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A life-course approach to vaccination: adapting European policies



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Disclaimer:

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Executive summary

Vaccination is arguably one of the most powerful and cost-effective types of primary prevention available to protect against a number of diseases,¹ yet its benefits are not always understood, nor consistently realised across European countries. A number of factors threaten the successful implementation of vaccination programmes, including growing vaccine hesitancy and shifting epidemiology of many vaccine-preventable diseases due to migration.

With growing pressures on public health investment, we need to ensure vaccination policies achieve their full potential. Adopting a life-course approach to vaccination in Europe may be a possible way forward.

A life-course approach has yet to be fully applied to vaccination, and will require looking at vaccination through a different lens:

- Vaccination strategies are no longer segmented by age. Instead, they are designed to help maximise individuals' ability to protect themselves from infection and maintain good health over the course of their lives.
- Vaccination strategies are assessed not just based on their ability to prevent individual infections, but on their impact on other comorbidities and pathogens occurring in the population over time.

Adopting a life-course approach to vaccination may help maximise the benefits of vaccination for individuals, public health and society in general:

- **Individual health:** Individuals' ability to respond to pathogens (immune function) decreases with age.² Taking a life-course approach to vaccination may help boost individuals' immunity over their lifetime – thus also rendering them more resistant to other potential pathogens or comorbidities.
- **Public health:** Vaccinating people across their lifetime may protect them from the changing epidemiology of infectious disease propagated by migration. Vaccinating more individuals also stops the spread of infectious disease to vulnerable, unvaccinated populations (herd immunity).³ Fewer infected individuals means a lower use of antibiotics, thus potentially reducing antimicrobial resistance (AMR), which causes up to 700,000 deaths per year.⁴

- **Socioeconomic impact:** Vaccination may save society more than 10 times its original cost – and protecting one individual against up to 17 pathogens over a lifetime costs less than €3,400.⁵ Lower incidence of infectious disease may lead to significant savings to health and social care over time. Successful vaccination programmes also confer economic benefits to society as a whole: healthy, more resilient adults are also more likely to be active and contribute to social capital and productivity.⁶

Implementing a life-course approach in practice will require policymakers to lead five definitive pillars for change:



1. **Leadership from the top.** Global, EU and national public health leaders should advocate a life-course approach to vaccination, giving a clear mandate to regional and local authorities



2. **Changing the public's perception of vaccination,** for example through education from an early age



3. **Engaging healthcare professionals** to help rebuild public confidence in vaccination and encourage optimal coverage of existing vaccines



4. **Integrating vaccination into non-healthcare settings, such as schools or workplaces,** to encourage vaccination throughout all stages of life, including adulthood



5. **Improving surveillance, data and research on the impact of vaccination across the life-course** to build a compelling model to engage key decision-makers on the benefits of this approach.

The public health and economic case for adopting a life-course approach to vaccination is compelling. We call on all stakeholders to come together to implement concerted actions to ensure vaccination achieves its potential for future generations and remains a hallmark of successful prevention in years to come.



1 Introduction

Vaccination is unquestionably one of the most powerful and cost-effective public health measures available.¹ Despite this, some vaccines remain undervalued and underutilised, and there are numerous challenges to optimal uptake of vaccines.⁷ Europe has seen rapid growth in vaccine hesitancy in recent years and now has the most negative sentiment to vaccine safety compared with any other region in the world.⁸ AMR is on the rise, accounting for more than 700,000 preventable deaths per year.⁹ Recent outbreaks of vaccine-preventable diseases have occurred, such as measles in Bulgaria and diphtheria in the UK, Russia and Latvia.¹⁰ National vaccination policies are failing to achieve target coverage rates; whether due to incomplete scheduling or poor implementation, there is low uptake. Increasing movement of people through EU member states has caused shifts in the epidemiology and patterns of immunity against vaccine-preventable diseases.¹¹ As a result, vaccination has been recognised as one of the core strategic issues in current policy debates on cross-border health threats.^{12, 13}

This troubling landscape^{8 10 11 14} points to the urgent need for a new approach to European vaccination policy, to ensure the full public health and societal benefits of vaccines can be realised.

'It is unacceptable that in 2017 there are still children dying of diseases that should long have been eradicated in Europe.'

**Jean-Claude Juncker,
European Commission¹²**

Taking a life-course approach to vaccination may be a way forward. A life-course approach has been advocated by the World Health Organization (WHO) as a model of healthcare provision that would benefit both individuals and healthcare systems. It involves looking at health as a continuum through life: a dynamic and interconnected process, as opposed to rigid life stages.^{2, 16} It moves away from traditional approaches, where one develops and delivers vaccines in response to immediate threats for discrete age groups. Instead, investments in vaccination strategies should be based on their potential to strengthen individuals' ability to maintain good health over the course of their lives, and their impact on the prevention of other pathogens and comorbidities over time.

A life-course approach has yet to be fully applied to the field of vaccination – yet it has already been explored in other key areas of public health. For example, early-life nutrition has been linked to heart conditions, obesity, breast cancer and bone strength;^{17 18} lifelong physical activity is shown to be associated with a reduction in mortality;² vaccination during pregnancy offers an opportunity to protect women and newborns from future infection.¹⁹

This document is intended as a starting point for discussion of what a life-course approach to vaccination might look like, and how it may benefit future vaccination policies. It builds on the Supporting Active Ageing Through Immunisation (SAATI) partnership report,⁶ which endorsed a life-course approach to vaccination as a viable route to achieve the potential public health, societal and economic benefits of vaccines. Its ultimate aim is to reignite the debate on what a life-course approach to vaccination could offer, and highlight the steps needed to move this model forward concretely within different national contexts with the full engagement of all relevant stakeholders.

2 Methodology

This report aims to present an overview of current issues surrounding a life-course approach to vaccination in Europe. It is based on a combination of desk research and expert interviews.

The Health Policy Partnership conducted a pragmatic review of available peer-reviewed literature using the Web of Science database, and searched for grey literature and policy reports via Google and other web-based sources. Twenty-two experts in the field of vaccination or a life-course approach to public health were identified through desk research and consultation among the project team. All experts were invited to take part in a telephone interview, and 11 agreed to do so. Interviews were conducted by phone, lasting 45 minutes. Interviewees were subsequently invited to provide feedback on iterative drafts of this report; all have approved the final version.

All interviewees were in support of a life-course approach, and while some thought we have already begun implementing such an approach, many thought more work was needed. This report draws from their combined perspectives to identify key gaps in policy and delivery that may need to be addressed in order to fully implement a life-course approach to vaccination.

In accordance with the wishes of interviewees, quotes are not attributed to individual experts throughout the report.

3 Taking a life-course approach to vaccination: what does it mean?

'Health should not be viewed just as the absence of disease. Each individual has an innate ability to achieve and maintain good health (their "intrinsic capacity") throughout their life. Public health policies should aim to build and enhance that intrinsic capacity over people's lives.'

Expert interview

Experts appear to differ in their views of what a life-course approach to health entails. This report adopts the WHO definition,¹⁶ which stresses the importance and interconnectivity of all stages of life, supporting health promotion, disease prevention and management throughout life. This has two important implications for how we should approach vaccination policies:

- **Vaccination strategies should not be segmented by discrete stages of life, defined by age.** Instead, they should be designed to maximise individuals' ability to achieve and maintain good health throughout their life (their 'intrinsic capacity'). This may involve, for example, extending vaccination calendars throughout adulthood and into older age.
- **Vaccination strategies should be assessed not only based on their ability to prevent the related communicable disease,** but also on their impact on other conditions and pathogens occurring concurrently or subsequently in the population.

'Adopting a life-course approach to vaccination may modify decision-making on how, why and when we offer vaccinations.'

Expert interview



4

Why does a life-course approach to vaccination make sense?

Given the current landscape, vaccination policies must ensure they maximise the potential benefits of vaccination, as well as addressing some of the policy challenges currently facing them. These include rising AMR, shifting epidemiology due to migration, and economic sustainability of healthcare systems. The potential of a life-course approach to address these complexities is illustrated in *Figure 1*.

Figure 1. Optimising the impact of vaccination



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The benefits of a life-course approach to vaccination may be considered on three levels:

Individual health: Vaccines protect individuals from the ill health and disability caused by infectious diseases. Although this protection is often lifelong, individuals' ability to respond to pathogens (immune function) decreases with age. Taking a life-course approach to vaccination may help boost individuals' immunity over their lifetime, thus also rendering them more resistant to other potential pathogens or comorbidities.

Public health: Vaccinating people across their lifetime may protect them from the changing epidemiology of infectious disease propagated by migration. Vaccinating more individuals also stops the spread of infectious disease to vulnerable, unvaccinated populations through immunity of the community at large (herd immunity).³ Fewer infected individuals also means lower use of antibiotics,²⁰ thus reducing AMR, which is posing a growing threat to the success of modern medicine.^{4,21}

Socioeconomic impact: Although any vaccination policy requires an immediate investment, expanding vaccination to more individuals over the course of their lives may confer significant savings to health and social care over time through decreased incidence of disease. Successful vaccination programmes also confer economic benefits to society as a whole: healthy, more resilient adults are more likely to be active and contribute to social capital and productivity.⁶

Each of these areas is explored in more detail in the next section.

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5.1. Benefits to individual health



A life-course approach to vaccination may help to adapt to the decline in immune function that occurs with age.

The capacity of individuals to respond to new infections (immune function) decreases during the ageing process, more rapidly than other components of intrinsic capacity (see *Box 1*).² Vaccines can be used to strengthen the immune response to viruses from an early age and throughout life. This will mean older people are more protected from the viruses they are vaccinated against before their immune response begins to decline, giving their bodies a greater internal capacity (or resource) to withstand the strains of ageing to lead fuller, healthier lives for longer.

Box 1. Why does our immune function decline with age?

Decline in immune function with age is due to immunosenescence and inflammaging.

Immunosenescence: the immune system changes across the life course, reducing the protective effect of vaccination in older adults.^{2 22-24}

Inflammaging: the low-grade, chronic, systemic inflammation characteristic of the ageing process, in the absence of overt infection. This is a significant risk factor for both morbidity and mortality in elderly people.²⁵

A life-course approach may help promote vaccination for adults, who are often forgotten in existing vaccination policies. Vaccination policies currently tend to focus on specific stages of life: infants, adolescents (to an increasing degree) and older people. But risks to health – and the opportunity to manage these risks through vaccination – exist throughout the life course. Adult vaccinations have not received as much attention as childhood vaccines and – unlike in paediatrics, for example – no international or European recommendation exists.²³ Equally, adults are often unaware of how they may benefit from vaccination.

‘The groups that have been overlooked, yet provide the most promising opportunity for a life-course approach to vaccination, are adolescents, pregnant women and adults.’

Expert interview



Vaccinations may not only reduce the incidence of infectious disease, but may also impact the incidence and severity of comorbidities, including common chronic conditions such as diabetes or kidney disease.

More than one third of the European population over the age of 15 suffers from a chronic disease, and the number of chronic diseases is on the rise partly due to an ageing population.²⁶ People with chronic conditions are at a higher risk of many vaccine-preventable infectious diseases such as influenza, pneumococcal diseases and shingles. For example, patients with chronic kidney disease are at increased risk of pneumococcal infections²⁷ and patients with diabetes (type 1 or type 2), even when well-managed, are at high risk of serious flu complications, often resulting in hospitalisation and sometimes death.²⁷ These infections are also more difficult to manage in people with chronic diseases because of increased risks of drug interactions and potential adverse effects of drugs on underlying diseases.

Some infectious diseases may increase the risk of certain chronic conditions, so vaccination may also help reduce the incidence of these comorbidities. For example, research has shown people previously exposed to cytomegalovirus infection, a relatively benign condition, have a 12 times greater risk of acquiring type 2 diabetes.²⁸



5.2. Benefits to public health



The benefits of vaccination are not limited to the individual, but may also help reduce transmission of infection to others.

One of the most important benefits of vaccination is **herd immunity** – when high vaccination rates in a population reduce the risk of transmission to individuals who are unvaccinated.²⁹ Vaccinating individuals may also protect their family members from infection. For example, vaccinating mothers may protect newborns from infections such as pertussis. This strategy is known as cocooning.³⁰



Enhanced vaccination across the population may have an important role in reducing the threat of AMR by preventing infectious diseases that would require antibiotics.^{4, 21}

AMR is recognised as a significant challenge to modern medicine.^{4, 21} It threatens the sustainability of global public health responses to infection disease risks, and constitutes a significant drain on the global economy (see *Box 2*). Successful vaccination policies, particularly if effective over the life-course, may have a vital role in preventing the rise of resistant infections. In the USA, for example, the introduction of a new pneumococcal vaccine in 2010 was associated with a decline in resistant infectious pneumococcal disease by 97% in children under five years old and 64% among adults over the age of 65.²⁰

Box 2.

AMR: a significant drain on the global economy

The economic effects of AMR are numerous:

- Up to 700,000 deaths per year⁹
- Longer, more expensive treatment²¹ for those infected with resistant microbes
- Loss of protection from infection for patients undergoing medical procedures⁴
- Lost productivity for infected individuals.²¹



A life-course approach may help redress existing inequalities in access to vaccination linked to social deprivation and poor health literacy.

Social deprivation is associated with higher incidence of infectious diseases

but lower vaccination coverage,^{31, 32} reflecting lower levels of health literacy.

While the life-course approach is not a panacea for this (intractable) problem, it has the potential to introduce more opportunities for contact with health and social care systems to people of lower socioeconomic status. This would allow for more vaccination opportunities to prevent people from falling through the cracks and protect adults from the changing epidemiology of infectious disease propagated by migration.

5.3. Socioeconomic benefits



Currently, Organisation for Economic Co-operation and Development (OECD) countries spend only 3% of their health expenditure on public health and prevention. Of this, less than 10% on average is spent on vaccination, despite strong evidence that it is generally cost-effective, and in some cases cost-saving.³³

Vaccination is one of the most economically viable public health interventions.²³

It has been claimed that vaccines may ‘save society more than 10 times their original cost’.⁹ In Europe, it has been estimated that protecting one individual against up to 17 pathogens over a lifetime costs only around €3,395.⁵

Effective protection against infectious diseases may also contribute to the sustainability of healthcare systems, and the economy more generally.³⁴

Increased longevity and declining birth rates³⁵ present pressing challenges to publicly financed health and social care services. Vaccination can reduce strain on these services by preventing infection, thereby reducing the consumption of medicines, the cost of managing side effects, and the length of hospital stays.³⁴ Moreover, the older population represents a potentially vulnerable group, with infectious diseases remaining a cause of mortality and morbidity.¹⁴ By considering vaccination across the life course, we may utilise different vaccines to deliver cost-effective preventive strategies to strengthen the entire population, rather than a focus on paediatric vaccines or selected vaccines for older people.²³

Healthier individuals have a greater potential for social capital – and may help reduce the loss of productivity linked to infectious disease.^{36 37}

Successful vaccination policies may not only protect current populations from the threat of infection, but contribute to the long-term economic potential of future generations who may enjoy an environment free from these infections.

As has been mentioned, taking a life-course approach to vaccination requires viewing vaccination through a different lens, which will affect how we measure its impact and determine where investment is needed. This shift in approach, however, cannot happen in isolation. A similar lens should be applied to other areas of public health as well, if a coherent public health framework is to be adopted and implemented successfully across healthcare systems.

‘A life-course approach to vaccination should be embedded into a life-course approach to healthcare provision in general.’

Expert interview

Concrete actions must accompany this philosophical shift to ensure a gradual change in practice over time. Based on our research and expert interviews, we have summarised these actions into five pillars for change that may help pave the way towards this goal.

Implementing a life-course approach to vaccination: five pillars for change



1. **Leadership from the top.** Global, EU and national public health leaders should advocate a life-course approach to vaccination, giving a clear mandate to regional and local authorities



2. **Changing the public’s perception of vaccination,** for example through education from an early age



3. **Engaging healthcare professionals** to help rebuild public confidence in vaccination and encourage optimal coverage of existing vaccines



4. **Integrating vaccination into non-healthcare settings such as schools or workplaces,** to encourage vaccination throughout all stages of life, including adulthood



5. **Improving surveillance, data and research on the impact of vaccination across the life course** to build a compelling model to engage key decision-makers on the benefits of this approach.



Pillar 1: Leadership from the top

What we need:

- EU public health leaders and multi-stakeholder consortia, such as the European Centre for Disease Prevention and Control (ECDC) and the Joint Action on Vaccination, to consider a life-course approach to vaccination as a solution to the current policy landscape
- The WHO to encourage a life-course approach to vaccination, as it has with nutrition and physical activity.

Vaccination policies vary considerably from one country to another. There is no overarching EU-wide immunisation strategy across member states, and there are wide variations in national policies and schedules.³⁸ This being said, the EU complements national health policies by helping countries tackle shared challenges, such as cross-border health, where vaccination has been a key topic.

EU institutions may provide an important steer to national and sub-national health authorities by endorsing a life-course approach to vaccination.

There is, for example, ongoing work at the European level in the form of a Joint Action on Vaccination and the ECDC. However, despite widespread support for a life-course approach from many leaders in the field, there has been no public discourse or policy discussion on the subject for the last three years.

International institutions such as the WHO also have a key leadership role

in conveying the importance of looking at the impact of vaccination across the life course, as they have done in other areas of public health.



Pillar 2: Changing public perceptions

What we need:

- Targeted social media, as well as traditional media and communications approaches, to promote the public health impact of vaccination and present clear and balanced explanations of any potential risks and benefits to individuals
- Targeted awareness programmes considering health literacy levels, starting at school.

Public acceptance of vaccination across all stages of life is essential to ensure people engage with health and relevant institutions and consider vaccination as a natural and essential part of a healthy life. This is a long-term goal which, to be successful, necessitates overcoming the barriers presented by both vaccine hesitancy⁸ and poor health literacy.³⁹

Overcoming vaccine hesitancy

Overall, Europe has the most negative sentiment to vaccine safety: 41% of French survey respondents say they do not think vaccines are safe, and 15.4% of Italian respondents are sceptical about the importance of vaccines (against a global average of 5.8%).⁸



Vaccine hesitancy is a complex, multifactorial challenge, which is often linked to a distrust of government and ruling bodies⁴⁰ (see *Box 3*) among other factors. Lack of trust in industry, and scepticism as to industry's motives when promoting vaccines, may also have a role. Government authorities, healthcare professionals (HCPs), the biomedical industry and civic society must work together to provide comprehensive and accessible information that may help shift public perceptions.⁴⁰

Box 3. Swedish national poll during an influenza pandemic

A poll during an influenza pandemic showed that only 40–50% of respondents had a high level of trust in the Swedish government. People preferred to rely on their own judgement of the vaccination.⁴⁰

Several countries across Europe have made conscious efforts to combat vaccine hesitancy. Denmark and France have launched public campaigns via social media to try to boost vaccine confidence. Italy and France have tried to combat vaccine hesitancy by making some vaccinations mandatory. However, the evidence is unclear as to whether mandated vaccination is effective at improving coverage.⁴¹ The relative effectiveness of different means to combat vaccine hesitancy is still being explored (see *Box 4*).

Box 4. What works to address vaccine hesitancy?

A WHO systematic review examined interventions with the greatest effect on vaccine hesitancy. It included a consideration of interventions aiming to address complacency, convenience and confidence, three factors mentioned in WHO's definition of vaccine hesitancy.⁴² The interventions that were most effective were those that achieved one or more of the following factors:⁴³

- Directly targeted unvaccinated or under-vaccinated populations
- Increased knowledge and awareness surrounding vaccination
- Improved access to vaccination
- Targeted specific populations such as the local community and HCPs
- Mandated vaccination or imposed some type of sanction for non-vaccination
- Employed a reminder and follow-up service
- Engaged religious or influential leaders to promote vaccination in the community.

Improving health literacy

One of the underlying factors in vaccine hesitancy is poor health literacy about the relative benefits and risks of vaccination. Poor health literacy, in general, is most prevalent among people with low socioeconomic status – and this is generally reflected in low vaccination rates, as mentioned previously.^{31 32} Education from an early age, explaining how vaccination contributes to health, may improve health literacy in the long term. This kind of initiative can, for example, be run in schools (see *Pillar 4*).

'We have to give people the tools to discriminate between fact and fiction.'

Expert interview



Pillar 3: Engaging healthcare professionals and creating accountability

What we need:

- Expand medical curricula for all relevant HCPs to feature infectious disease, vaccines and the notion of intrinsic capacity more prominently
- Expand vaccine delivery and information to HCPs who are in contact with the public, not just patients (e.g. pharmacists)
- Encourage healthcare professionals to integrate vaccine advice into their general clinical discussions with patients
- Encourage multidisciplinary groups of HCPs to develop guidelines for the delivery and promotion of vaccination across the life course
- Work with professional associations to create accountability for successful vaccination within the healthcare professions, and embed incentives for successful delivery.

There is evidence that HCP recommendation is linked to higher vaccination uptake.⁴⁴ However, research suggests that some physicians are vaccine-hesitant.⁴⁵ Health professional leadership is pivotal to drive progress in vaccination, as HCPs are ultimately responsible for implementing health policies.

HCP engagement in the importance of vaccination across the life course is thus a key driver of success. A clear framework is necessary, from professional organisations and authorities down to individual HCPs, to ensure best practice in vaccination is embedded in every level of primary care. In some countries, a multidisciplinary approach to developing these frameworks can help ensure the broad base of support needed for successful implementation. This approach has been trialled successfully in Italy (see *Box 5*).



Box 5. Calendario Vaccinale Per La Vita: Vaccination Calendar for Life⁴⁶

In Italy, four professional associations representing paediatricians, GPs and public health, accounting for 25% of Italy's physicians, have been successfully collaborating on vaccine-related issues since 2010. This multidisciplinary approach culminated in 2012, with the publication of Calendar for Life, which provides evidence-based recommendations for vaccines across the life course — for children, adolescents, pregnant women and older people. Calendar for Life was updated in 2014 and 2016. It has been incorporated into the Ministry of Health's National Vaccination Plan 2017–2019, and has significantly contributed to the public debate on vaccination. Italy is now regarded as having one of the most comprehensive approaches to vaccination globally.

'Adolescents may go to a gynaecologist to talk about contraception, or a woman trying to get pregnant may go to talk about fertility, or someone who has been diagnosed with a chronic disease may meet with a specialist or GP. These are all opportunities for HCPs to give vaccine advice.'

Expert interview

Different healthcare encounters offer untapped opportunities to introduce vaccination to individuals, particularly in adulthood. In countries where GPs are the first point of contact for patients, awareness and support of vaccination should start with the GP. They are often closest to their communities and have repeated opportunities to discuss vaccination with their patients. Pharmacists may also play an important part in increasing vaccination uptake in groups who would not have otherwise been vaccinated,⁴⁷ as they are in contact with the 'well' population who do not necessarily visit the GP.

The role of digital health and e-solutions to convey information about vaccination should not be overlooked. For example, electronic health cards that enable the recording and sharing of health information between clinicians and patients may empower people to ask for vaccinations and encourage HCPs to adhere to the life-course approach to vaccination. Electronic vaccination records have already demonstrated this potential in Portugal.

'We need a tangible model of the life-course approach that can be easily translated into the training curriculum.'

Expert interview

The importance of training

HCPs, including pharmacists, must be given appropriate training to deliver and advise on vaccination. They may also need support to assess the impact of providing this role on their workload, and adapt accordingly. For example, a recent study found that 46% of English midwives in a survey did not want to vaccinate the women in their care, due to extra workload, lack of training and compensation, and fear of liability.⁴⁸ HCPs also need to be allowed time to keep up with their training on vaccines: one study found that 65% of midwives had given advice on influenza vaccination to pregnant women, but only 26% felt prepared for this role.⁴⁸



Pillar 4: Integrating vaccination into non-healthcare settings such as schools and the workplace, to encourage uptake across the life course

What we need:

- Capitalise on delivery systems that already exist across the life course in non-healthcare settings, such as schools and the workplace, to encourage uptake of adolescent and adult vaccination programmes.

Engaging adults in vaccination is one of the most difficult goals in vaccination programmes, as complacency and lack of convenient access contribute to existing vaccine hesitancy. Policies on adult vaccination vary considerably between European countries in terms of the vaccinations included, type of vaccine, total number of doses, and timing⁴⁹ (see Box 6).

'Only when people accept vaccination as a normal part of life, rather than an intervention for children, can a life-course approach be successful.'

Expert interview

Box 6. Variation in European adult vaccination recommendations³⁸

According to the 2012 VENICE II study:

- Only six countries had a comprehensive summary document or schedule: Austria, Spain, France, Germany, Iceland and the UK.
- Seventeen countries recommended at least one vaccine: Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Latvia, Luxembourg, Malta, The Netherlands, Norway, Portugal, Romania, Slovakia and Slovenia.
- Six countries had no specific schedule or document available: Belgium, Ireland, Italy, Lithuania, Poland and Sweden.

One solution is to create opportunities to embed vaccination within non-healthcare contexts that are part of people's daily lives, such as school, college and the workplace. Often these opportunities already exist, but there is a need to better understand how they can be incorporated into a life-course approach to vaccination.

School-based vaccination programmes

School-based programmes have been shown to be a cost-effective way of achieving high vaccination coverage in a population.^{50 51} They encourage good child health, but also adult health, for parents and school staff. There is also an opportunity to run health education parallel to vaccination programmes, providing an important platform for young people to understand the role and importance of vaccines.

Catch-up programmes

Booster and catch-up programmes work towards a life-course approach as they administer vaccination to adolescents and adults. However, policies are inconsistent and often temporary, varying by disease, risk and age category, and country. There is evidence for many types of vaccines that programmes which consistently vaccinate across the life-course have been associated with a larger reduction in disease transmission than those which do not (see *Box 7*).



Box 7. Meningococcal disease catch-up programmes in adolescents: better herd protection³

A UK programme consisting of vaccines at two, three and four months, with a catch-up to 18 years of age, was put in place to provide rapid protection at a time of outbreak. It was associated with a decrease in invasive meningococcal disease, consistent with the onset of herd protection soon after the programme started. A similar trend was seen in the Netherlands, where children were vaccinated at 14 months, with a catch-up to age 18. In Spain, a catch-up programme into adolescence was intermittently implemented and resulted in a lower herd protection than in the UK and the Netherlands.

Work-based vaccination programmes

Offering vaccinations to people at their workplace has been shown to improve vaccine acceptance and increase coverage.⁵² Vaccination of healthcare workers is especially important given the higher risk of infection transmission, and employees are usually encouraged, and sometimes obliged, to be vaccinated against a number of pathogens.⁵³

Generally, workplace vaccination programmes may lead to tangible benefits in the form of reduced absenteeism from infectious disease.³⁷ For example, one model estimated that influenza vaccination could lead to cost savings of up to \$1,500 per employee per year in a 1,000-person organisation.³⁷



Pillar 5: Improving surveillance, data and research on the impact of vaccination across the life course

What we need:

- Capitalise on the role and expertise of the ECDC to standardise measurement and analysis of vaccine uptake and public health impact across different countries
- Improve the functionality of immunisation information systems so that they can pull data on vaccine uptake from various sources, and link coverage data to effective reminder systems
- Use these data to guide research on immune function decline and the impact of vaccination policies on infectious disease epidemiology.

Monitoring and surveillance

To implement a life-course approach to vaccination, one needs the capacity to track and analyse the impact of vaccines delivered in any setting through sophisticated surveillance systems.^{6,44} Standardising and improving surveillance and monitoring of vaccination will help strategic bodies evaluate whether countries are meeting targets for vaccination uptake, compare approaches taken between countries or regions, identify the best delivery models, and allow comparisons between countries, regions or strategies.^{13,35}

Lack of coherence in surveillance of vaccination is a clear gap to be addressed across Europe. Research has shown massive differences in the monitoring of vaccination between and within countries. Not all countries consistently monitor vaccine coverage, and those that do so measure at different time intervals and use different methodologies.⁵⁴

Variations in vaccination infrastructure often compound differences in surveillance.

Vaccine-monitoring methodologies are work-intensive and must be well-managed to ensure accuracy.⁵⁵ Investment is needed in the appropriate IT infrastructure to pull data on vaccine uptake from various sources, and in sophisticated immunisation information systems. Linking surveillance systems to effective reminder services has also been shown to improve vaccine uptake.⁵⁶ A successful example of using technology to engage people in and remind people of vaccination is the 'MesVaccins' phone app in France (see *Box 8*).

Some successful models of monitoring and surveillance are provided in *Box 9*.

Box 8. MesVaccins⁵⁷

MesVaccins has developed a public-facing phone app which allows people to easily input the vaccines they have received and find out immediately which vaccines they need, depending on their health status and environment. This provides them with an electronic resource which can remind them to get vaccinated, and which they can share with HCPs.

Box 9. Examples of best practice in vaccination surveillance**Denmark**

The Danish surveillance system is an advanced IT structure that can pull vaccine coverage data from different registries and is integrated into the national IT infrastructure. It helps create electronic vaccination cards for citizens, and aids decision-making and research.⁵⁸

Norway

The Norwegian Immunisation Information System 'SYSVAK' is an example of real-time surveillance of measles, mumps and rubella (MMR) vaccinations. Children missing their second dose (MMR2) by age 14 will appear on a list of unvaccinated 15-year-olds before they leave secondary school. As a result, MMR2 coverage has increased, with only 3 out of 19 counties continuing to have MMR2 coverage levels below 90% in 16-year-olds in 2016.⁵⁹

Research

One of the most notable barriers to building a life-course approach to vaccination is the lack of suitable data to model its potential impact. There is a particular dearth of data on the decline in immune function in older age and the effect this has on other aspects of intrinsic capacity, as well as the effects of earlier life exposures on intrinsic capacity. These data are needed to build compelling models that demonstrate the full impact of a life-course approach to vaccination. Funding for this kind of research is essential and may be difficult to obtain – and this may require a unique contribution from a multi-stakeholder platform, including industry, to help present credible models of the potential impact of a life-course approach to vaccination on individual health, public health and society more generally.

'Industry has a role and responsibility in funding a multi-stakeholder platform and research that could further the life-course approach.'

Expert interview

This report has outlined the benefits and challenges to implementing a life-course approach to vaccination. It is intended as a starting point to guide a potential shift of vaccination policies towards a life-course approach.

Taking a whole-society, life-course approach to vaccination may enable realisation of the full potential of vaccination and address some of the most significant threats to its success, over time. Taking this holistic view may help us to anticipate new threats and develop policies that address them. By vaccinating and educating people about vaccination throughout their lives, we can build a population that has a better capacity to lead healthy, productive lives for longer. This, in turn, will contribute to the sustainability of our healthcare systems and the productivity of our societies overall, for current and future generations.

This shift in approach will, invariably, require us to look at vaccination policies through a broader lens, not only transcending age barriers, but also looking at the impact across different socioeconomic groups, geographies and individual diseases. It is our hope that this report presents a compelling case for making this shift and putting concrete actions in place to help harness its potential in different healthcare contexts.

We call on all stakeholders to come together to implement concerted actions to ensure vaccination achieves its potential for future generations and remains a hallmark of successful prevention in years to come.



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