succeed.

6.1.3. Opportunities for vaccination

Recognition of the importance of vaccination in children is undoubtedly part of the reason for the success of childhood vaccination programmes, but several other elements of the programmes are fundamental to their success. For example, most adult interaction with the healthcare services is in the context of an acute visit or follow-up appointment for chronic conditions. It is not appropriate (or the time is not available) to have a general conversation about health and well-being at these meetings. In particular, the opportunities for vaccination that are provided within the healthcare system and the systems associated with the programmes (e.g., regular scheduled visits, vaccination record booklets and appointment-reminder schemes) have a recognised impact on vaccination uptake [53]. These aspects of childhood vaccination programmes are often unavailable to adults.

Appropriate information technology systems can encourage physician–patient discussions and the dissemination of information about disease prevention. Such systems have proved effective in raising compliance with existing disease-prevention and health-promotion initiatives, such as those developed for Pap smears and

cardiovascular well-being. The reimbursement of vaccines also has an impact on the willingness to be vaccinated [50], as does the provision of adult vaccination in convenient settings [54]. These issues must also be addressed if vaccination rates in adults are to be improved.

6.1.4. Attitudes, knowledge and beliefs

Attitudes to participation in vaccination programmes are governed by knowledge and beliefs and, more generally, by confidence in public health policies. Public information campaigns are a cornerstone of a vaccination policy. Awareness of vaccine-preventable disease in adulthood is poor, even for seasonal influenza for which there are often intensive promotional campaigns [21]. In the influenza vaccination coverage survey, awareness of the seriousness of influenza was a major driving factor for vaccination in the general population and the 50+ age group (55 and 59%, respectively) [34]. During the EUPHA conference, Luc Hessel presented a preliminary analysis of the critical determinants of seasonal influenza vaccine uptake conducted by European Vaccine Manufacturers (EVM: <http://www.evm-vaccines.org>). This showed that countries that did not have: (i) objectives for their vaccination programme, (ii) monitoring, and (iii) a clear communication campaign (the main

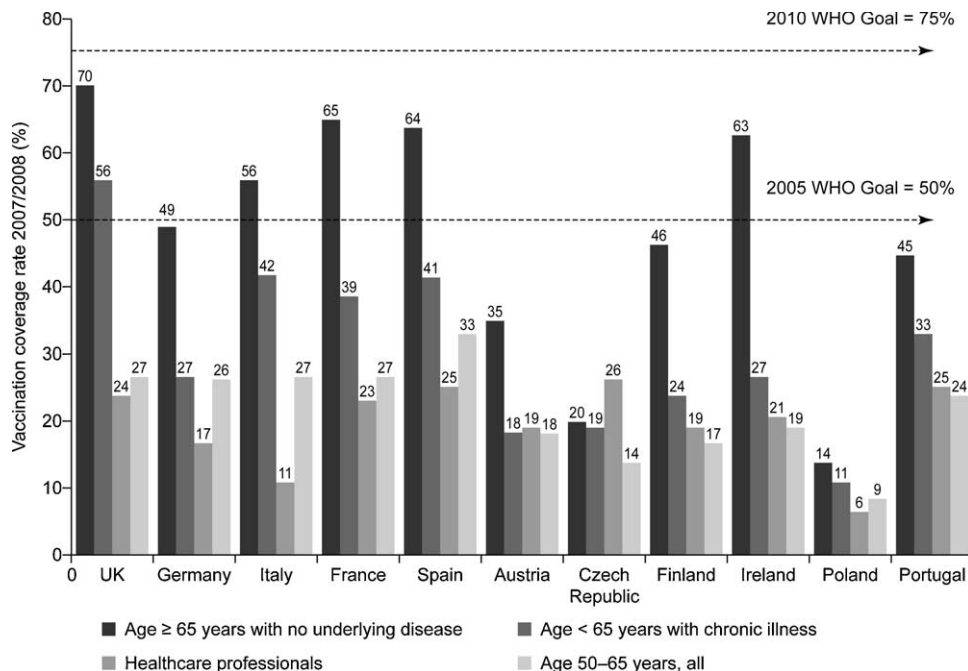


Fig. 3. Comparison of influenza vaccine coverage rates in European countries with WHO goals.

differences compared with the two countries with vaccination rates > 70%) achieved a vaccination rate of only 61% despite implementing several other key measures such as financial incentives to HCPs, free vaccines and personal invitations [Luc Hessel, personal communication]. The use of social marketing techniques to target specific population groups using local media as a trusted source of health information may have been a critical factor in achieving high uptake rates for seasonal influenza vaccination in England.

There are small anti-vaccination movements in many European countries. These groups can be vocal and may use the Internet to disseminate concerns about poor efficacy or poor safety that are rarely based on scientific evidence.

The media can have a positive or a negative effect on the public perception of vaccination. However, the quality of the information provided by the media is variable and can sometimes be sensational. Negative reporting can result in a lack of confidence in government healthcare policies, and can cause people to reject public health initiatives that they do not view as being independent [55].

Individuals may offer many reasons for not being vaccinated; people may not perceive themselves as being at-risk of a vaccine-preventable disease, or may not consider the risk they may present to other people in their community. Of individuals never vaccinated in the influenza vaccination coverage survey, 39% did not think they were likely to catch influenza [34]. Fear of pain or of the needle itself often prevents people from getting vaccinated [56–58]. Finally, awareness of vaccination status is poor; many people do not know which (if any) vaccines they have received, or if their booster programme is up-to-date [59,60].

6.2. What we should do: proposals to improve vaccination uptake

Identification of the drivers and barriers discussed above has facilitated the development of specific, easy-to-implement changes. It has also raised numerous important and shared experiences relating to the implementation of 50+ vaccination programmes ('what we should do') that will help to ensure access to vaccination for those who are expected to benefit.

6.2.1. Encourage life-course vaccination to promote healthy ageing

6.2.1.1. Adoption of recommended vaccination programmes. To encourage life-course vaccination and promote healthy ageing, the vaccination schedule designed and endorsed by EUGMS and IAGG-ER Working Party [1,2] (Table 3) should be adopted and backed by policymakers and public health professionals. Guidelines are necessary and constitute an excellent starting point for the introduction of healthy ageing policies, but they cannot meet the overall concept of life-course vaccination; we would advocate beginning the vaccination schedule at 50 years of age (as outlined above). With regard to harmonising vaccine schedules across Europe, HCPs need to explore the differences and establish if they have a medical basis (e.g., relating to epidemiological patterns of infectious diseases in the different geographical areas of Europe). The disruption that may be caused by harmonisation should be balanced against potential public health benefits.

For the guidelines to succeed in improving vaccination rates in late adulthood, they must also be supported by HCPs and the public health service. Vaccination uptake is higher in countries in which specific objectives for the vaccination programme have been defined and monitored. In the UK and The Netherlands, successful influenza vaccination programmes resulted from a strong political will for implementation backed by substantial funding. The EVM

survey found that the two countries with the highest vaccination rates (74%) have objective setting, monitoring and communication combined with targeted personal invitations to recommended patients. In contrast, the country with the lowest vaccination rate (32%) did not set any objectives [Luc Hessel, personal communication].

6.2.1.2. Organisation of public health services. Public health programmes have had a major impact on general health. They have been largely responsible for raising the life expectancy of Europeans from 40 years to > 80 years during the last 150 years. Public health services are sophisticated systems and their organisation may be an important factor in the delivery of successful programmes. Trained public health workforces improve the implementation of national policies aimed at regional and local levels. The two countries that have achieved the highest influenza vaccination rates, the UK and The Netherlands, have specialist public health workforces that promote control of infectious diseases at national, regional and local levels. Also, establishment of their vaccination campaigns was adapted to the organisation of their healthcare systems.

6.2.1.3. Trust and influence. In some countries, a lack of trust regarding health recommendations has developed, particularly if industry and/or governments have key roles. In the UK, support for vaccination policy is driven by the national authority; vaccine manufacturers do not need to provide information. Other countries delegate information provision to industry, which can raise the issue of a conflict of interest. To avoid ambiguity, governments should be responsible for promoting their vaccination policies. The premise for collaboration between industry and government is logical but is often not understood by the public, and loss of trust is a powerful influence against vaccination. The issue of trust may also be relevant with regard to financial incentives; it may be difficult to explain why payment is necessary and may lay HCPs open to accusations of 'vaccinating to make more money'.

6.2.1.4. Vaccine efficacy in late adulthood. Compared with the development of childhood vaccines, there are special challenges involved in developing vaccines targeted towards older adults. Numerous studies have examined the means of improving their efficacy. Although vaccine responses are reduced in late adulthood, a 50+ vaccination programme would protect patients before age-related immunological decline has begun. The development of new vaccines challenging immunosenescence should not be awaited before starting such a programme.

6.2.1.5. Cost-effectiveness of population-based vaccination programmes. High levels of vaccination coverage are often used as indicators for the success of a programme, but considering the overall cost-effectiveness of vaccination programmes is important. Globally, vaccination is a highly cost-effective public health measure. Studies in the Caribbean in the 1990s showed that every US dollar spent on congenital rubella vaccination saved the health service US\$ 13 over the course of a child's life. The cost-effectiveness of human papillomavirus (HPV) vaccines has also been demonstrated (particularly if integrated with cancer screening programmes). Influenza and pneumococcal vaccines are cost saving in the short-term and cost-effective over the longer term after accounting for improved life expectancy. However, cost is just one element that affects the success of adult vaccination programmes and is a consideration for the future. Currently, the challenge is to get the programmes started, and kick-start an open discussion about the value of adult vaccination and its role in healthy ageing.

6.2.2. Improve the involvement of HCPs

6.2.2.1. Motivate HCPs to increase vaccination coverage. The crucial role of HCPs as vaccination providers should be recognised. HCPs are key players in the implementation of vaccination programmes, and can change the perceptions of vaccination and thus improve uptake. To do this they must embrace their role as informers and providers, and have a mandate to make vaccination a priority. Seasonal influenza vaccination coverage is high in countries in which a strongly motivated administration leads the vaccination drive. In the UK, health-service contracts require family doctors to develop and maintain a register listing all patients aged 2: 65 years and all patients at risk of influenza, as well as those people living in long-stay residential or nursing homes or other long-stay healthcare or social care facilities. All individuals on the register must be offered influenza vaccines annually.

HCPs need to discuss the benefits of vaccination in a similar way to the approaches used to influence patients to take part in programmes to reduce blood pressure and blood cholesterol. To ensure they fulfil this role effectively, HCPs require specific education and training (pre- and postgraduate), and information for communication to the public.

6.2.2.2. Incentives aimed at improving vaccination rates in the general population. Incentives for the involvement of HCPs in discussions about the benefits of vaccination may be financial (similar to those provided in the UK and The Netherlands with respect to seasonal influenza vaccination); time- or resource-related through the provision of integrated systems that help with initiation of patient discussions and the implementation of vaccination schedules; or audit-based and related to target setting and monitoring. In the EVM survey, the country with a vaccination rate of 69% does not offer a clear financial incentive or a clear assessment process. The two countries with vaccination rates of 74% offer these levers [Luc Hessel, personal communication].

Financial incentives are not the only method; other initiatives such as governance and audit can also drive better performance. In the UK, monitoring and publication of vaccination rates within general practice has improved performance. This initiative demonstrates the utility of monitoring and publishing data to make people aware of their performance against targets, a strategy that has been used successfully in other areas of healthcare in the UK. Some countries withhold public services, such as eligibility for school attendance, if people are not vaccinated. This has been used effectively in paediatric vaccination programmes in the USA, but similar initiatives in adults in Europe are unlikely to work.

Examining all potential incentive methods is important because financial initiatives such as those that have contributed significantly towards successful programmes in the UK and The Netherlands are expensive, and the sustainability of this type of incentive is an important consideration before its introduction [61].

6.2.2.3. Improve influenza vaccination coverage rates in HCPs. The vaccination rate among HCPs in all countries must be improved. It is important for HCPs to lead by example, and the difficulties that may arise for non-vaccinated HCPs when discussing benefits with patients must be highlighted. Several successful approaches have been developed to improve vaccination coverage rates in HCPs (Table 6) [50,62–65].

Other interventions have been tried to improve HCP coverage. The requirement by some hospitals for non-vaccinated HCPs to wear facemasks which, although of limited clinical effectiveness, is so disliked by HCPs that it has proved to be a good stimulus for them to get vaccinated. Studies have found that the use of forms for

Table 6

Approaches to improve influenza vaccination coverage rates in HCPs [52,66–69].

Provide vaccine at no cost to employees
Provide vaccination during all work shifts and introduce mobile vaccination carts
Expand vaccine offerings to non-HCP employees
Use of reminder methods and financial incentives
Kick-start events as well as awareness and education campaigns
Annual targets and evaluation of influenza vaccination rates
Use of 'declination forms' and analyses of reasons why employees chose not to participate

HCPs to formally record that they are declining influenza vaccination, in combination with other strategies, is effective in improving vaccination rates in HCPs [66]. Prevention of harm to others may be considered a valid reason for considering mandatory vaccination, but there are also arguments against this type of policy in relation to constraints on personal liberty and freedom of choice. A notice to exclude unvaccinated HCPs from work is unlikely to be successful, and may provoke a political backlash in Europe.

6.2.3. Expand opportunities for patients to receive vaccination

6.2.3.1. Introduce well-care checks. Any contact with the healthcare system is an opportunity to discuss vaccination and to check on vaccination status. For example, patients discharged from hospital should be monitored for their vaccination status. Asking mothers about the vaccination status of other members of the household and discussing the risks associated with not being vaccinated when they attend for their child's immunisations are valuable opportunities that should be maximised. Electronic record-keeping combined with automated prompting systems to inform HCPs about the vaccination status of their patients can help to ensure no opportunity is missed to establish vaccine requirements and to aid scheduling. Nevertheless, vaccination is better discussed during routine visits to physicians (preventive or well-care visits). Such well-care visits for patients aged > 50 years will improve vaccination uptake but, to be successful, such visits must be recommended by policymakers and reimbursed.

A useful approach would be to send people a birthday card on their 50th birthday inviting them to a well-care clinic. Funding for this is likely to be difficult in many countries, although it may be possible to broaden existing health-check programmes (such as those targeted at reducing cardiovascular mortality) to include vaccination monitoring and other interventions. However, these initiatives should be carefully planned before implementation because they can miss their target, and the people who do not turn up are often those most in need. These groups include people living in poverty, the socially isolated, and those with physical, sensory and mental-health problems. Specific action is required to reach these groups and to reduce the risk of widening health inequalities. Results from the influenza vaccination coverage survey suggest that to improve influenza vaccination rates, national vaccination campaigns may need to take into account country-specific socioeconomic factors (e.g., gender, the income and size of a household, and educational level) that may influence vaccine uptake [67].

6.2.3.2. Improve access to vaccination. Personal invitations from HCPs or public health services can be key elements in securing access to vaccines and high vaccination rates. Active reminders such as postcards, telephone calls, or other forms of communication to potential vaccinees and providers have been shown to increase vaccination uptake. In the UK and The Netherlands,

personal vaccination invitations are an important component of their successful influenza vaccination programmes. Experience with seasonal influenza vaccination obtained from the EVM survey revealed a vaccination rate of only 32% in a country that does not send personal invitations to targeted populations; a key difference compared with the three countries with vaccination rates > 69% [Luc Hessel, personal communication].

Opportunities also exist to improve the organisation of vaccination campaigns, such as developing simple access to vaccination and considering the location and timing of the vaccination. Vaccination can be a straightforward intervention that does not have to take place in a hospital or surgery setting. Depending on national and local circumstances, vaccinations could be carried out in non-traditional settings such as nursing homes and other institutions where vaccination can be provided under medical supervision. For adults living at home, access to vaccination centres could be made available in the evenings and at weekends, or vaccinations could be carried out during home visits. Mobile outreach vans, as used by the blood donor service in the UK, should also be considered at city-centre or work locations to improve uptake.

6.2.3.3. Reimbursement is a key element in vaccination uptake. The provision of free or partially free vaccines increases the number of individuals presenting for vaccination [34], particularly if people remain unaware of the risks and benefits. With regard to seasonal influenza, the EVM survey revealed that a country with strong incentive measures that does not provide vaccine funding has a lower vaccination rate (63%) than countries with weaker incentive measures that provide funding (67 and 66%) [Luc Hessel, personal communication].

6.2.4. Develop knowledge and improve attitudes and beliefs

6.2.4.1. Communicate the benefits of vaccination. In addition to publicising recommendations and policies, there is a need to improve understanding of healthcare issues and to convey the benefits of being vaccinated for themselves and others. Health literacy campaigns should also provide information about the target disease and its consequences, and the safety and efficacy of vaccines. People need to understand the benefits of vaccination, not just to themselves but also to their families and other people in their communities; convincing people that not being vaccinated will put others at risk is a powerful motivator. Many older people have a strong sense of civic duty and will often accept vaccination to protect others, particularly if advised to do so by their physicians. In the influenza vaccination coverage survey, avoidance of transmission to family members or friends was a driving factor for vaccination in 37% of the 50+ population [34].

6.2.4.2. Information campaigns and awareness. Awareness and motivation of the public is essential to achieve high vaccination coverage, but convincing people to be vaccinated is difficult. HCPs (particularly nurses) are a crucial and trusted source of information, but several innovative approaches to the provision of information are also being used. A successful initiative in the USA is to involve local community leaders and trusted local sources. For example, barbershops are trusted information sources in the Brooklyn Afro-American community, and barbers are trained to provide information about vaccination. A similar initiative has been used in ladies hairdressers in the UK for the promotion of screening for cervical cancer and breast cancer, which has proved to be more successful than other communication methods. Screening for bowel cancer has been promoted at football grounds in the UK to target low-income males because the uptake of

screening in this population is low. In Brazil, famous film stars, footballers and even a character on children's television have been used to successfully promote seasonal influenza vaccination. These schemes highlight the need to employ different communication routes that are appropriate to local or national circumstances. In Poland, high rates of attendance at church have led to the use of priests for the promotion of mammography. This has proved more successful than promotion by government or local authorities, or even than recommendation by family doctors. Another successful strategy used in rural areas of Poland is to broadcast messages during popular TV shows, for example showing a major character going for a mammography.

6.2.4.3. Relationship with the media. The media is an important source of information for the general public, and positive reporting must be encouraged. They can help overcome common misconceptions by delivering accurate, reliable, and positive information on the benefits of vaccines and the minimal risks associated with their use, as well as increasing awareness of the diseases that the vaccines prevent [68]. Such promotion of information is a vital part of achieving and maintaining high levels of vaccine uptake. A relationship of trust between medical experts and journalists is of crucial importance to increase demand for vaccination by promoting vaccination through patient education. The relationship with the media is important, and working closely with journalists can ensure that newspapers and TV programmes are good sources of information for educating the public in health-related matters. In the UK, local newspapers and radio are the most trusted mass media sources of information.

National Vaccination Awareness' periods that could analyse the critical elements of successful immunisation programmes would promote dialogue between HCPs, the media and the public. Such events have been successfully implemented in Europe (European Immunization Week; <http://www.euro.who.int/eiw>), USA (National Immunization Awareness Month; <http://www.cdc.gov/vaccines/events/niam/default.htm>) and Canada (National Immunization Awareness Week; <http://www.immunize.cpha.ca/en/events/niaw.aspx>).

6.2.4.4. Monitor personal vaccination status. The concept of healthy ageing embodies a shift in attitude from people as passive receivers of healthcare to an attitude of consumers. International travellers monitor their vaccination status through the use of yellow immunisation passports, and use of the record book issued to children could be expanded and employed throughout life to help monitor vaccination status. Immunisation records should be an essential part of personal health documentation, and individuals encouraged to maintain own vaccination schedules.

7. Conclusions

The expert discussions during the two meetings [4,5] raised several important and shared experiences relating to the implementation of 50+ vaccination programmes. It is clear that the policy goals are the foundation upon which they can work on/with to improve vaccination coverage and sustain vaccination programmes and vaccination policies.

We have laid out our vision for approaches to vaccination that promote better health throughout life. We hope that we have paved the way for further consideration and discussion. In particular, the proposals for family and life-course vaccination may help strengthen arguments in the developing world for more integrated health services and systems, and help resource-restrained settings to extend childhood immunisation programmes to other members of the family.

There is now strong evidence that a vaccination programme beginning in late adulthood or earlier is an important strategy for improving the health and quality of life in late adulthood across Europe. We should recommend these strategies and focus the attention of the public on the importance of vaccination to healthy ageing – a challenging new issue within healthcare and disease prevention. If we are to achieve the goal of health ageing and reap the benefits of a life-course approach to vaccination, measures should be instigated to aid the breakdown of barriers to immunisation and to encourage people to educate themselves on vaccination issues, to check their vaccination status, and to get vaccinated.

It is clear that the four policy goals are the foundation upon which national health authorities can develop sustainable vaccination programmes to improve vaccination coverage rates. Four common determinants for the successful implementation of influenza vaccination policies have been identified, as listed below.

- Vaccination uptake is higher in countries in which specific objectives have been defined for the vaccination programme, and if they are well advertised.
- HCPs are key players in the implementation of vaccination programmes.
- Access to vaccines, such as provision of free or partially free vaccines and personal invitations, as well as the location and timing of the vaccination, affects vaccination coverage.
- Awareness and motivation of the public is essential to achieve high vaccination coverage.

There is a need to adapt these drivers to individual national circumstances. Governments must recognise factors that are specific to their own situation, and identify the drivers that are essential to the success of their vaccination programmes.

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