ADULT VACCINATION: A KEY COMPONENT OF HEALTHY AGEING

The benefits of life-course immunisation in Europe

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Report commissioned by the Supporting Active Ageing Through Immunisation (SAATI) Partnership

FOREWORD

The challenge of healthy ageing

Global ageing, a welcome achievement for humanity and one to be celebrated by us all, is exponentially increasing and Europe's population is on the forefront. Demographic change shows an ever-increasing number of older people and even older, older people, in contrast to previous centuries where children largely outnumbered their elders. Typically, acute disease is seen in a young population, whereas chronic disease prevails in the older age groups. In the spirit of the World Health Organisation (WHO)'s call to add years to life and life to years, our healthcare systems by necessity must be reoriented and adapted to better serve the ageing population.

While infectious disease is frequent in children, in older people it is a major cause of incapacity and death. For example, a simple flu infection can result in long nursing home stays, causing the person to become either wheelchair bound, bedridden and, feared most of all by older people, losing autonomy and independent living. Recovery, even after a relatively short stay of one to two weeks in bed, proves exceedingly difficult for older people. Yet, vaccination programmes and schedules, well established in children, appear almost "forgotten" in the older population. For example, the WHO target for influenza vaccination in older persons will not be met in most countries.

Infectious disease does not simply stop at a country's borders or a person's age. The EUGMS (European Union Geriatric Medicine Society) and the IAGG-ER (International Association of Gerontology and Geriatrics-European Region) have long argued for a approach to vaccination. We fully agree that we have a unique opportunity to tackle healthy ageing, including by sharing common criteria for vaccination guidelines that span the entire life-course in a seamless continuum from young to old. We support the report's call for a multi-stakeholder European Platform to move this process forward and guide discussions.

Another important but often-ignored issue is that of old frail people being at risk of getting infected by the surrounding healthcare environment. A single nurse or physician can sometimes cause influenza outbreaks in local care facilities. Several studies have clearly shown that vaccinating health care workers reduces the likelihood of infection in these settings. In turn, vaccinated healthcare professionals become good ambassadors for promoting vaccination in the people they care for.

Given our challenges of an ageing population, many of the issues highlighted in this report could and should be addressed now, by reorienting our healthcare systems to take a life-course approach to prevention in which timely immunisation against infectious diseases takes its rightful place. To tackle healthy ageing head on, we geriatricians are looking forward to contributing our part to a strong partnership with SAATI.

J. P. Baeyens
Past-President IAGG-European Region Associate Professor, University of Luxembourg

PREFACE

Europe is not doing enough to protect citizens of all ages from serious infectious diseases such as flu, pneumonia, whooping cough, shingles, meningitis, diphtheria or tetanus.

Vaccination is not just for children. It is essential across the life-course.

As we get older, the immune system weakens, increasing our risk of contracting infectious diseases. Furthermore, acquired immunity to certain infections (tetanus, whooping cough, diphtheria) declines with age; due to this, vaccination and revaccination are a particularly relevant prevention strategy for adults.

Despite this, many adults are unaware of which vaccinations they need and when they should receive them. Adult vaccine schedules that fail to align on evidence-based recommendations create confusion among patients and healthcare providers. Furthermore, gaps in life-course immunisation policies result in low awareness and access.

Concerned by the lack of adequate action in Europe, patients' and professionals' associations, industry partners and experts have joined forces as part of the Supporting Active Ageing Through Immunisation (SAATI) Partnership.

SAATI partners believe that, by preventing infectious diseases, life-course immunisation policies contribute to keeping people healthy and active, while curbing the costs of healthcare and social welfare.

We are determined to engage with all relevant stakeholders to make life-course immunisation the norm as part of healthy ageing, public health or prevention strategies.

In 2012, we contracted research to generate evidence of the value of life-course immunisation policies. This report presents the results of this research, followed by five recommendations for the implementation of consistent policies, reflecting the respective roles and competences of EU Institutions, ECDC and EU Member States.

The challenge now is to give impetus to effective life-course immunisation policies as part of the "EU 2020" strategy to achieve sustainable and inclusive growth.

To move forward, national adult immunisation programmes and European guidance on age-based schedules, following recommendations from relevant scientific organisations and third parties, are needed as a matter of priority.

Prof. Dr. Javier Garau, Chair
On behalf of the SAATI partners

EXECUTIVE SUMMARY

The Supporting Active Ageing Through Immunisation (SAATI) Partnership came together to raise awareness of the need for, and the value of, life-course immunisation. The evidence put forward in this report supports the call for the immunisation of adults in Europe's ageing society.

Why is it necessary to protect the ageing society in Europe against the threat of infectious diseases?

Beliefs persist that infectious diseases are a "problem of the past" and that there is not enough evidence to justify implementing a life-course approach to immunisation. Furthermore, childhood immunisation strategies have to some extent eliminated these threats, and outbreaks have been experienced by fewer people.

However infectious diseases such as seasonal influenza, pneumococcal diseases (including pneumococcal meningitis, pneumococcal pneumonia and invasive pneumococcal disease), pertussis, herpes zoster, measles, diphtheria and tetanus **continue to place a significant burden on individuals of all age groups and on Europe's ageing society.**

These diseases threaten the life or the quality of life of patients: older adults may suffer more frequently than younger people from these severe infections, and their impact is often greater, with poorer outcomes noted in the older population [Michel 2010]. This is due to a variety of factors such as underlying chronic medical conditions, age-related reduction in immunity ("immunosenescence") and unwillingness among individuals to get vaccinated or take booster injections. Adults contracting these diseases may also infect unvaccinated individuals (e.g. newborn infants or the older people), who can also be severely affected.

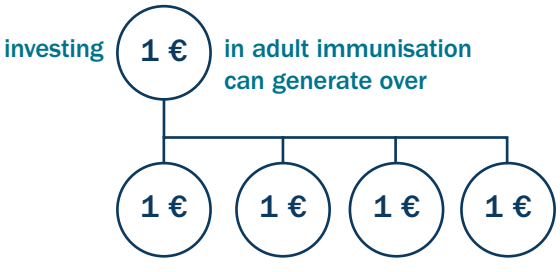
In the face of this situation, **maintaining high immunisation rates across all age groups,** including adults, is essential to **protect the population and avoid the risks of outbreaks** [ECDC 2013].

The benefits of a life-course approach to immunisation

This report puts forward evidence that adult immunisation programmes, especially for those aged above 50, can bring significant **health and socio-economic benefits.** These include:

- Extending protection beyond the patient to the **wider society** through **herd protection** and protection of individuals who have not developed immunity (e.g. newborn infants).
- Contributing to the **fight against antimicrobial resistance**.
- For herpes zoster, seasonal influenza, IPD and pneumonia, studies were found for 13 EU Member States that show immunisation is likely to provide a **cost-effective strategy** for those aged 50 years or over.

Furthermore, **a broader and more long-term view of vaccination** shows its strongly beneficial economic consequences, for example, through its **effects on growth, productivity and workforce participation, as well as on tax and pension systems.**



In particular, a framework to evaluate investments in health from a government perspective shows that **every €1 invested in adult vaccination commencing at the age of 50 years would yield €4.02 of future economic revenue for government** over the lifetime of the cohort (Netherlands case study, Section 2).

Without **life-course immunisation,** infectious diseases will continue to cause substantial morbidity and mortality, especially in late adulthood. This is a particular concern in light of current demographic trends in Europe, and their impact on healthcare systems:

- By 2025, nearly 50% of Europeans are expected to be 50 years or older [Swedish National Institute For Health, 2006].
- Around 50% of healthcare spending is targeted to those over the age of 65 years [UK: NHS].
- In light of these trends, a potential shortfall of around one million healthcare workers is expected in Europe by 2020 [European Commission, 2012].

Why is there no adequate implementation of adult immunisation policies?

Despite tangible benefits, this report indicates that there is reluctance to take firmer action to improve standards of adult immunisation in Europe. Vaccination policy in EU Member States mainly focuses on the young (aged below 18), to some extent the old (aged above 65), especially for seasonal influenza and pneumococcal diseases, and those in at-risk groups.

Adult vaccination remains **an underused public health strategy** to promote healthy ageing. Very few EU countries operate a comprehensive **adult immunisation schedule.** Countries often recommend vaccination to at-risk groups, whilst age-based recommendations – which allow individuals to self-assess their status – are not applied for all vaccine preventable diseases. Furthermore, the **lack of implementation of these recommendations** may be linked to a variety of factors, including:

- Gaps in access to the vaccines and reimbursement;
- Limited awareness of infectious diseases and vaccines in the population of all age groups;
- Gaps in the promotion of adult vaccination schedules by public health authorities;
- Limited leadership from healthcare professionals in recommending vaccination;
- Inconsistent monitoring and surveillance systems.

As a result, **adult vaccination coverage rates are often low and vary across European countries.** They are also significantly lower than early childhood vaccination rates. In addition, Central and Eastern European countries often perform less well than Western Europe in terms of uptake results.

To tackle these problems, and on the basis of the evidence in this report, the SAATI Partnership calls for **immunisation as a prevention strategy to be part of an age-based health approach throughout all phases of life.**

Achieving consistent strategies to spur action

The challenge now is to give impetus to effective adult vaccination policies, and to initiate an open discussion about **the value of life-course immunisation in promoting healthy ageing. This aligns strongly with the "EU 2020" strategy to achieve sustainable and inclusive growth in Europe by 2020.**

At EU and national level, the SAATI partnership recommends that the following steps be taken:

- Incorporate life-course immunisation into EU and national level healthy and active ageing policies or public health and prevention strategies to prevent infectious diseases;
- Expand opportunities for the whole EU population to receive vaccination across the life-course as a part of national immunisation policies;
- Work with healthcare professionals (HCPs) to improve their leadership in recommending immunisation across the life-course, as well as improving their own vaccination rates;
- Strengthen health literacy for patients and the public to improve attitudes and beliefs towards immunisation, as part of European and national policies;
- Enhance the European surveillance and monitoring system to better measure the burden of infectious diseases.

In order to give impetus to effective adult vaccination programmes, and to stimulate discussions about the value of life-course immunisation in promoting healthy ageing, the SAATI Partnership calls for **the establishment of a European Health and Vaccination Platform as a matter of priority.** Such a Platform would discuss these recommendations and develop strategies for their implementation.

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LIST OF ABBREVIATIONS AND ACRONYMS

AAA	Asthma and Allergy Association (France)
ACIP	Advisory Committee on Immunisation Practices (US)
AIDS	Acquired immunodeficiency syndrome
BAGSO	Bundesarbeitsgemeinschaft der Senioren-Organisationen (Germany)
BALTIPA	Baltic Immunoprophylactic Association
BMA	British Medical Association
BMI	Body Mass Index
C. Diphtheriae	Corynebacterium diphtheria
C. Ulcerans	Corynebacterium ulcerans
CDC	Centers for Disease Control and Prevention (US)
CERs	Cost-effectiveness ratios
CEVAG	Central European Vaccination Awareness Group
CHF	Swiss Franc
CoMO	Confederation of Meningitis Organisations
CSF	Cerebrospinal fluid
DKK	Danish Krone
EAMA	European Academy for Medicine of Ageing
EAP	European Academy of Paediatrics
ECCMID	European Society of Clinical Microbiology and Infectious Diseases
ECDC	European Centre for Disease Prevention and Control
ECU	European Currency Unit
EDSN	European Diphtheria Surveillance Network
EEA	European Economic Area
EED	Economic Evaluation Database
EFA	European Federation of Allergy and Airways Diseases
EIWF	European Institute of Women's Health
EMHF	European Men's Health Forum
EMRs	Electronic Medical Records
ESCMID	European Society of Clinical Microbiology and Infectious Diseases
ESPID	European Society for Paediatric Infectious Diseases
EU	European Union
EUGMS	European Union Geriatric Medicine Society
EUR	Euro
EUVAC.Net	European Network for Surveillance of Vaccine Preventable Infectious Diseases
GDP	Gross Domestic Product
GMAS	Global Market Access Solutions
GÖG	Gesundheit Österreich GmbH (Austria)
GP	General practitioner
HCP	Healthcare professional
HIB	Haemophilus influenzae type B
HIV	Human immunodeficiency virus
HM Government	Her Majesty's Government (UK)
HPSC	Health Protection Surveillance Centre (Ireland)
IAGG-ER	International Association of Gerontology and Geriatrics for the European Region
ICD	International Classification of Diseases (WHO)
ICER	Incremental cost-effectiveness ratio
ICU	Intensive Care Unit
ID	Intradermal vaccination
ILC-UK	International Longevity Centre-UK

ILI	Influenza-like illness
InVS	Institut de Veille Sanitaire (France)
IPD	Invasive pneumococcal disease
iPRI	International Prevention Research Institute
ISPOR	International Society for Pharmacoeconomics and Outcomes Research
JCVI	Joint Committee on Vaccination and Immunisation (UK)
KCE	Kenniscentrum (Belgium)
KRAR	Kansallinen rokotusasiantuntijaryhmä (Finland)
KTL	Kansanterveyslaitos (Finland)
MMR	Mumps, measles, rubella
NBI	Net Budget Impact
NHS	National Health Service (UK)
NIKO	National Immunisation Committee (Czech Republic)
PCV	Pneumococcal conjugate vaccine
PLN	Polish Zloty
PPSV	Pneumococcal polysaccharide vaccine
PPV-23	Pneumovax 23
RCMS	Research Centre for Medical Studies
QALY	Quality Adjusted Life Year
S. pneumoniae	Streptococcus pneumonia
SAATI	Supporting Active Ageing Through Immunisation
SARS	Severe Acute Respiratory Syndrome
SPILF	Société de Pathologie Infectieuses de Langue Française (France)
SSMG	Société Scientifique de Médecine Générale (Belgium)
STIKO	Ständige Impfkommission (Germany)
TPP	Third Party Payer
UK	United Kingdom
UN	United Nations
UNICEF	United Nations Children's Fund
US	United States
USD	United States Dollar
VCR	Vaccination coverage rate
VENICE	Vaccine European New Integrated Collaboration Effort
VPD	Vaccine-preventable disease
WHA	World Health Assembly
WHO	World Health Organisation

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LIST OF DEFINITIONS

Adult immunisation	Ensuring on-going protection against vaccine-preventable diseases in adulthood through the implementation of effective vaccination programmes, especially for adults aged above 50 years.
Adult vaccination schedule	A set of key recommendations per vaccine and age group issued by a public health authority to guide the adult population in its vaccination choices. ▪ Specific at-risk population groups may also be referred. ▪ National schedules are published on the ECDC website.
Antimicrobial resistance	The reduced susceptibility of pathogenic bacteria to one or more antimicrobial agents (antibiotics) administered in clinical medicine.
At-risk groups	Individuals with certain medical or social conditions who may have a higher risk of contracting certain infectious diseases than the rest of the population.
Diphtheria	A life-threatening infection of the upper respiratory tract caused by Corynebacterium diphtheria. May also affect internal organs and/or the skin.
Healthy ageing policies	Policy frameworks involving actions that promote healthy ageing and address the impact of an ageing society on workforce, retirement policies, public health and social protection.
Herd protection	Situation in which enough of a population is vaccinated against an infectious organism making spread of disease less likely and reducing risk of disease in unvaccinated individuals.
Herpes zoster (shingles)	A painful, blistering skin rash caused by the varicella-zoster virus, which also causes chickenpox. After a chickenpox infection, the virus remains inactive in certain nerves in the body. Shingles occurs when the virus becomes active again years later. Symptoms include severe pain, tingling or burning and the appearance of a rash and small blisters that may burst and crust over. The triggers for viral reactivation are unknown, and it is impossible to predict if and when shingles will occur.

Immunocompromised	Reduced immune responsiveness as a result of inherited defects or infection, or by administration of immunosuppressive drugs, by irradiation, by malnutrition, and by certain disease processes, e.g. cancer.
Influenza	An acute respiratory disease caused by human influenza viruses. Symptoms include fever, headache, muscle pain, runny nose, sore throat, non-productive cough and a general feeling of ill-health.
Invasive pneumococcal disease (IPD)	An acute and potentially life-threatening disease caused by different strains of the bacterium Streptococcus pneumonia. Invasive infection can lead to septicaemia, pneumonia and meningitis.
Life-course approach to immunisation	Stresses vaccination through all stages of life, including the adult years, as a cost-effective strategy to promote healthy and active ageing.
Meningitis	Potentially life-threatening inflammation of the protective membranes covering the brain and spinal cord (a.k.a. meninges). Most common symptoms include headache, neck stiffness, associated with fever, altered consciousness, vomiting, photophobia and phonophobia.
Pertussis (whooping cough)	A highly contagious acute respiratory infection caused by the bacterium Bordetella pertussis. Symptoms in children include severe cough of at least 14 days, plus paroxysmal cough, inspiratory whoop or post tussive vomiting. Symptoms in adults can be mild and unspecific. Adults appear to serve as the reservoir of the organism.
Pneumonia	An acute infection of the lung tissue. Streptococcus pneumoniae is responsible for approximately 40% of cases. Morbidity and mortality are highest among the very young (<5 years of age) and the older people (>60 years of age).
Septicaemia	Potentially life-threatening infection in which large amounts of bacteria are present in the blood (blood poisoning).
Tetanus	An illness caused by contamination of wounds by the bacterium Clostridium tetani. Leads to muscular spasms that sometimes result in death. Tetanus is not transmitted from person to person.

INTRODUCTION

The Supporting Active Ageing Through Immunisation (SAATI) Partnership is a coalition of healthcare professionals, academics, advocates from patient, health and older people's organisations, healthy ageing experts, along with industry partners, who have come together to raise awareness of the need for, and the value of, life-course vaccination as part of European policies promoting healthy ageing.

The **demographic transition** underway in Europe poses many medical and socio-economic challenges. As Europe's population ages, disease morbidity and treatment costs in the adult population are likely to rise substantially [Chlibek 2012]. These challenges can be addressed by lessening the effects of an ageing society through **promoting healthy ageing** early in life and adopting a life-course approach to health [Michel 2010].

- A **life-course approach to health** recognises the impact of early life experiences on ageing and requires significant investments in health promotion, disease prevention, support services and information systems.
- A **life-course approach to immunisation** stresses vaccination through all stages of life, including the adult years, as a cost-effective strategy to promote healthy and active ageing.
- **Adult immunisation**, especially the implementation of effective vaccination programmes for adults aged above 50, is proposed as a core public health strategy for the promotion of life-course immunisation and healthy ageing.

Among these challenges, **infectious diseases** play a prominent part, due to the substantial morbidity and mortality they cause in late adulthood, and their capacity to reduce workforce participation [Michel 2010]. **Vaccinating children and adults** can provide cost-effective protection against these diseases both to the individuals who are vaccinated and to their communities. Furthermore, a **life-course approach to vaccination** can reduce suffering and provide a major contribution to **herd protection** while bringing significant **economic benefits** to an ageing society [Michel 2010].

However, vaccination policy in EU Member States is currently inadequate and mainly focused on the young (aged below 18 years), to some extent the old (aged above 65 years), especially for seasonal influenza, and those in high-risk groups (e.g. those with medical conditions that make them more susceptible to certain infectious diseases). **Vaccination in adults remains an underused public health strategy in the promotion of healthy ageing.** In contrast to childhood immunisation programmes, it is not considered to be a routine health intervention. This situation has the following consequence:

- Vaccine uptake among adults remains low
- There is a lack of coordinated programmes for vaccination of adults [Chlibek 2012]
- Adults are not well protected against infectious diseases [Michel 2010].

Even for seasonal influenza vaccination, for which European countries provide strong recommendations, vaccination rates in Europe remain limited among adults and among specific high-priority groups [Blank 2012].

To tackle these problems the SAATI partnership argues that vaccination, as a **prevention** strategy, should be part of an **age-based approach to health throughout all phases of life.**

This report was commissioned by the partnership to support this argument by consolidating existing research on the incidence of the main vaccine-preventable diseases in Europe and bringing new evidence on the **economic benefits of adult vaccination.** It analyses the barriers to adult vaccination and sheds light on the gaps existing in adult immunisation policies in EU Member States. It identifies the **key determinants** for the successful implementation of adult vaccination policies across Europe and provides **practical recommendations** to improve vaccination rates in adults. Finally, it includes a **snapshot of the adult immunisation policy landscape in each EU Member State,** with the aim of helping to facilitate national decision-making.

A significant amount of research has been conducted to form the basis of this report and to bridge some of the gaps in the evidence base currently available to decision-makers. The **methodologies** used to gather the various pieces of research are detailed in the Appendices. Most of the research was performed in 2012. When 2013 sources were available at the time of writing (e.g. ECDC Annual Epidemiological Report 2012, VENICE II), they have been used to update the research.

The **lack of adequate epidemiological evidence** is believed to be one of the main hurdles for the implementation of life-course immunisation [Vaccines Europe 2013]. The first section of the report aims to shed light on the public health need for life-course immunisation by providing a detailed overview of the main vaccine-preventable diseases, their incidence and their negative medical and social consequences. The section also demonstrates that inconsistent surveillance and reporting systems in Europe may lead to an **underestimation of the burden** of infectious diseases. Data was gathered by the International Prevention Research Institute (iPRI) in 2012, making use of European Centre for Disease Prevention and Control (ECDC) and World Health Organisation (WHO) databases, and has been complemented with the information contained in the 2012 ECDC Annual Epidemiological Report, published after the research [ECDC 2013].

The **second section** highlights the well-known **health benefits of immunisation.** It provides new evidence that taking a life-course approach to immunisation is a cost-effective prevention strategy in a number of EU Member States and create **socio-economic benefits in the context of an ageing society**. The section is based on two elements: (1) a study of the cost-effectiveness evidence for adult immunisation strategies across Europe, undertaken by the life sciences consultancy Heron; and (2) a case study performed by the consultancy Global Market Access Solutions (GMAS) in the Netherlands. The study demonstrates the positive fiscal benefits of adult immunisation strategies on the basis of government taking a broader approach to determining the value that adult immunisation brings to society.

The **third section** analyses existing adult immunisation strategies across all EU Member States with the aim of identifying **gaps and barriers in access to vaccines.** It is based on (1) research performed by the International Longevity Center-UK (ILC-UK) on national adult immunisation strategies, and (2) a survey among a core group of SAATI partners on public awareness of adult vaccination (the list of interviewees can be found in the Appendix). The survey was conducted to complement the lack of adequate information available on attitudes and beliefs around adult immunisation and gathers expert views. It is complemented by the findings of a survey of public health authorities on the drivers underpinning the limited utilisation of vaccination for lifespan immunisation commissioned by Vaccines Europe in 2013. The section shows how low awareness and the absence of consistent and comprehensive adult immunisation strategies in Europe can be related to **low uptake of vaccines in the adult population.**

Building on the above findings, **section four** outlines the conclusions of the report. Included are a set of key recommendations to help policymakers at European and national level to implement consistent, comprehensive and impactful adult immunisation strategies and build on successful childhood immunisation strategies in place across Europe.

Finally, the narrative report is followed by a **snapshot about adult vaccine-preventable disease policies in each EU Member State,** including the incidence of diseases and a review of national adult immunisation strategies in place. These country snapshots aim to identify local barriers to the implementation of vaccination programmes for the adult population and to facilitate national decision-making.

With these elements, the report provides a strong rationale for life-course vaccination within the context of healthy ageing and a strong basis to start establishing and sustaining adult vaccination policies against the main vaccine-preventable diseases in all EU Member States.

MEDICAL SCOPE:

The report focuses on the main **infectious diseases (seasonal influenza, pneumococcal diseases (pneumonia, invasive pneumococcal disease), herpes zoster, pertussis, diphtheria and tetanus).** This decision was based on discussions by SAATI partners in early 2012. These diseases were considered relevant because of the extensive burden they place on healthcare systems in Europe (notably in the case of the first three mentioned) and their impact on public health. Indeed, these are life threatening-diseases and diseases which adversely impact patients' quality of life. Furthermore, the level of vaccination coverage in adults for these diseases is often low and varies across all European countries. Finally, they form the basis of the core vaccinations that the two European geriatric and gerontological societies - the European Union Geriatric Medicine Society (EUGMS) and the International Association of Gerontology and Geriatrics – European Region (IAGG-ER) – propose to recommend in their vaccination programme for the older people [Michel 2009].

GEOGRAPHICAL SCOPE:

The report covers the **27 Member States of the European Union (EU) up to the end of June 2013, and does not include Croatia.** This is due to the main part of the research being conducted during 2012, prior to Croatia's accession to the EU on 1st July 2013. The **fiscal impact of adult immunisation** was evaluated in a prototype analysis conducted for the Netherlands, selected as the prototype country due to the availability of data on public expenditure and meaningful data on the clinical benefits of vaccination. The results described in the prototype analysis would be broadly applicable to other EU Member States where issues of an ageing workforce, extending productive working years and sustainable public finances are priorities on the policy agenda. In this context, the fiscal impact of immunisation analysis provides a framework to other countries to consider adequate budget allocations to influence the fiscal life-course.

AGE GROUPS:

This report looks at the **benefits of life-course immunisation in the context of an ageing society.** The two economic studies (Heron/GMAS) were commissioned to look specifically at cost-effectiveness and the fiscal impact of vaccinating adult population **from the age of 50.** Because the benefits of vaccination accrue over a long time horizon, the fiscal model evaluated an immunisation program starting at the age of 50 with benefits estimated over the remaining life. The research commissioned on adult vaccination strategies and polices (ILC-UK) adopted a **broader approach** and looked at adult vaccination policies across Europe. This allowed ILC-UK to explore how guidelines differ by age across Europe. Reflecting the paucity of data available for incidence of the diseases across Europe, the findings on incidence (iPRI) could not be broken down by age.

SECTION 1:

VACCINE-PREVENTABLE DISEASES: A HIGH BURDEN ON EUROPE'S AGEING SOCIETY

1. Vaccine-preventable diseases: a high burden on Europe's ageing society

Infectious diseases place a high health and socio-economic burden on Europe's ageing society. These diseases result in considerable suffering, reduced quality of life and unnecessary death in Europe. Some of these diseases (e.g. pneumonia, seasonal influenza) may also incur significant cost to health systems in Europe.

Older people are more vulnerable to frequent and severe infections and have poorer outcomes than younger people. There are several contributing factors to this trend among older people [Michel 2010]:

- *Underlying chronic medical conditions*
- *Age-related reduction in immunity ("immunosenescence")*
- *Unwillingness to take booster injections against diseases such as diphtheria, tetanus or pertussis*

The high burden of illness persists despite the fact that vaccination can prevent many infectious diseases among older people. This burden remains underestimated due to inconsistent surveillance and monitoring systems, variations in the methodologies used, and, in some cases, underdiagnosis and underreporting (e.g. for pertussis).

Implementing a life-course approach to immunisation as part of healthy ageing policies, with effective adult vaccination policies, especially for adults aged above 50, is a priority to tackle the high burden of infectious diseases [Michel 2010].

1.1 INFLUENZA

Influenza is a seasonal disease in Europe, with a peak during the months from October to May. While most people recover quickly, regular seasonal epidemics in Europe cause severe illness and death [ECDC 2013]. The high prevalence of milder forms of the disease also contributes to a substantial social and economic burden, and pressure on health services [ECDC 2013].

Seasonal influenza particularly affects high-risk groups:

- Young people (<15 years of age)
- Older people (>65 years of age)
- Pregnant women
- People with a chronic medical condition (e.g. chronic pulmonary disease, chronic cardiovascular disease)

EPIDEMIOLOGY

The **2010–11 influenza season** in Europe was epidemiologically important as it was the first after the pandemic in 2009 and gave some indication of the characteristics of the new interpandemic (seasonal) influenza [ECDC 2013].

- Adults <65 years of age had the most severe disease *(Figure 1)*
  - Most had underlying medical conditions
  - In the previous interpandemic, older adults (≥65 years) with underlying conditions had the most severe disease [ECDC 2013]
- Children frequently presented in primary care
- Greece, Ireland, the UK and to a lesser extent Denmark and France, had a high incidence of severe disease and deaths [ECDC 2013]
- There was considerable pressure on hospital and intensive care services [ECDC 2013]

INFLUENZA

- An acute respiratory disease caused by human influenza viruses
- Symptoms include fever, headache, muscle pain, runny nose, sore throat, non-productive cough and a general feeling of ill-health

INFLUENZA TYPE A VIRUS

- Cause of most severe disease
- Associated with epidemics and pandemics

OTHER INFLUENZA VIRUS STRAINS

- Type B virus also contributes to epidemics
- Novel strains occasionally develop to which humans have little immunity

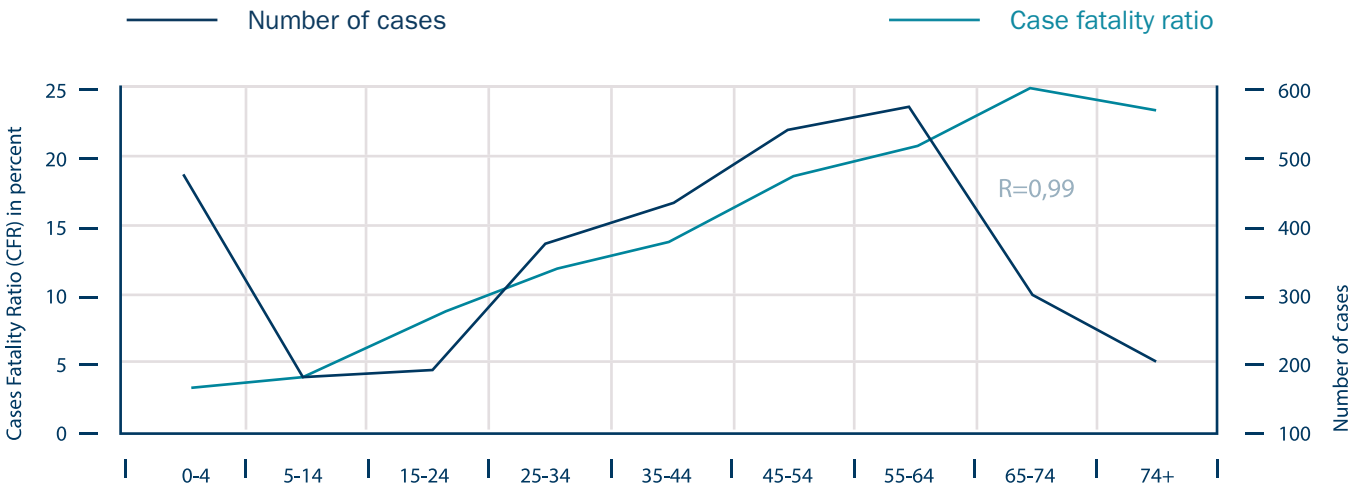


Figure 1: Distribution of influenza-related severe acute respiratory infection cases and case-fatality ratio by age group, 2010–11 season, EU/EEA countries [ECDC 2013]

A complete report is not yet available for the **2012-13 season**, but early data from France can provide preliminary indications of the burden of illness to the population [Institut de Veille Sanitaire 2013].

- More than 3.5 million people were affected
- There were 724 serious cases requiring intensive care
- Among the serious cases, only 11% were known to be vaccinated
- There were at least 117 influenza deaths (ages ranged between 5 months and 97 years of age)

HOSPITALISATION [WHO European Hospital Morbidity Database]

- Hospitalisation rates peaked at 0.35 per 1000 during the pandemic year of 2009
- The highest rates (0.87 and 1.55 per 1000) were recorded in Latvia and Lithuania, respectively

MORTALITY [WHO Detailed European Mortality Database]

Use of reported influenza deaths to estimate influenza incidence provides comparable data over a number of countries. However, these reports probably underestimate deaths due to influenza and do not account for deaths occurring from a secondary infection (e.g. pneumonia) as a consequence of influenza.

- Mortality rates in the EU were uniformly low in 2005 (less than 0.4 per 100,000) and during the 2009 pandemic year (around 0.25 per 100,000)

VACCINATION AND CONTROL STRATEGIES

Vaccination of high risk and other groups can reduce the clinical and economic burden of seasonal influenza; in the US the Centers for Disease Control and Prevention (CDC) recommends that all adults be vaccinated against seasonal influenza. In Europe, ECDC notes that there is a continuing need to [ECDC 2013]:

- Increase influenza vaccine uptake
- Improve surveillance for development of resistance to antiviral drugs
- Recommend influenza immunisation to the population group aged over 65 years

INFLUENZA: SUMMARY OF KEY POINTS

- Influenza is a seasonal disease, with a winter peak
- It particularly affects the young, older people, pregnant women and those with chronic medical conditions
- Epidemics can result in severe illness and death, significant socio-economic burden and pressure on health services
- Mortality rates are probably underestimated
- Influenza vaccine uptake should be increased, and is particularly recommended among older adults

1.2 PNEUMOCOCCAL DISEASES: INVASIVE PNEUMOCOCCAL DISEASE (IPD) AND PNEUMONIA

1.2.1 INVASIVE PNEUMOCOCCAL DISEASE (IPD)

Globally, an estimated **1.6 million people** die of IPD annually [ECDC 2013]. Groups at **high risk** of contracting IPD include [ECDC 2013]:

- Children (1 million deaths annually)
- Immunocompromised people (e.g. patients with chronic renal failure)
- Older people (>65 years of age)

INVASIVE PNEUMOCOCCAL DISEASE

- An acute and potentially life-threatening disease caused by different strains of the bacterium *Streptococcus pneumonia*
- Invasive infection can lead to septicaemia (blood poisoning), pneumonia and meningitis (potentially life-threatening inflammation of the meninges)

PNEUMONIA

- An acute infection of the lung tissue
- *Streptococcus pneumoniae* is responsible for 40% of cases [Lim 2009]
- Morbidity and mortality are highest among the very young (<5 years of age)

Diagnosis and treatment can be difficult:

- Diagnosis must be confirmed by laboratory analysis of blood, cerebrospinal fluid, pleural fluid, or peritoneal fluid [Werno 2008]
- Multidrug resistance (resistance to three or more antibiotic classes) can occur [ECDC 2013]

EPIDEMIOLOGY [ECDC 2013]

2006–10 (*Figure 2*)

- The rate of confirmed cases in Europe remained unchanged from 2006 to 2009
- More cases were reported in 2010 than in 2009 (21,565 compared to 14,273, respectively), likely due to **improved surveillance and reporting** systems in some countries

Regional differences in 2010

- The highest rates were reported by Belgium and the Nordic countries
- Lower rates were reported by Lithuania and The Netherlands
- In England and Wales, effective paediatric vaccination programmes have led to significant decreases in IPD cases (including adults through herd protection), and in pneumococcal pneumonia and acute otitis media in children [Miller 2011]

Age

- Rates were higher among children aged <5 years and adults aged >65 years (9.6 and 14.4 cases per 100,000, respectively) (*Figure 3*)
- The rate increased in older people, from 9.84 in 2009 to 14.4 in 2010

MORTALITY [WHO Detailed European Mortality Database]

- Mortality due to *Streptococcus pneumoniae* infection in Europe is low, with an average rate of 0.152 per 100,000 (averaged over countries and years)
- In 2009, rates were highest in Estonia, Finland and France (0.40–0.45 per 100,000)

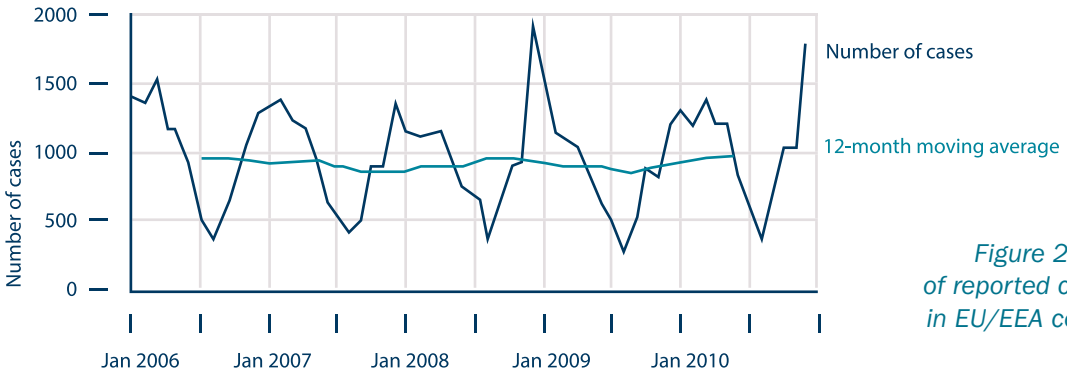


Figure 2: Trend and number of reported confirmed IPD cases in EU/EEA countries, 2006–10 [ECDC 2013]*

**Austria, Belgium, Cyprus, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden.*

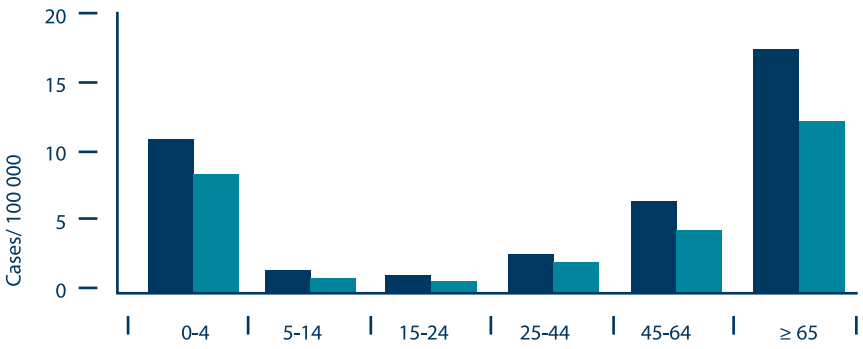


Figure 3: Rates of reported confirmed IPD cases, by age and gender, EU/EEA countries, 2006–10 [ECDC 2013]*

**Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Malta, Netherlands, Norway, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, UK.*

1.2.2 PNEUMONIA

Pneumonia is a major cause of death and hospitalisation, but is not required by law to be reported to government authorities in most EU countries. Pneumonia resulting from *Streptococcus pneumoniae* infection (pneumococcal pneumonia) is one of the most common types of pneumonia [Lim 2009]. (*Note that not all types of pneumonia are vaccine-preventable; the information below refers to all types of pneumonia*)

HOSPITALISATION [WHO European Hospital Morbidity Database]

- Pneumonia is responsible for 2% of hospitalisations in the EU-27
- The average hospital stay was approximately 10 days in 2005
- From 2005-11, the average hospitalisation rate was 3.3 per 1,000 population, with the highest rates in Finland, Lithuania and Norway

MORTALITY [WHO Detailed European Mortality Database]

- In England and Wales in 2011, 25,696 people died of pneumonia (5.3% of all deaths), compared to 109 with influenza and 316 with pandemic influenza
- Wide variations in mortality rates are seen between some countries; in 2009 there was a six-fold difference in rates between Slovakia and Hungary (31 vs. 5 per 100,000, respectively), partly due to reporting methods
- In all countries, older people, disabled and those with healthcare-associated pneumonia are at increased risk of multidrug resistance mortality
- Mortality is over 30% in patients requiring intensive care

PNEUMOCOCCAL DISEASES: SUMMARY OF KEY POINTS

- Children (<5 years), immunocompromised patients and older people (>60 years) are most at risk
- Improvement in EU surveillance systems in 2010 shows increased number of cases
- Although mortality from IPD is low, pneumonia is a major cause of death
- Countries such as the UK with an effective childhood immunisation programme have seen dramatic decreases in cases (including adults through herd protection)

1.3 PERTUSSIS

The global incidence of **pertussis** is estimated at 48.5 million cases a year with 295,000 deaths [Mattoo 2005]. In the US, pertussis has the greatest incidence and mortality of all vaccine-preventable diseases [Roush 2007].

PERTUSSIS (WHOOPING COUGH)

- A highly contagious acute respiratory infection caused by the bacterium *Bordetella pertussis*
- Symptoms in children include severe cough of at least 14 days, plus paroxysmal cough, inspiratory whoop or post tussive vomiting
- Symptoms in adults can be mild and unspecific
- Adults appear to serve as the reservoir of the organism

Pertussis continues to be a public health concern, even in countries with high vaccination coverage [ECDC 2013].

- Adults may be unaware of having the disease and may infect vulnerable infants who are not yet vaccinated [ECDC 2013]
- Infants can be severely affected by the disease [ECDC 2013]

EPIDEMIOLOGY [ECDC 2013]

The incidence of pertussis varies widely in Europe due to differences in vaccination policies, levels of awareness, and surveillance procedures.

- In 2010, confirmed cases were low overall (3.87 per 100,000 population), with the highest rates reported in Estonia and Norway (95.44 and 73.28 per 100,000, respectively)
- Austria, Estonia, Slovakia and Spain reported an increase in confirmed cases in 2010
- Children aged 5–14 years are the most affected *(Figure 4)*
- There is a considerable gap between number of confirmed cases reported in the EU in 2010 (14,000) when compared to epidemiological evidence from the US showing infection rates of 1–6% (800,000 to 1 million cases) during non-epidemic periods [Cherry 2012]

There has been an increase in pertussis cases in some countries in the EU (Belgium, France, Germany, the Netherlands and Spain), particularly among older children, adolescents and adults [ECDC 2013]. This may be due to:

- Public concern over vaccines
- Vaccination programme failure
- Changes in the infectious organism

RECENT PERTUSSIS OUTBREAKS

Pertussis outbreaks *(Figure 5)* occur even in the presence of excellent paediatric vaccination programmes, and peaks are typically seen every 3–4 years. Recently there was an outbreak in England and Wales in 2011 that continued into 2012 [Health Protection Agency UK]:

  - Reported cases more than doubled from 2010 to 2011 (421 to 1,040 cases, respectively)
- Total cases in 2011 were higher than a typical peak year
- There were 665 confirmed cases between January and March 2012
- Most of the increase was due to infection in teenagers and adults aged 15-40 years, but also included very young children with highest risk of complications

HOSPITALISATION AND MORTALITY [WHO European Hospital Morbidity Database, WHO Detailed European Mortality Database]

Hospitalisation and mortality for pertussis are rare in Europe.

- Hospitalisation rates vary from 0 to 0.035 per 1000
- Age standardised mortality rates range from 0.0005 per 100,000 in Germany in 2009 to 0.125 per 100,000 in Cyprus, in 2006

VACCINATION AND CONTROL STRATEGIES

In view of concerns about transmission of pertussis from adults and adolescents to young children, several countries have recommended booster doses for adolescents (e.g. Austria, France and Germany) and adults (e.g. Austria). In addition, the Global Pertussis Initiative has recommended universal adult immunisation [Tan 2005]. Success of these strategies depends on:

- Increasing awareness among the public and health professionals
- Optimising diagnostic methods
- Improving surveillance systems [ECDC 2013]

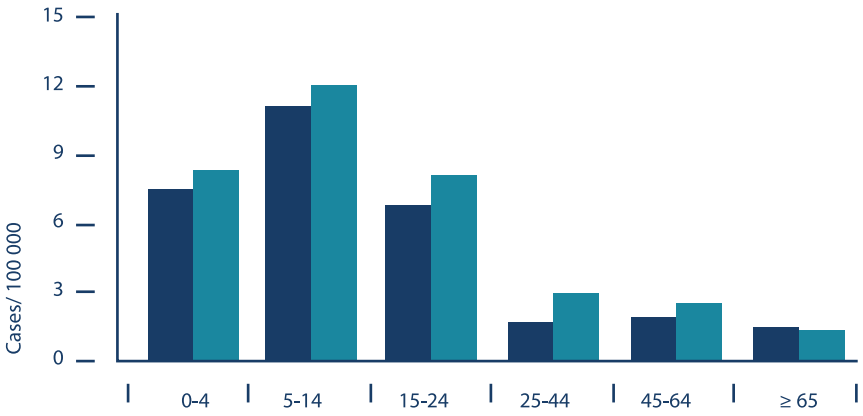


Figure 4: Rates of reported confirmed pertussis cases, by age and gender, EU/EEA countries, 2010 [ECDC 2013]*

**Austria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Ireland, Italy Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.*

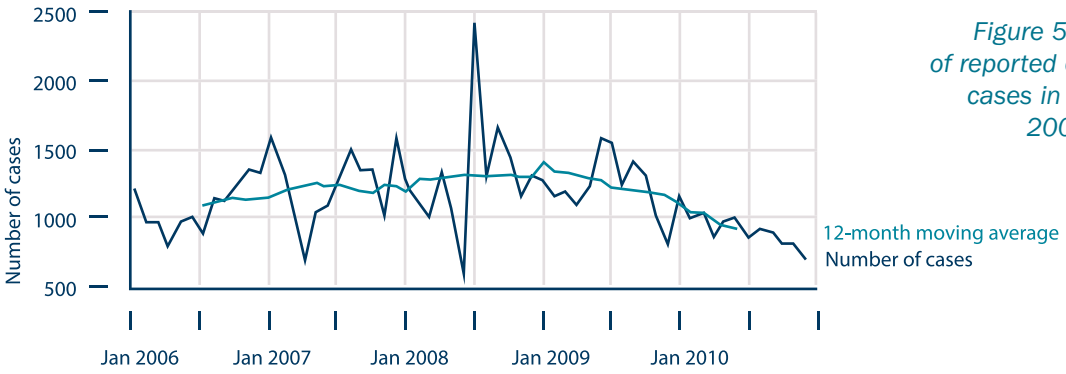


Figure 5: Trend and number of reported confirmed pertussis cases in EU/EEA countries, 2006–10 [ECDC 2013]*

**Austria, Belgium, Cyprus, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden.*

PERTUSSIS (WHOOPING COUGH): SUMMARY OF KEY POINTS

- Pertussis is relatively common and underdiagnosed in EU countries
- It remains a public health concern, even in countries with high vaccination coverage
- Many EU countries report an increase in cases, particularly among adolescents and adults
- Infected adults are a source of infection for unvaccinated infants, who may be severely affected
- Vaccination strategies call for vaccination of adults and teenagers, and increased awareness among the public and health care professionals

1.4 HERPES ZOSTER

Herpes zoster is a serious disease in older people and in the immunocompromised. In the absence of antiviral therapy, up to **45% of patients over 60 years of age experience considerable pain for 6–12 months** [Scott et al, 2006; Wareham and Breuer 2007], severely affecting their quality of life [Drolet 2010].

HERPES ZOSTER (SHINGLES)

- A painful, blistering skin rash caused by the varicella-zoster virus, which also causes chickenpox
- After a chickenpox infection, the virus remains inactive in certain nerves in the body [Harpaz 2008]
- Shingles occurs when the virus becomes active again years later
- Symptoms include severe pain, tingling or burning and the appearance of a rash and small blisters that may burst and crust over
- The triggers for viral reactivation are unknown, and it is impossible to predict if and when shingles will occur [Harpaz 2008]

EPIDEMIOLOGY

Herpes Zoster is common in people ≥50 years of age.

- People ≥50 years of age account for 70% of the estimated 1 million new cases per year seen in the US [Harpaz 2008]
- The incidence in people >60 years of age is 10 cases per 1000 population per year [Thomas and Hall 2007]
- The lifetime risk of developing shingles is approximately 1 in 3 [Harpaz 2008]
- By the age of 85 years, 50% of people will have had shingles [Thomas and Hall 2007]
- The disease can recur more than once [Harpaz 2008]

TRANSMISSION

Shingles is considerably less contagious than chickenpox but can be transmitted to non-immune people, resulting in a primary varicella infection [CDC 2013].

COMPLICATIONS

Postherpetic neuralgia (nerve pain) is the most common complication of shingles. A variety of other complications can occur [Harpaz 2008]:

- Neurologic (nervous system)
- Ophthalmic (vision)
- Cutaneous (skin)
- Visceral (gut; rare)

Complications such as pneumonia and encephalitis rarely occur, but may lead to persistent complications or even death.

HOSPITALISATION [WHO European Hospital Morbidity Database]

Hospitalisation rates are very low in EU-27.

- Austria has much higher reported rates of hospitalisations (~0.3 per 1000) than any other reporting country

MORTALITY [WHO Detailed European Mortality Database]

Mortality rates are very low in EU-27.

- In 2010 the mortality rates had fallen to an average of 0.03 per 100,000
- The Netherlands had the highest mortality rate at 0.09 per 100,000, followed by Sweden and the UK at 0.05 per 100,000

VACCINATION AND CONTROL STRATEGIES

- It is difficult to eradicate varicella-zoster because of its ability to establish latency (i.e. the virus can lie dormant).
- In the US, universal varicella vaccination was adopted for children in 1995. The vaccination programme produced a 90-95% decline in chicken pox in children aged 1-9 years of age and reduced the incidence of zoster in children aged 10 years by 55%. Live attenuated varicella-zoster vaccination is recommended for healthy adults aged 60 or more and at risk groups [CDC, US children and adult schedules 2012].
- In Europe, recommendations cover people aged over 50.

HERPES ZOSTER: SUMMARY OF KEY POINTS

- Herpes Zoster is extremely painful and serious in older adults and the immunocompromised
- Up to 45% of >60 year olds with shingles experience pain for 6-12 months
- By the age of 85 years, 50% of people will have had shingles
- Hospitalisation and mortality rates are low

1.5 DIPHTHERIA AND TETANUS

In Europe, both diphtheria and tetanus are rare infections due to universal childhood vaccination and regular boosters [ECDC 2013].

DIPHTHERIA

- A life-threatening infection of the upper respiratory tract caused by *Corynebacterium diphtheria*
- Also affects internal organs and/or the skin

TETANUS

- An illness caused by contamination of wounds by the bacterium *Clostridium tetani*
- Leads to muscular spasms that sometimes result in death
- Tetanus is not transmitted from person to person
- *Clostridium tetani* is found anywhere in the environment

1.5.1 DIPHTHERIA

Risk groups for contracting diphtheria include **women** and **older people:**

- Women may have closer contact with pets (which can harbour bacteria) and be less likely to have routine military vaccinations than men [ECDC 2013]
- Adults aged 45–65 have reduced immunity due to the absence of booster doses [ECDC 2013]
- Older people may never have been properly vaccinated against diphtheria; in Spain less than half of those born before 1975 were properly vaccinated [ECDC 2013]

EPIDEMIOLOGY

In 2010, there were only 14 confirmed cases of diphtheria in the EU *(Figure 6)*.

- Cases occurred in France, Germany, Latvia and the UK
- Most cases were women aged 45 years and older [ECDC 2013]

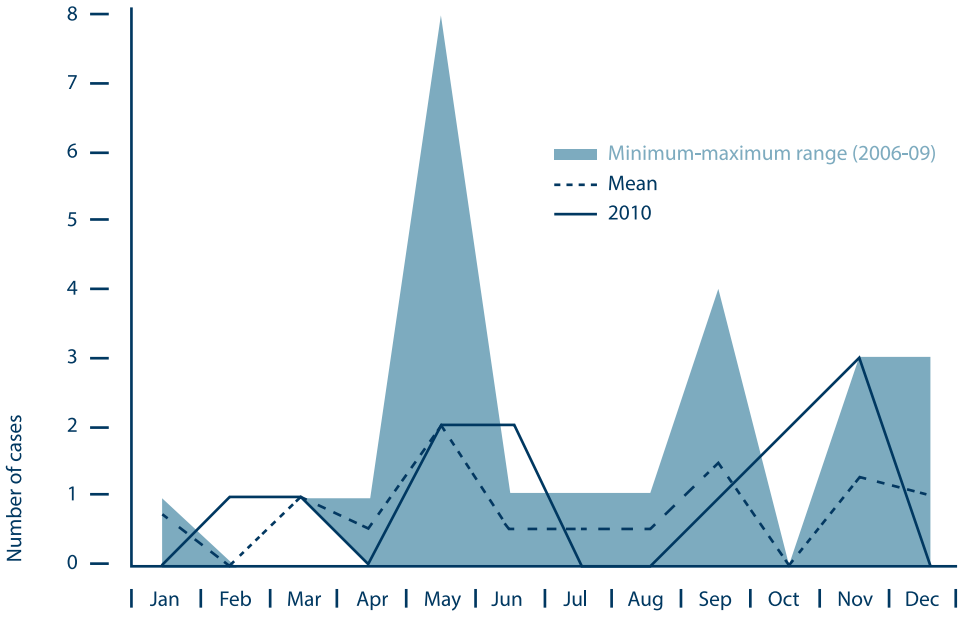


Figure 6: Trend and number of reported confirmed diphtheria cases in EU/EEA countries, 2006–10 [ECDC 2013]*

**Austria, Belgium, Cyprus, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden.*

Although rare in the EU, diphtheria remains prevalent in some of the countries of the former Soviet Union (Latvia, Russia and Ukraine).

- Sporadic cases reported from Europe may have been imported from countries where diphtheria is still endemic [European Diphtheria Surveillance Network]
- There is a risk of new outbreaks if population immunity is suboptimal [ECDC 2013]

VACCINATION AND CONTROL STRATEGIES

Diphtheria is an example of a disease where **maintaining high vaccination coverage through all age groups is necessary** despite the rarity of the disease today. ECDC recommends high routine and booster diphtheria vaccination coverage to prevent future outbreaks in the EU [ECDC 2013].

DIPHTHERIA: SUMMARY OF KEY POINTS

- Diphtheria is a life-threatening infection which mainly affects women and older people
- Only sporadic cases in Europe
- To prevent future outbreaks, there is a need for vaccination through all age groups

1.5.2 TETANUS

Tetanus differs from diphtheria in that there is no person-to person spread of the organism, and exposure will never disappear because the bacterium is found ubiquitously in the environment.

EPIDEMIOLOGY

Tetanus is a sporadic and relatively uncommon infection in Europe. The confirmed case rate remains low, mainly because laboratory confirmation is usually not performed for tetanus and diagnosis is based on clinical presentation.

- The overall confirmed case rate in the EU is 0.02 per 100,000
- In 2010, 130 cases, including 74 confirmed cases were reported by 12 EU/EEA countries
- In 2010, Italy accounted for 57 of the 74 confirmed cases; Italy has the highest number of tetanus cases since 2006 for unknown reasons [ECDC 2013] *(Figure 7)*
- The highest reported rate is in the age group **aged 65 years and older** (0.02 per 100,000) [ECDC 2013]
- Females account for 63% of reported cases almost all of them in the 65 year and older group [ECDC 2013]

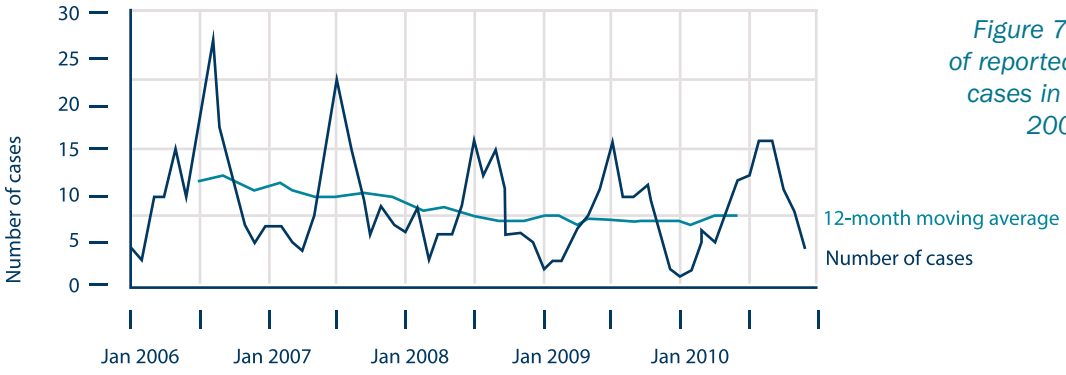


Figure 7: Trend and number of reported confirmed tetanus cases in EU/EEA countries, 2006–10 [ECDC 2013]*

**Austria, Belgium, Cyprus, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden.*

VACCINATION AND CONTROL STRATEGIES

Tetanus is included in the primary vaccination schedule of all EU countries, and widespread use of tetanus vaccination in EU/EEA countries contributes to the low disease rate. Periodic vaccination in adulthood is required to maintain immunity [ECDC 2013].

- For both tetanus and diphtheria, maintaining high vaccination through all age groups, including adult booster coverage, is essential to build on the progresses achieved and avoid the risks of outbreaks [ECDC 2013].

TETANUS: SUMMARY OF KEY POINTS

- Tetanus is a sporadic and uncommon infection due to universal childhood vaccination and regular boosters in EU/EEA
- There is no person-to-person spread
- Highest reported rates are seen in adults aged >65 years
- Periodic vaccination in adulthood is required to maintain immunity
- Catch-up vaccination strategies are needed in countries with higher rates of disease

SECTION 2:

THE BENEFITS OF LIFE-COURSE IMMUNISATION

Adult immunisation policies are a vital part of a life-course approach to immunisation. As Europe's population ages, disease morbidity and treatment costs in the adult population are likely to rise substantially. This underlines the need for prevention strategies such as vaccination in order to preserve the ageing population's health and its economic contribution to society. Not only can a life-course approach help tackle the burden of infectious diseases, but it is also likely to create further tangible health and socio-economic benefits, including helping to reduce some of the burden of an ageing society on government resources.

2.1. CLINICAL BENEFITS

Vaccines prevent up to 3 million deaths worldwide each year [Ehreth 2005]. The **clinical (i.e. health) benefits of immunisation** are clear. Vaccination **success stories** are well documented. Vaccines are widely regarded as an effective tool for improving health, and children in all countries are routinely immunised against major diseases [Bloom 2005]. Smallpox has been eradicated and wild poliovirus has been eliminated from most countries. Haemophilus influenzae type B (Hib) was eliminated within a few years of introduction of conjugate Hib vaccines in countries such as the UK, France and Germany [Ehreth 2005].

The benefits of vaccination extend beyond the individual patient to the wider society [Chlibek 2012] and **herd protection** is a well-known effect of vaccinating a significant portion of the population. However, herd protection *(Figure 8)* works only if vaccination coverage is high enough to reduce the transmission to unvaccinated individuals. If the herd effect is sufficient, then the infection may be significantly reduced or even eliminated from that population.

Vaccination of family members can be used to protect a vulnerable newborn from infections like pertussis. This vaccination strategy, known as cocooning, establishes immunity in a group of people who are in close contact with the infant. These individuals cannot become infected and cannot, therefore pass on the infection to the infant.

Public authorities are also increasingly acknowledging the **role of vaccination in the fight against antimicrobial resistance.** Resistance to bacterial infections is a major clinical problem: these are becoming harder to treat and causing more prolonged and severe disease. This leads to reduced quality of life and higher healthcare costs [Vaccines Europe 2013]. Evidence suggests that antibiotic use can decrease in association with the initiation of immunisation programmes or increased uptake of available vaccines (e.g. pneumococcal and influenza immunisation programmes) [Coignard 2008]. Vaccination limits the development of antimicrobial resistance by decreasing the likelihood that bacteria targeted by these vaccines are exposed to antimicrobial agents (antibiotics) [Vaccines Europe 2013].

Furthermore, several infectious diseases are often transmitted and/or acquired in healthcare settings, particularly hospitals, while patients are receiving treatment for medical or surgical conditions. These infections include bacterial pneumonia, pertussis or the secondary complications of e.g. influenza. Effective prevention of these diseases through immunisation should decrease their prevalence in healthcare settings and help drive a reduction in the use of antimicrobials [Vaccines Europe 2013]. *(Figure 9)*

The clinical benefits of **vaccinating adults as part of life-course immunisation strategies** have been shown in the following examples:

- Cohort studies show that **influenza vaccination** provides substantial health benefits, including reduced hospitalisations, outpatient visits, mor-

tality and antibiotics prescription among older people [Nichol, as cited in Chlibek 2012].

- A vaccination programme for older people was shown to be effective at reducing cases of **invasive pneumococcal disease (IPD)** in the UK. Recent clinical studies also suggest vaccination with pneumococcal conjugate vaccines may provide a benefit in adults [Jackson, as cited in Chlibek 2012].
- The implementation of a **herpes zoster** vaccination programme for older people has the potential to improve their quality of life markedly by reducing the incidence and severity of the disease. One study, based on a randomised control trial, found a reduction in disease burden in older adults of 61% and a reduction of postherpetic neuralgia by 67% [Oxman 2005, as cited in Chlibek 2012].
- Since the initiation of widespread vaccination of infants and children, the burden of **pertussis** has shifted to adolescents and adults. Several countries have reported an increased incidence in older age groups. As these older age groups can transmit the disease to unprotected infants, there is **an additional need for an effective pertussis booster vaccination programme in older age groups** [De Greeff, as cited in Chlibek 2012].

In addition to these clinical benefits, a range of economic benefits are also associated with life-course immunisation and the implementation of adult immunisation programmes.

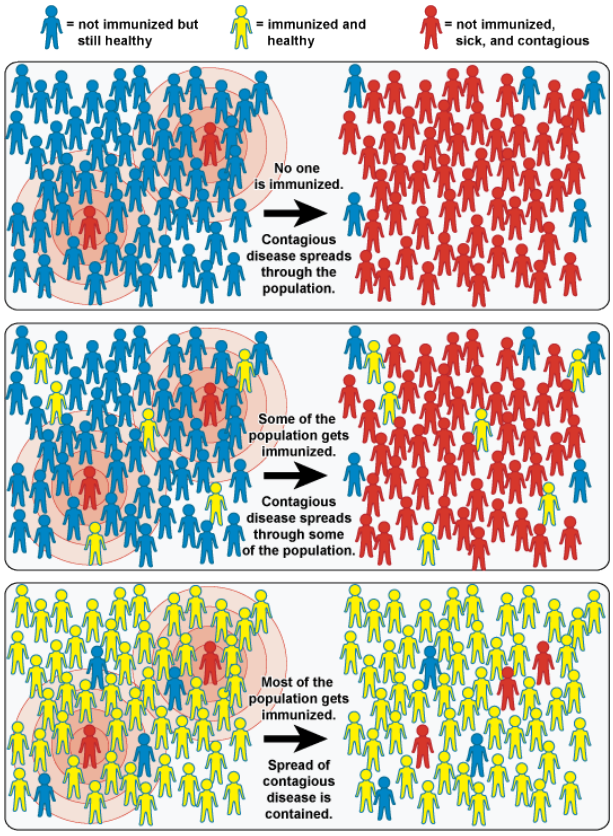
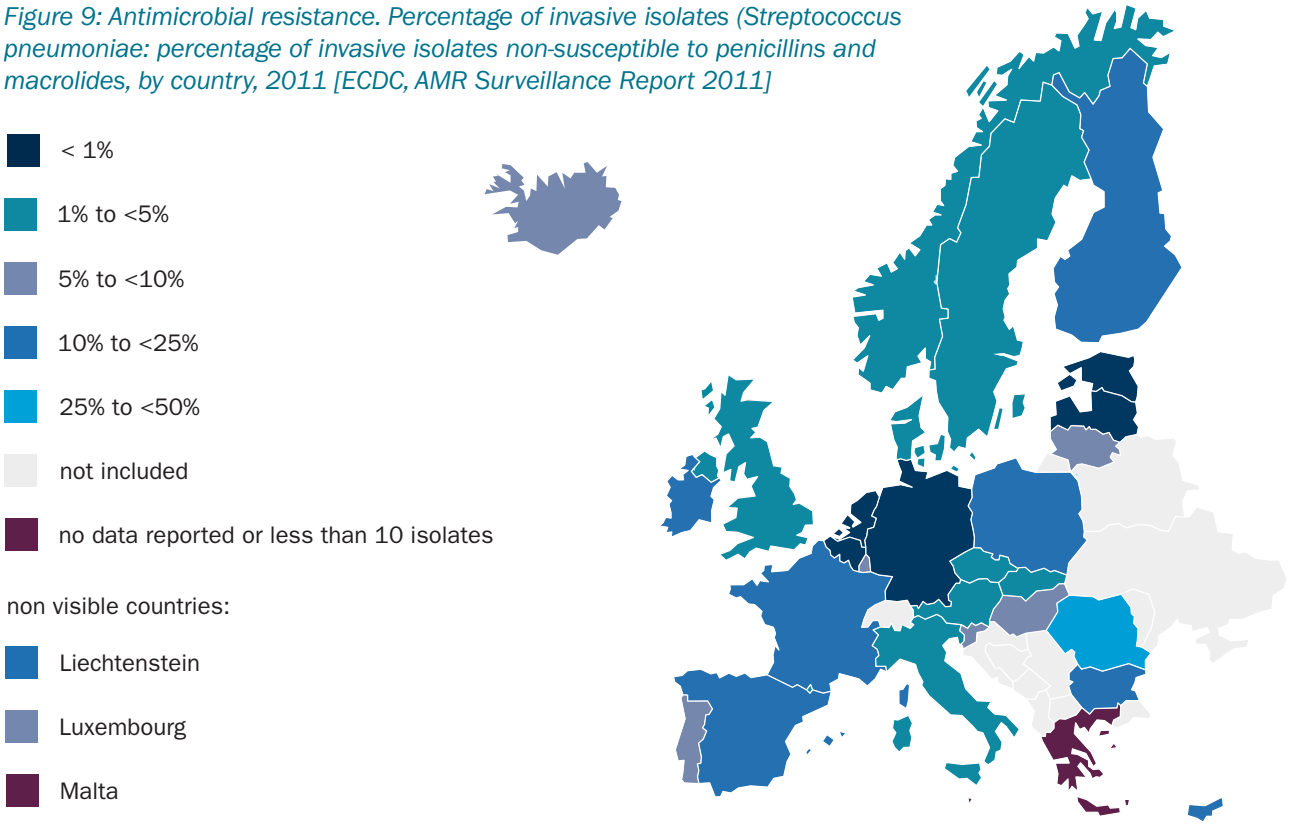


Figure 8: Community Immunity ("Herd" Immunity), [NIH http://www.niaid.nih.gov/topics/pages/communityimmunity.aspx]

Figure 9: Antimicrobial resistance. Percentage of invasive isolates (Streptococcus pneumoniae: percentage of invasive isolates non-susceptible to penicillins and macrolides, by country, 2011 [ECDC, AMR Surveillance Report 2011]



KEY FINDINGS:

- Cost-effectiveness studies were found for 4 of the 7 key vaccine-preventable diseases in this report: herpes zoster, influenza, IPD and pneumonia.
- For these 4 diseases, studies were found for 13 EU nations that show immunisation is likely to provide a cost-effective strategy for those aged 50 years or over. This provides positive economic support for comprehensive immunisation strategies for adults.
- **No study was found in the scope of the research** on the cost-effectiveness of **pertussis, tetanus and diphtheria.** This may be due to the fact that for instance for tetanus and diphtheria booster immunisation was broadly used and recognised as an effective preventative tool before the widespread use of such economic models.
- There is a **lack of health economic research in low- and middle- income countries** of the European region.
- A **broader view of the long-term benefits of vaccination** demonstrates that immunisation programmes are worthwhile in terms of their economic advantages.

2.2. REDUCING MEDICAL COSTS

A systematic review of the relevant literature in English on the **cost-effectiveness of immunisation for adults aged 50 years or over in all EU Member States** was performed for this Report. Cost-effectiveness studies were found for 13 EU Member States (the UK, Germany, the Netherlands, Sweden, Belgium, France, Italy, Spain, Poland, Denmark, Finland, Slovakia and Czech Republic) and for 4 of the seven key vaccine preventable diseases examined in this report: herpes zoster, seasonal influenza, IPD and pneumococcal pneumonia. These studies showed that immunisation is likely to provide a cost-effective strategy for adults aged 50 years or over. This provides **strong economic support for arguments supporting comprehensive adult immunisation strategies in European countries.**

During the research process, **no study in English language was found in EU Member States on the cost-effectiveness of pertussis, tetanus and diphtheria** for the population aged 50 years and above. This may be due to the fact that for instance for tetanus and diphtheria booster immunisation was broadly used and recognised as an effective preventative tool before the development of such economic models.

Whilst the studies were based in different country settings and applied different economic models, the **findings were similar and comparable,** and there is evidence that the results have face validity. **Immunisation strategies can be recommended** for specific age groups in a number of the seven disease areas, particularly for the high-income countries:

- **Herpes zoster:** the general consensus across studies that compared a vaccination strategy versus no vaccination strategy was that vaccination is a cost-saving or a cost-effective intervention. Existing evidence indicated that if immunisation was not cost-effective in the short-term, it did not imply cost-ineffectiveness in the long run. [Van Hoek 2012]. There is evidence that adult vaccination is a valuable preventive option when targeting populations aged 50-54 years [Ultsch 2012] and that vaccinating older cohorts (70+) is less cost-effective than vaccinating younger cohorts [Van Hoek 2009, Bresse 2012].
- **IPD:** A study [Evers 2007] conducted a multi-country analysis across 10 EU countries to analyse the cost-effectiveness of pneumococcal vaccination for IPD across those aged >65 years. The study observed substantial variation in the Incremental Cost-Effectiveness Ratios (ICERs) across the countries, with older populations generally having higher ICERs. A UK based study [Melegaro 2004] recommended routine vaccination of all populations aged ≥ 65 years. It was estimated to be the best strategy, with lower cost per life year gained compared to vaccinating high-risk groups only.
- **Pneumococcal pneumonia**: Two studies conducted in the Netherlands concluded vaccination with pneumococcal conjugate vaccine to be cost-effective when compared with no vaccination [Baltussen 1997, Rozenbaum 2010] for both the general population and high risk populations aged ≥65 years. A Finnish study [Martikainen 2012] presented similar findings.
- **Seasonal influenza**: The results of the multi-country analysis [Aballea 2007, Scuffham 2002] found vaccination for influenza to be cost-effective across all the countries of interest. An Italian study [Garattini 2011] concluded that the economic advantage of extending influenza vaccination to healthy adult workers aged 50-64 years mainly

relate to indirect costs such as costs associated with productivity loss.

The systematic review highlighted the **lack of health economic research in low- and middle- income EU Member States.** This lack of evidence makes it difficult to draw any conclusions as to whether such strategies represent good value for the scarce health-care resources available in these countries. However, this research is helpful in understanding the various models developed in this area, their advantages and disadvantages, and will benefit these countries in developing their own cost-effectiveness analyses using the new models or adapting existing models [Postma 2011]. Potential users of these models in low- and middle-income countries need to consider the specific building blocks of cost-effectiveness analysis including the nature, scope, design, assumptions, and how these assumptions influence the model outcomes. In addition, they need to consider results from the existing studies based in high-income economies and structured reviews such as this one [Postma 2011]. All this information, combined with local data on burden of disease, may already provide an **indication of the expected benefits of adult vaccination.**

The review has also shed light on some of the potential limitations of such studies:

- **Potential interdependencies across diseases:** A key feature of vaccine preventable diseases is the potential interdependencies across such diseases. However, none of the economic models identified in this review considered this aspect.
- **Herd immunity:** only 3 studies mentioned assumptions surrounding herd immunity.
- **Co-morbidity:** a key feature of vaccine preventable diseases is the presence of co-morbidities. However, the economic evaluations conducted across herpes zoster, influenza, invasive pneumococcal disease and pneumonia did not consider this important aspect in the analyses.

Although cost-effectiveness provides a robust demonstration of the extent to which vaccines reduce medical costs, such traditional health economic frameworks do not take into account the **wider range of benefits associated with immunisation.** In fact, previous research has shown that **they tend to underplay the benefits of vaccination** by focusing on the averted costs of medical treatment and healthcare. In particular, they tend to not take into account the following:

- The cost of averted infections that may occur over the long-term
- Recent academic work on **the effects of health on incomes and economic growth**
- The fact that immunisation also protects individuals against the long-term effects that an illness can have on an individual's physical, emotional and cognitive development.

Current health economic studies usually do not take all relevant government perspectives into account. One example is the fiscal consequences of preventing disease and death. **A broader view of the long-term benefits of vaccination shows immunisation programmes to be much more worthwhile in terms of their economic consequences.** As such, recent research calls for a more thorough investigation of the impacts of vaccination, looking not only at direct medical cost savings and averted illness, but also at **the effects on e.g. productivity, income, savings and investment** [Bloom 2005].

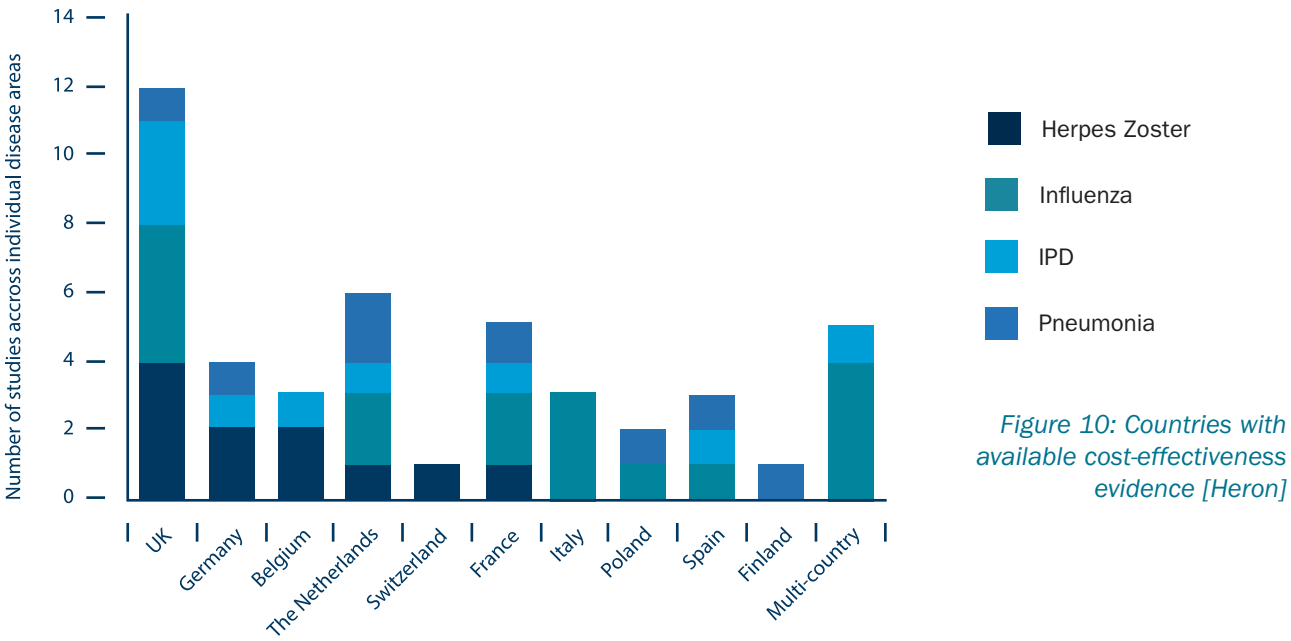


Figure 10: Countries with available cost-effectiveness evidence [Heron]

2.3 POSITIVE FISCAL OUTCOMES ATTRIBUTED TO ADULT IMMUNISATION

In recent years non-government organisations have sought to understand the broader economic consequences of immunisation policy (Kotsopoulos 2013; WHO 2012). Considering the benefits of immunisation accrue over many generations long timeframes are required for the economic benefits to fully mature. Consistent with these views, SAATI members sought to better understand the long-term fiscal consequence of adult immunisation by applying a **"government perspective" framework to estimate the fiscal benefits associated with vaccinating a cohort of adults aged 50.**

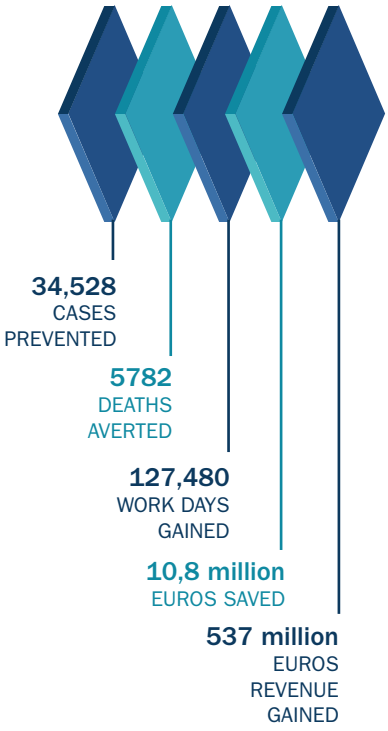
Adopting a government perspective framework to evaluate investments in health and resulting changes in morbidity and mortality allows an estimation of how governments can benefit from adult immunisation programmes. Investments in healthcare that influence lifetime productivity capacity can be used to estimate future net tax revenues linked to changes in productive capacity. Similarly, transfer costs that arise from severe morbidities linked to infectious diseases such as pneumococcal disease can give rise to additional "transfer costs" (e.g. disability payments, social services) for government, in addition to the traditional direct health costs. As mentioned above, this contrasts with conventional cost-effectiveness frameworks, which do not capture the impact of adult infectious diseases on government lost tax revenue and increased transfer costs attributed to poor health.

To better understand the fiscal consequences of adult vaccination, **a case study was conducted to evaluate comprehensive adult vaccination for those over the age of 50 years in the Netherlands.** The Netherlands was selected due to the availability of data on public expenditure and meaningful data on the clinical benefits of vaccination. To assess the fiscal impact of health, this study followed a "lifetime modelling" approach, which considered how investments influence both transfers from government (e.g. social services, pensions, healthcare) compared with ongoing tax transfers to government (e.g. income tax, value added tax, social insurance).

The analysis takes into account the gross tax receipts to the government for adults vaccinated against the seven main infectious diseases (seasonal influenza, pneumococcal diseases, pertussis, herpes zoster, diphtheria and tetanus) compared with those non-vaccinated. Estimates for lifetime productivity and labour force participation are derived from projected incidence rates for each of the diseases in vaccinated and non-vaccinated cohorts. Linked to vaccine investment costs, the analysis projects future tax revenue associated with the resulting changes to morbidity and mortality rates. This entails accounting for future income tax payments (over their remaining lifetime), based on: retirement projected to the age of 67, lifetime value added tax contributions, and social insurance contributions. These three contributions reflect the financial value to the Dutch government from the changes in tax revenue, linked to infection rates.

The budget needed for vaccinating a cohort of individuals aged 50 years in 2012 was estimated to be **€136 million,** which includes annual costs for influenza vaccination for the remainder of life. These costs were based on historical evidence of influenza vaccination coverage rates of 77%, and were extended to all vaccines. In return, the adult immunisation programme for the seven main infectious diseases in the Netherlands was projected to:

- **Prevent 34,528 infectious disease cases** over the remaining life span.
- Prevent roughly **5,782 premature deaths from infections.**
- **Reduce the number of lost work days by 127,480 days** with an estimate of 29 fewer disability cases over the remaining number working years for those vaccinated at 50-years of age.
- **Generate health cost savings reaching €6.6 million** and an **additional €4.2 million in social insurance savings** paid towards disability and sick day payments to workers.
- **Generate future lifetime tax contributions** from implementing adult vaccination, which would result in a **revenue gain of €537 million** over the remaining life years of the cohort.



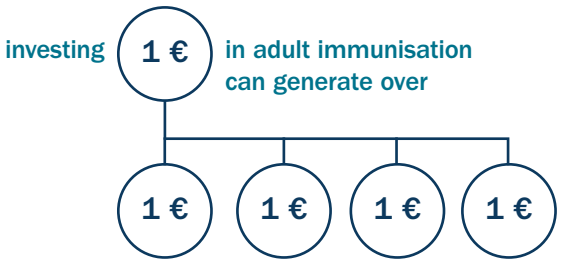
The project revenue gains yielded a benefit-cost ratio of 4.02, suggesting that for **every €1 invested in adult vaccination commencing at the age of 50 years would yield €4.02 over the remaining lifetime of the cohort.** The economic consequences of reducing the number of infectious cases in adults was projected to yield a range of benefits for government including medical cost savings, reduced disability costs and increased tax revenue linked to labour force activity. These findings are consistent with the SHARE study (2005) which demonstrated that older populations, despite diminishing earnings, have a significant residual societal and fiscal value (i.e. disposable income and consumption), which translates into tax revenue for the government.

Impact of adult vaccination on government costs (i.e. transfers) and tax revenue over lifetime of 50-year old cohort in the Netherlands

Government budget item	Value	Incremental Fiscal impact
Medical cost-savings	Savings	€6.651.724
Productivity loss (social insurance)	Savings	€4.199.281
Prevented disability costs	Savings	€502.426
Gross discounted tax	Revenue	€537.394.410

Although this analysis is specific to the Netherlands, the **results are relevant for countries across Europe, because they share many features in terms of tax burden and social transfer costs** [European Commission 1999]. Whilst there could be some variation across Europe, one would expect to find **consistency in terms of the productivity gains and associated gross tax revenue linked with adult immunisation.** This analysis is relevant not only to countries with tax-funded health systems but also to countries with high rates of private health care. In the former, strategies increasing tax revenues are core to sustaining an effective healthcare system.

Keeping healthy and productive people in the workforce is a key priority for public debt sustainability and for economic growth. Health may positively impact the economy through several channels, while increased tax revenue may be channelled to public investments that stimulate the economy. **Investments in adult immunisation are estimated to yield positive benefits for government in terms of cost savings and increased tax revenue: an investment in vaccination of €1 is likely to provide over €4 of future economic revenue for government.**



of future economic revenue for government (case study in the Netherlands)

2.4 TACKLING THE RISKS OF AN AGEING SOCIETY

The above findings are an important consideration for the development of future health policies, not least given the fiscal challenges associated with an ageing population. In coming generations, the **opportunities for economic growth will be under threat due to fewer numbers of working aged adults supporting tax financed public programmes.** In this context, the importance of a healthy workforce for maintaining economic growth highlights the need for adult immunisation programmes [Connolly 2010].

The demographic shift in Europe also poses challenges for health services, including **meeting the healthcare needs of both an ageing population and those working and supporting publicly financed programmes.** As populations continue to age the demand on health services for those aged 65 years and older is likely to increase, while the proportion of people supporting tax-funded health systems starts to decline. UK estimates suggest that 50% of healthcare spending is targeted at those over the age of 65 years [NHS]. This situation also poses major healthcare workforce challenges: the European Commission estimates a potential **shortfall of around one million healthcare workers by 2020.** This means that **around 15% of total care will not be covered** compared to 2010, raising concerns over **patient safety and quality of care** [European Commission 2012].

Given the demands of an ageing population on public finances, and the potentially increased tax burden on those working, commentators have suggested that age-related expenditure patterns could lead to **intergenerational conflict** [Binstock 2010, Walker 1990]. Indeed, research into intergenerational inequity has noted a **steady deterioration in intergenerational fairness over the past two decades, with increasing burden being placed on younger generations** [Leach 2012].

In the interest of achieving many of the goals of fiscal sustainability, improved productivity and labour force participation, European policy makers should consider life-course immunisation and comprehensive adult immunisation programmes as an important policy option. It can both improve the welfare of society, and also influence a broad range of economic outcomes.

SECTION 3:

ADULT IMMUNISATION: POLICY GAPS AND BARRIERS

3. Adult immunisation: policy gaps and barriers

This chapter analyses existing adult immunisation strategies across 27 EU Member States to identify policy gaps and barriers in access to vaccines. Despite the demonstrated benefits of life-course immunisation, adult vaccination remains an underused public health strategy to promote healthy ageing in Europe [Michel 2010]. Adult vaccination coverage rates (VCRs) are often low and vary across European countries. They are also significantly lower than early childhood vaccination rates.

Previous research on influenza vaccination policies among older people in European countries has established that the presence of certain national policy elements may increase VCRs [Blank 2012]:

- ✓ *Good monitoring systems regarding vaccine uptake rates*
- ✓ *Setting national objectives*
- ✓ *Incentives for healthcare professionals*
- ✓ *Leadership from healthcare professionals in recommending vaccination to patients*
- ✓ *Vaccination reimbursement systems*
- ✓ *Awareness campaigns and clear VCRs objectives*
- ✓ *Broad information and reminding systems*
- ✓ *Strong official recommendations*
- ✓ *Easy access to the vaccines*

However, a systematic review of national adult immunisation policies in Europe, forming a core part of this Report, highlights significant policy gaps and barriers:

- *Age-based recommendations, which allow individuals to assess their own status with regard to vaccination, are not applied to all diseases. When they are, the age of recommended vaccination varies across countries.*
- *Countries often recommend vaccination for certain at-risk groups only. The definition of what constitutes an at-risk group also varies across countries.*
- *The lack of implementation of these recommendations may be linked to limited vaccination reimbursement systems and access to vaccines.*
- *Coupled with limited awareness and promotion of adult vaccination schedules by healthcare professionals and health authorities, it may result in low and inconsistent uptake.*

Furthermore, disparities exist between Western countries on the one hand and Central and Eastern European (CEE) countries on the other hand, with CEE countries often performing less well:[1]

- *Only one CEE country, Estonia, has a healthy ageing policy framework, identifiable through available government documentation, in place.*
- *Countries that perform the poorest in terms of seasonal influenza vaccination uptake are from the CEE region: the four countries with the lowest recorded levels are Estonia, Latvia, Poland and Slovenia with results of 1.1%, 1.7%, 14.2% and 16.2% respectively.*
- *The trend in CEE countries is to recommend fewer vaccines for which funding mechanisms would need to be provided.*
- *This is not a uniform rule: some CEE countries perform well whilst some Western countries perform well whilst some Western countries perform less well. For instance, Luxembourg and Sweden perform moderately in terms of uptake of seasonal influenza vaccination, with 45.1% and 44% respectively.*

3.1 INCONSISTENT RECOMMENDATIONS

12 EU Member States have **healthy ageing strategies or policies** in place that can be identified through government documentation: Austria, Denmark, Spain, Finland, Greece, Ireland, Italy, Malta, Estonia, Portugal, Sweden and the UK. However, in most cases these strategies do not incorporate adult immunisation.

Most EU Member States also fail to acknowledge the importance of establishing an **adult immunisation schedule, especially for adults aged above 50 years.** There are only a few EU Member States which operate a document with specific age-based recommendations for adult vaccination against each of the main infectious diseases.

Furthermore, there are wide variations across the Member States in the **official recommendations for adult vaccination** against the main infectious diseases looked at in this report:

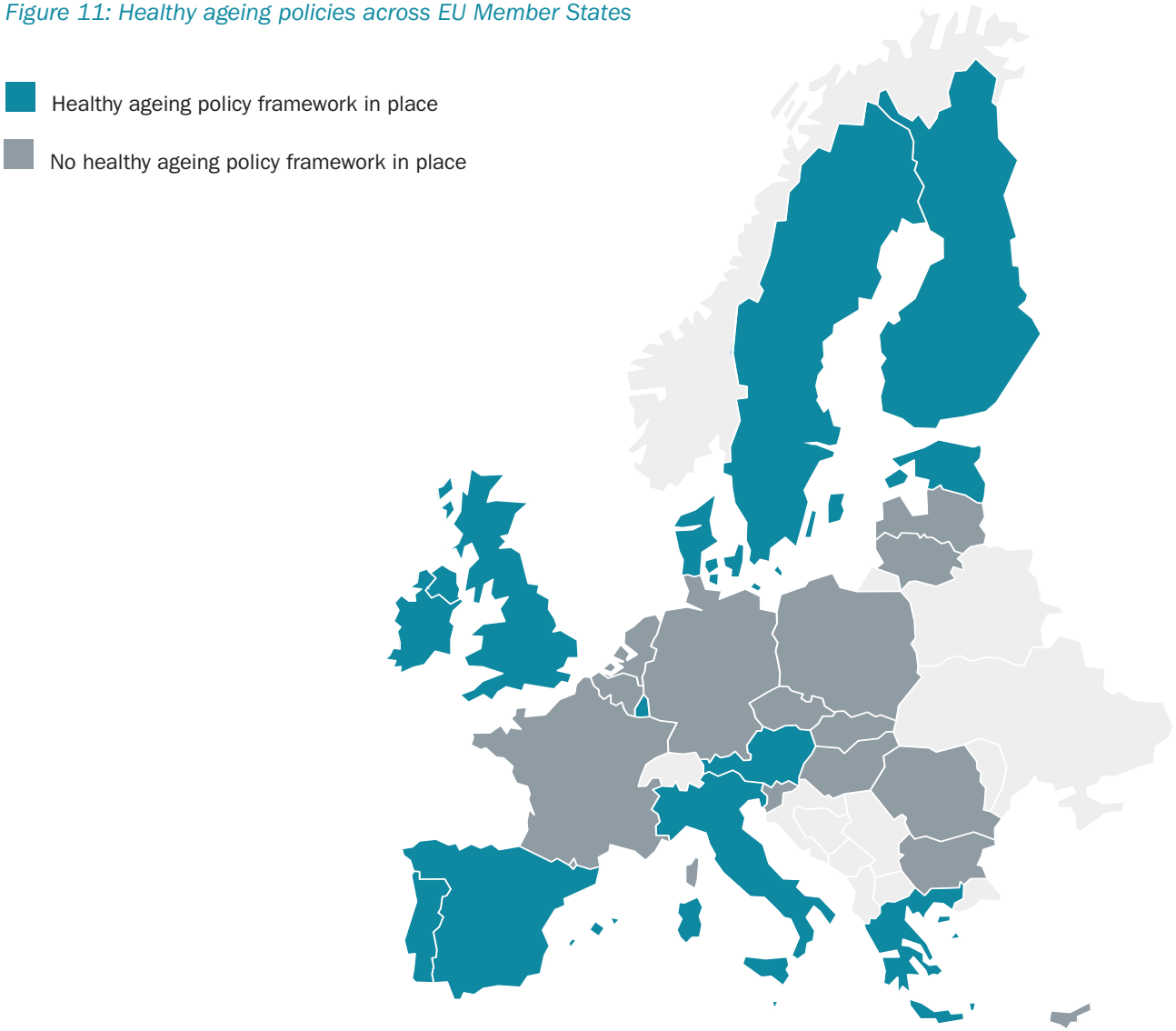
- All countries operate **age-based recommendations** for adults for seasonal influenza, but only 17 for

[1] North/West/Mediterranean countries: UK, Belgium, Austria, Germany, Sweden, Denmark, Finland, Denmark, Netherlands, Luxembourg, Ireland, Spain, Italy, France, Portugal, Cyprus, Malta, Greece. CEE countries: Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia.

IPD and three for herpes zoster. Diphtheria and tetanus are recommended as boosters in 22 countries, with pertussis being sometimes recommended in combination.

- The **age of recommended vaccination** varies across countries: respectively 20 and 12 countries recommend vaccination against influenza and IPD at the age of 65 years; other countries recommend vaccination earlier; the age recommendation for herpes zoster vaccination varies between 50, 60 and 70 years; and some countries recommend other tetanus and diphtheria boosters than the 10-year booster recommended in 18 countries.
- In **Italy and Spain,** recommendations vary across regions. This can result in variations in communication plans and lower coverage rates.

Figure 11: Healthy ageing policies across EU Member States



A detailed overview of local policies and barriers in each EU Member State is included in the country snapshots at the end of this report.

Figure 12: Age/booster recommendation

AGE OF SEASONAL INFLUENZA RECOMMENDATION

50	Austria
55	Poland, Malta
59	Slovakia
60	Germany, Greece, Netherlands
65	Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Portugal, Romania, Slovenia, Spain, Sweden, United Kingdom

AGE OF INVASIVE PNEUMOCOCCAL DISEASE (IPD) RECOMMENDATION

50	Austria, Greece
59	Slovakia
60	Germany, Luxembourg
65	Belgium, Bulgaria, Denmark, Estonia, Hungary, Ireland, Lithuania, Poland, Slovenia, Spain, Sweden, United Kingdom

AGE OF HERPES ZOSTER RECOMMENDATION

50	Austria, Germany (Saxony)
60	Greece
70-79	United Kingdom (as a one-off inoculation)

BOOSTER TETANUS & DIPHTHERIA

10 year	Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Poland, Portugal, Slovenia, Spain
15 year	Romania, Slovakia
20 year	France

BOOSTER PERTUSSIS

10 year	Austria

Note:
Czech Republic: booster every 10-15 years and certain at risk groups (recommended ages: 30, 50, 65, 75, 85) for tetanus & diphteria. One-off inoculation for pertussis
France: pertussis is recommended at the age of 25 and for parents planning to start a family, pregnant women and family members during pregnancy, and for women who have recently given birth ; dTap vaccine (booster to be taken at the age of: 25, 45, 65 and at ten year intervals thereafter
Greece: Pertussis is recommended for all adults who have not been vaccinated, in combination with tetanus and diphtheria, once before the age of 65
Poland: IPD vaccination is recommended at the age of 50 and 65 (different vaccines are administered).
United Kingdom: one-off inoculation for herpes zoster ; tetanus & diphtheria: as a booster (5 inoculations throughout the life-course).

National authorities sometimes recommend **vaccination for at-risk groups only.** When they do, a high level of inconsistency is found in the definition of "at risk groups" and in the information available to the public on these groups:[1]

- All countries recommend that those with certain **chronic medical conditions** (e.g. pulmonary disease, cardiovascular disease, kidney disease) receive seasonal influenza vaccination.
- Fewer countries operate seasonal influenza vaccination recommendations for **other categories** (e.g. pregnant women, those with occupational risks).
- A high proportion of countries that recommend **IPD** vaccination also make a recommendation for those with certain chronic medical conditions.
- The provision of public information on at-risk groups for **tetanus, diphtheria, pertussis and herpes zoster** is very inconsistent across Europe.

In general, **vaccination against pertussis and herpes zoster is recommended far less frequently** compared to seasonal influenza, IPD, diphtheria and tetanus, with various modalities of recommendation and administration:

- For instance, Belgium only recommends **pertussis** vaccination for certain at risk groups.
- Among the few countries that recommend **herpes zoster** vaccination, only the UK has a clear and effectively funded programme to support its recommendation, which comes into effect as of September 2013.

[1] The reader must be informed that in the interest of streamlining the report, to allow for meaningful and manageable analysis, some analytical items were not examined. Notably, the full range of at risk groups for which vaccination can be recommended have not been captured within this analysis, rather the research has sought to capture the most consistently recommended at risk groups. Inconsistent availability of data with regards to at risk groups for certain diseases (e.g. pertussis, diphtheria and tetanus) limit the research results further.

Figure 13:
Risk based recommendation for seasonal influenza and invasive pneumococcal disease

	Seasonal Influenza								Invasive Pneumococcal Disease (IPD)								
	Chronic pulmonary disease	Chronic cardiovascular disease	Chronic kidney diseases	Haematological or metabolic diseases	Immunodeficiencies	Pregnant women	Health care professionals	Long-term residents of care facilities	Asplenia or dysfuntion of the spine	Chronic respiratory disease	Chronic heart disease	Chronic kidney disease	Chronic liver disease	Diabetes	Immunosupression	Individuals with cochlear implants	Individuals with cerebrospinal fluid leaks
Austria	✓	✓	✓	✓	✓	✓	✓			✓	✓				✓		
Belgium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓
Bulgaria	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		
Cyprus	✓	✓	✓	✓	✓	✓	✓	✓									
Czech Republic	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓			
Denmark	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		✓		
Estonia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Finland	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	
France	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		
Germany	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		
Greece	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		
Hungary	✓	✓	✓	✓	✓	✓	✓	✓									
Ireland	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓			✓		
Italy	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	
Latvia	✓	✓	✓	✓	✓		✓	✓									
Lithuania	✓	✓	✓	✓	✓	✓	✓	✓									
Luxembourg	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	
Malta	✓	✓	✓	✓	✓		✓	✓									
Netherlands	✓	✓	✓	✓	✓		✓	✓		✓	✓		✓				
Poland	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Portugal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	
Romania	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
Slovakia	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓				✓		✓
Slovenia	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓
Spain	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Sweden	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓		
United Kingdom	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	27	27	27	27	27	22	26	24	17	19	19	17	10	14	19	10	7

☐ ☐ no at-risk groups identified

3.2 LACK OF IMPLEMENTATION OF ADULT RECOMMENDATIONS

These recommendations are not consistently followed across Europe, as shown by **low uptake rates for adult vaccination recommendations:**

- **Seasonal influenza** is the disease for which age-based guidelines and uptake monitoring are applied most consistently.[1] Nonetheless, **adult vaccination rates remain limited [Blank 2012] and vary considerably across Europe** – from 1.1% in Estonia to 77.2% in the Netherlands (people aged over 65 years). A steady decrease in uptake in adults has been observed in eight European countries from the 2009-10 season to the 2011-12 season, which may be related to lower levels of public trust after the pandemic season.[2]

US ADULT IMMUNISATION SCHEDULE:

- Adults are recommended to receive vaccinations for influenza, tetanus, diphtheria, herpes zoster and IPD.
- The Advisory Committee on Immunisation Practices (ACIP) revises vaccine recommendations every 3-5 years.
- A national survey was conducted in 2007 and demonstrated high results for seasonal influenza and IPD: 71.6% for seasonal influenza, 27.7% for tetanus and diphtheria (dTap), 68.6% for IPD and 2.8% for herpes zoster (vaccination had just started).
- Uptake is assessed through surveys, which may be less reliable than other means such as registry results.

This example (and others proposed by European geriatric societies and experts) may be useful as template for adult immunisation schedules in Europe.

- Public information for **IPD** is only available in a few countries. Uptake is also low and inconsistent: 1% in at risk groups in Denmark, 13% in those aged over 60 years in Belgium (2008), 41% in Ireland (2006) and 69% in the UK (2008).
- Available data for **diptheria and tetanus** show higher uptake levels: 61% of adults aged above 18 years in Belgium (2008), 74% of adults above 26 years in Bulgaria (2009), 63% of women and 67% of men in certain at risk groups in Germany (2009), 62% of adults above 25 years in Latvia (2009) and 61% of adults above 65 years in 2010 in Portugal.[3]
- Despite strong recommendations from a majority of countries, **vaccination rates among HCPs themselves remain low.** For instance, the seasonal influenza vaccination rate among HCPs in Europe is **below 30%** [Michel 2010].[4] Common reasons may include lack of awareness of the risk and of the availability of vaccines and lack of time [Michel 2010]. In such circumstances, **HCPs struggle to set an example** to the adult population.

This low and inconsistent uptake of adult immunisation recommendations may be linked to **a combination of factors,** including:

- Limited reimbursement and access to the vaccines
- Inconsistent monitoring of uptake for recommended vaccinations
- Gaps in public knowledge and awareness
- Limited promotion of adult vaccination schedules by health authorities
- Lack of leadership from healthcare professionals in recommending vaccination to patients
- Inconsistent monitoring and surveillance systems

The sections below describe these gaps in greater detail.

[1] All countries operate an age-based recommendation, 22 countries measure uptake and the WHO has set a specific target of 75% of the population aged 65+ [WHA 56.19] which has been completed by a Council Recommendation in 2009.
[2] These countries are: France (62.7% to 54%), Luxembourg (52.4% to 45.1%), Netherlands (81.1% to 77.2%), Portugal (52.2% to 43.4%), Romania (28.5% to 20.9%), Slovakia (30.5% to 21.9%), Slovenia (22.1% to 16.2%) & Spain (65.7% to 57.5%)
[3] Uptake data for tetanus & diphtheria vaccination is also available in France. However, the French data have been measured through surveys performed at different times (34% in 2002, 73% of 18+ years in 2009) and are believed to be unreliable: vaccine administered in combination.
[4] The French Institute for Health Surveillance also notes that uptake of non-mandatory vaccines in HCPs in France is low: 25% of HCPs are vaccinated against seasonal influenza and 11% are up-to-date with pertussis boosters, as opposed to a 90% uptake for mandatory vaccines [Guthmann 2009].

UPTAKE TARGETS IN EUROPE:

- The WHO has set a specific **seasonal influenza vaccination target of 75% of the population aged over 65** years [WHA 56.19] which has been completed by an EU Council Recommendation in 2009. Targets are also set for at risk groups and healthcare professionals.
- 8 EU Member States have set **national seasonal influenza vaccination targets,** among which six have taken the 75% target as a reference. The Netherlands has set a target of 100%.
- Often, national targets are set for **at risk groups only.**
- Often, **targets are not defined for infectious diseases** other than influenza.

3.3 LIMITED REIMBURSEMENT AND ACCESS TO THE VACCINES

The provision of free or partially free vaccines increases the volume of individuals willing to receive vaccination, particularly if people remain unaware of the risks and benefits [Michel 2010]. A review of government funding systems for adult immunisation in place across Europe shows that **reimbursement of adult vaccines is often limited**:

- The two substantive types of reimbursement systems[1] looked at are **government funding** (the cost of the vaccine is totally paid by the government to the vaccine' recipient) and **partial funding** (the vaccine' recipient bears a share of the cost whilst the government covers the rest).
- **Life-course vaccination against tetanus and diphtheria received high governmental support** (20 countries cover the cost of vaccination totally or partially). The relatively lower cost of vaccination may explain why it is more broadly recommended and reimbursed, even in Central and Eastern European countries.
- **For seasonal influenza, 21 countries** have a full funding mechanism in place (for some groups only in 6 countries) and three countries have a partial payment system in place for those falling within their aged-based recommendations.
- Among the countries that recommend **IPD vaccination,** 14 have a government funding mechanism in place (Cyprus, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Poland, Slovakia, Spain, Sweden and the UK).

[1] The reader must be informed that in the interest of streamlining the report, to allow for meaningful and manageable analysis, some analytical items were not examined. In relation to vaccine funding specifically, the research did not seek to measure funding arrangements that included financial assistance from employers or health insurers, but rather assessed funding through broader analytical categories.

Figure 14: Funding schemes operated for recommended vaccines

Note:
***Belgium:** government funding only in Flemish communities
* **Greece, Ireland:** for some groups only

3.4 INCONSISTENT MONITORING OF UPTAKE FOR RECOMMENDED ADULT VACCINATIONS

In comparison to paediatric immunisation strategies, adult campaigns tend to suffer from inadequate data collection, especially in terms of measuring vaccination uptake. This renders evaluation of adult vaccination strategies more challenging:

- Uptake data are available in 22 countries for seasonal influenza, but only 6 countries for diphtheria and tetanus and 4 countries for IPD.
- No information is available for pertussis and herpes zoster.
- A variety of monitoring systems are established.
- Data vary significantly reflecting the variety of systems used (i.e. computerised registries, surveys, GP reporting or administrative methods that record the number of vaccinations administered).
- Current systems are fraught with significant concerns regarding their accuracy.
- The UK's computerised registry can be considered good practice as it offers close to real-time assessment of the percentage of the population that has received the vaccination.

Figure 15: Adult immunisation frameworks in place for the main vaccine-preventable diseases

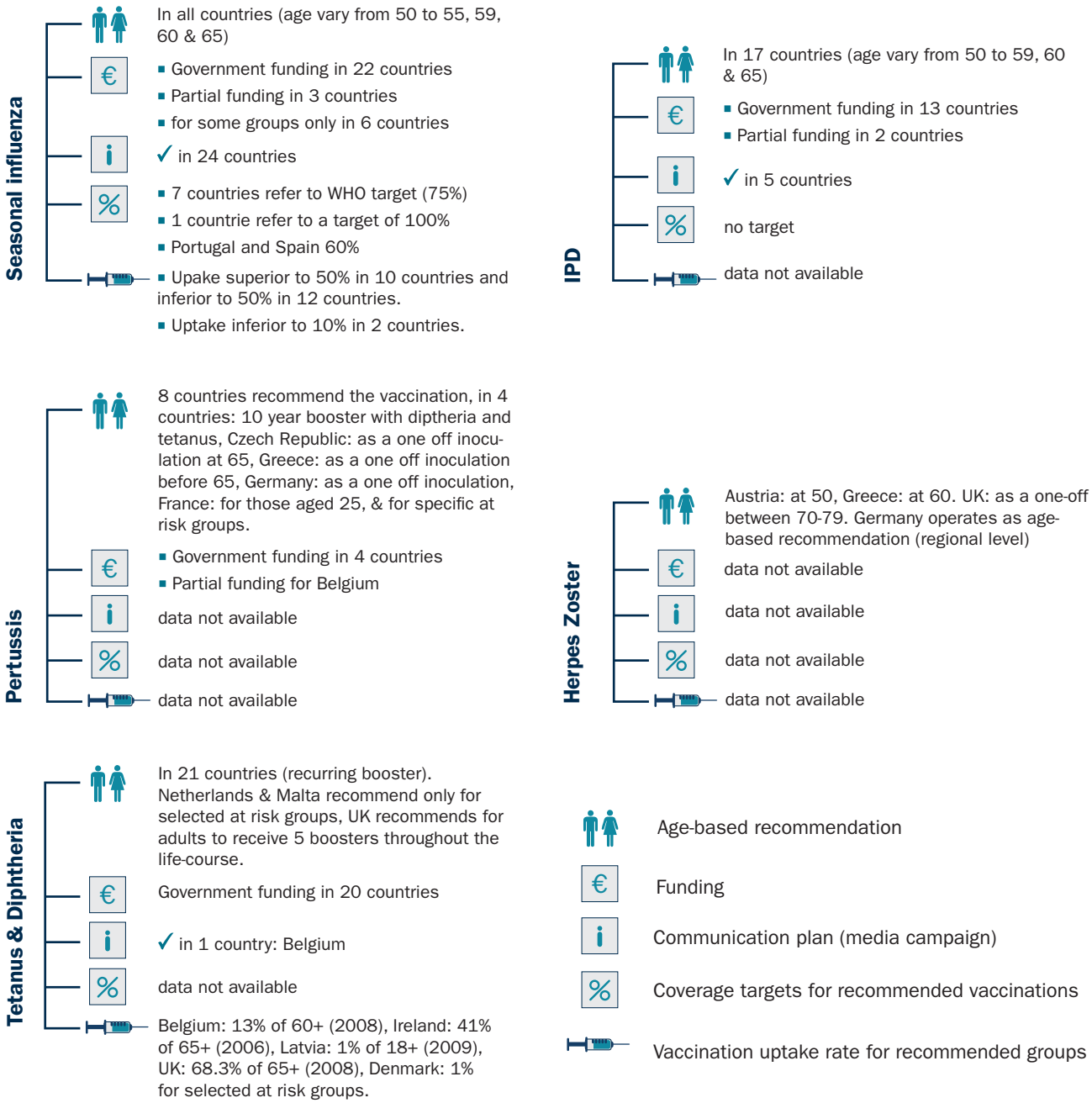


Figure 16: Adult immunisation policies against seasonal influenza

SEASONAL INFLUENZA & COMMUNICATION PLANS

Government funding for the recommended vaccines

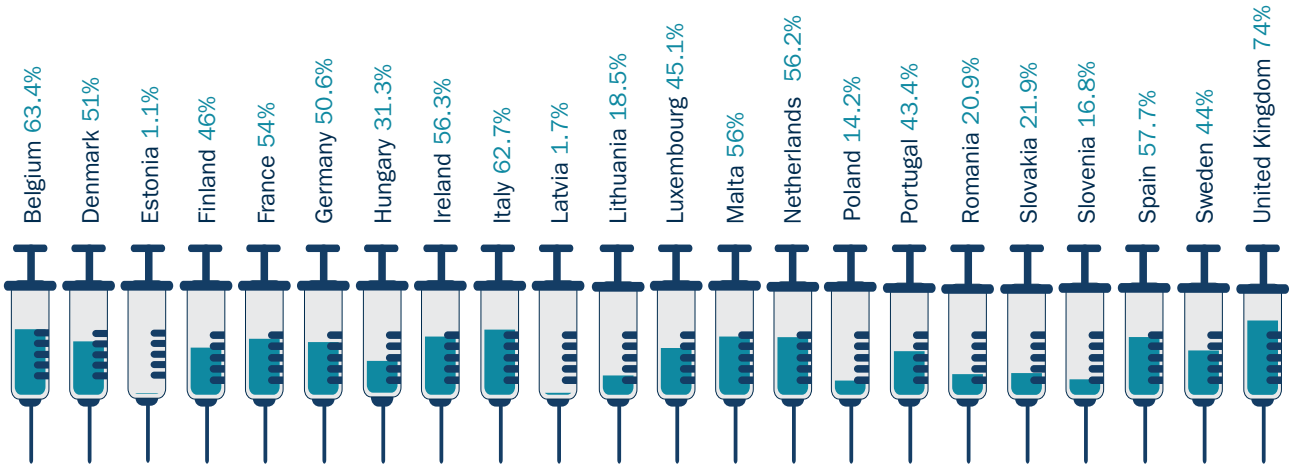
Partial funding for the recommended vaccines

Communication plan in place

SEASONAL INFLUENZA AGE RECOMMENDATION

50	Austria
55	Poland, Malta
59	Slovakia
60	Germany, Greece, Netherlands
65	Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Portugal, Romania, Slovenia, Spain, Sweden, United Kingdom

RECORDED SEASONAL INFLUENZA UPTAKE DATA FOR THE SEASON 2011-12



Note:
A few countries do not have data available for the season 2011-12. In these instances, the last recorded season has been taken as a basis for reference: 2003-04 season in Belgium, 2009-10 season in Finland, 2010-11 season in Malta, Estonia and Germany. Austria, Bulgaria, Greece, Cyprus and Czech Republic do not record uptake.

3.5 LIMITED AWARENESS AND PROMOTION OF ADULT VACCINATION SCHEDULES BY HEALTH SERVICES AND HEALTHCARE PROFESSIONALS

Another important policy factor is how the beliefs and attitudes of the public, as well as promotion by health-care professionals (HCPs), may influence uptake of life-course immunisation. Since there is limited information available on this, a series of one-to-one interviews with a core group of SAATI partners[1] took place to gather expert views in an attempt to bridge this gap. The findings of this survey, complemented by the findings of a survey of public health authorities on the drivers underpinning the limited utilisation of vaccination throughout the lifespan, commissioned by Vaccines Europe in 2012[2], are presented below.

3.5.1 LACK OF KNOWLEDGE AND INDIFFERENCE MAY CONTRIBUTE TO A LOW IMMUNISATION UPTAKE BY ADULTS

Many adults tend to consider that infectious diseases are "problems of the past" and that they do not need to get vaccinated. This may be due to several factors:

- A proportion of the (young) adult population has not experienced the impact of an infectious disease outbreak [Vaccines Europe 2013].
- Healthy adults, who may get vaccinated when travelling, will not necessarily **perceive themselves as being at risk** at home. They may also overlook the **risks that they present to other members of the community** (e.g. unvaccinated infants, older people).
- There are **few opportunities for adults (especially healthy adults) to interact with health services** to receive information on infectious diseases [Vaccines Europe 2013].
- **Doctors, patients and vaccine delivery services do not have an accurate immunisation history for adult patients,** who often do not know which vaccines (if any) they have received or if their booster programme is up-to-date [Michel 2010].[3]
- Fears and false perceptions (e.g. the perception that antibiotics can treat all infectious diseases easily, fear of the side effects of vaccines, fear of the needle).

Such complacent attitudes and knowledge gaps are a driver of poor demand for life-course immunisation [Vaccines Europe 2013].

Efforts to increase uptake of immunisation in adults should therefore focus more on:

- Improving the understanding of infectious diseases and vaccines in the adult population.
- Developing **self-management tools** and **empowering patients** track their personal immunisation status actively throughout life: vaccination passports are currently often reserved for children, pets and travelling adults; the development of a **European vaccination passport template** could be a means to help promote life-course immunisation.

> « *The attitudes towards infectious diseases tend to be a mix of lack of awareness and indifference, combined with a poor understanding of the benefits and risks of vaccines.* **Hildrun Sundseth,** European Institute of Women's Health (EIWH) »

3.5.2 CONTINUED INVESTMENT IN CAMPAIGNS TO INFORM THE PUBLIC OF ADULT SCHEDULES ARE NEEDED

Recent ECDC research has shown that immunisation uptake can also be improved by **public campaigns that promote national vaccines schedules** [ECDC 2012]. However, there is a perception that the state will advise citizens on what vaccines they should have rather than those they could benefit from [Vaccines Europe 2013]: only the Flemish region in Belgium informs the public about tetanus and diphtheria vaccine, and campaigns to encourage adult vaccination against IPD are only found in a few countries (e.g. Belgium, Greece, Hungary and Spain – and mentioned as part of influenza campaign in Ireland). These gaps may impact immunisation uptake negatively.

Another major challenge today is that the environment in which such campaigns are performed is not favourable. Public trust in information issued by national health services on immunisation has been undermined during the last influenza pandemic season in a number of EU Member States. Discus-

[1] A detailed list of interviewees can be found in the Appendix.

[2] The study is based on one-to-one interviews with 22 relevant country- and EU-level stakeholders (e.g. national payers, Vaccine Committee members, health authorities, ECDC and European Commission representatives, Scientific Advisory groups) across five EU Member States (France, Italy, Netherlands, Poland, UK).

[3] Established systems exist to track children's record of immunisation history, allowing an easy follow-up with parents. However, at later stages of life, when citizens become increasingly mobile and receive vaccinations from different sources, an **accurate immunisation** history cannot be maintained and vaccine delivery services cannot proactively target citizens for immunisations. Efforts invested in targeting and following up processes also vary, which results in fragmented access opportunities across localities [Vaccines Europe 2013].

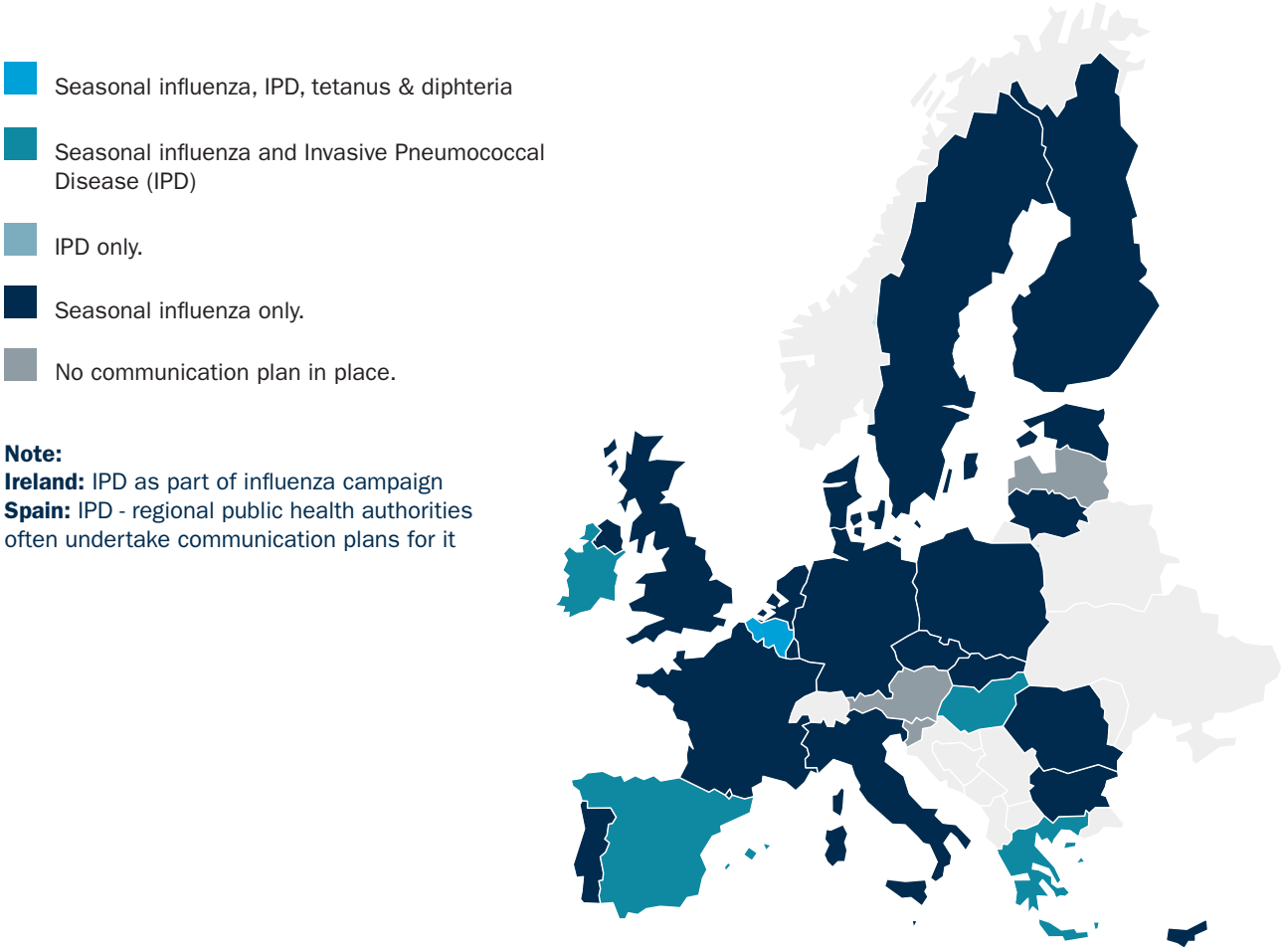
sions with SAATI partners highlighted that although the industry has a necessary role to play in providing transparent information to public authorities and HCPs on the safety and the efficacy of vaccines, industry involvement in public campaigns may have been perceived negatively in some countries.

Given the positive impact of promotional communications on knowledge and behaviour, and the challenges faced, **governments should invest in health literacy campaigns to improve the knowledge of infectious diseases, and health campaigns to improve awareness of schedules.**

The following factors could improve the effectiveness of such campaigns:

- Providing **information** about target diseases and their consequences, as well as the safety, the efficacy and the potential side effects of vaccines.
- **Motivating** adults by convincing them that not being vaccinated will put others at risk.
- Taking into account the needs of **specific population groups (such as men, migrant workers).** This would include **developing behavioural research around immunisation,** targeting campaigns to specific groups and tailoring messages, taking into account cultural, gender-related & age-specific differences that inform vaccine-hesitant or vaccine-resistant behaviour.
- **Expanding access to vaccines** as part of adult schedule promotional campaigns. This can be achieved by making immunisation available in convenient settings [Michel 2010], revising national policy frameworks to **expand the types of settings where vaccines are available** (such as the workplace, pharmacies or supermarkets) and convincing employers and trade unions of the economic case to support workplace-related vaccination programmes.

Figure 17: Government communication plans (media campaigns) to encourage vaccination



Note:
Ireland: IPD as part of influenza campaign
Spain: IPD - regional public health authorities often undertake communication plans for it

3.5.3 LACK OF LEADERSHIP FROM HEALTHCARE PROFESSIONALS (HCPs)

Recommendation by HCPs to their patients has been shown to be positively linked to vaccination rates. HCP leadership is therefore an important element of effective life-course immunisation strategies.

There is however a perception that HCPs do not always provide **accurate information** to citizens on immunisation. This may be due to a variety of factors:

- **Not enough information about immunisation and poor understanding of the benefits of new vaccines and their potential side effects:** medical schools do not always place sufficient focus on immunisation within their curricula [Vaccines Europe 2013]. Some SAATI experts have even identified a knowledge gap due to the standards of immunology education in medical universities. General practitioners (GPs) do not engage enough in **continuous professional development** and may lack up to date information [Vaccines Europe 2013].

> *We need to improve training and to provide HCPs with the right tools and resources to take on a more prominent role in adult vaccination.* **Prof. E. Ludwig,** Szent László Teaching Hospital

- **Lack of time, incentives, proactive reminding systems and tools for GPs** to effectively discuss immunisation with patients [Michel 2010]: GP remuneration systems are not focused on ensuring immunisation coverage at all stages of life. Given this, there is little incentive for GPs to highlight the benefits of immunisation to adult patients. GPs also have limited time during the patient-doctor consultation period, and are likely to have other health targets to meet (e.g. blood pressure, diabetes, cholesterol screening) [Vaccines Europe 2013].

> *To improve immunisation uptake, we must understand the needs of specific groups showing vaccine-resistant behaviours better. For instance, men have a tendency to react differently to health information than women and to not to take part in screening, testing or vaccination programmes.* **Dr. Ian Banks,** European Men's Health Forum (EMHF)

- Some HCPs may be **reluctant to recommend vaccines to healthy adults** and prefer to prescribe antibiotics to sick patients.
- **Divergent advice and mixed messages** from HCPs can confuse patients [Vaccines Europe 2013] and undermine uptake in the adult population [Gautier 2008].

The above factors point to a need for **effective interventions towards HCPs** to increase their uptake and to support successful adult vaccination programmes [Michel 2010]. **HCPs (especially GPs, pharmacists, nurses and specialists in charge of at-risk patients)** must embrace their role as informers and providers for adult immunisation, the same way as paediatricians do for childhood immunisation.

Support from public health services to HCPs is needed to ensure they fulfil this role effectively:

- **Specific education and training, and information for communication to the public:** HCPs should be equipped with appropriate tools to track the personal vaccination status of their patients and support vaccination uptake monitoring. National health systems integrating adult immunisation into Electronic Medical Records (EMRs) and adult immunisation registries would help doctors keep track of the immunisation status of their patients.
- **Incentives for GPs to promote and prioritise life-course immunisation:** previous research has highlighted the benefits of incentives, for example time- and/or resource-related (e.g. the provision of integrated systems that help to initiate discussions with patients and implement vaccines schedules). Incentives can also be audit-based and relate to achieving targets and monitoring[1] [Michel 2010].

3.5.4 BROADER SOCIETAL INVOLVEMENT COULD INFLUENCE IMMUNISATION UPTAKE POSITIVELY

The wide availability of **misinformation online and through the broadcast media** may also have a negative effect on public confidence in immunisation [ECDC 2012]:

- **Anti-vaccine pressure groups** are powerful at driving negative messages regarding vaccines and making negative information publically available via **social media and the internet** [Vaccines Europe 2013].
- **Negative media reporting** can also create a lack of confidence in government healthcare policies and can cause people to reject public health initiatives.

To maintain or restore public confidence, official communications about vaccination should counterbalance

[1] In the UK, monitoring and publication of vaccination rates with GPs has improved performance. This demonstrates the use of monitoring and publishing data to make people aware of how they perform against set immunisation targets

misleading information from anti-vaccine pressure groups **by using consistent positive messages** from trusted and independent public sources and third parties. During discussions with SAATI partners, the **limited involvement of civil society** in that regard was emphasised as one of the factors influencing low uptake of life-course immunisation.

Convincing people to get vaccinated and building acceptance for national vaccines schedules is difficult. To be effective, efforts from public health services must be complemented by **multiple stakeholders, credible opinion formers and champions** (e.g. medical associations, non-profit organisations, patients' groups and community leaders). Non-profit and patients' organisations, which tend to benefit from a high level of credibility and trust should play a more active role to help shape perceptions in favour of immunisation and reinforce messages around the well-documented safety of vaccines.

3.6 GAPS IN THE EUROPEAN SURVEILLANCE AND REPORTING SYSTEM

Finally, the **burden of illness remains underestimated** in Europe due to inconsistent surveillance and monitoring systems, variations in the methodologies used, and, in some cases, underdiagnosis and underreporting (e.g. pertussis). The reporting of infectious diseases in Europe needs to be improved to ensure that valid data are available for public health decisions. Reliable and accurate epidemiological data may also help convince individual adults to get vaccinated to protect themselves and their communities. This section highlights the main gaps in the European surveillance and reporting system.

ECDC and WHO Europe, together with disease and vaccination networks, have successfully obtained incidence data for infectious diseases in Europe. The **comparability of the data has improved** since publication of the first ECDC epidemiological report in 2007 and the EU now has standard case definitions for the main diseases. Public health microbiology tests underlying the data are also becoming standardised as ECDC and its partners invest in strengthening laboratory cooperation [ECDC 2013].

However, **health and surveillance systems differ widely between Member States** and the relationship between reported cases rates and actual occurrence varies between countries for certain diseases. Obtaining standardised data over the whole EU is relatively advanced for the administrative health outcomes, e.g. hospitalisation and mortality. It is less comprehensive for diseases that require consensus over case definition and consistency about confirming a case. ECDC and iPRI have both pointed out **significant gaps in surveillance and reporting systems in Europe,** which are outlined below.

There are significant differences between countries in diseases rates, which may be due to random fluctuations or differences in national surveillance systems.[2] These **differences** have the following consequences:

- It is not feasible to give a reliable and robust summary of the incidence of seasonal influenza, pneumococcal diseases, herpes zoster and pertussis for the EU.
- For diphtheria and tetanus, case report data are relatively robust and an overall EU summary of relatively few cases each year is a reasonable summary.
- **Epidemiological data broken down by age and gender are not available** for the main infectious diseases in Europe.
- In the absence of reliable systems, **epidemiological data are likely underestimates.**

Other diseases, such as pertussis, are also likely to be underdiagnosed and underreported, complicating efforts to assess their burden and develop appropriate public health interventions. **Reporting** cases according to the agreed EU case definitions **remains a challenge** for some Member States [ECDC 2013] and the availability of administrative data in EU countries also varies significantly. For instance, all EU countries provide mortality data for pneumonia and influenza to the WHO database. In contrast, tetanus, diphtheria and pertussis, are not well covered; in 2005-11, only eight countries reported data on diphtheria mortality and 14 on pertussis.

A detailed overview of specific challenges in the surveillance systems for each of the main infectious diseases examined in this report can be found in Appendix 5.

[2] For example, France reported an age standardised pneumonia mortality rate of 9.07 per 100 000 in 2009 whereas the Netherlands reported 20.2 per 100 000. It is unlikely that such a large difference exists in neighbouring countries with similar socioeconomic standards. Similar differences also occur between Spain and Portugal. This suggests that different practices in countries contribute to the differences in reported rates rather than actual variation in incidence.

The speed with which epidemiological data becomes available at European level is also an issue. In many individual EU countries, national surveillance data are available within a year, or even less. **EU-wide data have a time lag of at least two years,** calling into question their value for guiding national programmes [ECDC 2013]. Finally, iPRI research shows that national data reported by each country are slightly different from those reported to ECDC and WHO. This is likely due to differences in definition, reporting period and reporting date.

SECTION 4:

CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

This report provides a **strong rationale for adopting a life-course approach to immunisation** within the context of healthy ageing. It illustrates the benefits of implementing **national adult immunisation programmes** (especially in those aged above 50 years) to protect the European population against the main vaccine-preventable diseases.

Beliefs persist that there is not enough evidence in Europe to justify implementing a life-course approach to immunisation in Europe. However, infectious diseases present a **high burden** to Europe's ageing society, which may even be **underestimated** due to shortfalls with epidemiological data across Europe (with issues of comparability, coverage and accuracy).

Without adult immunisation programmes, infectious diseases will continue to cause substantial morbidity and mortality, especially in late adulthood. Instead, such policies can bring **significant health and economic outcomes.** These include:

- Extending benefits beyond the individual patient to the **wider society** through herd protection and contributing to the **fight against antimicrobial resistance.**
- For herpes zoster, seasonal influenza, IPD and pneumonia, studies were found for 13 EU Member States that show immunisation is likely to provide a **cost-effective strategy** for those aged 50 years or over.

Furthermore, a **broader and more long-term view of vaccination** also shows its strongly beneficial economic consequences, for example, through its **effects on growth, productivity and workforce participation, as well as on tax and pension systems.**

In particular, evaluating investments in health and resulting changes in morbidity and mortality from a government perspective suggests that **every €1 invested in adult vaccination commencing at the age of 50 years would yield €4.02 of future economic revenue for government** over the remaining lifetime of the cohort (case study in the Netherlands).

This report has found that vaccination policy in EU Member States mainly focuses on the young (aged below 18 years), to some extent the old (aged above 65 years), especially for seasonal influenza, pneumococcal diseases and those in at-risk groups. The implementation of adult vaccination programmes and recommendations remains patchy and life-course immunisation is not viewed as a core part of national healthy ageing policies and prevention strategies when they exist. As a result, there are important **gaps in knowledge and awareness of:**

1) infectious diseases,
2) access to vaccines and reimbursement,
3) communication of national schedules,
4) data available on infectious diseases epidemiology,
5) monitoring of uptake for adult vaccination recommendations and
6) involvement from healthcare professionals.

To tackle these problems, **immunisation as a prevention strategy should be part of an age-based health approach throughout all phases of life.**

4.2 RECOMMENDATIONS - PRIORITISING LIFE-COURSE IMMUNISATION: A TOOLBOX FOR POLICYMAKERS

This section outlines **five recommendations** for EU and national policymakers to implement life-course immunisation strategies and to improve vaccination rates in adults especially aged 50+ years.

These recommendations draw on the research in the report, as well as on previous research on adult immunisation [e.g. Michel 2010, Blank 2012, Chlibek 2012]. They emphasise the **need for a comprehensive approach to life-course immunisation to protect EU citizens, including vulnerable groups, from infectious diseases:**

- **Incorporate life-course immunisation into healthy and active ageing policies, and public health and prevention strategies;**
- **Expand opportunities for citizens to receive vaccination;**
- **Improve the leadership of healthcare professionals;**
- **Strengthen health literacy and public communications; and**
- **Improve surveillance and monitoring.**

In today's economic climate, the workforce is getting older as the age of retirement increases, and there

is much movement of workers across borders. Therefore, a more joined-up approach between Member States and the EU on vaccination policymaking is important. The European Commission should play a role in setting the strategic framework to combat infectious diseases in the EU and guide national policymaking, while Member States should focus on implementing adult immunisation programmes and increasing vaccination uptake

1. Incorporate life-course immunisation into EU and national level healthy and active ageing policies or public health and prevention strategies to prevent infectious diseases

1.1 **At EU level,** the European Commission should set up a **European Platform to address Health and Vaccination across the life-course.** The European Platform, along with other stakeholders, **should identify and advance key policy strategies,** including:

- ✓ **Bring together key medical** societies and stakeholders with the aim to generate recommendations for adults on life-course immunisation and consensus among all stakeholders involved in adult vaccination (e.g. GPs, family physicians, chest physicians, internists, infectious disease specialists, microbiologists).
- ✓ In some EU countries vaccination levels are low and worrying. Therefore, there is a need to look at these special situations and propose specific solutions.
- ✓ Work towards the adoption of a **Council Recommendation on Life-Course Immunisation** to better align existing policies, facilitate the implementation of comprehensive vaccination policies and share practices.

1.2 At **national level,** in light of its positive impact on health, workforce participation and growth, EU Member States should consider **integrating life-course immunisation as a core strategy in their healthy ageing policy frameworks or public health and prevention strategies.** Other Member States should consider the opportunity to develop such frameworks or strategies incorporating life-course immunisation.

1.3 At European level, create a simplified evidence-based framework for an age-based adult vaccination schedule designed to promote a life-course approach to immunisation. This should not aim to replace national vaccination recommendations but instead **be a template that can be modified by national health authorities to meet the priorities, healthcare budgets and service infrastructures of individual EU Member States.**

- ✓ This template should be developed following the **issuing of clear guidance on an age-based vaccination schedule** by the European Advisory Committee, bringing together key medical societies and stakeholders.
- ✓ It should be developed on the basis of a **thorough review of existing adult vaccination guidelines,** such as those proposed by the EUGMS and IAGG-ER Working Party and the Central European Vaccination Awareness Group (CEVAG), the U.S. National Immunisation Schedule, other good practices in EU Member States (please refer to Appendix 3).
- ✓ It should include **vaccination against diseases that represent a high burden in adults** in terms of mortality and morbidity, such as those detailed in this report; influenza, pneumococcal diseases, pertussis, herpes zoster, diphtheria and tetanus.
- ✓ It should aim to **simplify vaccination recommendations** and to promote recommendations **by age groups,** alongside recommendations pertaining to certain at-risk groups, with a view to increasing compliance across the adult population.

2. Expand opportunities for the whole EU population to receive vaccination across the life-course as a part of national immunisation policies

2.1 Establish and sustain **national adult vaccination programmes (50+ years)** against the main vaccine-preventable diseases. The national adult vaccination-programmes should reflect the **success factors** identified in the research:

- ✓ Set take up targets, including for adults aged over 50 years
- ✓ Evaluate implementation and monitor uptake of the recommended vaccines
- ✓ Continue to invest in vaccination campaigns
- ✓ Decision-making processes must include the **transparent consultation** of relevant medical societies, patients' associations, industry and other bodies. **Physicians' professional bodies** must also be consulted and involved in implementing these programmes.

2.2 Include evidence based recommendations and ensure adequate reimbursement systems. In light of the demonstrated economic benefits of vaccination, all EU Member States should strategically prioritise life-course immunisation and give priority to reimbursing the vaccines that they recommend.

2.3 **Authorities should facilitate access to vaccines** through measures including:

- ✓ Promoting the availability of **alternative settings** for vaccination **than GP offices** (e.g. pharmacies), taking into account cultural differences in EU Member States, as well as their promotions by a wide range of HCPs (e.g. nurses, pharmacists, GPs, specialists).
- ✓ Encouraging the **involvement of employers and trade unions** in promoting vaccination to their employees.

2.4 Recommending and reimburse **routine well-care visits for adults aged 50+** to promote prevention.

2.5 National decision-makers should look at **alternative ways of funding vaccination, such as encouraging sick funds and health insurers to reimburse vaccination.**

3. Work with healthcare professionals (HCPs) to improve leadership in recommending immunisation across the life-course, as well as improving their own vaccination rates

3.1 Provide **education and training** as part of both the medical curricula and continuous professional development to improve the understanding and use of vaccination.

3.2 Encourage and motivate HCPs to become pro-active/take leadership in their approach to vaccination of older adults, drawing upon existing best practice in Member States.

3.3 **Monitor vaccination rates among HCPs** and their impact on population health status, on the basis of established national targets.

3.4 Promote ways for HCPs to check the vaccination status of patients (e.g. electronic medical records with computerised prompts).

3.5 All people involved in health and social care activities should be supported in getting vaccinated.

4. Strengthen health literacy for patients and the general public to improve attitudes and beliefs towards immunisation as a part of European and national policies

4.1 Encourage the inclusion of vaccination in **permanent electronic health records** and/or the use of **national vaccination passports** as part of a life-course immunisation approach, to give patients and their doctors means to self-assess their status with regards to vaccination.

4.2 Conduct **health literacy campaigns** to inform the population of infectious diseases and the safety and efficacy of vaccines, and to make adults more aware of the benefits of vaccination, not only to themselves but to others.

- ✓ Encourage medical associations, non-profit organisations, patients' groups, community leaders and the media to support positive messages around immunisation.
- ✓ Evaluate opportunities to make use of new digital and social media tools.

4.3 Improve **behavioural research** into the determinants of effective public communication campaigns, especially towards specific vaccine-resistant groups.

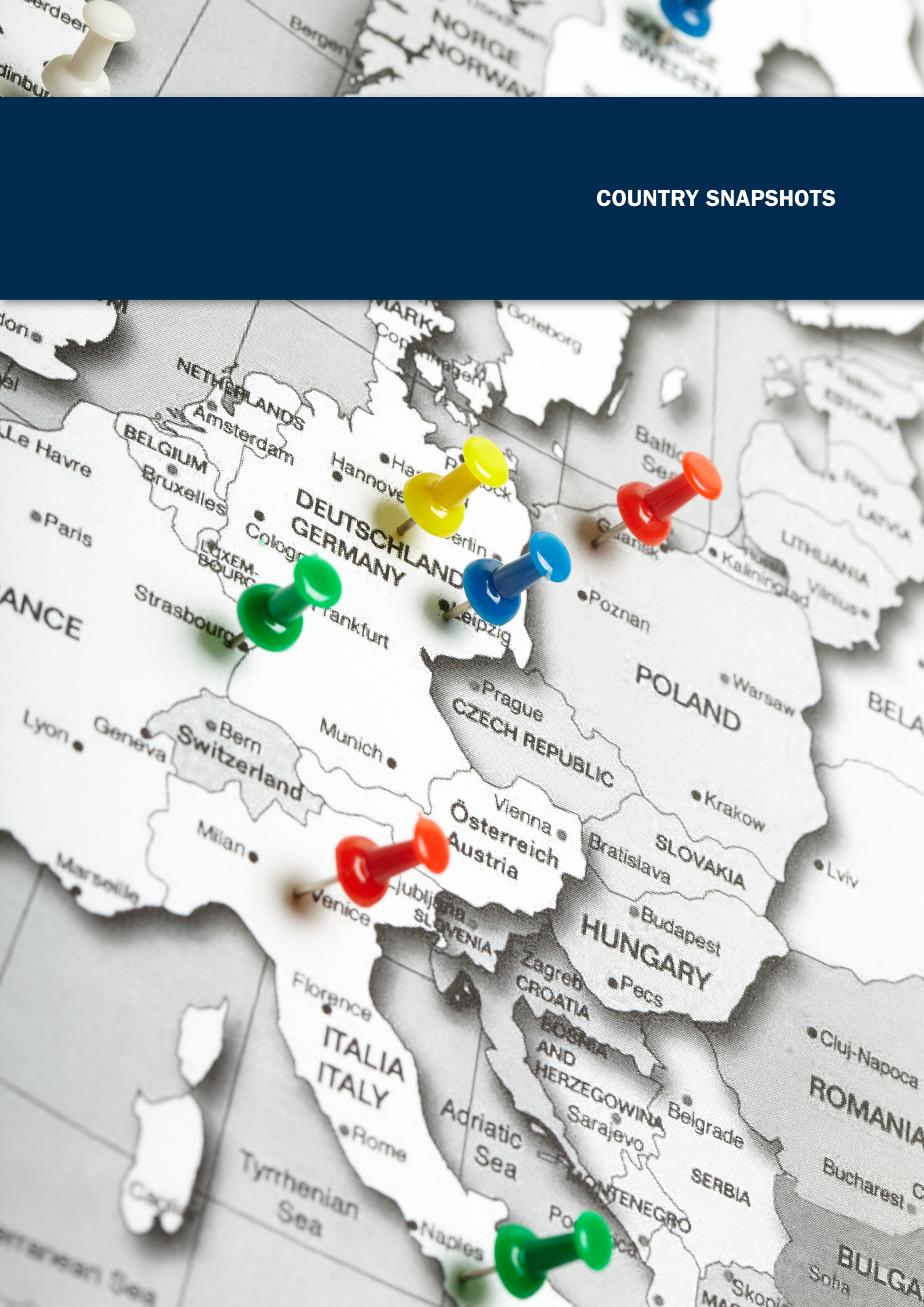
5. Enhance European and national surveillance and monitoring systems to better measure the burden of infectious diseases

5.1 The ECDC should continue to work closely with EU Member States to support the **harmonisation and standardisation of laboratory methods** for diagnostics, characterisation and confirmation of disease cases, which can be used for the evaluation of the effects of immunisation programmes. The EU-level coordination of national surveillance systems for hospitals should be strengthened.

5.2 National health authorities should perform **prevalence studies** in EU Member States to identify and address gaps in population immunity. Discrepancies between the prevalence data reported nationally and by the ECDC should be addressed simultaneously. National vaccination policies should refer to **valid and recent data on the burden of vaccine-preventable diseases and on adverse events.** National surveillance systems for hospitals should be strengthened.

The challenge now is to give impetus to effective adult vaccination programmes, and to initiate an open discussion about **the value of life-course immunisation in promoting healthy ageing and its related contribution to health and growth.** The SAATI Partnership calls for **the establishment of a life-course immunisation platform as a matter of priority,** so that these recommendations can be discussed and implemented.

COUNTRY SNAPSHOTS



The data for this audit was recorded and collated through comprehensive desk research initially conducted by ILC-UK between April and September 2012. Sources consulted over this period include relevant academic and non-academic literature (e.g. government documents) that was identified through the application of systematic search terms. A key source for the key points on incidence is the research conducted by iPRI. In addition to the desk research, a series of interviews were conducted with SAATI partners, who were requested to review initial data findings regarding their respective countries, comment on accuracy, and provide assistance in the case of data gaps. All interviews were conducted in English. The data collected through desk research and interviews was taken for a further round of review in 2013 with SAATI partners, Vaccines Europe and Pfizer country representatives.

Data sources for the country profiles:

Official UN population data is used within each country profile. The data used was collected by the population division within the UN and is part of the "World Population Prospects: The 2012 Revision". The estimates are figures for 2010. This data was used as the database contains a division of population by age groups, which was essential to obtain the population aged over 55 years. All data is available on: http://esa.un.org/wpp/Excel-Data/population.htm. Retirement age data for countries is taken from the Employment, Social Affairs and Inclusion division of the European Commission: http://ec.europa.eu/social/main.jsp?catId=858&langId=en (the retirement date for the France country profile reflects more up to date information).

Further details on the methodology and limitations of this research can be found in the Methodology section of this Report.

AUSTRIA

Total population:	8 401 924
Population over 55 years:	2 440 239
State pension age:	men 65, women 60
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	All 6 vaccine-preventable diseases included. Seasonal influenza & IPD: from 50 years. Herpes zoster: from 50 years, which stands out compared to other EU countries.
Communication plans:	✗
Government funding:	Partial for seasonal influenza
Uptake monitoring system:	✗

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Seasonal influenza**: during the 2010-11 season, Austria was among the few countries which reported high intensity, together with Greece, Portugal and Sweden.
- **Pneumonia**: Austria reported one of the lowest mortality rates in Europe (5 per 100 000) in 2009.
- **Herpes zoster**: Austria reports much higher rates of hospitalisations (~0.3 per 1000) than any other EU/EEA country reporting.
- **Pertussis**: Austria is among the few countries which have recommended acellular booster doses for adolescents and adults, in light of concerns with potential transmission to young children. In 2010, Austria, Norway and Poland reported the highest hospitalisation rates (0.016 per 1000).
- **Diphtheria/tetanus**: no reported cases in 2006-2011.

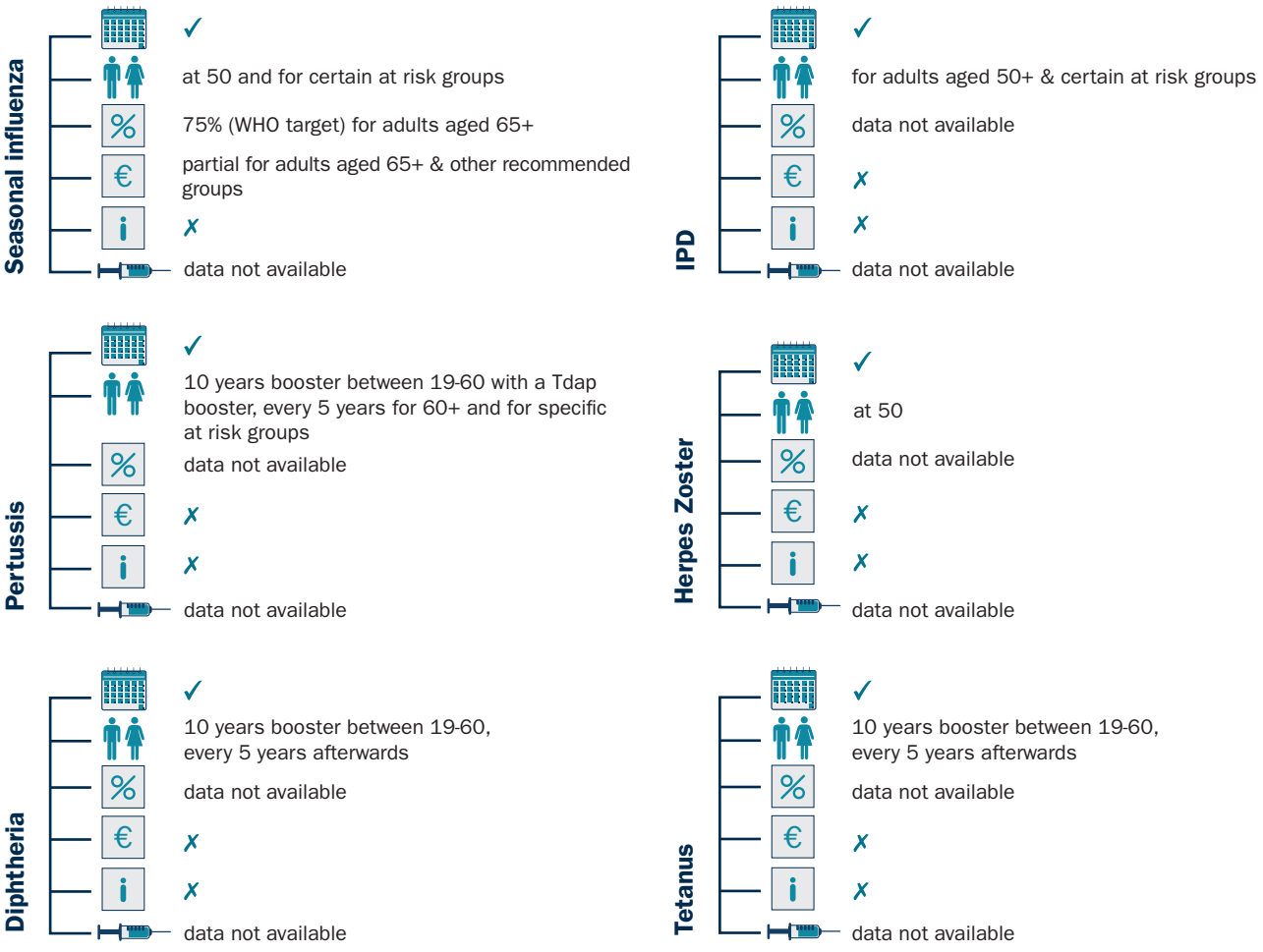
	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0243	0,0289	0,0395	0,0891	0,0713	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,0768	0,0837	0,1002	0,1452	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD) number of cases and rates per 100 000. Source: ECDC						
Total cases	141	361	133	296	-	-
Rates	1,71	4,36	1,6	3,54	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	72/78	133/136	183/175	183/2	414/ -	309/ -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,3022	0,2905	0,2965	0,2828	-	-

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Vaccination is not mentioned in the Government's Health Ageing Strategy Paper (Bundesplan für Senioren') from June 2012, indicating that adult vaccination is not a core prevention strategy. There is no budget specifically allocated for adult immunisation as a proportion of the national healthcare budget.The 1998 Health Promotion Law sets out clear provisions for the maintenance, promotion and enhancement of population health through an integrated approach throughout the life course. It includes a specific budget and an implementing agency, the Gesundheit Österreich GmbH (GÖG), which is now established as the National Research and Planning Institute of Public Health and National Competence Centre for Public Health. It develops campaigns to encourage health promotion and prevention, notably targeting older people [Austrian Ministry of Health].

ADULT VACCINATION POLICY

No summary document outlines Austria's strategic approach to adult immunisation. The National Vaccination Board (Nationales Impfgremium), a technical committee comprised of six experts, provides recommendations to the Austrian Ministry of Health regarding the vaccination schedule. Previously, the committee issued these recommendations on an annual basis. Now, the Health Ministry consults the Board when it deems it appropriate. Unlike vaccination committees found in other EU countries, the Austrian Board is not bound by formal terms of reference although it was established through legislation [WHO 2008]. There is no monitoring system for seasonal influenza [VENICE II 2009]. A number of scientific societies, such as the Austrian Society of General Practitioners, issue independent guidelines. In line with the WHO target, since 2013 the MMR (measles, mumps, rubella) vaccine is funded in Austria for adults up to 45 years.



At risk groups: Seasonal influenza: chronic lung disease, circulatory disease (bar hypertension), kidney disorders, neurological diseases, metabolic diseases (including diabetes mellitus) and immunodeficiencies, pregnant women, obese individuals, carers (e.g. In hospitals, nursing homes and at home), household contacts of high risk and people from health professions who have frequent contact with the public. **IPD:** immunodeficiencies, sickle cell disease, organ transplant patients, cell transplant patients, nephrotic syndrome, patients about to undergo chemotheraphy. Pertussis: women with infertility (before becoming pregnant), individuals in the vicinity of a new born baby, all individuals working in the medical professions, doctors, midwives, baby nurses, caregivers, staff of child care facilities and schools, caregivers in hospitals, retirement homes, nursing homes and in home carers, staff who have frequent contact with individuals over the age of 60, adults with underlying diseases, asthma, COPD, chronic lung, heart and circulatory disease, immunosuppression and smokers.

BELGIUM

Total population:	10 941 288
Population over 55 years:	3 241 120
State pension age:	men & women 65
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Flu (65+, high risk & 50+ who have co-morbidities) + pneumococcal disease (65+, high risk, co-morbidity). Herpes zoster is not recommended and pertussis is included as part of a cocoon strategy Health objective Flanders region: IPD: target and monitoring to be introduced for 2018.
Communication plans:	▪ Seasonal influenza ▪ IPD ▪ Tetanus ▪ Diphtheria
Government funding:	Partial for seasonal influenza & pertussis. Funding is also available for some other vaccines, but as vaccination is part of the responsibilities of the regions, no priority for federal payer.
Uptake monitoring system:	✓ for influenza in adults aged 65+: 63,4% (2003-04), for IPD: 13% for adults aged 60+ (2008).

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Invasive pneumococcal disease:** Belgium reports relatively high rates of confirmed cases compared to other reporting countries, with a year on year increase during the 2005-2009 period, but relatively low rates of mortality from *S. Pneumoniae* (0.3 per 100 000).
- **Pertussis:** Belgium has seen a resurgence of pertussis in recent years.
- **Diphtheria:** No reported cases of diphtheria over the period 2006-2011.

	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD9:481). Source: WHO						
Total	0,2130	0,2086	0,2054	0,1992	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) cases, ICD9 (038, 320, 481). Source: WHO						
Total	0,7728	0,8191	0,8781	-	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): Number of cases and rates per 100 000. Source: ECDC						
Total cases	1484	1728	1875	2051	-	
Rates	14,12	16,33	17,58	19,23	-	
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	196/ 197	293/214	260/174	- /160	133/ -	103/ -

HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD9: 053. Source: WHO						
Total	0,1308	0,1259	0,1287	-	-	-
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	1/1	1/1	2/1	2/0	0/ -	0/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

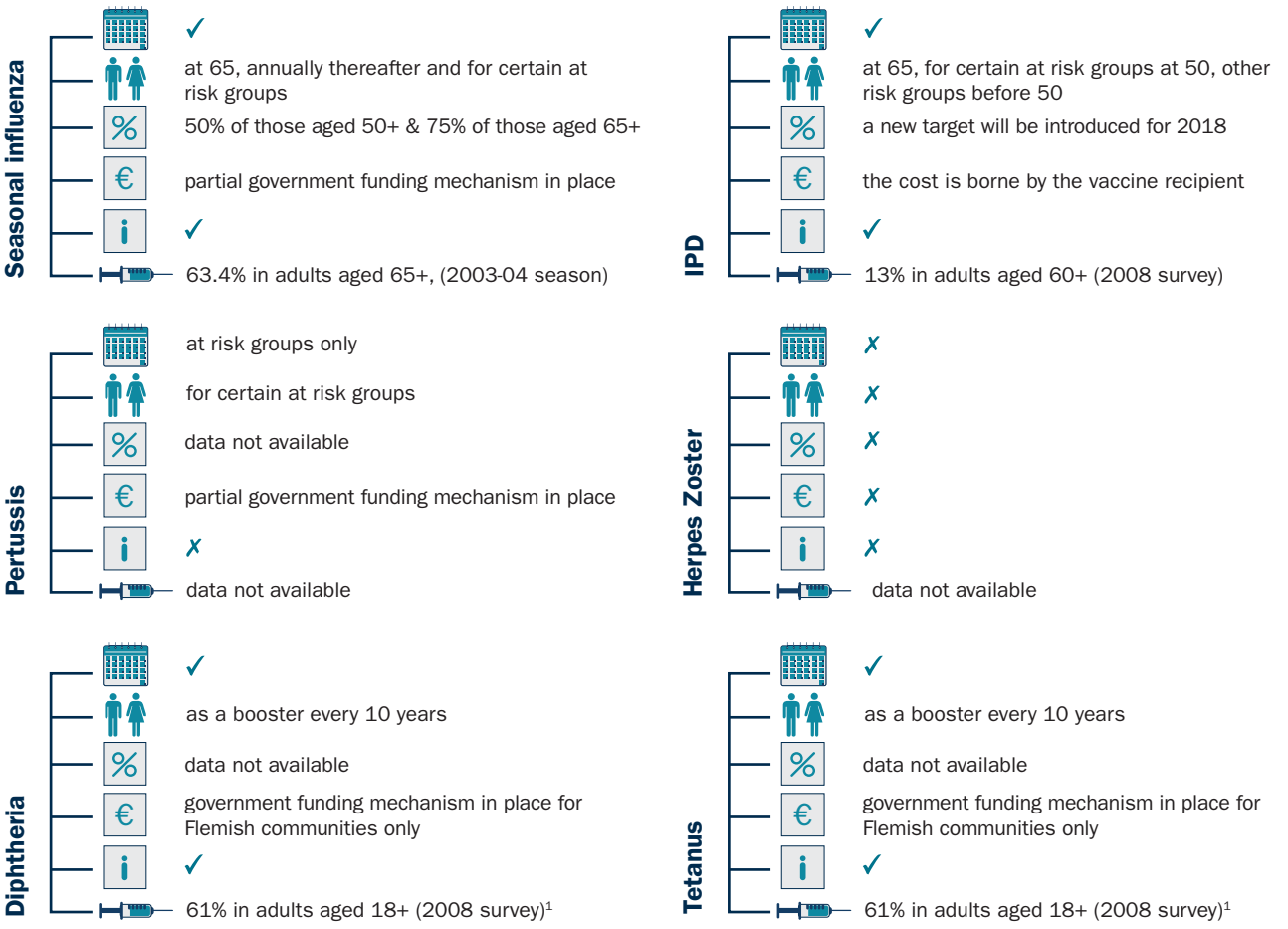
Belgium lacks a healthy ageing policy framework at national level and there is no consideration of vaccination as a prevention strategy for older people in Belgium. Currently, vaccination does not have a significant preventive role in health policy, although in 2016 Flemish authorities will begin the consultation process for an adult vaccination strategy to be implemented in 2020. There are currently no plans to implement an adult immunisation strategy in the French-speaking regions of Belgium.

ADULT VACCINATION POLICY

No summary document provides a strategic overview of the approach of Belgian authorities with regard to adult immunisation. However, a Working Group is involved in the Belgian adult immunisation schedule. The Group reports to the Superior Health Council, which is tasked with providing recommendations for the vaccination schedule [2012 Work programme]. A group of experts, KCE – Kennniscentrum, also provides advice and is influential.

The VENICE 2009-10 study on seasonal influenza states that there is a monitoring system in place for uptake including for people aged over 65 years but not for at-risk groups. The system is based on a survey which was last completed to assess uptake during the 2003-04 season. Uptake for IPD is also measured through surveys. The last survey was conducted in 2008.

A number of clinical bodies issue further guidance pertaining to adult immunisation in Belgium, notably the GP associations SSMG and Domus Medica. In addition, a number of specialist organisations that focus on a specific condition, for example the pulmonary association, issue their own guidance.



[1] Last survey performed in December 2012.

At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary disease (including asthma), cardiovascular (except hypertension) disease, renal disease, hepatic disease, Haematological or metabolic disorders (including diabetes mellitus), Immunologic disorders other than HIV/AIDS, HIV/AIDS, pregnancy, Any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration. Occupational at risk groups: hospital workers, long-term care facilities, out-patient care clinics, residents of long-term care facilities, and household contacts of those who are recommended the vaccine. **IPD:** chronic broncho-pulmonary disease, HIV, asplenia or splenectomy, congestive heart disease, ethylism with or without cirrhosis, the following at risk groups can be recommended the vaccine according to clinical judgement: organ transplant patients, lymphoma, chronic lymphatic leukaemia, multiple myeloma, cerebrospinal fluid leak, other chronic disorders such as chronic renal diseases and other cardiovascular diseases. **Pertussis:** all adults in contact with young children, including healthcare workers.

BULGARIA

Total population:	7 389 175
Population over 55 years:	2 412 726
State pension age:	men 63, women 60
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Recommendation of vaccination for people aged 65+, for both seasonal influenza and IPD
Communication plans:	▪ Seasonal influenza
Government funding:	✗
Uptake monitoring system:	Tetanus & diphtheria uptake is measured sporadically and for the entire adult population

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** There is no data available on pneumonia for the period 2006-2011.
- **Herpes zoster:** Bulgaria does not differentiate between varicella and herpes zoster when reporting data, which means that the burden of herpes zoster cannot be assessed.
- **Diphtheria:** No reported cases over the period 2006-2011.

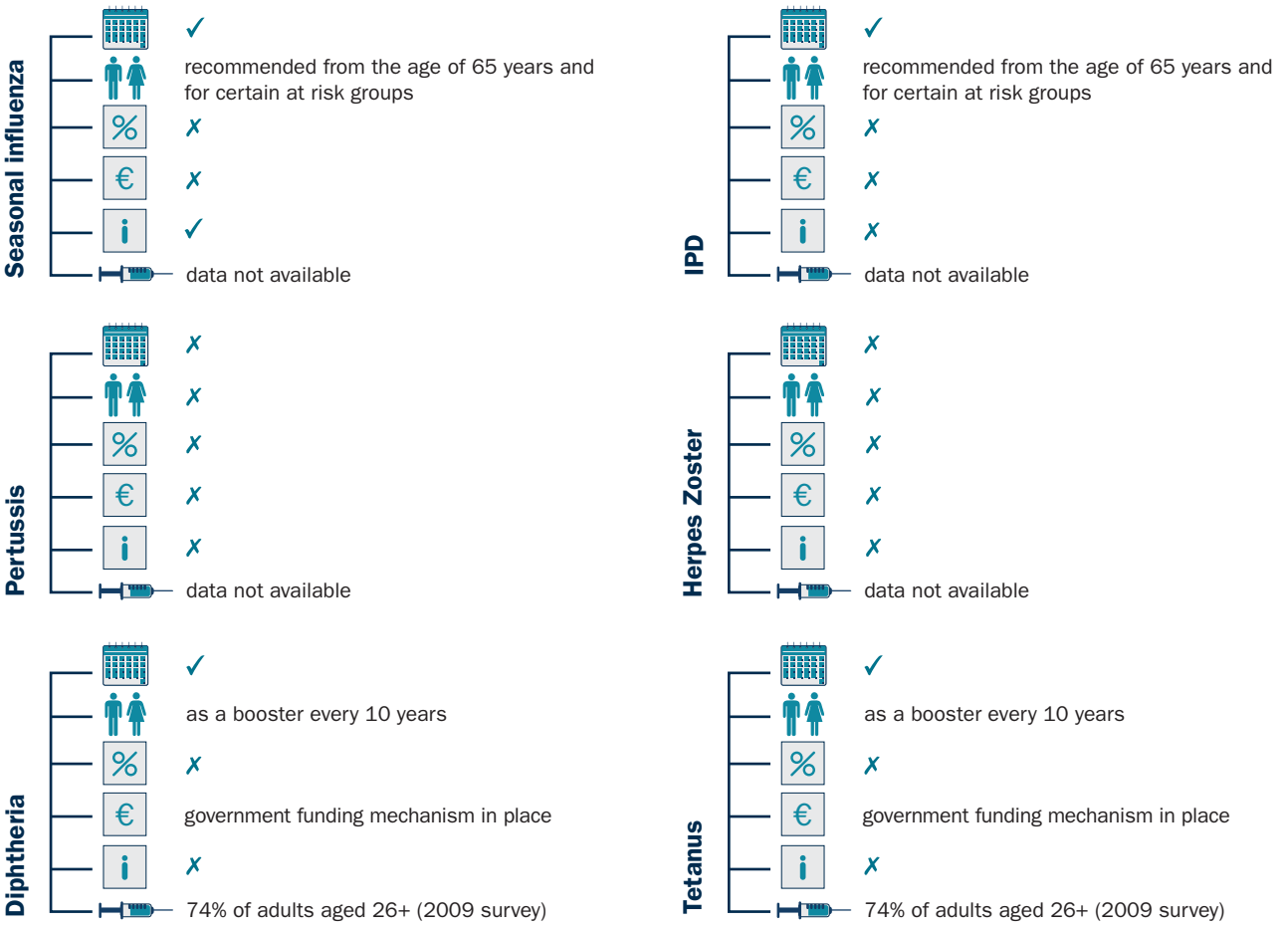
	2006	2007	2008	2009	2010	2011
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	1	39	35	46	-	
Rates	0,01	0,51	0,46	0,6	-	
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	335/335	269/235	193/130	251/133	54/ -	- / -
HERPES ZOSTER: data per 100 000 population						
Total	-	-	-	-	261,8	368,9
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	4/4	0/0	2/2	- /0	2/ -	- / -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Bulgaria has no healthy ageing framework. There is no indication that this is a priority currently, although this should change in the near future. The gross medication budget of Bulgaria stands at 450 million EUR. Of this budget, 20 million EUR is reserved for immunisation. However approximately 1% of this budget is spent on adult immunisation. The Tdap vaccine against tetanus and diphtheria is the only adult vaccine reimbursed by the government.

ADULT VACCINATION POLICY

No summary document outlines all of the vaccinations recommended for adults within the Bulgarian vaccination schedule. The Advisory Committee for the Surveillance of Communicable Diseases, Immune Phrophylaxis and Anti-epidemic Control, comprised of 13 voting members and two non-voting members, provides clinical recommendations regarding the Bulgarian immunisation schedule through the guide of formal written terms of reference [WHO 2008]. Uptake is measured for tetanus and diptheria, for all adults. Uptake is not recorded for invasive pneumococcal disease [VENICE II 2010]. The Bulgarian authorities also do not have a mechanism to measure uptake for seasonal influenza among people aged over 65 years [VENICE II 2011]. Several specific medical societies issue further recommendations and guidance in regard to infectious diseases, including the Infectious Disease Society and the Pulmonary Society.



At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary disease, chronic cardiovascular disease, renal disease, chronic hepatic disease, chronic heamatological or metabolic disease, immunologic disorder other than HIV/AIDS, HIV/Aids as a separate risk group. Occupational at risk groups: staff of hospitals, out-patient care clinics, laboratories, long-term care facilities, residents of long term care, household contacts of infected individuals. Others: military, essential services. **IPD:** patients with chronic cardiovascular, pulmonary, metabolic diabetes, alcoholic, renal, hepatic disease, asplenia, open cranial fractures, neoplasms, immunosuppression including HIV.

CYPRUS

Total population:	840 407 000 (Cyprus Republic)
Population over 55 years:	204 573 000 (Cyprus Republic)
State pension age:	men & women 65
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Seasonal influenza & IPD: at 65 years. Tetanus & diphtheria: as a 10 year booster.
Communication plans:	▪ Seasonal influenza
Government funding:	✓ for seasonal influenza, IPD, diphtheria & tetanus
Uptake monitoring system:	not for those aged 65+ contrary to most EU countries

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** Cyprus recorded the lowest hospitalisation rate (less than 1 per 1000, or 1.3% of hospital admissions) in EU/EEA countries in 2009. No data available before 2009.
- **Diphtheria/Tetanus:** no reported cases over the period 2006-2011.

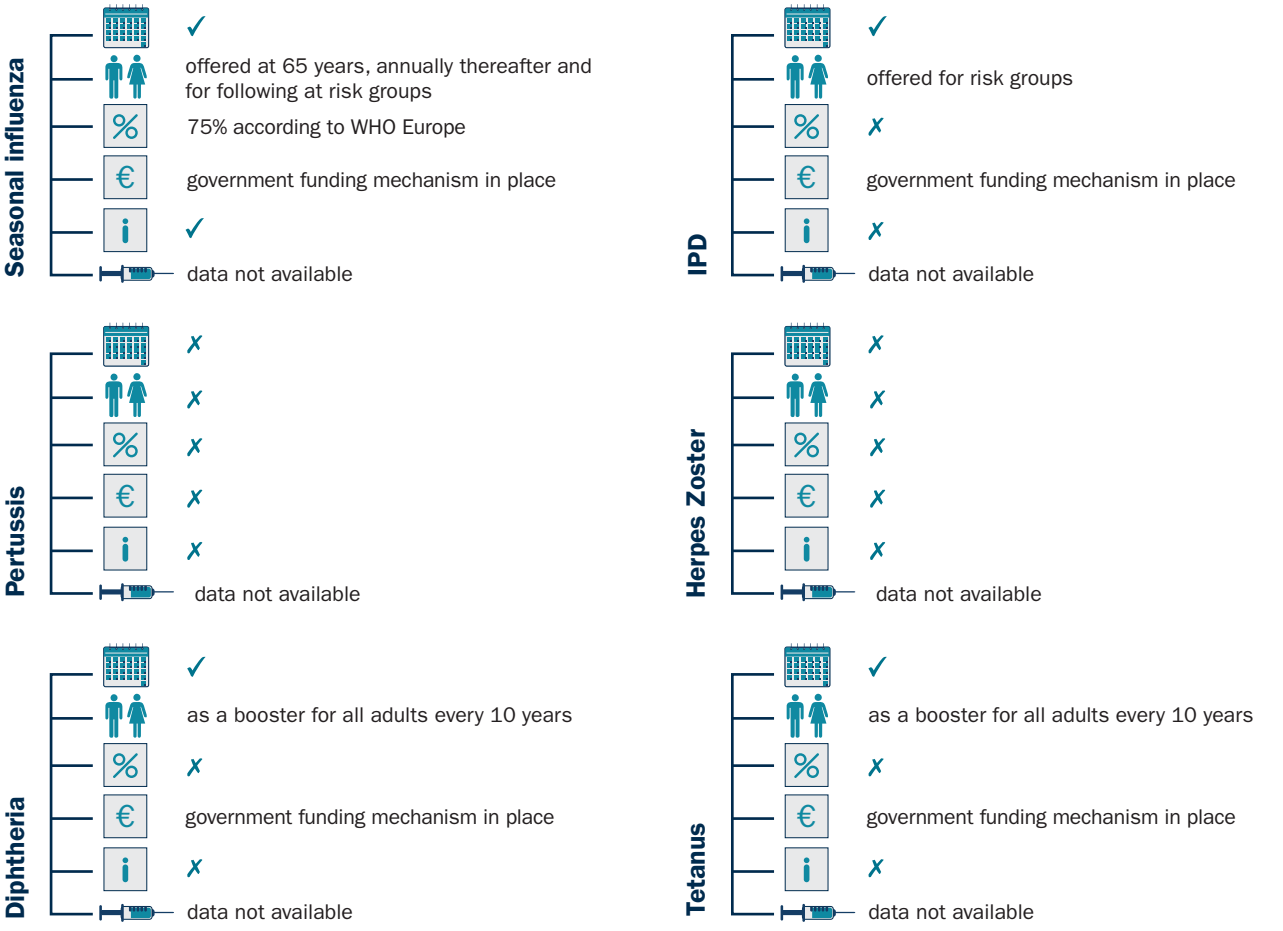
	2006	2007	2008	2009	2010	2011
PNEUMONIA: Hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	-	-	-	0,0025	0,0050	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,013	0,0059	0,0076	-	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	7	6	21	9	-	-
Rates	0,91	0,77	2,66	1,13	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	8/3	9/9	3/3	8/5	0/ -	2/ -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD9: 053. Source: WHO						
Total	0,0143	0,0107	0,0088	-	-	-

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Cyprus has attempted to use its term as President of the European Union to emphasise 2012 as the European Year of Healthy Ageing, which included the promotion of healthy lifestyles [Cyprus Presidency]. Nonetheless, there is no formal healthy ageing policy framework in Cyprus.

ADULT VACCINATION POLICY

No summary document outlines all of the adult vaccinations that are included in the national schedule. The National Immunisation Advisory Committee, composed of five voting members, provides clinical recommendations to the Cypriot Ministry of Health through formal written terms of reference. Cyprus does not have a system to monitor seasonal influenza coverage for people aged over 65 years [VENICE II 2011]. No specific medical society outlines further recommendations across infectious diseases.



Inclusion in an adult schedule

Government policy guidelines

National targets rates for recommended groups

Access (funding mechanisms in place)

Government communication plans (media campaigns)

Vaccination uptake rate for recommended groups

At risk groups: Seasonal influenza: people in nursing homes or chronic illness patients in other care institutions.

CZECH REPUBLIC

Total population:	10 553 701
Population over 55 years:	3 119 564
State pension age:	men 62, women 60
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Seasonal influenza: for 65+ & all persons with co-morbidities. Tetanus: as a booster to be taken every 10-15 years, however not diphtheria. Mandatory reimbursed pneumococcal vaccination for institutionalised patients (seniors homes, hospices etc.)
Communication plans:	▪ Seasonal influenza
Government funding:	✓ for seasonal influenza, IPD & tetanus
Uptake monitoring system:	✗ only measured through volume of vaccines sold and reveals very low uptake levels, with just a few portion of the population aged over 65 years pneumococcal vaccination (<1%) and seasonal influenza (approx.20%)

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** Czech Republic recorded the lowest percentage of hospital admissions among EU/EEA countries in 2005 (1%).
- **Diphtheria/Tetanus:** no reported case of diphtheria/tetanus for the period 2006-2011.

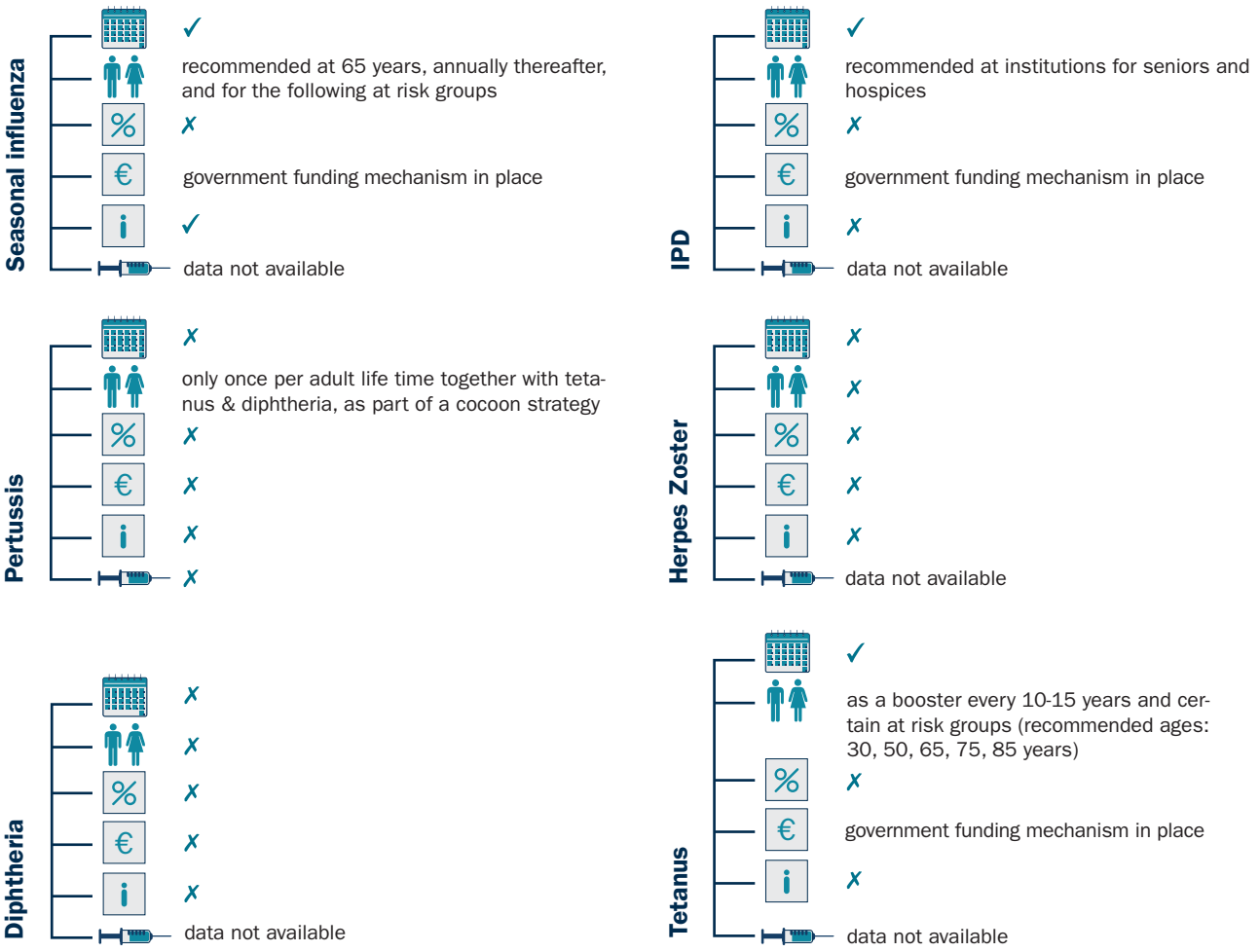
	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0082	0,0142	0,0218	0,0276	0,0312	0,0082
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,0533	0,0589	0,073	0,082	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: : Reports of National Institute of Public Health (2008-2012)						
Total cases	-	299	345	356	343	385
Rates	-	2.9	3.3	3.4	3.3	3.7
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	234/233	186/184	767/763	956/953	662/ -	324/ -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,1973	0,2	0,1731	0,1725	-	-

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Although the Ministry of Health and the Ministry of Labour and Social Affairs discuss the issue, there is no governmental healthy ageing framework as of early 2013. No public information is available on the proportion of the healthcare budget that is reserved for immunisation, specifically adult immunisation.

ADULT VACCINATION POLICY

The National Immunisation Committee (NIKO), comprised of 10 voting members, provides medical guidance to the Ministry of Health on the national immunisation programme. The Committee does not operate under formal written terms of reference [WHO 2010]. Several medical societies may issue further clinical guidance, including the Czech Vaccinology Society, the Society of General Practice (GP), the Society for Infectious Diseases, the Society for Epidemiology and Microbiology, the Czech Society for Pneumology and Phthisiology, the Czech Society for Oncology, the Czech Society for Rheumatology and the Czech Society of Cardiology, however NIKO recommendations are the official government body. Seasonal influenza uptake among over people aged over 65 years is not monitored. However staff of long-term care facilities is monitored to record uptake in this group [VENICE II 2009]. There are no official targets for uptake that are followed by the state authorities.



NIKO Members: MUDr. Vladimír Valenta, Chairman, Chief Hygienist of the Czech Republic; prof. MUDr. Roman Chlíbek, Ph.D.,Vicechair of NIKO, vaccinologist, Dean of Faculty of Military Health Science of the University of Defence, Scientific Secretary of the Czech Vaccinology Society; MUDr. Jozef Dlhý, Ph.D., Secretary, Department of Public Health, Ministry of Health; doc. MUDr. Vilma Marešová, CSc., infectionist,, Teaching hospital Na Bulovce, Prague; MUDr. Jitka Částková, CSc., epidemiologist, National Institute of Public Health; MUDr. Josef Trmal, Ph.D., epidemiologist, Director of Regional Hygiene station; MUDr. Zuzana Vančíková, CSc., pediatric pulmonologist,Head of the Pediatric department in hospital Hořovice; MUDr. Stanislav Konštacký, CSc., GP, Faculty of General Practitionery and Urgent medicine, University of Defence;. MUDr. Hana Cabrnochová, pediatrician Vicechair of the Czech Vaccinology Society, MUDr. Alena Šebková, Chairperson of the Association of General Pediatricians

At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary disease, chronic cardiovascular disease, renal disease, hepatic disease, haematological or metabolic disorders, immunologic disorders other than HIV/AIDS, HIV/AIDS, any condition affecting respiratory association. Other: pregnant women. **IPD:** 65 and at risk groups: those in hospices and sanatoria or other collective housing, insulin dependent diabetes, respiratory disease, chronic CVD, renal diseases. **Tetanus:** tetanus-prone wounds in high risk groups.

DENMARK

Total population:	5 550 959
Population over 55 years:	1 643 387
State pension age:	men & women: 65 (67 when 60th birthday before 01.06.1999)
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	seasonal influenza vaccine is recommended from 65 years, as is pneumococcal vaccine.
Communication plans:	▪ Seasonal influenza
Government funding:	▪ partly for pneumococcal disease (risk groups) ▪ Seasonal influenza
Uptake monitoring system:	relatively modest coverage rates in Denmark (51% for seasonal influenza during the 2011-12 season, and 1% for IPD)

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** Denmark had admission rates of 7.1 per 1000 in 2011. (Statistics Denmark)
- **IPD meningitis:** Mortality rate of 0,3 per 100 000. (Statens Serum Institut)
- **Pertussis:** Denmark had the 5th highest hospitalisation rate reported in Europe in 2005 (0.018 per 1000).
- **Diphtheria:** no reported case of diphtheria over the period 2006-2011.

Denmark did not report **pneumonia, invasive pneumococcal disease and herpes zoster** data to the WHO after 2006.

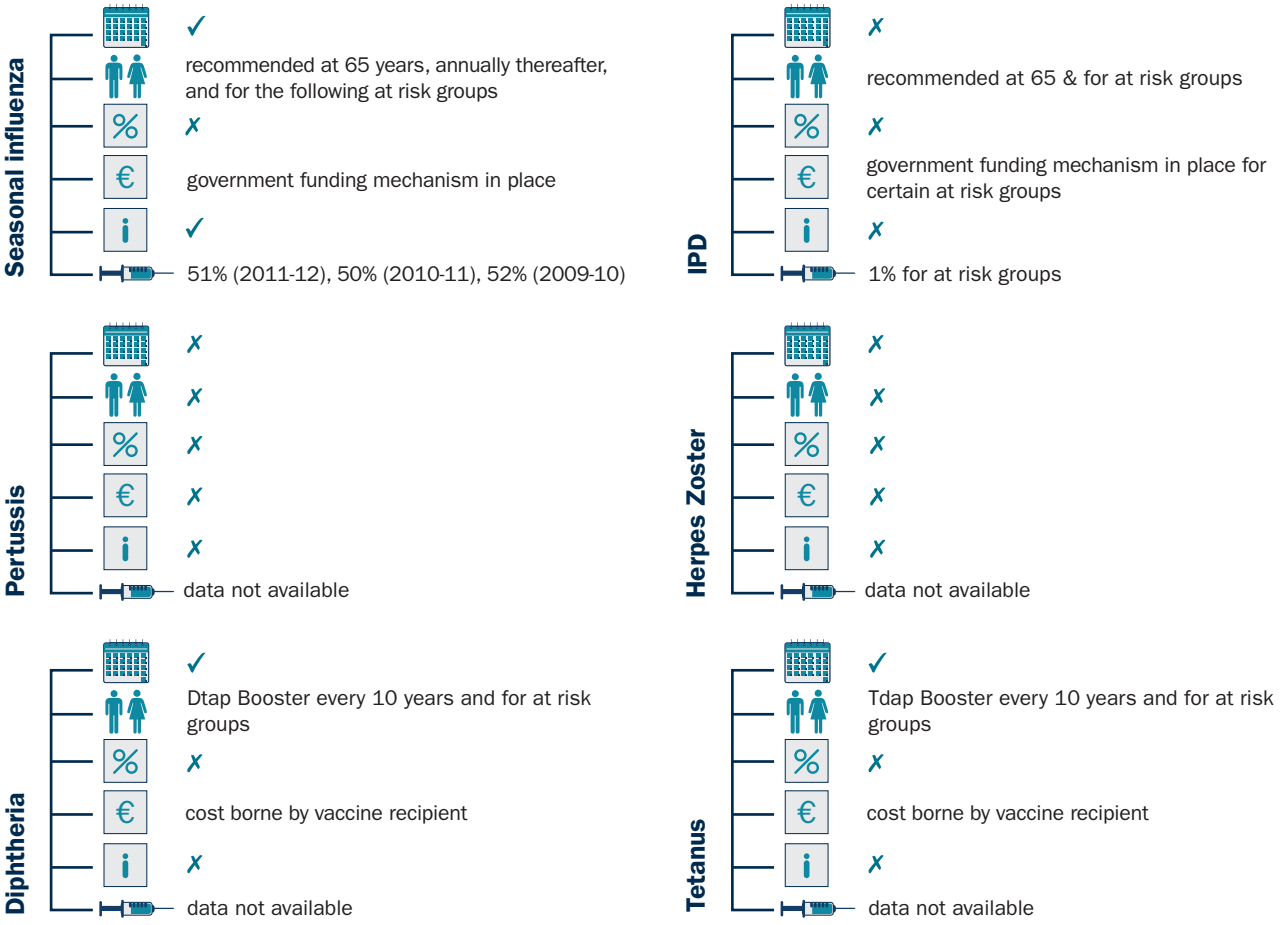
	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0865	-	-	-	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,2151	-	-	-	-	
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	92	101	120	129	960	
Rates	1,7	1,85	2,19	2,34	17.35	
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	55/54	81/94	105/106	83/91	77/ -	71/ -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,0539	-	-	-	-	-
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	2/2	3/3	1/2	0/0	0/ -	0/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

The Government, regional payers and local municipalities agreed in June 2013 on a national action plan for older patients that are prone to using health services on a regular basis. Prevention of unnecessary hospital admissions is a central pillar of the national action plan with a focus on e.g. patients with pneumonia and COPD. Immunisation is not among the listed tools, but the plan calls for increased cooperation between hospitals, GPs and local health services to achieve higher quality in the services and improved outcomes for patients. A parliamentary question revealed that in 2010, total public spending on the seasonal influenza vaccine for older people amounted to 78 million DKK. The total annual healthcare budget of Denmark is about 112 billion DKK. Public spending on adult vaccination is less than 1% of the total public spending on medicine.

ADULT VACCINATION POLICY

Information about vaccinations recommended for adults is listed on the website of the Statens Serum Institut (SSI.dk). The Danish Health and Medicines Authority (SST.dk) advises the Danish Ministry of Health about immunisation, including vaccinations recommended for adults. The SSI and the DHMA share responsibilities and tasks regarding planning and information about vaccination. In addition, several specific medical organisations issue recommendations that include vaccination.
Denmark has a monitoring system in place to monitor coverage for seasonal influenza for people aged over 65 years, as well as all at-risk groups that the vaccine is recommended for. The mode of coverage data used is that of pharmaceutical sales data from the national purchaser with the aggregate number of vaccines administered recorded. Uptake among people aged over 65 years during the 2009-10 season was 52% [VENICE II 2011]. There are no specified national targets for any of the vaccinations recommended for adults in Denmark.



At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary disease, chronic cardiovascular disease, renal disease, hepatic disease, haematological or metabolic disorders, immunologic disorders other than HIV/AIDS, HIV/AIDS, any condition affecting respiratory association. Other: pregnant women, residents of long-term care facilities, household contacts of infected individuals. **IPD:** The following groups are recommended vaccination: person above age 65 and patients who receive treatment or attend follow up visits for chronic cardiac, pulmonary, hepatic or kidney disease or diabetes mellitus. Reimbursement for high risk groups: planned/performed splenectomy, organ transplant or cochlear transplant, splenic dysfunction (e.g. following radiation), leakage of cerebrospinal fluid, previous invasive pneumococcal disease (IPD), immunosuppression (e.g. due to HIV infection or lymphoma),and reimbursement to persons below 18 years of age with; • cyanotic heart disease, cardiac failure, palliative surgery for cardiac condition, chronic pulmonary condition (e.g. cystic fibrosis), hypodynamic respiratory insufficiency, nephrotic syndrome, immunodeficiencies, excluding agammaglobulinaemia and SCID. **Diphtheria:** adults who have had major wounds or other skin lesions that may present a risk of infection with tetanus bacteria. **Tetanus:** adults who have had major wounds or other skin lesions that may present a risk of infection with tetanus bacteria.

ESTONIA

Total population:	1 286 479
Population over 55 years:	399 502
State pension age:	men 63, women 61.5
Healthy Ageing Policies or Strategies:	✓ only Central and Eastern European country with an identifiable healthy ageing policy framework in place
Adult schedule (vaccination recommendations from the government):	includes vaccination against seasonal influenza and IPD within its national immunisation programme at 65 years
Communication plans:	▪ Seasonal influenza
Government funding:	✓ for diphtheria & tetanus
Uptake monitoring system:	✓ only measured amongst 65+ for seasonal influenza and Estonia performs very poorly (1.1% of coverage in 2010-11)

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Invasive pneumococcal disease:** Estonia had the highest mortality rate from *S. Pneumoniae* in 2005 (0.840 per 100 000) and 2009 (0.40-0.45 per 100 000).
- **Pertussis:** In 2010, Estonia reported the highest incidence rate in Europe (96.6 per 100 000), with an increasing trend along the years.
- **Herpes zoster:** Estonia does not differentiate between varicella and herpes zoster when reporting incidence data, which means that the burden of herpes zoster cannot be assessed.
- **Diphtheria:** no reported cases over the period 2006-2011.
- **Tetanus:** no cases reported to WHO/ECDC over the period 2006-2011. Two cases reported to the WHO in 2011.

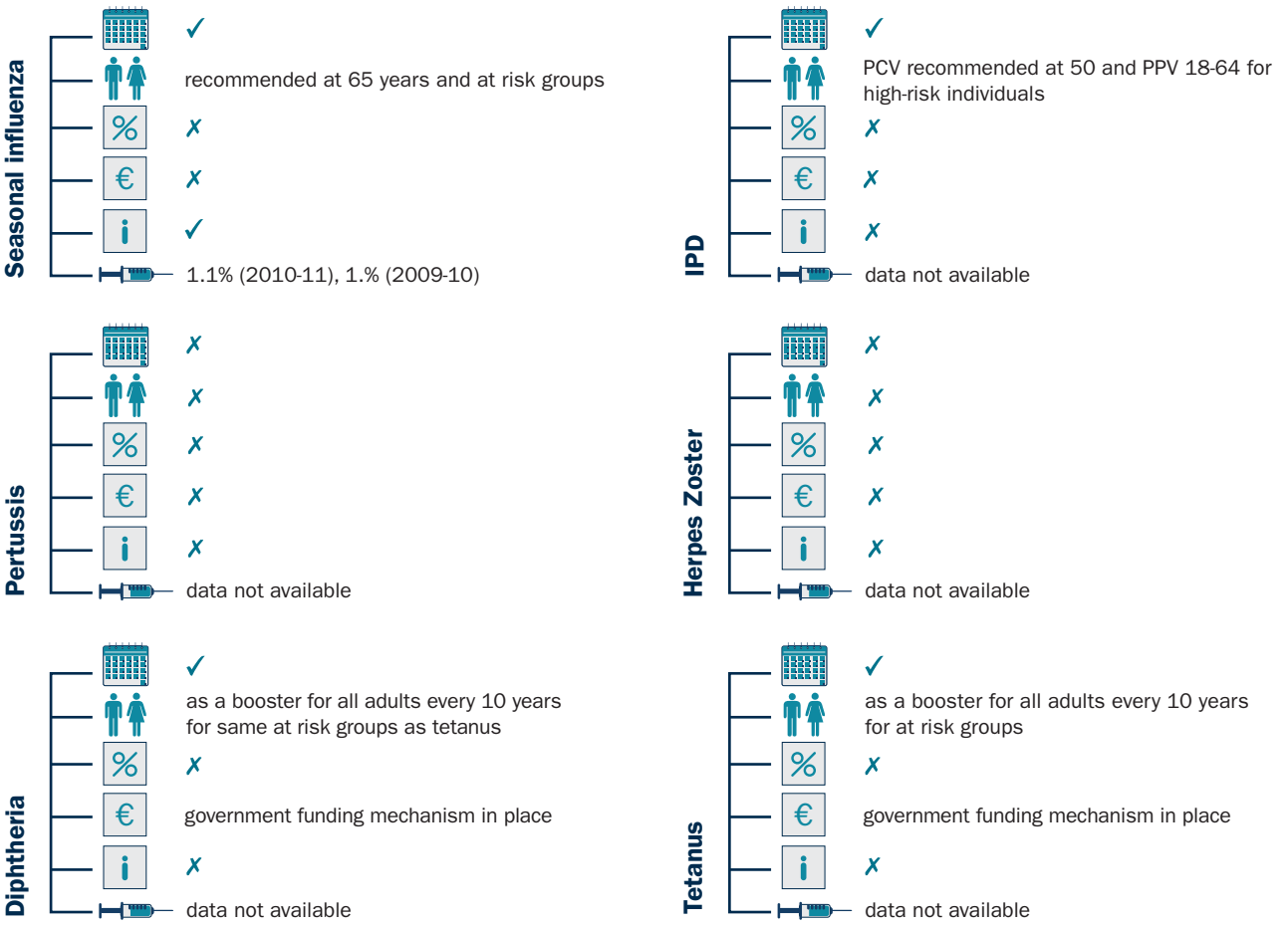
	2006	2007	2008	2009	2010	2011
PNEUMONIA: new cases (ICD codes J12-J18). Source: WHO						
Total	12776	14471	12531	12673	12995	13740
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	37	36	32	14	36	62
Rates	2,75	2,68	2,39	1,04	2,7	4,6
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	153/153	409/409	485/485	629/629	1295/ -	478/ -
HERPES ZOSTER data. Incidence rate per 100 000 inhabitants. Source: National Institute for Health Development						
Total	6679	7795	7479	8556	6146	8995

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

The Ministry for Social Affairs in Estonia operates a policy for older people which includes a number of objectives pertaining to the welfare of older people in the country. One of these objectives is to raise public awareness on ageing and healthy habits, as well as retaining physical, mental and social abilities that contribute to the prolongation of average life expectancy [Sotsiaal Ministeerium]. While the breakdown of the vaccination budget between children and adults is not available, the budget of the State for the entire national immunisation programme in 2012 was 1.917 million EUR.

ADULT VACCINATION POLICY

No summary document outlines all of the adult vaccinations that are included in the national schedule. The Expert Committee for Immunoprophylaxis, comprised of 12 voting members and 12 non-voting members, provides clinical recommendations to the Estonian Ministry of Health concerning the national immunisation programme through formal written terms of reference [WHO 2008]. Among the medical societies that issue further clinical guidance, the Estonian Association of Infectionists is a prominent participant [Vaktsiin.ee]. Seasonal influenza is the only vaccine for which adult uptake is measured. An administrative record is utilised that takes note of the vaccines administered [VENICE II 2011].



At risk groups: Seasonal influenza: medical at risk groups: chronic heart, lung, kidney, and metabolic system diseases (especially diabetes), hemoglobineemiad, treatment, immunodeficiency, HIV infection, diabetes, spinal fluid leak, asplenia, conditions which increase the risk of aspiration. Occupation at risk groups: health care workers, hooldekande agency staff, nurses, staff of long-term care facilities. Others: pregnant women, residents of long-term care facilities. **IPD:** diabetes, cerebrospinal fluid leak, asplenia, splenic dysfunction, chronic renal diseases, chronic lung disease, asthma, chronic liver disease, chronic heart disease, conditions which increase the risk of aspiration, immunodeficiency disorders, individuals receiving immunosuppressive therapy, individuals undergoing organ transplant, cochlear implant wearers, cancer patients, HIV positive, older residents of long-term care facilities. **Tetanus:** farm labourers, soldiers, rescue workers, police officers, health care workers in surgical fields, veterinary staff, unvaccinated adults who have not received prior inoculations.

FINLAND

Total population:	5 615 000
Population over 55 years:	1 965 000
State pension age:	men & women: 65
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	for seasonal influenza from 65 years, as well as tetanus & diphtheria as a booster every 10 year (Td), MMR for those who have not received two doses of MMR OR have not had the MMR diseases
Communication plans:	▪ Seasonal influenza (only information brochures for primary care practices)
Government funding:	✓ for all vaccines in National Immunization Programme (NIP). Pneumococcal vaccines recommended to adult risk groups, but funded only for stem cell transplant patients
Uptake monitoring system:	✓ only measured for seasonal influenza and remains modest (46% for 2009-10)

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** Finland and four other countries had hospital admission rates in excess of 5 per 1000 in 2005 and 2009. The trend in Finland stands out as increasing from 5.59 in 2005 to 6.44 in 2010 and Finland had the longest average hospital length of stay at 16 days in 2010 when the average over the countries was 9.8 days.
- **Invasive pneumococcal disease:** Finland had relatively high rates of confirmed cases and high mortality rates from *Streptococcus Pneumoniae* in 2009, with the latter at 0.40-0.45 per 100 000.
- **Pertussis:** Finland reported comparatively high rates of confirmed cases, at 9,9 per 100 000 in 2012.
- **Herpes zoster:** Finland has a laboratory based surveillance system which does not separate clinical disease and therefore includes both varicella and herpes zoster.
- **Diphtheria:** no reported cases over the period 2006-2011.
- **Tetanus:** Tetanus is not a reportable disease in Finland.

	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0693	0,0840	0,0824	0,0925	0,0766	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,2372	0,2696	0,2721	0,2916	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	0	791	925	855	-	-
Rates	0	14,99	17,45	16,05	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	535/0	480/480	511/511	267/267	336/ -	555/ -

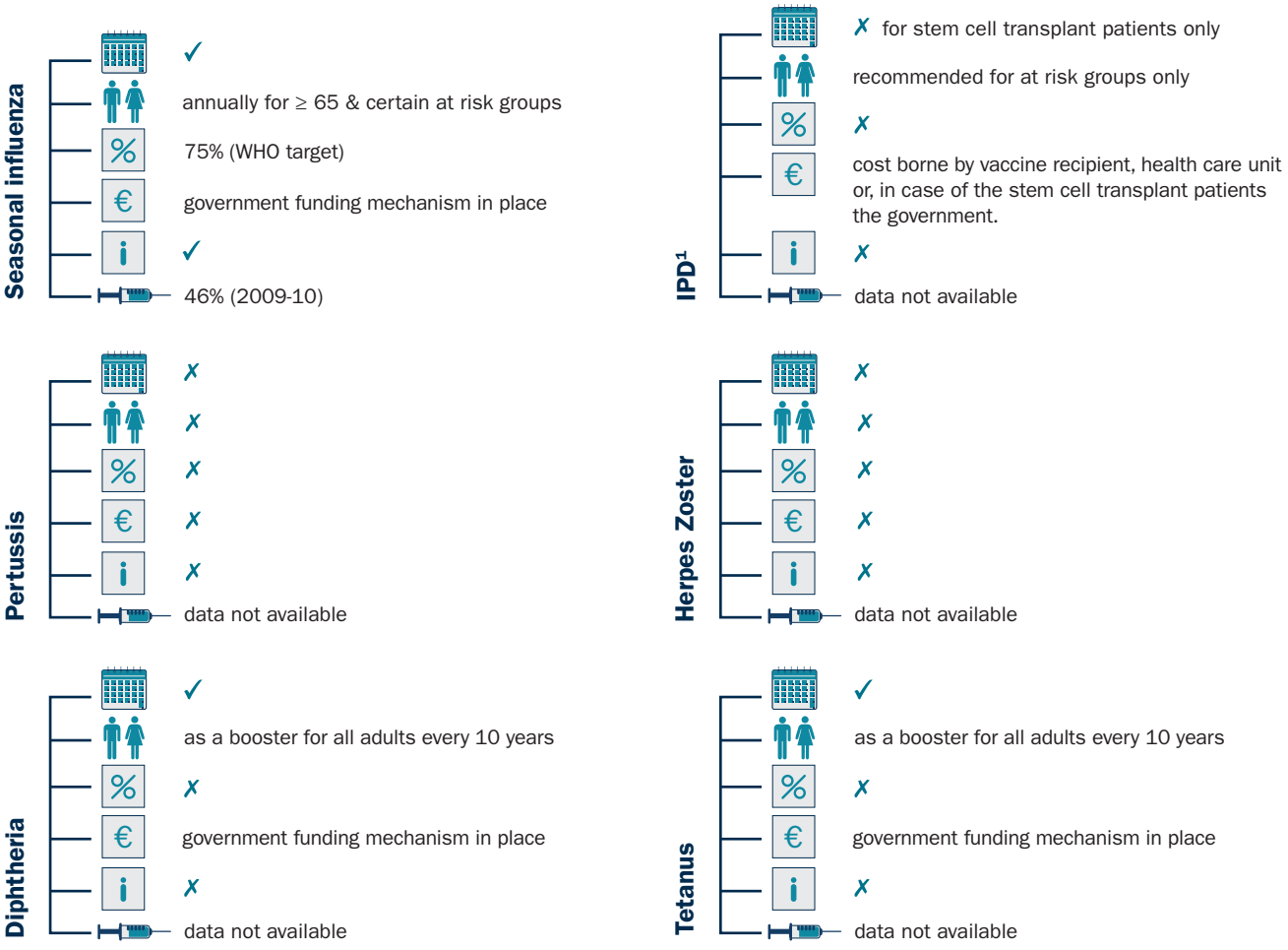
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,1001	0,0908	0,0918	0,089	-	-

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

The Finnish Prime Minister's Office produced an Ageing Report in 2009, setting out the country's policy approach to the demographic trends taking place in Finland. This report followed on from Prime Minister Matti Vanhanen's first Cabinet report on demographic trends, population policy and preparation for ageing. The report, 'Finland for people of all ages', outlined the broad objectives of Finland's ageing policy, among which the promotion of health and functional ability. The report recommends that the promotion of the population's health requires 'policy linkage' across government; that a larger share of health care resources must be ring-fenced for health promotion activities; and that reducing alcohol and tobacco consumption is paramount [Prime Minister's Office 2009]. Finland's most recent government health strategy, Health 2015, is broader and calls upon a greater number of participants to implement health improvements (e.g. greater involvement of municipalities). Health 2015 sets a number of life-health goals including a target set specifically for older people; maintaining an upward trends in functional abilities of people 75 years and older [WHO Europe].
While vaccination is listed on the Ministry of Health and Social Affairs website as an important aspect of health promotion, it emphasis this in regard to child immunisation and there is no clear evidence that vaccination is a key prevention strategy for adults. The National Public Health Institutes' website states that all adults should 'take care of themselves' in ensuring that they have received the full batch of inoculations that they are recommended.

ADULT VACCINATION POLICY

No summary document outlines the adult immunisation schedule in Finland. The National Vaccination Committee (KRAR, Kansallinen rokotusasiantuntijaryhmä), comprised of 12 members and based on written terms of reference, provides clinical recommendations for consideration by the Ministry of Health. Its activities are overseen by the National Public Health Institute (KTL) [WHO 2008]. The National Public Health Institute's website states that adult immunisation is not supported by a central registry. To this end it is recommended that adults maintain personal records pertaining to the vaccinations that they have received throughout their life course. Physicians are encouraged to distribute personal record cards to their adult patients to help them manage their immunisation requirements.
There is a monitoring system in place for seasonal influenza for people aged over 65 years, not for at-risk groups [VENICE II 2009]. Seasonal influenza uptake is measured by the National Registry for Infectious Diseases, based on uptake notifications issued from laboratories. The National Public health Institute's website indicates that uptake among people aged over 65 years was 43% for the 2009-10 season. Reference is made to the WHO target of 75% and to the fact that the 2009-10 performance is a clear area for improvement. There is no coverage data available for tetanus, diphtheria or pneumococcal vaccines [VENICE II 2010].



Inclusion in an adult schedule

Government policy guidelines

National targets rates for recommended groups

Access (funding mechanisms in place)

Government communication plans (media campaigns)

Vaccination uptake rate for recommended groups

[1] Clinical practice in Finland is usually to diagnose pneumonia; rare to make test to diagnose IPD.

At risk groups: Seasonal influenza: cardiovascular disease, lung disease, renal failure, impaired immune response, chronic neurological disease. **IPD:** cardiac insufficiency, chronic pulmonary disease (bar asthma alone), diabetes, liver dysfunction, renal insufficiency, liquor fistel, choclear implant, alcoholism, those living in permanent institutions, lymphoma, multiple myeloma, nephoric syndrome, functional or anatomical asplenia, HIV, congenital or acquired immunodeficiency (not agammablobulinemia), bone marrow and solid organ transplant, long term systemic chorticosteroid treatment or immunosuppressive treatment.

FRANCE

Total population:	66 150 000
Population over 55 years:	21 842 000
State pension age:	men & women: 62
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Seasonal influenza: at 65 and for specific at risk groups (whatever the age). Tetanus & diphtheria: as a booster every 20 years from 25 until 65, at which point the recommended interval is reduced to 10 years. IPD: for at risk groups. Pertussis: once at 25 and for specific at risk groups. (Vaccination Calendar 2013, published in BEH)
Health Authorities communication plans:	▪ Seasonal influenza Beyond this, every year the Ministry of Health organises a "vaccination week" (April), covering all the vaccination calendar (see INPES site).
Government funding:	Mandatory, age-based recommendations are funded by the state, in the case of vaccines recommended for at risk groups, there is a funding mechanism in place, apart from seasonal influenza, for which the state provides the vaccine for free for at risk groups and all 65+.
Uptake monitoring system:	✓ 54% for seasonal influenza, 73% for tetanus and 34% for diphtheria for the adult population as a whole (Venice Report Sept 2012-Feb 2013).

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Invasive pneumococcal disease:** mortality from S. Pneumoniae is relatively high in France, at 0.40-0.45 per 100 000 in 2009.
- **Pertussis:** France has seen a recent resurgence, with adults playing an important role in transmitting the infection to young infants. France is one of the EU/EEA countries which have recommended acellular booster doses for adolescents, in light of concerns with transmission to young children.
- **Tetanus:** France and four other EU/EEA countries report meaningful cases of tetanus.

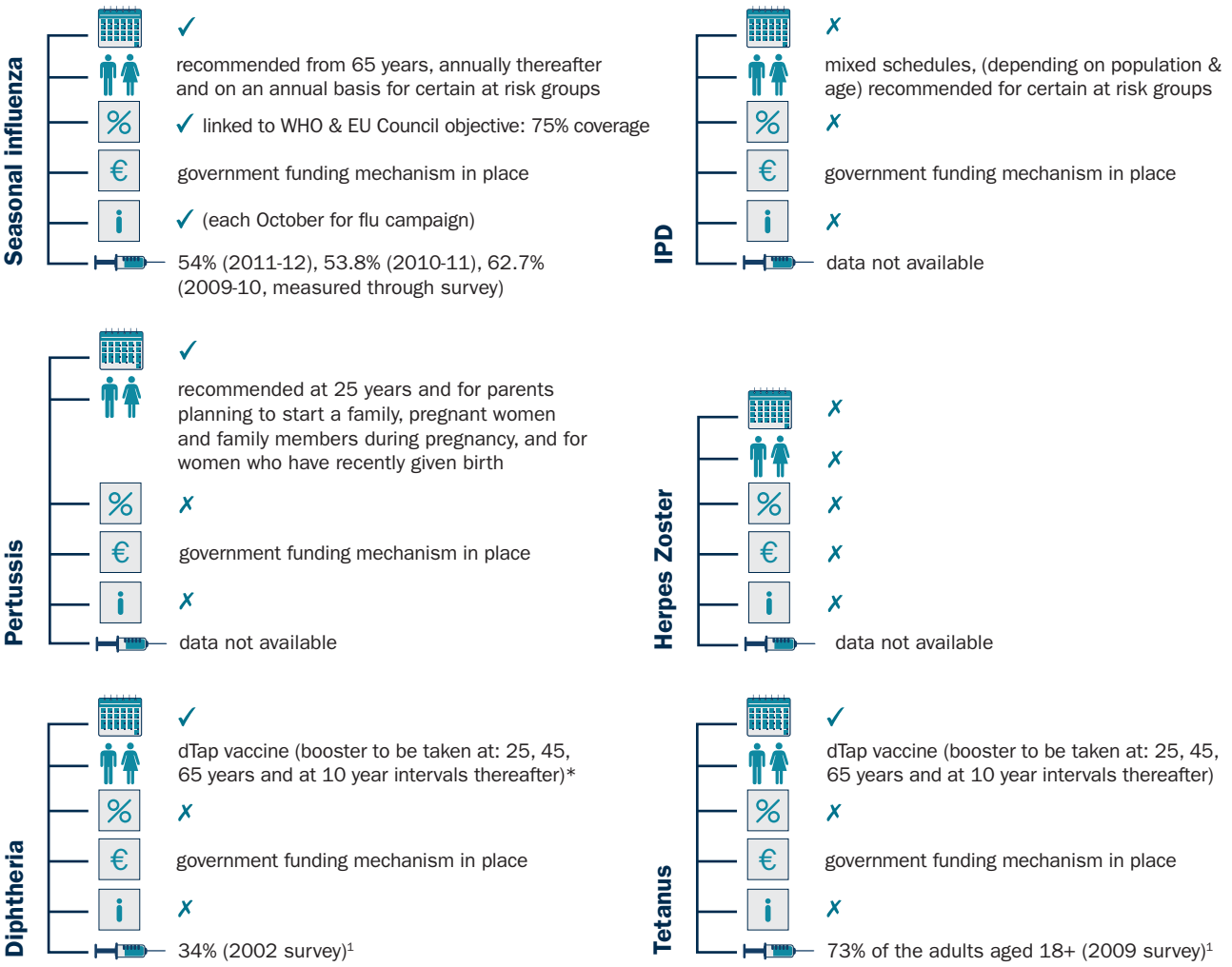
	2006	2007	2008	2009	2010	2011
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	246/125	- /61	- /55	- / 82	- / -	- / -
HERPES ZOSTER: Cases of Zona. Data for varicella are much higher. Source: French GP Sentinelles Network						
Total	223185	272818	256208	346988	269820	219822
DIPHTHERIA: reported cases. Source: WHO/Source: ECDC						
Total	3/3	1/1	5/5	0/1	- / -	- / -
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	16/17	8/7	8/3	8/8	14/ -	9/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

France has no healthy ageing policy framework, with nationally set programmes. It is also not possible to assess the proportion of the healthcare budget that is spent on immunisation, adult immunisation in particular, from public records.

ADULT VACCINATION POLICY

A full summary document published in 2010 by the High Council for Public Health set out the full French immunisation schedule, including for adults, and this document has given the rationale to update the vaccination calendar, that was reviewed and was updated in April 2013 (French vaccination calendar, published in BEH (n°14-15, 2013), and recommendations and accompanying guidelines have been drawn from this version. The National Vaccination Committee (Comité technique des Vaccinations / Haut Conseil de la Santé Publique), comprised of 20 voting members and 13 non-voting members, issues clinical guidance regarding the schedule, under the guidance of formal written terms of reference [WHO 2008]. In addition, several medical societies, such as the French Society of Immunology, or French Infectious Diseases Society, issue further clinical guidance. The French Institute for Public Health Surveillance (INVS) monitors vaccination coverage in the general population. Occasional survey studies undertaken by or under the auspices of the Health System Agency provide a snapshot of the immunisation picture. There is no systematic surveillance system for at-risk groups but take up in at-risk groups may be monitored by specialist bodies.



[1] **Diphtheria** was not included in the national schedule until 2005. The surveys measuring take up for tetanus and diptheria have been performed at different times and the results are believed to be unreliable. Vaccination is taken in combination and take up data should converge.

At risk groups: Seasonal influenza: medical at risk groups: suffers of broncho-pulmonary disorders, respiratory failure, asthma, chronic bronchitis, bronchial hyperresponsiveness, bronchopulmonary dysplasia, cystic fibrosis, cyanotic congenital heart disease, heart failure, coronary heart disease, a history of stroke, severe neurological and muscle…(including myopathy, poliomyelitis, myasthenia gravis, Charcot's disease – paraplegia and quadriplegia homozygous and double heterozygous S/C, spa sickle cell – Type 2 diabetes & type 2 diabetes, primary immunodeficiences or acquired (oncologic and hematologic diseases, organ transplantation and hematopoietic stem cells, hereditary immune deficiencies, inflammatory diseases and/or autoimmune disorders receiving immunosuppressive therapy), except those who receive regular treatment with immunoglobulins, people infected with HIV regardless of their age and status ummunovirological c, obese people with a BMI above 40kg/m2, d/of the family environment infants younger than 6 months with risk factors for severe influenza, people staying in a nursing home accommodation regardless of their age. Occupational at risk groups: hospital staff, out-patient care clinics, laboratory staff, staff in long-term care facilities, (plus all other health professionals). Others: pregnant women, residents of long-term care facilities. **IPD:** asplenia or splenectomy, homozygous sickle cell disease, HIV infection, congenital immunodeficiencies or secondary: chronic kidney disease or syndrome nyphrotic, immunosuppressive therapy or radiotherapy for malignancy, lymphoma or Hodgskin disease, leukemia, organ transplantation, cyanotic congenital heart disease, congestive heart, chronic lung disease (except asthma), ostéoméningée breach, diabetes, candidates for implants.

GERMANY

Total population:	83 017 404
Population over 55 years:	27 181 387
State pension age:	men & women: 65
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	All 6 vaccine-preventable diseases recommended (although herpes zoster a regional recommendation). Pertussis: as a booster every 10 years together with tetanus and diphtheria. Herpes zoster is implemented in Saxony at 50 years.
Communication plans:	✗
Government funding:	✓ apart from herpes zoster
Uptake monitoring system:	No vaccination targets are set for adults. Seasonal influenza: 59% for women and 54% for men. Tetanus and diphtheria are also measured for adults aged over 65+, with 63% coverage for women and 67% coverage for men.

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia and invasive pneumococcal disease:** data available does not differentiate between the various types of pneumonia.
- **Pertussis:** data are only available for a few Länders. Germany has seen a resurgence of pertussis in recent years. It is one of the few EU/EEA countries which recommend acellular booster doses for adolescents in light of concerns relating to transmission to young infants.
- **Herpes zoster:** Germany does not differentiate between varicella and herpes zoster data, which means that the burden of herpes zoster cannot be assessed. No data are available after 2007.
- **Tetanus:** no data available over the period 2006-2011.

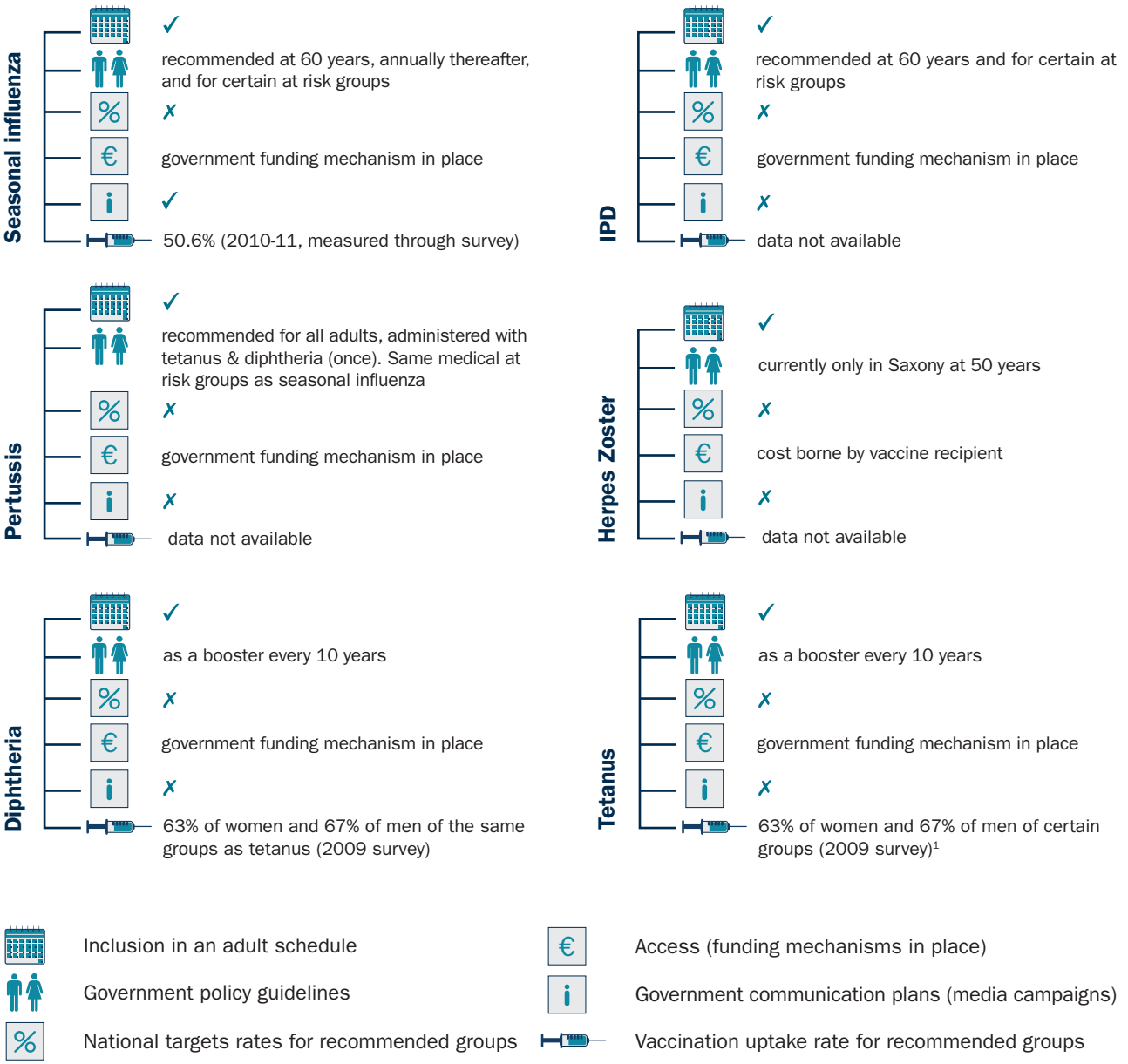
	2006	2007	2008	2009	2010	2011
INVASIVE PNEUMOCOCCAL DISEASE (IPD): all cases. Source: Robert Koch Institute						
Total	-	1676	1581	1659	1645	1614
PERTUSSIS: reported cases (there data only correspond to a few regions: Brandenburg, Mecklenburg-Western Pomerania, Saxony-Anhalt and Thuringia). Source: Robert Koch Institute						
Total	4086	4004	3551	1913	-	-
HERPES ZOSTER: Varicella cases. Data are only available for the period January-December2006 and January-November 2007. Source: Robert Koch Institute						
Total	25300	17000	-	-	-	-
DIPHTHERIA: reported cases. Source: WHO/Source: ECDC						
Total	0/0	2/2	0/0	4/4	8/ -	4/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Germany has no healthy ageing policy framework. In 2013, the Government proposed legislation relating to prevention, but this did not pass before the Federal Elections took place.

ADULT VACCINATION POLICY

The Robert Koch Institute issues a document that sets out the full vaccination schedule for Germany, for all age groups. The German Standing Vaccination Committee (STIKO), which includes 29 members (of which 19 have a voting capacity) and is based on written terms of reference, provides recommendations for the immunisation schedule [WHO 2008]. Several patient organisations and scientific societies, including the German Society for Haematology and Oncology, the German Society for Paediatric Infectology, the German Society of Surgery, the German Society for Pneumology and Respiratory Medicine, the German AIDS Society and BAGSO Service GmbH, provide further recommendations for infectious diseases. Coverage is estimated by counting the number of vaccines which are distributed to pharmacies; vaccines received at private clinics are therefore not included. Private clinics keep track of coverage but these data are not easy to find. There are no national targets in place for adult immunisations in Germany.



[1] Proportion of people aged 65+ that have received tetanus vaccination in the last 10 years.

At risk groups: Seasonal influenza: medical at risk groups: Chronic pulmonary (including asthma) disease, Cardiovascular (except hypertension) disease, Renal disease, Hepatic disease, Haematological or metabolic disorders (including diabetes mellitus), Immunologic disorders other than HIV/AIDS, HIV/AIDS, Any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration. Occupational at risk groups: hospitals, long-term care facilities, out-patient care clinics, families that raise poultry, military. Others: pregnant women, residents of long term-care facilities. IPD: medical at risk groups: Chronic pulmonary (including asthma) disease, Cardiovascular (except hypertension) disease, Renal disease, Hepatic disease, Haematological or metabolic disorders (including diabetes mellitus), Immunologic disorders other than HIV/AIDS, HIV/AIDS, Any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration. Occupational at risk groups: hospitals, long-term care facilities, out-patient care clinics, families that raise poultry, military. Others: pregnant women, residents of long term-care facilities.

GREECE

Total population:	11 109 999
Population over 55 years:	3 453 957
State pension age:	men: 65, women: 60
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	IPD: at 50 years, whilst seasonal influenza and herpes zoster are recommended at 60 years. Tetanus and diphtheria: as a booster. Pertussis: as a one-off inoculation if not already received with tetanus and diphtheria before 65 years.
Communication plans:	▪ Seasonal influenza ▪ IPD
Government funding:	✓ apart from herpes zoster
Uptake monitoring system:	No target and no measurement for seasonal influenza among the population over-60 years of age

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Seasonal influenza:** during the 2010-11 season, Greece was among the few countries which reported high intensity, together with Austria, Portugal and Sweden.
- **Pneumonia:** no data available over the period 2006-2013.
- **Diphtheria:** no reported cases over the period 2006 - October 2013.
- **Tetanus:** very low number of confirmed cases since 2008.

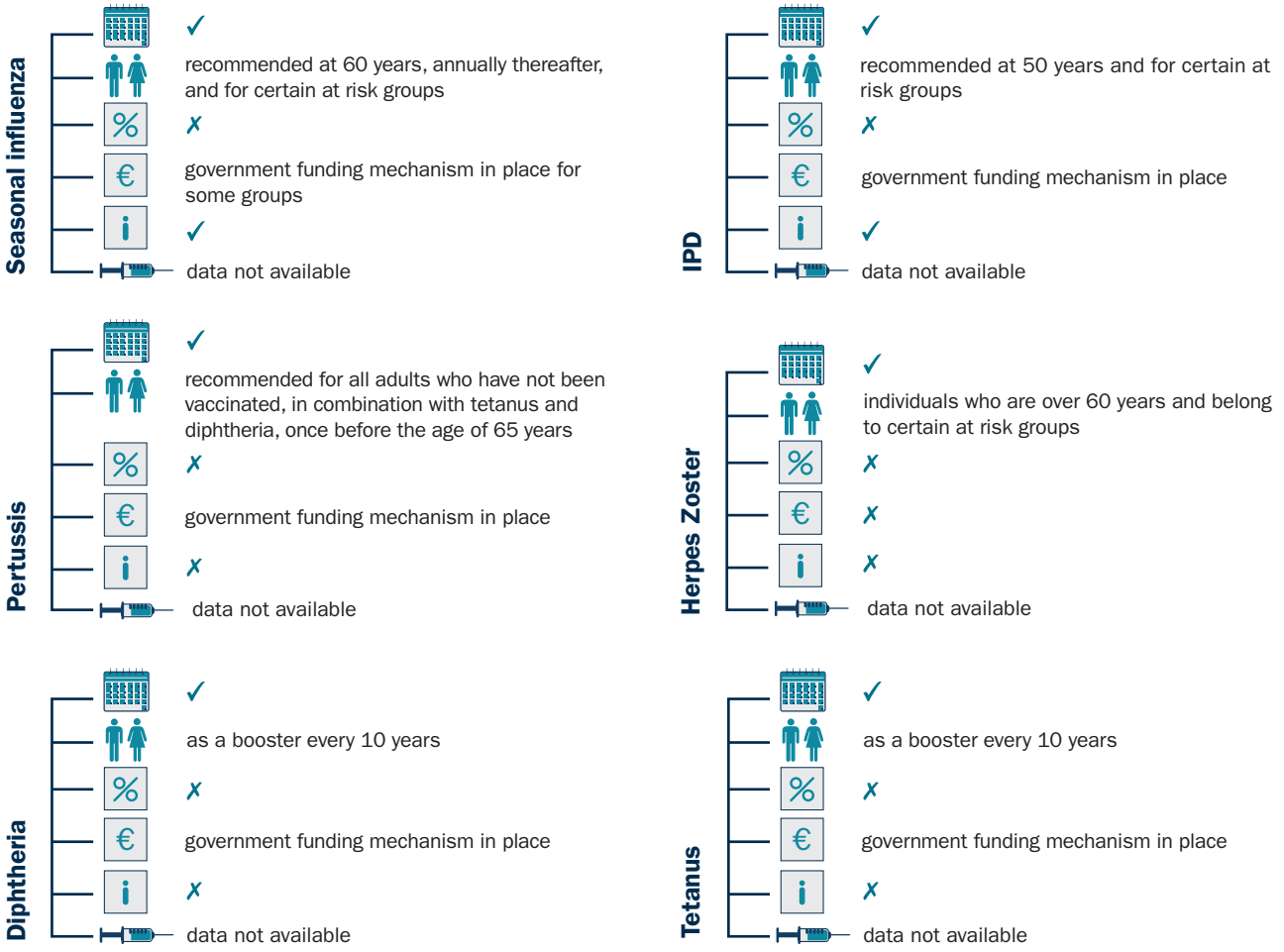
	2006	2007	2008	2009	2010	2011	2012
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC, Hellenic Centre for Disease Control and Prevention (2011, 2012)							
Total cases	-	-	63	66	38	41	43
Rates	-	-	0,56	0,59	0,34	0,37	0,39
PERTUSSIS: reported cases. Source: WHO/Source: ECDC							
Total	13/5	29/6	22/10	27/16	64/55	3/ -	56/ -
HERPES ZOSTER: cases of Chickenpox with complications. Source: Hellenic Centre for Disease Prevention and Control							
Total	30	30	17	7	5	2	4
TETANUS: reported cases. Source: WHO/Source: ECDC							
Total	12/5	10/8	7/0	2/0	5/1	11/ -	7/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

In a Ministry of Health and Social Solidarity publication on ageing and current policy trends in Greece, the emphasis is placed on aligning policies with ageing trend. The integration and the participation of older citizens is listed as a policy objective and specific programmes, such as the Open Protection Centres of the Elderly scheme which provides assistance to people aged over 60 years, especially from low socio-economic status, are in place to achieve this objective. The same report states that shifting health policy from treatment to prevention for cardiovascular diseases, cancer, diabetes, mental illness and dementia, is a key priority with regards to improving older people's health [Ministry of Health 2010].

ADULT VACCINATION POLICY

Greece is one of the few EU Member States that can refer to a detailed guidance document setting out what constitutes an adult immunisation schedule, the Adult Vaccination Programme published in 2011. The National Immunisation Committee provides clinical recommendations to the Greek Ministry of Health. The Committee consists of 11 voting members and does not operate under formal written terms of reference [WHO 2008]. In addition, several organisations, such as the National Infectious Disease Society, the National Pulmonary Society and GP associations, issue guidance for infectious diseases. The Greek authorities have not set national coverage targets for infectious diseases.



At risk groups: Seasonal influenza: medical at risk groups: HIV infected individuals, diabetes, heart disease, chronic pulmonary disease, chronic alcoholic individuals, chronic smokers, final stage of kidney disease, dialysis, health care worker, asplenia, supplement insufficiency, insufficiency of IgG2, pregnancy, immunosuppression (other than HIV). Occupational at risk groups: healthcare professionals, hospital staff, staff of out-patient care clinics, laboratory staff, staff of long-term care facilities, military, workers in the poultry industry. Others: residents of long-term care facilities, household contacts of infected individuals. **IPD:** healthcare professionals, HIV infected individuals, diabetes, heart disease, chronic pulmonary disease, chronic alcoholic individuals, chronic smokers, final stage of kidney disease, dialysis, asplenia, supplement insufficiency, insufficiency of IgG2, pregnancy, immunosuppression (other than HIV), immigrants. **Herpes zoster:** healthcare professionals, HIV infected individuals (CD4 >200cells/µl), diabetes, heart disease, chronic pulmonary disease, chronic alcoholic individuals, chronic smokers, final stage of kidney disease, dialysis, health care worker, asplenia, supplement insufficiency, insufficiency of IgG2.

HUNGARY

Total population:	10 014 633
Population over 55 years:	3 015 582
State pension age:	men & women: 62
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Seasonal influenza. For IPD: for 50+ & 65+ (different vaccines administered) Tetanus, diphtheria & pertussis: as a booster every 10 years
Communication plans:	▪ Seasonal influenza ▪ IPD
Government funding:	✓ Seasonal influenza >65 funding Partial funding for IPD.
Uptake monitoring system:	recorded only for seasonal influenza: 31.3% in 2011-12

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** Hungary reported the lowest pneumonia mortality rates in Europe in 2005 and in 2009 (5 per 100 000).
- **Herpes zoster:** Hungary does not differentiate between varicella and herpes zoster data, which means that the burden of herpes zoster cannot be assessed.
- **Diphtheria:** no cases reported over the period 2006-2011.
- **Tetanus:** inconsistent data reported to WHO and ECDC over the period 2006-2011.

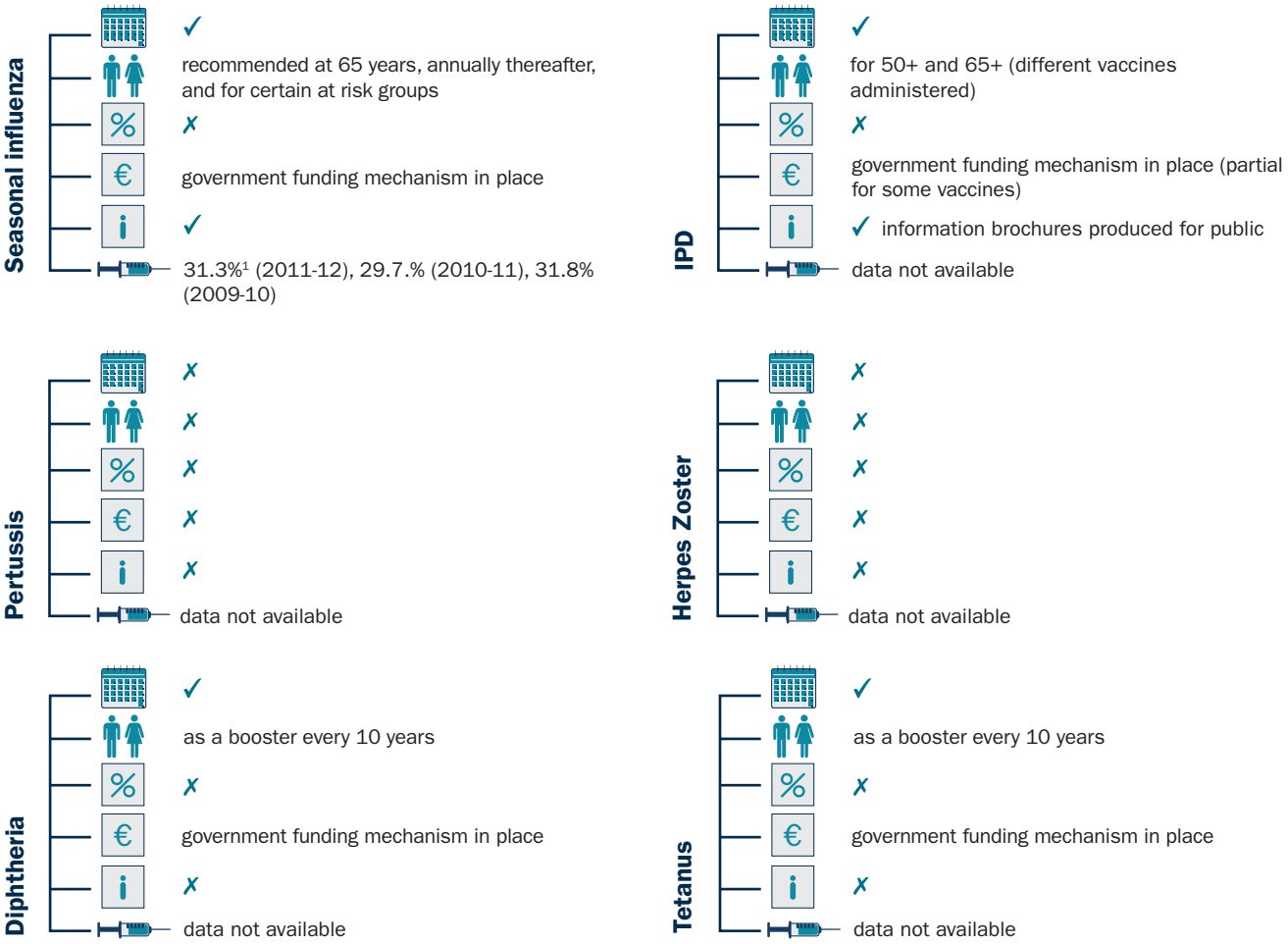
	2006	2007	2008	2009	2010	2011
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	56	57	65	49	-	-
Rates	0,56	0,57	0,65	0,49	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	17/17	48/48	33/33	33/31	25/ -	9/ -
HERPES ZOSTER: varicella cases. Incidence per 100 000 population. Source: EPA						
Total	46372	48313	36412	40460	39602	40 389
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	7/7	4/0	4/0	6/0	0/ -	4/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Hungary does not have a healthy ageing policy framework in place.

ADULT VACCINATION POLICY

No summary document outlines an adult schedule with the full range of vaccines for adults in Hungary. The National Centre for Epidemiology includes the Immunisation Advisory Board, comprised of 12 voting members, which makes recommendations about the national immunisation schedule [WHO 2008]. The Board advises on guidelines and plays a role in shaping insurance policies and provides recommendations on an annual basis. It does not operate under formal written terms of reference. Seasonal influenza uptake is measured through recording the volume of vaccines that are administered [VENICE II 2011].



Inclusion in an adult schedule

Government policy guidelines

National targets rates for recommended groups

Access (funding mechanisms in place)

Government communication plans (media campaigns)

Vaccination uptake rate for recommended groups

[1] ≥60 year age group

At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary disease (including asthma), cardiovascular disease (except hypertension), renal disease, Haematological or metabolic disorders (including diabetes mellitus), immunologic disorders other than HIV/AIDS. Occupational at risk groups: staff in long-term care facilities, health workers poultry industry. Other: residents of long-term care facilities.

IRELAND

Total population:	4 467 561
Population over 55 years:	955 665
State pension age:	men & women: 65
Healthy Ageing Policies or Strategies:	✓ as well as a Minister of State for Disability, Equality, Mental Health and Older People.
Adult schedule (vaccination recommendations from the government):	Seasonal influenza: at 65. IPD: at 65, as well as for specific at risk groups.
Communication plans:	▪ Seasonal influenza, also referencing pneumonia within campaign.
Government funding:	✓ for seasonal influenza & IPD
Uptake monitoring system:	Seasonal influenza: 56.3% for 2011-12 IPD: 41%

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** In 2009, Ireland reported one of the highest rates of mortality caused by pneumonia, with over 25 deaths per 100 000.
- **Invasive Pneumococcal Disease:** Ireland reported relatively high rates of confirmed cases in 2009. Among the countries reporting high rates, the trend is relatively static in Ireland.
- **Herpes zoster:** Health Protection Surveillance Centre (HPSC) started recording chickenpox hospitalisation cases in 2012 and has reported 82 cases in 2012.
- **Diphtheria:** no reported cases over the period 2006-2011.

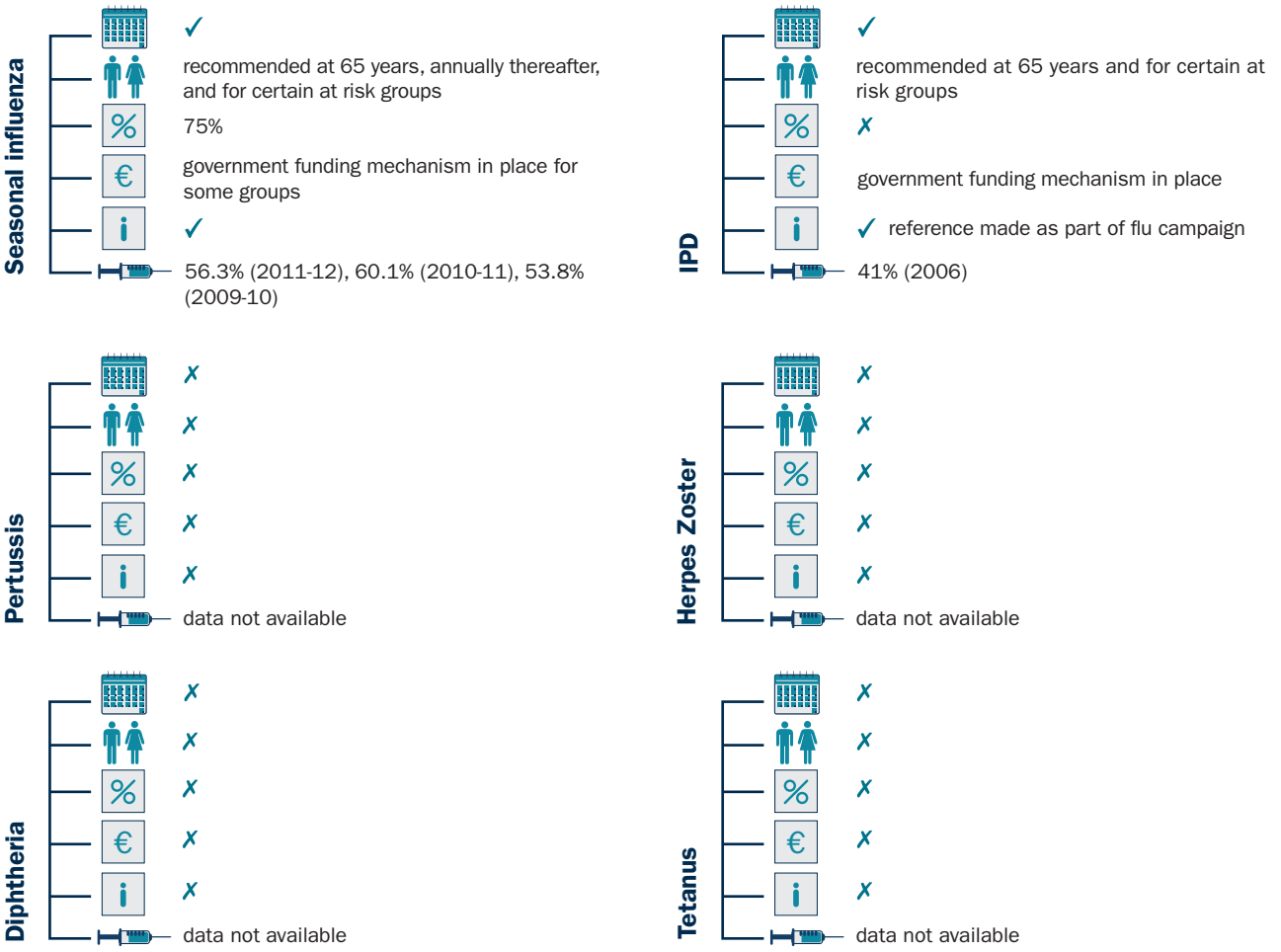
	2006	2007	2008	2009	2010	2011
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	407	313	400	359	-	-
Rates	9,67	7,26	9,09	8,07	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	62/38	78/47	102/71	80/61	107/ -	229/ -
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	0/0	1/1	2/2	0/0	0/ -	0/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Irish authorities initiated a National Positive Ageing Strategy and created the Minister of State for Disability, Equality, Mental Health and Older People in 2007. A new strategy was published in April 2013, however it did not include reference to vaccination. In 2011, the National Immunisation Office (NIO) had a budget of €38,630 million for immunisation expenditure, of which 92% (€35,435 million) was spent on vaccine procurement [NIO].

ADULT VACCINATION POLICY

The National Vaccination office outlines recommendations on adult immunisation in Ireland. The National Immunisation Advisory Committee provides guidance to the Chief Medical Officer on vaccines recommended for use in Ireland. It also advises the Department of Health on immunisation-related policy matters [Royal College of Physicians of Ireland]. In addition, several organisations , including the Irish Gerontological Society and the Diabetes Ireland, issue guidelines for infectious diseases. While Ireland utilises a sentinel coverage system for paediatric immunisation, this system is not yet in place for adult immunisation against seasonal influenza, which is measured through administrative record data [VENICE II 2011]. A national telephone survey was undertaken in 2006 to measure uptake for IPD. The survey revealed that 41% of people aged over 65 years took up the vaccine and 11% of 18-64 year olds who belonged to at-risk groups had been vaccinated.



At risk groups: Seasonal influenza: medical at risk groups: chronic respiratory disease, cystic fibrosis, moderate or severe asthma, chronic heart disease, bronchopulmonary dysplasia, diabetes mellitus, haemoglobinopathies, chronic renal failure, chronic liver disease, chronic neurological disease, Immunosuppression due to disease or treatment, including asplenia or splenic dysfunction, those with morbid obesity. Others: residents of nursing homes, old people's homes, and other long-stay facilities where rapid spread is likely to follow introduction of, those likely to transmit influenza to a person at high risk for influenza complications (including household contacts and out-of-home care givers) infection, healthcare workers, both for their own protection – as these are a group likely to come in contact with influenza during outbreaks – and for the protection of their patients, people who have close, regular contact with pigs, poultry or water fowl. **IPD:** those with no spleen, with splenic dysfunction, immunosuppression including that associated with HIV infection, nephrotic syndrome or chronic renal disease.

ITALY

Total population:	60 508 978
Population over 55 years:	19 753 026
State pension age:	men: 65, women: 60
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	Seasonal influenza: at 65 years. IPD: for certain at risk groups. Tetanus and diphtheria: as a booster every 10 years
Communication plans:	▪ Seasonal influenza
Government funding:	✓
Uptake monitoring system:	Seasonal influenza: 62.7% in 2011-12. Whilst the roll-out of computerised immunisation registries across Italy's regional health area is impressive, it has not been implemented in regard to the adult vaccination schedule.

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Seasonal influenza:** During the season 2010-11, Italy reported the highest consultation levels but only a moderate intensity.
- **Pneumonia:** Italy reports amongst the lowest rates of pneumonia incidence (5 per 100 000).
- **Diphtheria:** no reported cases over the period 2006-2010.
- **Tetanus:** In 2010, Italy accounted for 57 of the 74 confirmed cases in the EU.

	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD9:481). Source: WHO						
Total	0,0456	-	-	-	0,0495	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,4555	-	-	-	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	-	-	694	738	-	-
Rates	-	-	1,16	1,23	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	545/796	474/795	174/336	315/604	187/ -	- / -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations); ICD9: 053. Source: WHO						
Total	0,0561	-	-	-	-	-
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	- /64	22/59	- /53	62/58	57/ -	- / -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

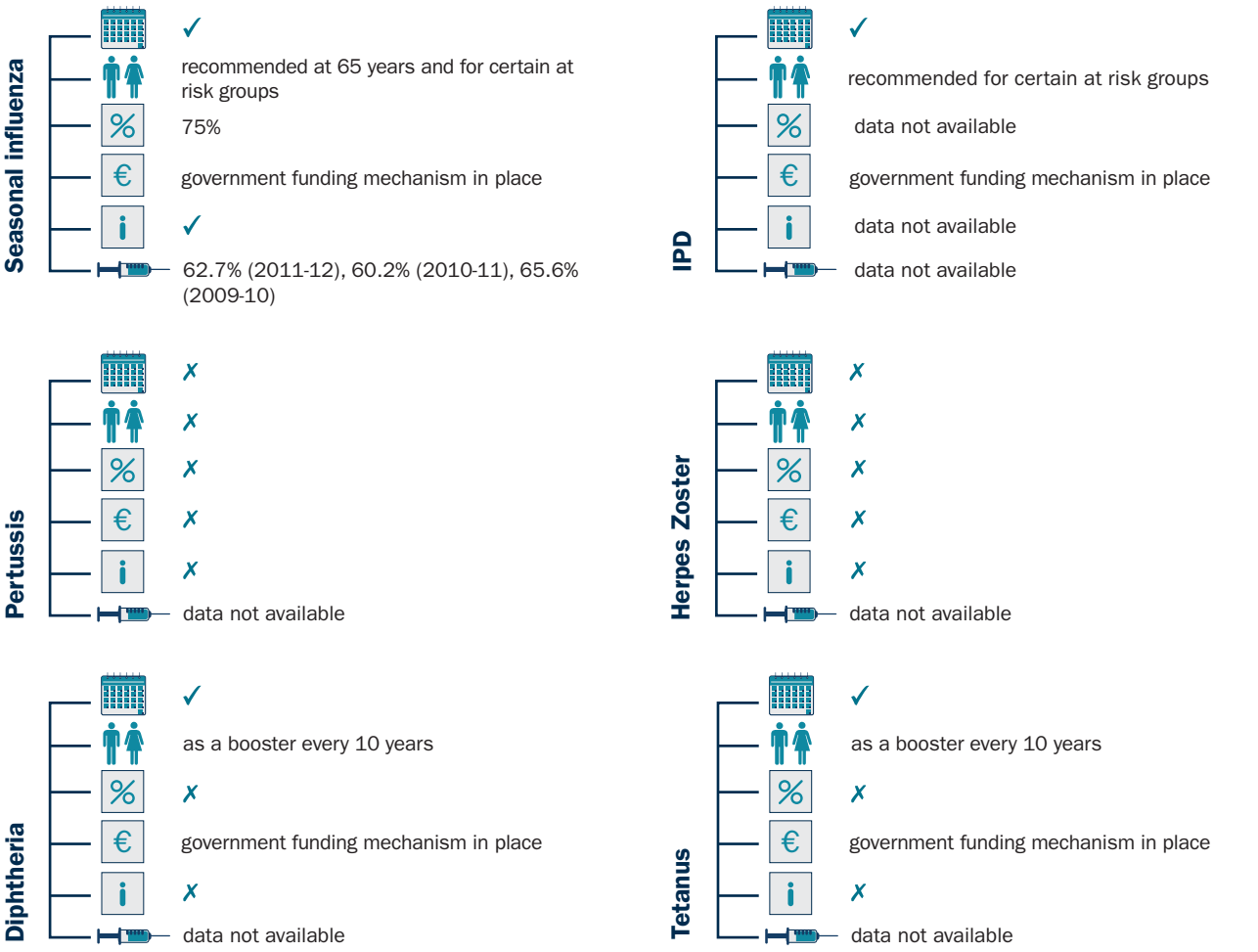
Several healthy ageing policies have been implemented in Italy, in particular in relation to obesity and exercise. Furthermore, the Italian Ministry of Health produces periodic reports on the health status of the population. The latest report (2009-10) sets out a series of measures for the promotion of health and the prevention of diseases in several areas, including infectious diseases [Ministry of Health]. The 'Steps Silver' programme monitors the health status of the population aged over 64 years to support decision-making in relation to the promotion of health among older people. It outlines three pillars of healthy ageing: participation, health and safety [Istituto Superiore di Sanita]. Italian authorities have placed a great deal of emphasis on vaccination. Five percent of the health budget is allocated to preventive health measures although in practice hospital funding takes priority and only 1-2% of this amount goes to the respective regions. There is no available data concerning the proportion of the healthcare budget reserved for immunisation.

ADULT VACCINATION POLICY

The National Vaccine Prevention Plan 2012-2014 includes the following objectives:

- Maintain and develop the epidemiological surveillance of diseases;
- Strengthening of disease surveillance;
- Ensure the availability of a functional and free immunisation programme for target groups including influenza target of 75% and 95% for people aged over 60 years and at-risk groups ;
- Target at-risk and vulnerable groups and develop initiatives to reach them;
- Make all registries computerized in order to improve surveillance.

Governance for new vaccination recommendation involves the National Superior Council of Health (CSS), National Institute of Health (ISS), Inter-regional Prevention Group (CIP), MoH office for Prevention. Seasonal influenza uptake among people aged over 65 years is recorded through the national immunisation registry. The National Vaccine Prevention Plan also includes plans to introduce within 2 years a computerised registry to assess coverage rates – it is not certain that this will include adult vaccination. Currently, an annual survey gathers data from GPs with regards to the volume of influenza vaccines that they have administered. The current target for influenza coverage is set at 75%. Under the National Vaccine Prevention Plan 2012-2014 however, the target is to reach 95% within 2 years.



At risk groups for seasonal influenza: diseases of the cardio-circulatory system, including congenital and acquired heart disease, diabetes mellitus and other metabolic diseases (including obese with BMI> 30 and severe comorbidities), chronic renal failure, diseases of the hematopoietic organs and hemoglobinopathies, tumors, congenital or acquired diseases involving defective production of antibodies, immunosuppression induced by medications or by HIV, and chronic inflammatory syndromes intestinal malabsorption, diseases for which are programmed important surgery, conditions associated with an increased risk of aspiration respiratory secretions (eg. Diseases neuromuscular disorders), chronic liver disease, all those admitted to long term care facilities, doctors and health care providers, police, fire fighters, those whose occupations involve live animals (eg. Breeders, vets, slaughterers). **IPD:** lived cirrhosis, chronic liver disease evolution caused by alcoholism, diabetes mellitus, CSF fistulas, sickle cell amenia and thalasemmia, congenital or acquired immunodeficiences, anatomic of functional asplenia, leukimias, lymphomas, multiple myeloma, cancer spread, organ or bone transplant, clinically significant iatrogenic immunosuppression, chronic renal failure, nephrotic syndrome, HIV positive, cochlear implant wearers.

LATVIA

Total population:	2 090 519
Population over 55 years:	634 041
State pension age:	men & women: 62
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Seasonal influenza: at 65 years whilst tetanus and diphtheria are recommended as a booster every 10 years and for people with tetanus prone wounds in high risk groups
Communication plans:	✗
Government funding:	Partial for seasonal influenza (50%) and full for tetanus & diphtheria.
Uptake monitoring system:	Seasonal influenza: very low (1.7% recorded in 2011-12)

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Seasonal influenza:** Latvia consistently reports high rates of hospitalization and reported the highest rates in 2005 and 2009, of 0.24 per 1000 and 0.87 per 1000 respectively.
- **Pneumonia:** Latvia along with four other EU/EEA countries had hospital admission rates in excess of 5 per 1000 in 2005 and experienced the biggest decreasing trend along the years.
- **Diphtheria:** The indigenous transmission continues in Latvia, Ukraine and in Russian Federation, which means that epidemic diphtheria could return to the EU. Therefore, high vaccination coverage must be sustained and adult booster coverage increased.
- **Tetanus:** no reported case of tetanus over the period 2006-2011 except one in 2007.

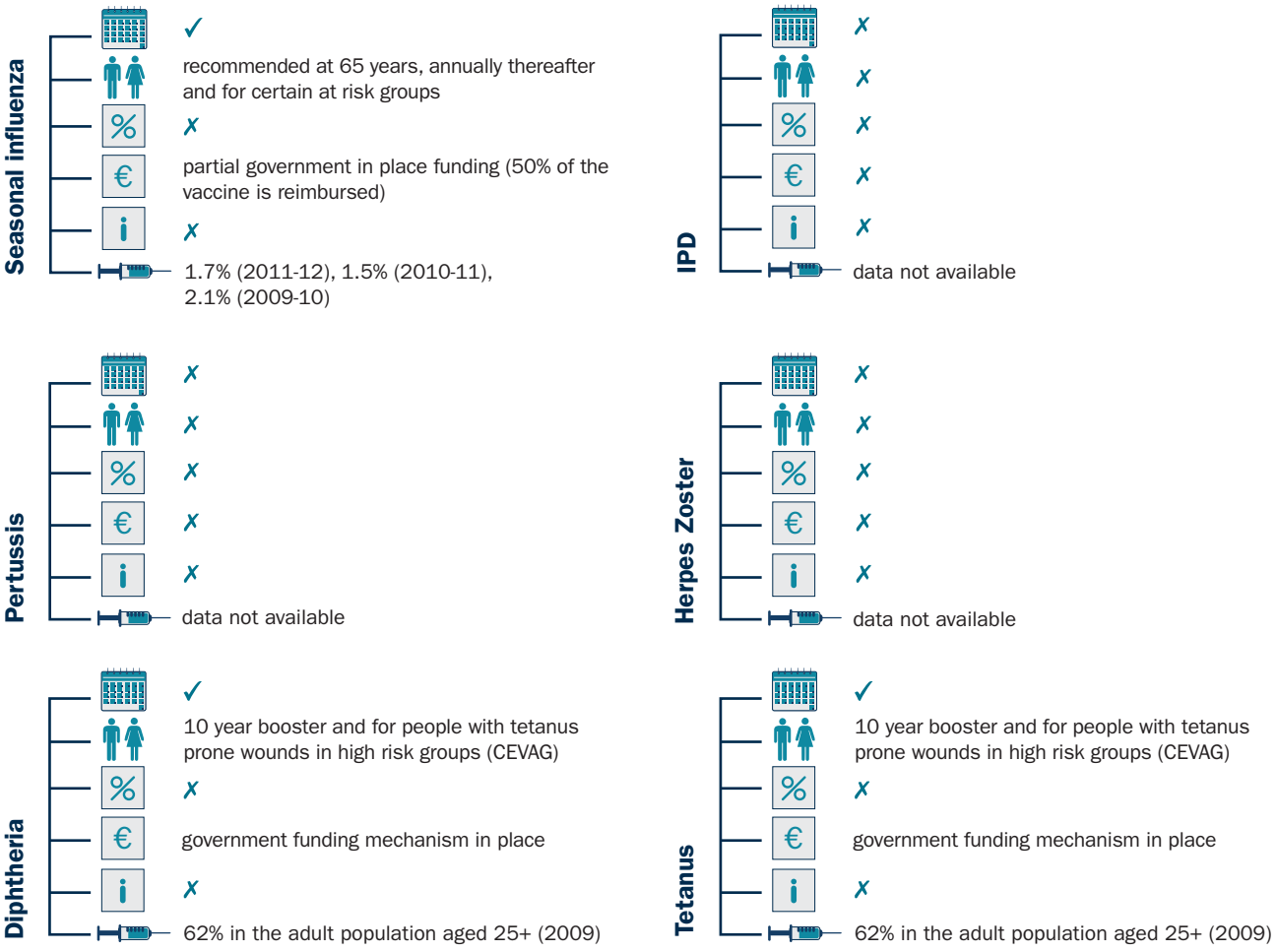
	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD9:481). Source: WHO						
Total	0,0039	0,0066	0,0022	0,0004	0,0022	0,0063
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) of cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,0494	0,0501	0,0366	0,0346	0,0288	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	0	4	3	5	-	-
Rates	0	0,18	0,13	0,22	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	29/10	27/15	14/7	9/8	9/ -	10/ -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations). ICD10: B02. Source: WHO						
Total	0,1224	0,1283	0,1394	0,1095	0,0887	-
DIPHTHERIA: reported cases. Source: WHO/Source: ECDC						
Total	32/64	18/15	28/29	6/5	2/ -	6/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Latvia does not have an official healthy ageing policy framework. Due to falling immunisation rates in recent years, Latvian authorities launched the National Immunisation Plan 2012-2014, within which the preventive utility of immunisation is emphasised. The Plan also includes measures to improve Latvia's relatively poor performance with targets and performance indicators listed for a number of vaccines [National Immunisation Plan]. Yet, budgetary restrictions mean that adult immunisation is somewhat threadbare in Latvia. Of the total healthcare budget, 0.96% is spent on vaccination, and this is almost entirely dedicated for paediatric vaccination [Health Budget 2012]. Tdap booster for tetanus and diptheria is the only adult vaccination reimbursed.

ADULT VACCINATION POLICY

No summary document outlines all the adult vaccinations included in the national vaccination programme. The State Immunisation Council, comprised of 12 voting members and operating under formal written terms of reference, makes recommendations to the Ministry of Health regarding the national immunisation programme [WHO 2008]. Latvia has no monitoring system in place to measure seasonal influenza uptake amongst at-risk groups but measures uptake among people aged over 65 years through medical records [VENICE II 2011]. Tdap uptake is measured for the entire adult population [VENICE II 2009]. The Latvian State 'Infectology' Centre released a national statistical overview in 2009 in which the number of vaccine recipients per vaccine was listed. A total of 21 098 people were listed as having received the seasonal influenza vaccine, among which 1493 children between the ages of 0 and 17 years. The National Immunisation Plan 2012-2014 emphasizes Latvia's poor record of seasonal influenza coverage for people aged over 65 years (2.2% during the last season) and states that coverage across all age groups is 0.8%.



At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary disease, cardiovascular (except hypertension) disease, renal disease, Haematological or metabolic disorders (including diabetes mellitus), immunologic disorders other than HIV/AIDS, HIV/AIDS. Occupational at risk groups: hospital staff, long-term care facilities, out-patient care clinics, laboratory staff.

LITHUANIA

Total population:	3 068 457
Population over 55 years:	801 619
State pension age:	men: 62.5, women: 60
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Seasonal influenza & IPD: for 65+ and for risk groups 18-64 years of age. Tetanus & diphtheria: as a booster every 10 years for 24+ years and for people with tetanus-prone wounds in high-risk groups
Communication plans:	▪ Seasonal influenza
Government funding:	▪ Seasonal influenza: for risk groups ▪ Tetanus & diphtheria (every 10 years for 24+ years) ▪ Tetanus: for people with tetanus-prone wounds.
Uptake monitoring system:	Seasonal influenza: quite low among people aged 65+ (18.5% in 2011-12)

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Seasonal influenza:** Lithuania reported the highest rate (1.55 per 1000) in the pandemic year of 2009.
- **Invasive Pneumococcal Disease:** Lithuania has relatively low and stable mortality rates.
- **Pneumonia:** Lithuania and three other countries had hospital admission rates in excess of 5 per 1000 in 2005 and in 2009, with a decreasing trend. Pneumonia admissions represented 3.1% of hospitalisations in 2010.
- **Pertussis:** Lithuania had the 2nd highest hospitalisation rate in Europe in 2005 (0.021 per 1000).

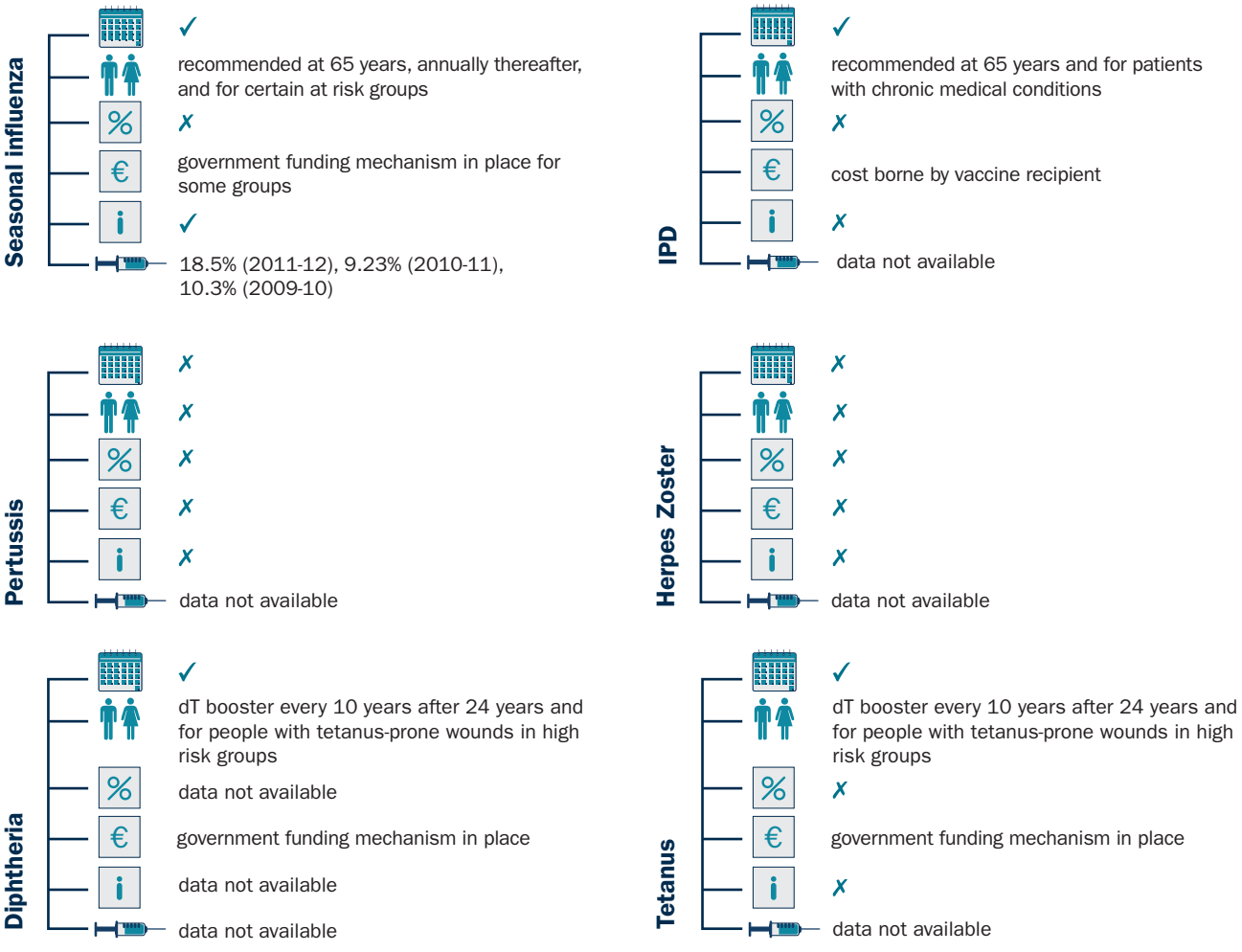
	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0312	0,0284	0,0176	0,0114	0,0167	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) of cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,107	0,1117	0,0861	0,0665	0,0737	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	10	32	18	16	-	-
Rates	0,29	0,95	0,53	0,48	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	6/4	17/17	51/51	233/233	19/ -	30/ -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,081	0,0744	0,0923	0,0865	0,0916	-
DIPHTHERIA: reported cases. Source: WHO/Source: ECDC						
Total	0/0	0/0	4/2	0/0	0/ -	1/ -
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	3/1	1/1	0/1	0/0	2/ -	2/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Lithuania does not have a healthy ageing policy framework in place. Only 0.5% of the healthcare budget is reserved for immunisation, while 0.08% is reserved specifically for adult immunisation.

ADULT VACCINATION POLICY

No summary document outlines the vaccinations that are included on the adult schedule in Lithuania. The Board for the Coordination of the National Immunisation Programme, composed of 13 voting members, provides clinical recommendations to the Ministry of Health regarding the national immunisation programme [WHO 2008]. It does not operate under formal written terms of reference. BALTIPA, the Baltic Immunoprophylactic Association, and Lithuanian Society for Infectious Diseases are among the prominent organisations which issue further guidance on adult immunisation [Viaconventus]. Lithuania monitors adult coverage rates for seasonal influenza only. Vaccinations are recorded through a self-reporting system in which medical centres document and communicate the number of vaccines they have administered for a specific purpose [VENICE II 2011].



Inclusion in an adult schedule

Government policy guidelines

National targets rates for recommended groups

Access (funding mechanisms in place)

Government communication plans (media campaigns)

Vaccination uptake rate for recommended groups

At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary disease, chronic cardiovascular disease, chronic renal disease, haematological or metabolic disorders (including diabetes mellitus), immunologic disorders other than HIV/AIDS, individuals with HIV/AIDS. Occupational at risk groups: medical staff, staff in long-term care facilities. Others: pregnant women, residents of long-term care facilities, household contacts of infected individuals.

LUXEMBOURG

Total population:	507 885
Population over 55 years:	126 301
State pension age:	men & women: 65
Healthy Ageing Policies or Strategies:	✓ that draws on internationally recognized charters of good practice
Adult schedule (vaccination recommendations from the government):	✓ full, with seasonal influenza recommended at 65 years, IPD at 60 years, and pertussis, diphtheria and tetanus recommended as a joint booster every 10 years
Communication plans:	▪ Seasonal influenza
Government funding:	partial funding for seasonal influenza ▪ Pertussis ▪ Diphteria ▪ Tetanus
Uptake monitoring system:	Seasonal influenza: moderate uptake of 45.1% measured in 2011-12

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Herpes zoster:** Luxembourg reports the highest age standardized mortality rate in Europe (0.16 per 100 000).
- **Diphtheria/tetanus:** no cases reported over the period 2006-2011.

	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0677	0,0729	0,0900	0,1045	0,0723	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) of cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,1143	0,1271	0,1412	0,1658	0,1064	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	0	2	0	-	-	-
Rates	0	0,42	0	-	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	0/0	0/4	2/2	1/1	0/ -	4/ -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,0402	0,0396	0,043	0,0512	0,0614	-

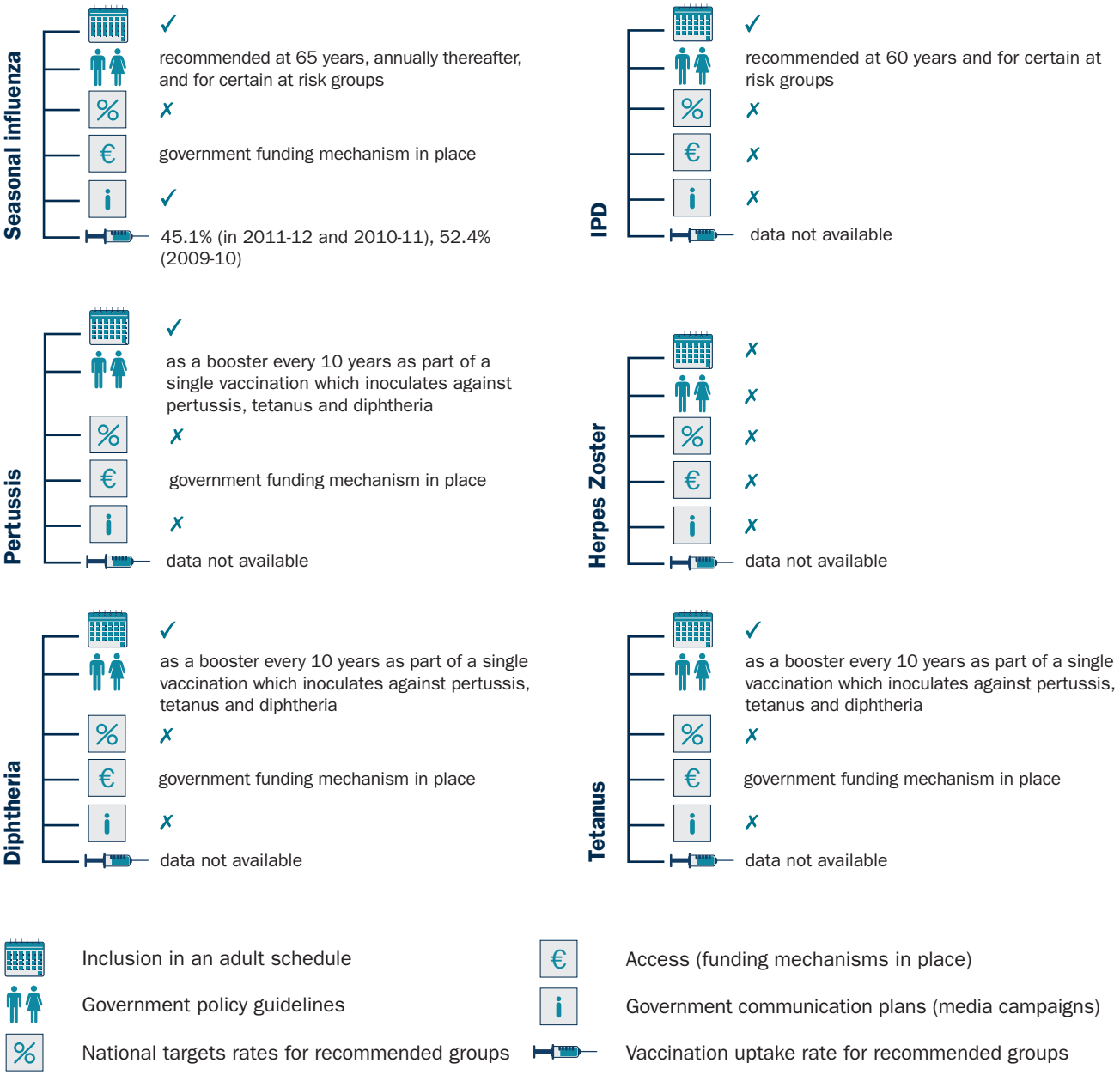
IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Luxembourg's healthy ageing strategy draws upon internationally accepted standards, including WHO recommendations and the Ottawa Charter. Allowing all citizens to achieve their full health potential is the main aim of the strategy. Its main objectives are to promote and protect the health of individuals throughout their lives and to

reduce the incidence of major diseases and major trauma and suffering. Two overarching values underpin it: health is a fundamental right of human beings; equity in health; and participation of individuals, groups, populations, institutions, organizations and sectors [Ministry of Health]. Vaccination is a key component of this strategy and is listed as one of the fundamental actions for promotion of health and prevention [Ministry of Health]. A break-down of the vaccination budget between paediatric and adult immunisation is not available, but the total 2012 vaccines' budget is 30 million EUR.

ADULT VACCINATION POLICY

No summary document outlines all of the vaccines on the adult immunisation schedule. The Supreme Council for Infectious Diseases (formerly High Council for Infectious Diseases) works with the Department of Health in formulating immunisation recommendations. Seasonal influenza vaccination uptake is measured through recording the volume of vaccines administered [VENICE II 2011].



At risk groups: Seasonal influenza: chronic lung disease, chronic cardiovascular disease, diabetes mellitus, liver cirrhosis, alcoholic patients, patients with a fistula CSF flow, people with cochlear implants available or proposed, patients who are resident in nursing homes or other long-term institutions, immunocompromised patients, especially patients with congenital absence of spleen or splenectomy, a lymphoma, multiple myeloma, chronic renal insufficiency, a syndrome, nephrotic, sickle cell, an organ transplant & HIV infected patients.

MALTA

Total population:	424 738
Population over 55 years:	122 713
State pension age:	men & women: 65 (if born after January 1st 1962)
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	Seasonal influenza: at 55 years. Tetanus and diphtheria: for certain at risk groups only.
Communication plans:	▪ Seasonal influenza
Government funding:	✓ for all recommended vaccines
Uptake monitoring system:	Seasonal influenza: 51% of people aged 65+ in 2010-11

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** Hospitalisations represented 1.3% of hospital admissions in 2010, one of the lowest percentages in the EU.
- **Diphtheria/tetanus:** no cases reported over the period 2006-2011.

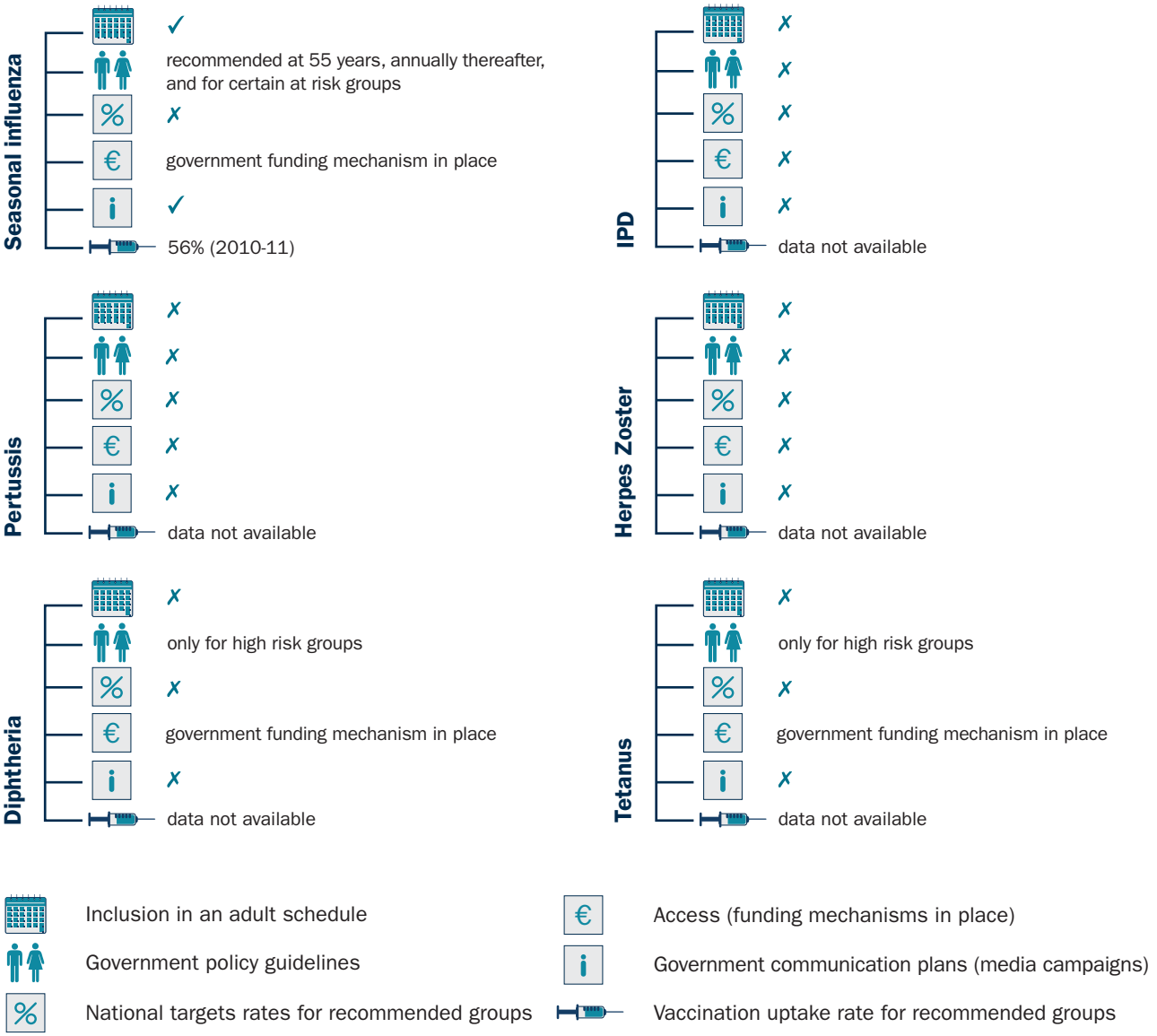
	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	-	-	-	0,0024	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) of cases, ICD10 (A40, G00, J13). Source: WHO						
Total	-	-	-	0,0243	0,0146	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	0	0	0	9	11	
Rates	0	0	0	2,18	2,66	
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	2/0	0/0	1/0	0/0	2/ -	8/ -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	-	-	-	0,034	0,0461	-

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

The Maltese Ministry of Health's Health Promotion Unit undertakes a number of activities in relation to healthy ageing. It provides information specifically on smoking, memory, medicine and nutrition. There is no public data available on the proportion of the healthcare budget reserved specifically for immunisation and adult immunisation.

ADULT VACCINATION POLICY

No summary document outlines the vaccines recommended for older adults within the Maltese immunisation programme. The Advisory Committee on Immunisation Policy, composed of eight voting members and two non-voting members, provides clinical recommendations to the Ministry of Health under formal written terms of reference [WHO 2008] – these are not always followed. The Committee was established in 2007 following the publication of Legal Notice 253/07. Seasonal influenza uptake among people aged over 65 years is measured through an immunisation registry. Uptake was last recorded during the 2008-09 season at 51% [VENICE II 2011].



Members of the Advisory Committee on Immunisation Policy: Dr Charmaine Gauci (Chair); Dr Victoria Farrugia Sant'Angelo (Secretary); Prof Simon Attard Montalto; Dr Christopher Barbara; Dr Paul Caruana; Dr Tonio Piscopo; Dr Gianfranco Spiteri; Mr Peter Zarb.

At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary disease (including asthma), cardiovascular disease (excluding hypertension), renal disease, hepatic disease, haematological or metabolic disorders (including diabetes), immunologic disorders other than HIV/AIDS, HIV/AIDS, Any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration. Occupational at risk groups: Hospital staff, long-term care facilities, out-patient care clinics, laboratory staff, essential services (eg. Firemen), veterinary services, poultry industry, military. Others: residents of long-term care facilities.

THE NETHERLANDS

Total population:	16 615 243
Population over 55 years:	4 744 473
State pension age:	men & women: 65
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Despite the existence of a Dutch adult immunisation schedule, vaccination at 60 years is only recommended for seasonal influenza. Pertussis, IPD, diphtheria and tetanus: for at risk groups only.
Communication plans:	▪ Seasonal influenza (information brochures for the public and healthcare professionals)
Government funding:	▪ Seasonal influenza
Uptake monitoring system:	Seasonal influenza: 56.2% for those aged 60+, 77.2% for those aged 65+ (2011-12 (against a national target of 100%, higher than the WHO target of 75%))

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Invasive Pneumococcal Disease:** Recorded mortality from S. Pneumoniae was among the lowest in EU/EEA countries (0.3 per 100,000) in 2005.
- **Pertussis:** The country has seen a resurgence of pertussis. Reported annual incidence rates in 2005 were eight times higher than in most other reporting countries (40.1 per 100 000), with continually high rates since then.
- **Herpes zoster:** mortality from herpes zoster is high in the Netherlands (0.09 per 100 000).
- **Diphtheria/tetanus:** no cases reported over the period 2006-2011, except one case of diphtheria reported to the WHO in 2011, one case of tetanus reported to the WHO in 2009 and five cases of tetanus reported to the WHO in 2011.

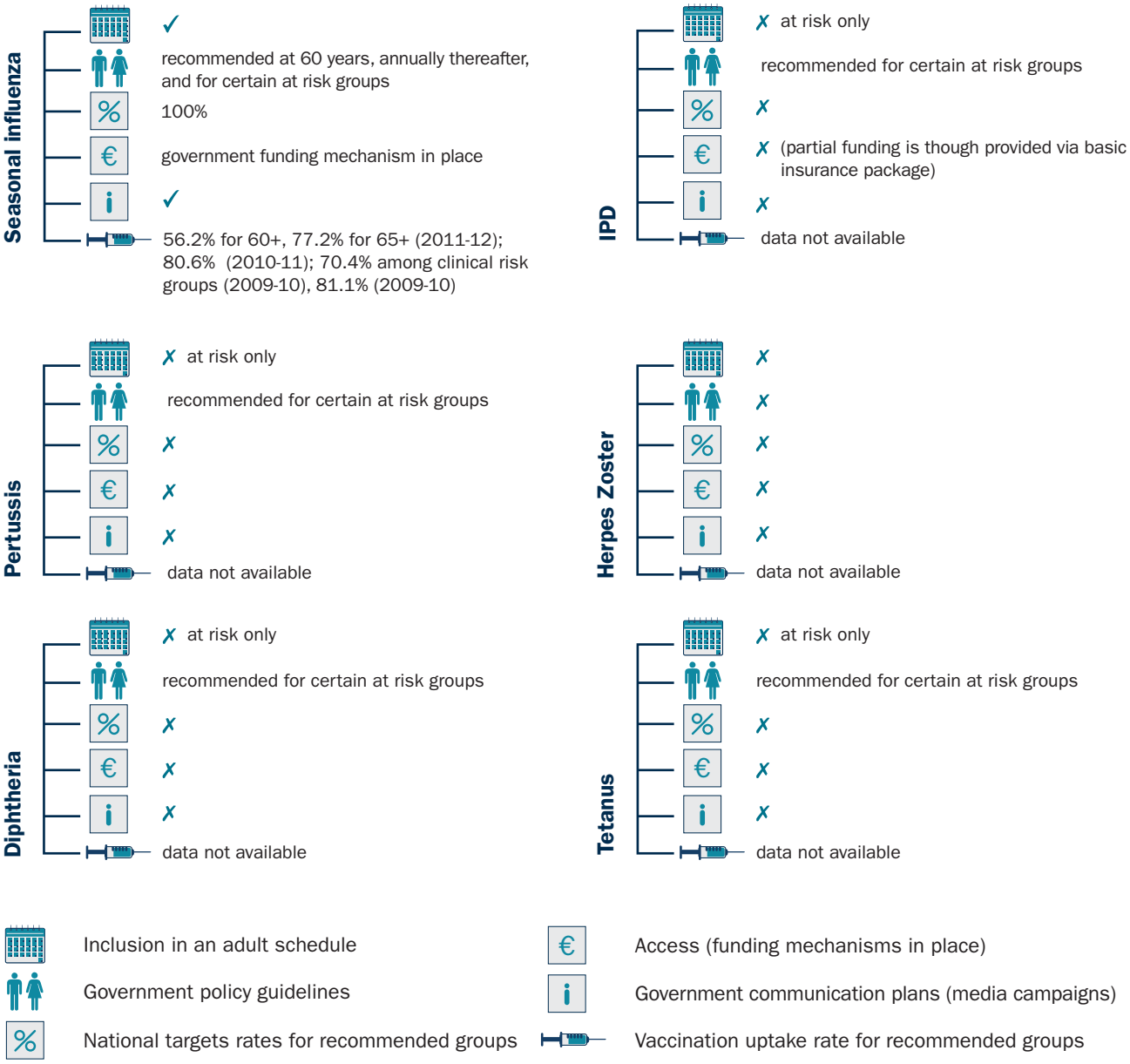
	2006	2007	2008	2009	2010	2011
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	-	0	0	35	-	-
Rates	-	0	0	0,21	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	4298/4174	7325/7185	8661/8557	6202/5751	2912/ -	6726/ -
HERPES ZOSTER cases. Source: Scientific publication: http://www.biomedcentral.com/1471-2334/12/110						
Total	652	700	738	-	-	-

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Few initiatives exist and healthy ageing policies do not play a significant role in the nation's health policies. The national vaccination strategy also lacks coordination and impetus at the national level. There are however a number of local healthy ageing organisations and initiatives which provide limited funding for health ageing schemes. Influenza is the only vaccine included in the Dutch national immunisation schedule for adults. For the main other infectious diseases there are no national recommendations. Influenza is recommended at the age of 65.

ADULT VACCINATION POLICY

No summary document outlines the vaccinations included on the adult schedule. The National Health Council, composed of specialists from various fields, is involved in the process of establishing the Dutch national immunisation schedule by the Dutch authorities (www.wgr.nl). An influenza committee meets two to three times a year to assess the influenza programme. The country does not have a computerised registry that records uptake rates in adults as for paediatric immunisation. Rather, uptake rate is gauged by the volume of vaccines that are distributed to GPs. The Dutch government set the coverage target for influenza at 100%.
The Dutch government covers the cost of all the influenza vaccinations for those over 60. The vast majority of influenza vaccinations to older people are administered by GPs, who are offered an incentive to vaccinate patients. Dutch GPs have a computer registry of all of their patients which will inform them as to whom, in terms of age, is eligible for vaccination, and on this basis individuals are invited to receive vaccination. Vaccination against other infectious diseases may be recommended for those suffering from chronic diseases. Whether these are administered or not depends on the physician and the health insurance company. It may be that there is a consultation between the patient and his/her health insurance company to decide whether the vaccine will be covered. It is however unlikely that pertussis, diphtheria, tetanus or herpes zoster will be authorised by the health insurer.



At risk groups for seasonal influenza: medical at risk groups: chronic pulmonary (including asthma) disease, Cardiovascular (except hypertension) disease, Renal disease, Hepatic disease, Haematological or metabolic disorders (including diabetes mellitus), Immunologic disorders other than HIV/AIDS, HIV/AIDS, Any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration. Occupational at risk groups: Hospitals, long-term care facilities, out-patient care clinics. Others: residents of long-term care facilities. **IPD:** chronic heart disease, chronic lung disease and diabetes. **Pertussis:** chronic heart disease, chronic lung disease and diabetes. **Diphtheria:** chronic heart disease, chronic lung disease and diabetes. **Tetanus:** chronic heart disease, chronic lung disease and diabetes.

POLAND

Total population:	38 198 754
Population over 55 years:	10 237 652
State pension age:	men: 65, women: 60
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Seasonal influenza: at 55. IPD: at ages 50 & 65 (different vaccines administered) Pertussis, tetanus and diphtheria: as a booster every 10 years
Communication plans:	▪ Seasonal influenza (informative brochures for the public and health-care professionals)
Government funding:	▪ Seasonal influenza ▪ IPD
Uptake monitoring system:	Seasonal influenza: very low (14.2% in 2011-12)

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Herpes zoster:** reported mortality from herpes zoster is low in Poland.
- **Pertussis:** in 2010, Poland had one of the highest hospitalisation rates (as had Austria and Norway), at around 0.016 per 1000.
- **Diphtheria:** no cases reported over the period 2006-2011.
- **Tetanus:** Poland is one of the few European countries to have recorded meaningful numbers of tetanus cases.

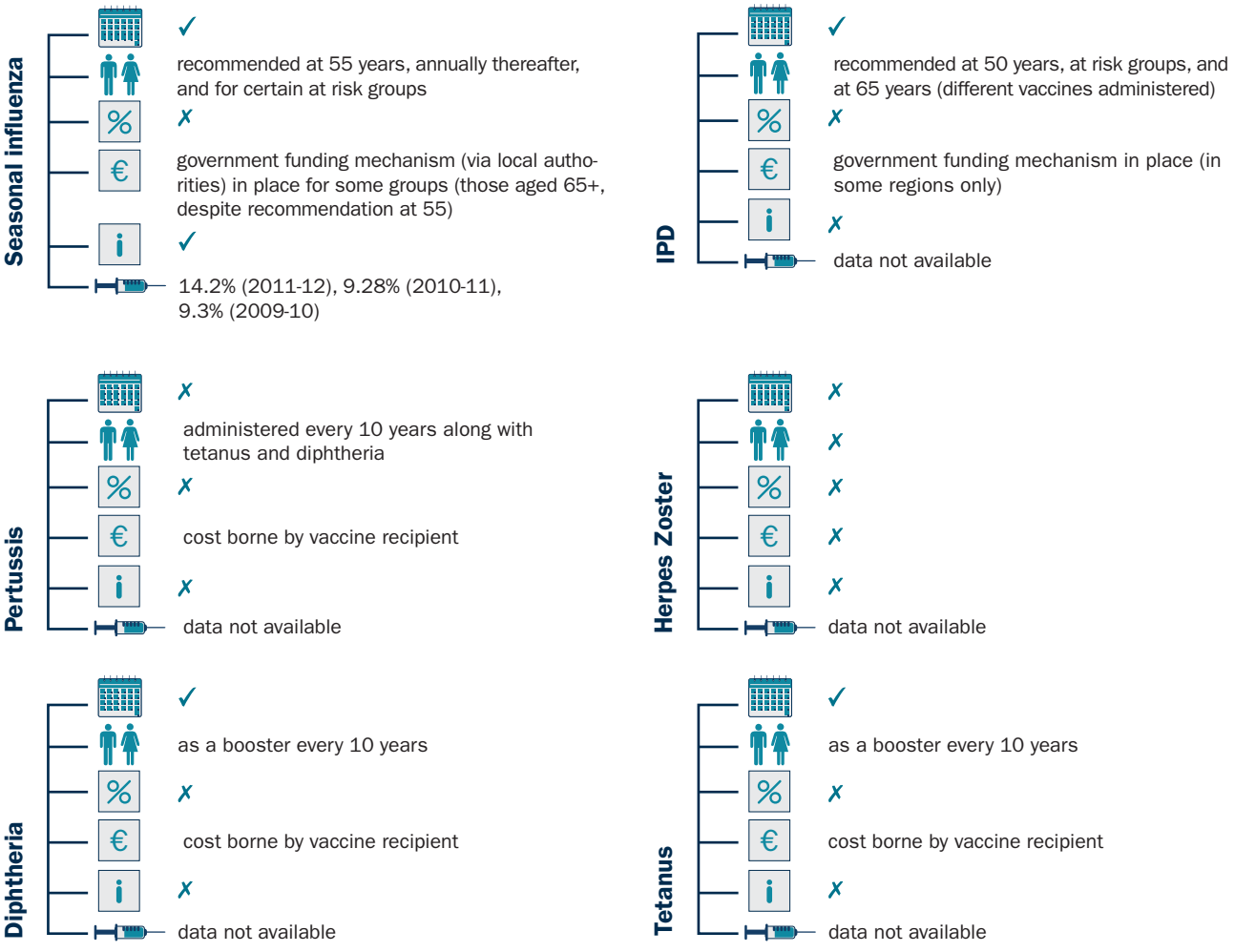
	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0100	0,0092	0,0114	0,0205	0,0185	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) of cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,0462	0,0429	0,0442	0,062	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	196	250	212	274	-	-
Rates	0,51	0,66	0,56	0,72	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	1525/1368	1987/1667	- /1272	2390/1056	1266/ -	- / -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,0586	0,0525	0,0472	0,0496	-	-
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	22/22	19/19	- /14	19/1	16/ -	- / -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

While the National Health Programme 2006-2015 aims to reduce differences in health outcomes in specific groups including older disabled people, there is not a specific policy framework in place to address healthy ageing [AGE Europe]. One hundred million Polish Zloty are spent on the national immunisation programme. No breakdown for adult immunisation spending is unavailable.

ADULT VACCINATION POLICY

The 1985 Sanitary – Epidemiological Council, comprised of 20 voting members, provides clinical recommendations to the Ministry of Health under formal written terms of reference [WHO 2008]. In addition, several organisations, including the Polish General Practitioner Society, the Polish Vaccinology Society, the Polish Infectious Diseases Society and the National Microbiology Consultant, issue clinical guidance. Influenza coverage is measured through medical records for the entire population. Poland does not have a system in place to monitor coverage in adult at-risk groups for whom the vaccine is recommended. No uptake targets are set for any of the vaccines included for adults within the Polish vaccination schedule.



Inclusion in an adult schedule

Government policy guidelines

National targets rates for recommended groups

Access (funding mechanisms in place)

Government communication plans (media campaigns)

Vaccination uptake rate for recommended groups

At risk groups: Seasonal influenza: medical at risk groups: pulmonary disease (including asthma) and cardiovascular disease (except hypertension), renal disease, hepatic disease, haematological or metabolic disease (including diabetes mellutis), immunologic disorders other than HIV/AIDS, HIV/AIDS. Occupational at risk groups: those working in hospitals, long-term care facilities, out-patient care clinics, working in the trade industry, working in transport, working in schools and universities.

PORTUGAL

Total population:	10 589 792
Population over 55 years:	3 178 392
State pension age:	men & women: 65
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	Seasonal influenza: at 65 years, as well as pertussis, diphtheria and tetanus as a booster every 10 years.
Communication plans:	▪ Seasonal influenza
Government funding:	partial funding for seasonal influenza ▪ Pertussis ▪ Diphteria ▪ Tetanus
Target rates:	Target rates of 60% for seasonal influenza only
Uptake monitoring system:	Seasonal influenza: 43.4% in 2011-12 Pertussis, diphtheria and tetanus: 61% for people aged 65+ in 2010

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Seasonal influenza:** during the 2010-11 season, Portugal was among the few countries which reported high intensity, together with Austria, Greece and Sweden.
- **Pneumonia:** the highest percentage of hospitalisations for pneumonia in EU/EEA countries in 2005 was recorded by Portugal with 4.2% of hospitalisations. In 2009, Portugal (as well as Ireland, Slovakia and the UK) had the highest mortality rates, with over 25 deaths per 100 000.
- **Pertussis:** In 2005, Portugal reported the 4th highest hospitalisation rate in EU/EEA countries (0.019 per 1000) after Croatia, Lithuania and Norway.
- **Diphtheria:** no cases reported over the period 2006-2011.

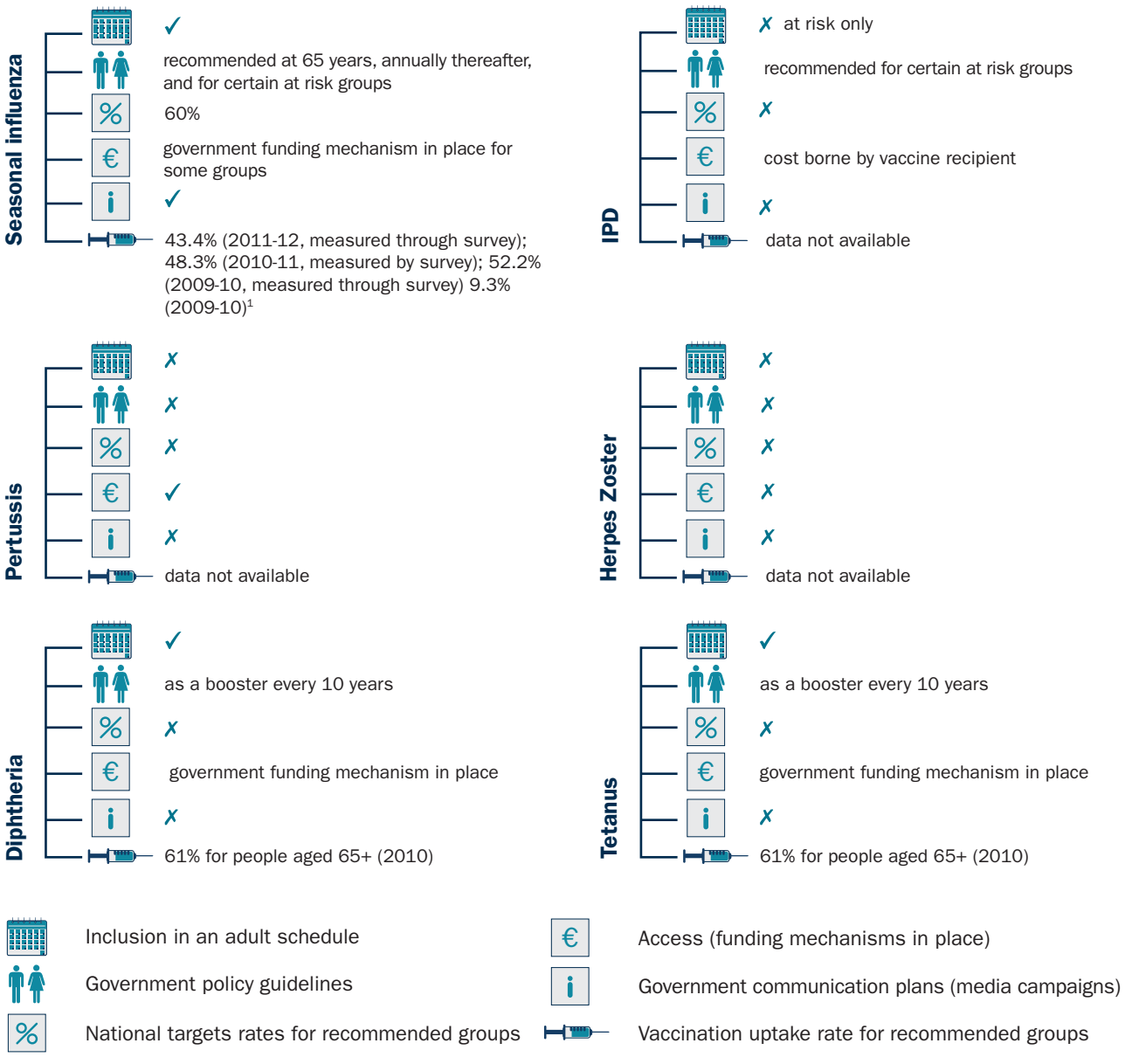
	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,2559	0,2772	0,2465	-	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) of cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,5956	0,589	0,5882	-	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	22/21	22/20	69/68	68/63	14/ -	32 / -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,0132	0,0138	0,0141	-	-	-
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	7/7	9/9	1/1	6/0	3/ -	0/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Portugal has set out healthy ageing provisions within the Portuguese National Health Plan 2004-2010, which includes as a central pillar the promotion of health throughout the life cycle [Ministry of Health]. The 2013 health budget includes reductions of approximately 9.3%that will impact the pharmaceutical expenditure. No information is available on the budget reserved for adult immunisation.

ADULT VACCINATION POLICY

No summary document outlines the adult immunisation schedule. The Technical Committee on Immunisation (Comissão Técnica de Vacinação), composed of 14 experts from various disciplines, is tasked with providing technical advice and guidance on all vaccinations that are included within the Portuguese vaccination schedule, paediatric and adult [National Vaccination Programme]. Health authorities measure seasonal influenza uptake coverage for people aged over 65 years and a number of occupation risk groups: hospital staff, long-term care facilities, out-patients care. Uptake is estimated through the use of the immunisation registry and surveys [VENICE II 2009]. There is no evidence of national targets in place for any of the vaccinations recommended on the Portuguese adult immunisation schedule.



[1] Measured through administrative method, other methods used including survey.

At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary (including asthma) disease, cardiovascular (except hypertension) disease, renal disease, hepatic disease, Haematological or metabolic disorders (including diabetes mellitus), immunologic disorders (other than HIV/AIDS), HIV/AIDS, pregnancy, Any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration. Occupational at risk groups: hospital staff, long-term care facilities, out-patient care clinics, laboratory staff, Professionals who can be involved in culling operations of avian-influenza infected poultry. Others: pregnant women, residents of long-term care facilities, household contacts of individuals for whom vaccination is recommended. **IPD:** Sickle-cell disease and other hemoglobinopathies, Anatomic asplenia (congenital or acquired) HIV infection, individuals with cochlear implants, individuals with down syndrome, chronic lung disease, chronic heart disease, chronic liver disease, diabetes mellitus, chronic renal failure, nephrotic syndrome, CSF fistula, donor bone marrow, congenital immunodeficiency, acquired immunodeficiency, individuals waiting to give organ transplants.

ROMANIA

Total population:	21 861 476
Population over 55 years:	5 838 245
State pension age:	men: 64, women: 59
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Seasonal influenza: at 65 years. Tetanus and diphtheria: as a booster every 15 years. IPD: for certain at risk groups.
Communication plans:	▪ Seasonal influenza
Government funding:	✓ for recommended vaccines except for IPD
Uptake monitoring system:	Seasonal influenza: 20.9% in 2011-12

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** In 2005, mortality rates were highest in Romania (over 25 per 100 000) than in any other EU/EEA country.
- **Herpes zoster:** Romania does not differentiate between varicella and herpes zoster data, which means that the burden of herpes zoster cannot be assessed over the period 2006-2011.
- **Diphtheria:** no cases reported over the period 2006-2011.

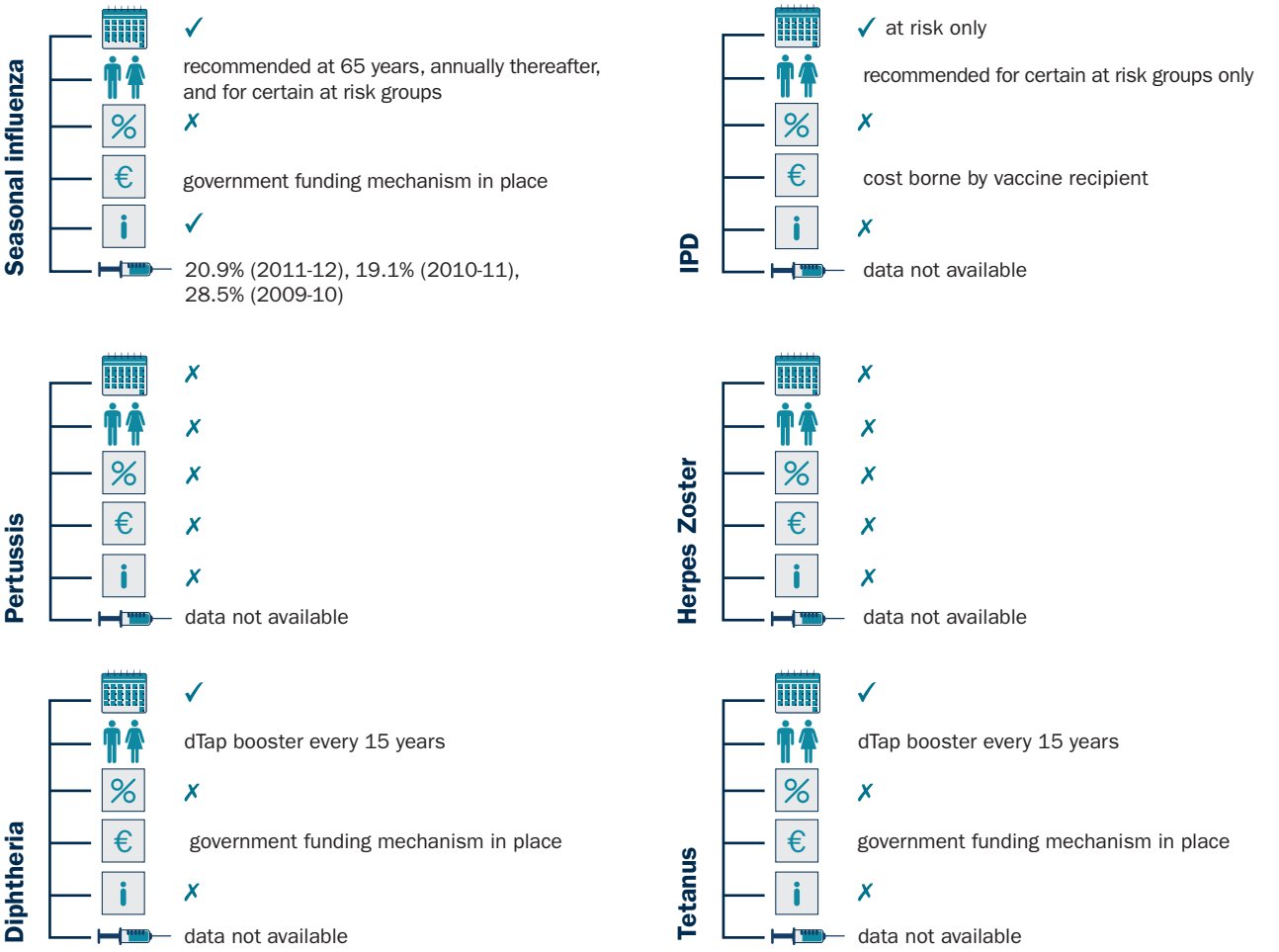
	2006	2007	2008	2009	2010	2011
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	-	-	0	122	-	-
Rates	-	-	0	0,57	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	33/14	35/2	51/0	10/0	29/ -	86/ -
HERPES ZOSTER: Varicella cases. Source: National Centre for Surveillance and Infectious Diseases Control						
Total	-	-	49809	44693	36245	52342
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	10/10	12/9	11/11	9/7	9/ -	20/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Romania does not have a healthy ageing policy framework in place. The healthcare budget (of which 7-10% is allocated to prevention) takes up 4% of the national GDP. The amount that is allocated to adult immunisation is minimal.

ADULT VACCINATION POLICY

No summary document outlines an adult immunisation schedule. The Vaccinology Commission, composed of 12-14 members, makes clinical guidelines directly for the Romanian Ministry of Health. In addition, several national societies, including the Romanian Society of Pneumology, the Romanian Society of Cardiology and the National Society of Family Medicine, issue recommendations. Seasonal influenza is monitored through recording the volume of vaccines administered [VENICE II 2011].



Inclusion in an adult schedule

Government policy guidelines

National targets rates for recommended groups

Access (funding mechanisms in place)

Government communication plans (media campaigns)

Vaccination uptake rate for recommended groups

Members of the Vaccinology Commission: Prof. Adrian STREINU-CERCEL (Boli Infectioase, BUCURESTI) ; Conf. Molnar GHEZA (Epidemiologie, BUCURESTI); Prof. Doina AZOICĂI (Epidemiologie, IASI); Prof. Sorin RUGINA (Boli Infectioase, CONSTANTA) ; Sef. Lucrari Daniela PITIGOI (Epidemiologie, BUCURESTI); Dr. Gratiana CHICIN (Epidemiologie, TIMISOARA); Conf. Alexandru RAFILA (Microbiologie, BUCURESTI); Dr. Camelia TRUICA (Epidemiologie, CALARASI) ; Dr. Adrian STOICA (Epidemiologie, PITESTI) ; Dr. Florin POPOVICI (Epidemiologie, BUCURESTI); Dr. Adriana PISTOL (Epidemiologie, BUCURESTI) ; Dr. Rodica TANASESCU (MF, BUCURESTI), Dr. Otilia MARGINEAN (Pediatrie, TIMISOARA) ; Dr. Dumitru ORASEANU (Pediatrie, BUCURESTI) ; Dr. Anca MORARU (BUCURESTI).

At risk groups: Seasonal influenza: medical at risk groups: chronic pulmonary disease, cardiovascular disease, haematological disease, renal diseases, individuals with metabolic and immunologic disorders, HIV/AIDS. Others: residents of long-term care facilities. **IPD:** including asplenia or splenic dysfunction, congenital or acquired immunodeficiency (including HIV infection, long-term cotricotherapy), chronic cardiovascular, pulmonary, renal, liver or metabolic disease, alcoholism, recurrent otitis media, CSF fluid leaks, before cochlear implant, nursing home/D institutionalized patients, transplant.

SLOVAKIA

Total population:	5 433 437
Population over 55 years:	1 345 626
State pension age:	men & women: 62
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	The only country in Europe recommending vaccination against seasonal influenza. IPD: mandatory and fully reimbursed for older home residents; full reimbursement for high risk groups from 59 years. Among the few countries to recommend tetanus and diphtheria vaccination as a booster every 15 years.
Communication plans:	▪ Seasonal influenza
Government funding:	✓ for all recommended vaccines
Uptake monitoring system:	Seasonal influenza: 21.9% of people aged 65+ years in 2011-12

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia and Invasive Pneumococcal Disease:** In 2010, Slovakia reported the highest pneumonia mortality rate (31 per 100 000) but a low mortality from *S. Pneumoniae*.
- **Pertussis:** Slovakia reported high incidence rates in 2010 (25.3 per 100 000) and in 2011 compared to the previous years. Hospitalisation rates in 2010 were about three times greater those in previous years.
- **Diphtheria:** no cases reported over the period 2006-2011.
- **Tetanus:** no cases reported over the period 2006-2011, except one case reported to the WHO in 2007 and one in 2011.

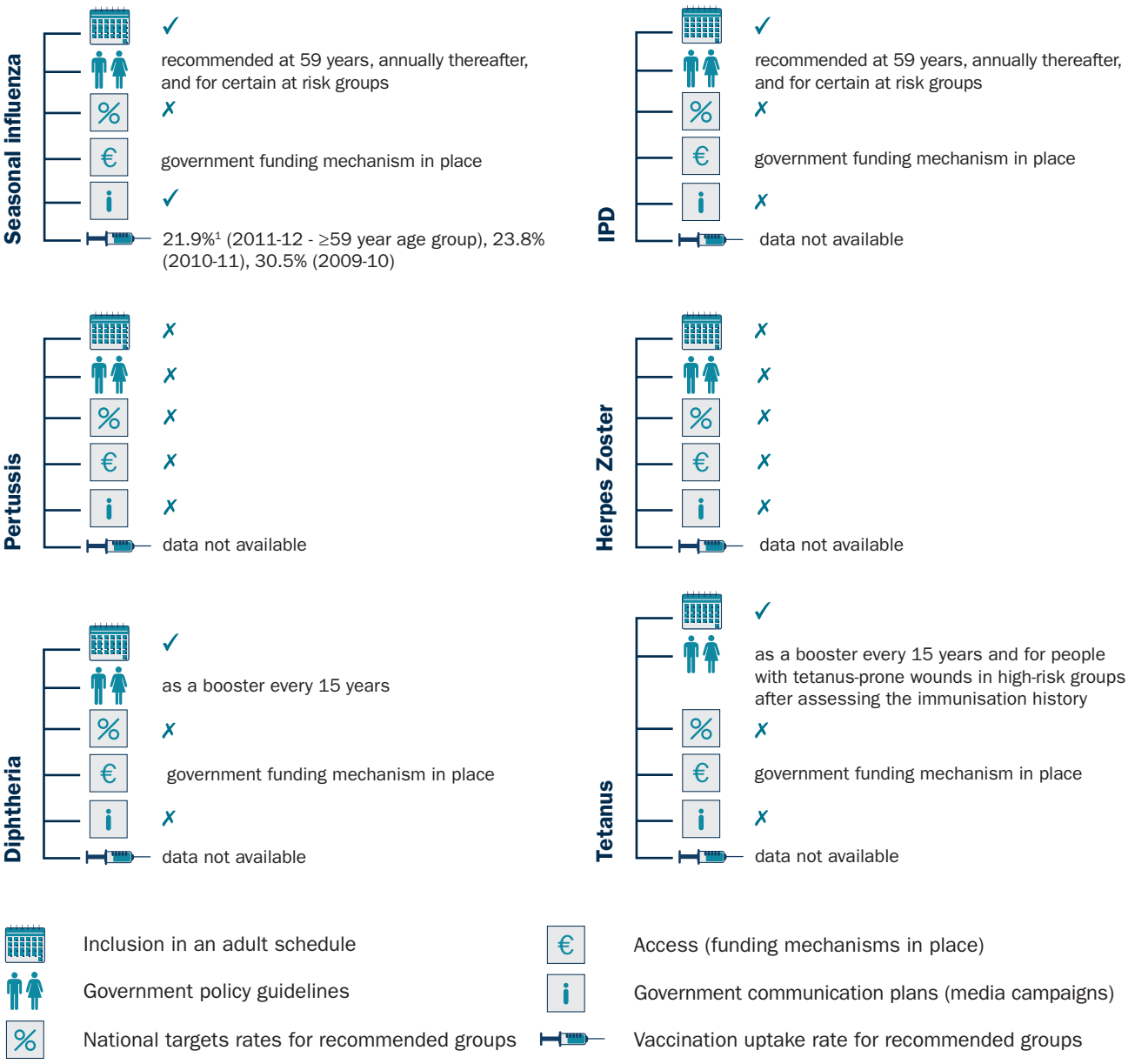
	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0204	0,0241	0,0131	0,0111	0,0081	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) of cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,0644	0,0575	0,0607	0,0434	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	44	37	36	29	-	-
Rates	0,82	0,69	0,67	0,54	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	21/21	21/21	105/99	288/288	1379/ -	936/ -
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,1783	0,1564	0,1666	0,1713	-	-

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Slovakian authorities take consideration of healthy ageing and have sought to implement policies to support it. In December 2011, the Slovakian Government published the National Work Programme for the European Year of Active Ageing, which includes specific provisions on healthy ageing. Since the release of this programme a new government has been elected and as of early 2013 their approach to healthy ageing remains equivocal. Vaccination is one the four objectives within the Slovakian State Public Health Concept. Reference is made to the success that Slovakia has had in eliminating pandemics and to WHO targets. However, the objective applies to immunisation in general and the greatest emphasis is placed on paediatric vaccination [Public Health Authority]. The purchase of drugs/medication accounts for 11.4% of the health care budget and 0.8% is spent specifically on vaccines, for paediatrics and adults.

ADULT VACCINATION POLICY

No summary document outlines an adult vaccination schedule in Slovakia. The Working Group for Immunisation Issues, composed of nine voting members, provides clinical recommendations to the Ministry of Health under formal written terms of reference [WHO 2008]. The National Institute for Public Health oversees the activities of the Working Group. A monitoring system is in place to assess coverage of seasonal influenza based on age, but not according to risk group. Monitoring of seasonal influenza across the entire population is measured through medical records at the age of 65 years, whereas at the age of 58 and 59 years it is measured through data from insurance companies. There are no national targets set.



[1] ≥59 year age group

At risk groups: Seasonal influenza: Occupational at risk groups: those working in hospitals, long-term care facilities, out-patient care clinics, veterinary services, poultry industry, military. Others: pregnant women, residents of long-term care facilities, those living in the same house of individuals who have been recommended the vaccine. IPD: chronic illness or other risk factors such as chronic cardiac or pulmonary disease, immunocomprimising condition, people before splenectomy and with anatomic or functional asplenia, & people placed in social centres.

SLOVENIA

Total population:	2 054 232
Population over 55 years:	608 192
State pension age:	men: 65, women: 63 (median band - retirement age; dependent on length of studies)
Healthy Ageing Policies or Strategies:	✗
Adult schedule (vaccination recommendations from the government):	Seasonal influenza and IPD: at 65 years and for certain at risk groups (> 5 years). Tetanus & diphtheria: as a booster every 10 years. Pertussis: as a booster given to healthcare workers in neonatal and infant hospital units.
Communication plans:	✗
Government funding:	✓ for Seasonal influenza, pertussis, diphtheria and tetanus Partial funding for IPD
Uptake monitoring system:	Seasonal influenza: > 65 years 16.8,% during the 2012-13 season

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pneumonia:** In 2005, Slovenia reported one of the highest mortality rates caused by pneumonia in EU/EEA countries.
- **Invasive Pneumococcal Disease:** Slovenia recorded high rates of confirmed cases in 2009. The incidence in 2006 was extremely low compared to the later years which show a year on year increase, likely due to surveillance issues.
- **Pertussis:** Slovenia reported the 2nd highest incidence rate (30.1 per 100 000). Hospitalisations showed an important change over the period 2005-2009, with an important increase in 2006.
- **Diphtheria:** no cases reported over the period 2006-11.

	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0453	0,0579	0,0686	0,0823	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) of cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,1389	0,1728	0,2025	0,2291	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases and rates per 100 000. Source: ECDC						
Total cases	13	192	204	253	-	-
Rates	0,65	9,55	10,15	12,45	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	551/446	706/533	181/162	442/351	610/ -	- / -

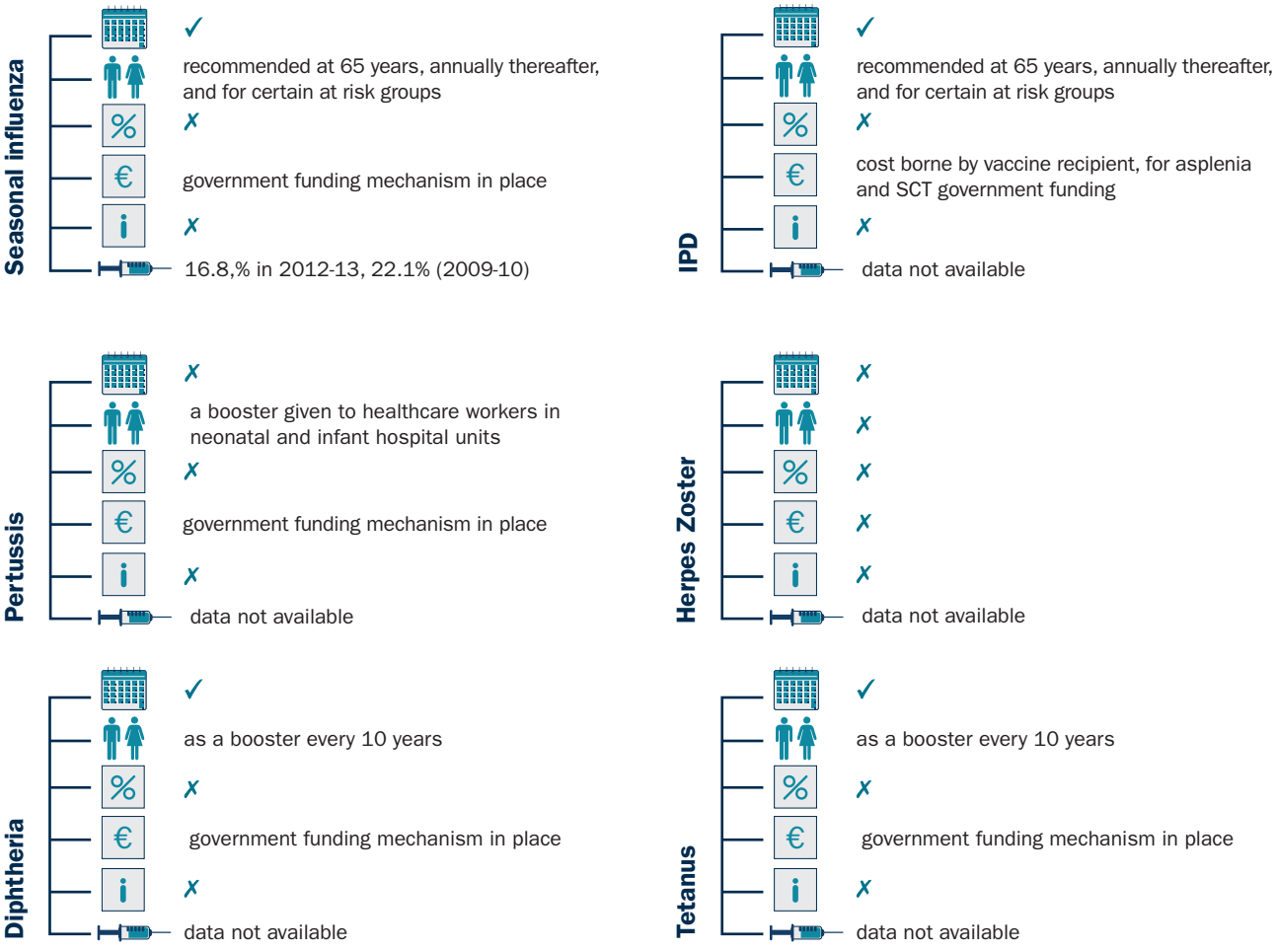
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,0682	0,0579	0,0677	0,0612	-	-
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	4/4	1/1	1/1	0/0	0/ -	0/ -

IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Slovenia does not have a healthy ageing framework in place. The healthcare budget reserves 11.4% for drugs and medication, and 0.8% for all vaccines, including both paediatric and adults vaccines.

ADULT VACCINATION POLICY

A summary document outlining an adult immunisation schedule is in place (Recommendations against pneumococcal infections for adults and children > 5 years). The IPH, composed of various experts including paediatricians, immunologists and infectologists, is the official technical committee that provides clinical recommendations to the Slovenian Ministry of Health. Seasonal influenza coverage is measured across all age groups through medical records, also among risk groups. The coverage rate for people aged over 65 years during the 2007-08 season was 25.6% [VENICE II 2010]. There are no national targets in place for any of the vaccinations included on the adult schedule.



At risk groups: Seasonal influenza: medical at risk groups: chronic lung disease, cardiovascular, metabolic, hepatic, renal and neuromuscular disease or are immunocomprimised. Occupational at risk groups: employees in health, education, care homes, police, fire services, staff of long-term care facilities. Others: pregnant women, long-term residents of care homes. **IPD:** Asplenia, chronic renal disease, cochlear implant, neuromuscular disease with increased aspiration risk, CFC leak, diabetes malignancy, immunodeficiency.

SPAIN

Total population:	46 182 038
Population over 55 years:	12 959 217
State pension age:	men & women: 65
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	The 19 regional health branches have a certain degree of autonomy with regards to vaccine recommendations. Seasonal influenza and IPD: at 65 years but some regions such as Murcia recommend vaccination against seasonal influenza at 60 years already (other regions set alternative age-based recommendations). Tetanus and diphtheria: as a booster with specifications. Pertussis: only for healthcare workers.
Communication plans:	▪ Seasonal influenza (national public communication plan ▪ IPD (regional public health authorities often undertake communication plans for it)
Government funding:	✓ for all recommended vaccines
Uptake monitoring system:	Seasonal influenza: 57.7% of people aged 65+ years in 2011-12

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Pertussis:** Spain has seen a resurgence of pertussis in recent years.
- **Herpes Zoster:** Following an agreement between national and regional health authorities in 2007, Spain now implements surveillance of herpes zoster.
- **Diphtheria:** no cases reported over the period 2006-2011.
- **Tetanus:** Meaningful numbers of cases are reported in Spain.

	2006	2007	2008	2009	2010	2011
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases per 100 000. Source: ECDC						
Total cases	2587	1428	1648	1339	2212	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	378/102	556/151	563/200	393/126	739/305	- / -
HERPES ZOSTER: varicella cases. Source: Health Institute Carlos III						
Total	177728	153099	125706	141399	157914	136823
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	18/13	11/8	15/10	7/3	9/6	- / -

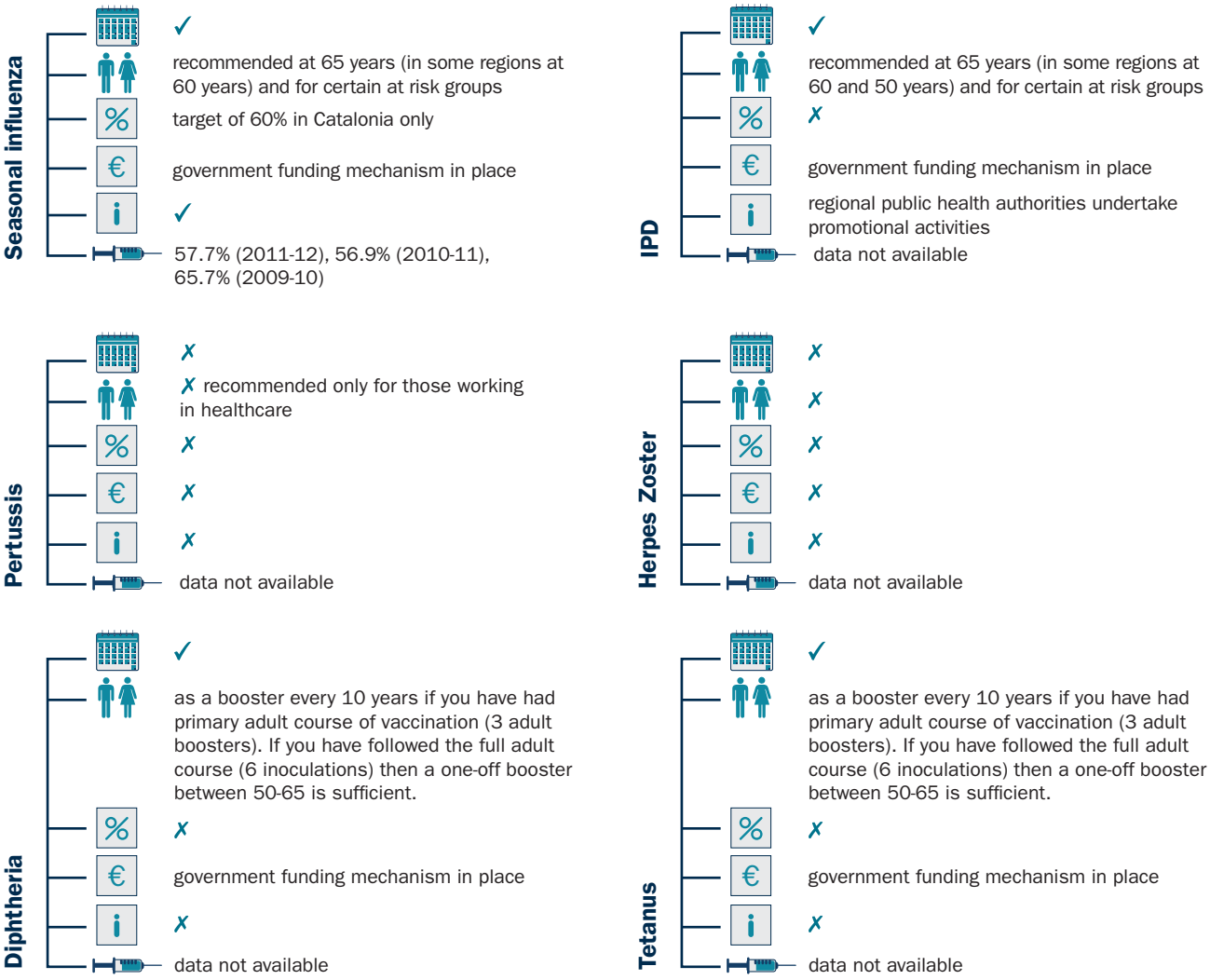
IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Spain places a high degree of policy emphasis on healthy ageing as evidenced in the White Paper 'Active Ageing' published in November 2011. Two surveys have been commissioned to develop the document: one among older people with regard to how they believe society perceives them, and the other one gathering the views of the general population towards the older people. The document includes specific programmes to be delivered through a broad network of participants [Ministry of Health].

ADULT VACCINATION POLICY

Under Spain's decentralised system, the Ministry of Health is responsible for coordination and public health policy. The Technical Working Group on Vaccines, overseen by the Spanish Ministry of Health, makes recommendations to the Commission on Public Health with regards to additions to the Spanish immunisation schedule. The National Immunisation Programme of the Ministry of Health coordinates the immunisation activities of the 17 Autonomous Communities and 2 Autonomous Cities, which enjoy a high degree of independence over their health governance [Instituto de Salud Carlos III]. A summary document outlining details of each vaccine recommended for adults is available [VENICE II 2010]. In addition, several Spanish societies for preventive medicine, pulmonology, microbiology, infectology, rheumatology, family physicians and haematology issue clinical guidance

Each Autonomous Region monitors vaccination coverage locally. Spain monitors uptake by recording the amount of doses administered through the Official Services of Vaccination which does not include vaccines purchased in pharmacies and those administered through the private sector. Data is provided to the Department of Public Health by the Autonomous Council following an inter-territorial National Health System Agreement. Of the vaccinations for which coverage is recorded, the only adult vaccination is influenza. National uptake of influenza for the season 2010-11 was 56.9%. Data are collected on an annual basis and the latest figure represents a reduction from previous years [Ministry of Health Immunisation Coverage statistics].



At risk groups: Seasonal influenza: those over 65 and in some areas those over 60, adults in care homes for older people or other facilities providing care for adults with chronic illnesses', individuals with cardiovascular or pulmonary conditions, those with regular health supervision or who have been hospitalized during the preceding year, chronic metabolic diseases including diabetes, renal failure, hemoglobinopatiace, immunosuppression, groups of people that could potentially transmit influenza to specific groups who are at greater risk of contracting the disease including people who provide care to home-based patients (of greater risk of contracting influenza), those who work in community services, students and others in central institutional centres that share dormitories, people infected with the human immunodeficiency virus, those travelling to the tropics, those travelling to the southern hemisphere between April and September, pregnant woman. **IPD:** individuals suffering from chronic diseases such as cardiovascular, respiratory, diabetes, cirrhosis and alcoholism. The vaccine is also offered to immunocompromised individuals suffering from conditions such as asplenia anatomical or functional disease, Hodgkin's disease, lymphoma, myeloma multiple renal syndrome, nephrotic sickle cell anemia, or specific circumstances such as organ transplantation (in immunosuppression), individuals with HIV infection, those who wear cochlear implants, asplenia failure, chronic renal failure, nephrotic syndrome, or other conditions associated with immunosuppression. **Diphtheria:** To be offered every ten years but to be targeted at specific groups whose immunity is most likely to be at risk of depletion. This includes: those over sixty five, those entering institutions such as geriatric, prison, psychological care institutions, people living in a rural environment, people who undertake work that puts them at increased risk of infection, people who undertake infection risk behaviours (eg. Intravenous drug takers and those who receive tattoos), patients at high risk (eg. HIV, diabetes, undertaking surgery and others), international travellers and sections of the immigrant population. The primary (child) course of Tetanus and Diptheria immunisation consists of three inoculations with an interval of between 1-2 months between the first two doses, and 6-12 months between the second and third. If the individual has received the full primary course of inoculation then they need only take one booster between ages 50-65. If the individual has not received the full course of primary inoculations then they should boost their immunity with a vaccine every ten years. **Tetanus:** Same at risk groups than diphtheria.

SWEDEN

Total population:	9 382 297
Population over 55 years:	2 910 703
State pension age:	men & women: 65
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	Seasonal influenza and IPD: at 65 years and for certain at risk groups.
Communication plans:	▪ Seasonal influenza
Government funding:	Full government funding for IPD only, with government funding available for some groups for the seasonal influenza vaccine.
Uptake monitoring system:	Seasonal influenza: 44% in 2011-12

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Seasonal influenza:** During the 2010-11 season, Sweden was among the few countries which reported high intensity, together with Austria, Greece and Portugal.
- **Invasive pneumococcal disease:** Sweden consistently reported high rates of confirmed cases in 2005 and 2009, which approach or are greater than 10 per 100 000 while in the other countries the reported rates are less than 2 per 100 000.
- **Herpes zoster:** relatively high rates of age-standardised mortality (0.10 per 100 000)
- **Pertussis:** second highest incidence rate in Europe (15.1 per 100 000), with decreasing trends.

	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	-	-	-	-	0,1208	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases per 100 000. Source: ECDC						
Total cases	1334	1441	1789	1618	-	-
Rates	14,74	15,81	19,48	17,48	-	-
PERTUSSIS: reported cases. Source: WHO/Source: ECDC						
Total	795/794	689/690	459/459	281/279	266/ -	177/ -
DIPHTERIA: reported cases. Source: WHO/Source: ECDC						
Total	0/0	0/0	0/1	1/1	0/ -	2/ -
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	1/1	0/0	0/0	3/0	0/ -	3/ -

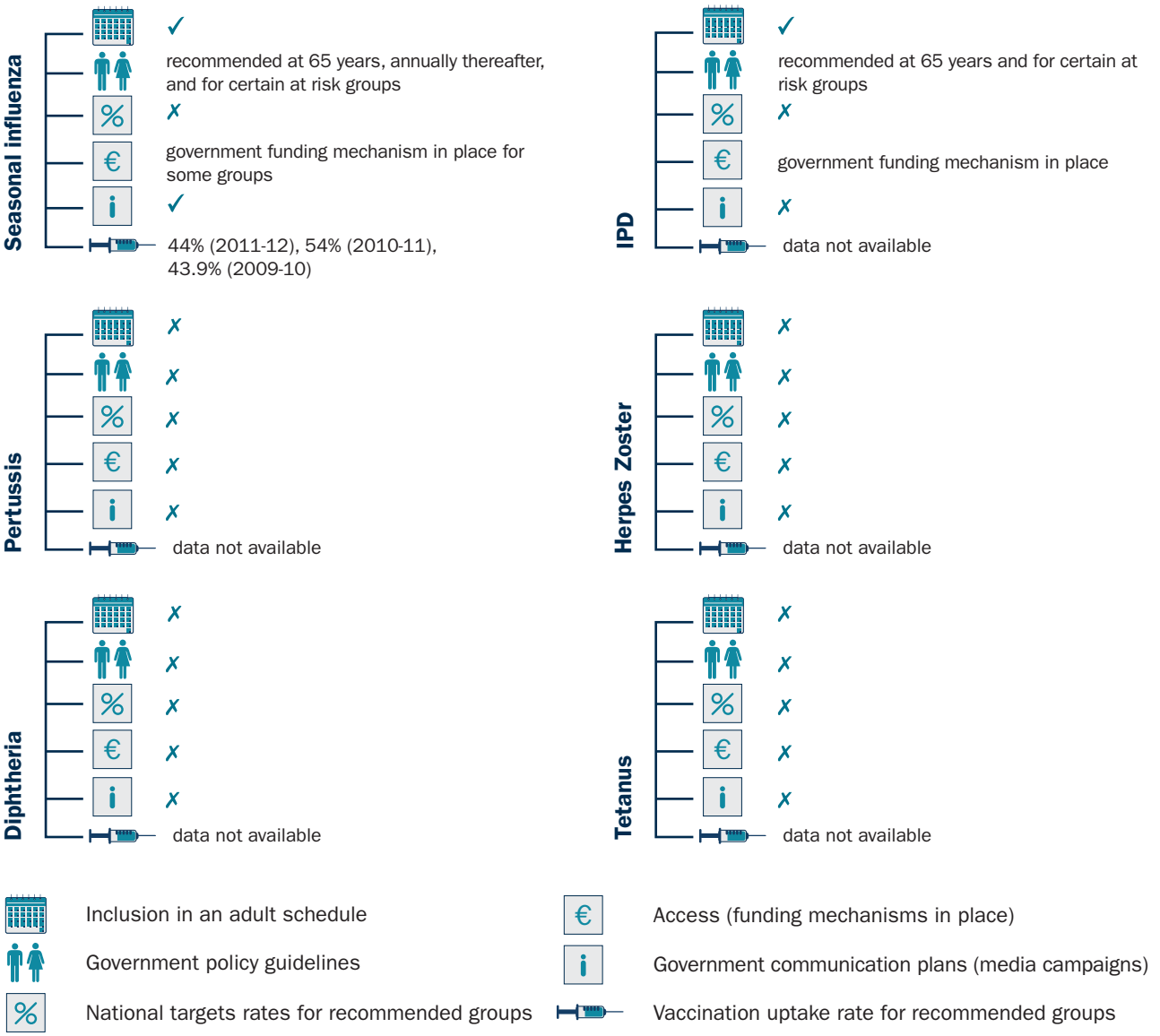
IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

Sweden invests substantial resources in the wellbeing of its older population, with investment in care for older people accounting for five times the national average [Sweden.se]. The Swedish Institute for Public Health sup-

ports regions and municipalities across a broad range of initiatives aimed at maintaining good health and prevention. Among these initiatives, the Health Ageing Framework seeks to promote health among older people through coaching citizens between the ages of 60-75 years. The programme is delivered through the collaboration of a number of participants across various sectors and levels of administration [Swedish National Institute of Public Health]. The Swedish government's concept of a national immunisation programme comprises two elements: a general vaccination programme for the entire population and a vaccination programme tailored to specific at-risk groups. Adults fall into the latter [Smittskyddsinstitutet].

ADULT VACCINATION POLICY

No summary document gives an overview of the adult immunisation schedule. Health authorities operate a standing advisory committee on vaccinations (REVAC), and ad hoc committees that are convened for special issues, although neither of them makes recommendations for the national immunisation schedule. Rather, the National Board of Health and Welfare provides clinical advice regarding which vaccinations should be included in the national immunisation schedule [WHO 2008]. Seasonal influenza vaccination uptake among people aged over 65 years is measured through routinely collected information through an immunisation registry. Pharmaceutical data is also assessed. Uptake during the 2007-08 season was recorded at 56% [VENICE II 2009]. No national targets are in place for any of the vaccinations included on the Swedish adult immunisation programme.



At risk groups: Seasonal influenza & IPD: sufferers of chronic diseases: chronic heart, lung or kidney disease, diabetes, alcoholism, liver cirrhosis and down syndrome patients with compromised immune systems due to damaged spleen, patients' immune compromised due to HIV infection, lymphoma, Hodgkin's disease and others, and patients with immunosuppressive therapy, which experience leads to increased risk for pneumococcal infections, patients with a skull fracture or leakage of fluid around the brain and spinal cord.

UNITED KINGDOM

Total population:	64 905 383
Population over 55 years:	20 515 787
State pension age:	men: 65, women: 60 (60 for women born on or before April 5th 1950, rising to 65 for those born after April 6th 1955)
Healthy Ageing Policies or Strategies:	✓
Adult schedule (vaccination recommendations from the government):	Seasonal influenza & IPD: at 65 and for certain at risk groups, as well as 5 inoculations throughout the life-course as a booster against tetanus and diphtheria. A national recommendation for adults to receive a one-off vaccination against herpes zoster has recently been agreed and will be established soon.
Communication plans:	▪ Seasonal influenza
Government funding:	✓ for all recommended vaccines
Uptake monitoring system:	Seasonal influenza: close to the target set (73% of people aged 65+ in England, 76.2% in Scotland, 67.7% in Wales and 77% in Northern Ireland) and for IPD (68,3%). All recommended vaccines are free of charge on the NHS. As many EU-27 countries, the UK operates a communication plan and vaccination target rates (75% as per the WHO recommendation) for seasonal influenza only.

INCIDENCE OF INFECTIOUS DISEASES: KEY POINTS

- **Seasonal influenza:** The UK reported a 2010-11 winter period more severe in terms of pressure on hospitals than during the 2009-10 pandemic winter. In 2012-13, excess death rates were the highest since 2008-09, with peaks coinciding with influenza circulation (Public Health England).
- **Pneumonia:** UK and Slovakia have the highest reported mortality rates in Europe (25 per 100 000 population cases in 2005 and 2009).
- **Invasive pneumococcal disease:** In 2005, the UK, as well as Belgium, Ireland and Sweden, reported rates of confirmed cases which approach or are greater than 10 per 100 000. There was a similar picture in 2009 with relatively high rates in the UK and in Belgium, Finland Ireland, Sweden and Slovenia compared to the other countries reporting. Among the countries reporting high rates, the trend is relatively static in the UK.
- **Pertussis:** the recent increase in pertussis notifications corresponds with the availability of enhanced diagnostic methods. Since 2006, there has been greater awareness and use of these testing methods, compared to previous years.

	2006	2007	2008	2009	2010	2011
PNEUMONIA: hospital in-patient rates (in patient/1000 populations), (ICD10:J13). Source: WHO						
Total	0,0512	0,0505	0,0523	0,0518	0,0539	-

INVASIVE PNEUMOCOCCAL DISEASE (IPD): hospital in-patient admission rates (in-patients/1000 populations) of cases, ICD10 (A40, G00, J13). Source: WHO						
Total	0,0995	0,0947	0,098	0,0982	-	-
INVASIVE PNEUMOCOCCAL DISEASE (IPD): number of cases per 100 000. Source: ECDC						
Total cases	5820	5624	5514	5019	-	-
Rates	9,63	9,25	9,01	8,2	-	-
PERTUSSIS: reported cases.Source: WHO/Source: ECDC						
Total	478/3	1163/65	1028/1051	846/852	518	1243
HERPES ZOSTER: hospital in-patient admission rates (in-patients/1000 populations), ICD10: B02. Source: WHO						
Total	0,0452	0,0433	0,0442	0,047	-	-
DIPHTERIA: reported cases. Source: WHO/Source: ECDC						
Total	3/3	3/3	5/6	3/4	0/ -	2/ -
TETANUS: reported cases. Source: WHO/Source: ECDC						
Total	3/3	4/0	5/0	6/1	9/ -	3/ -

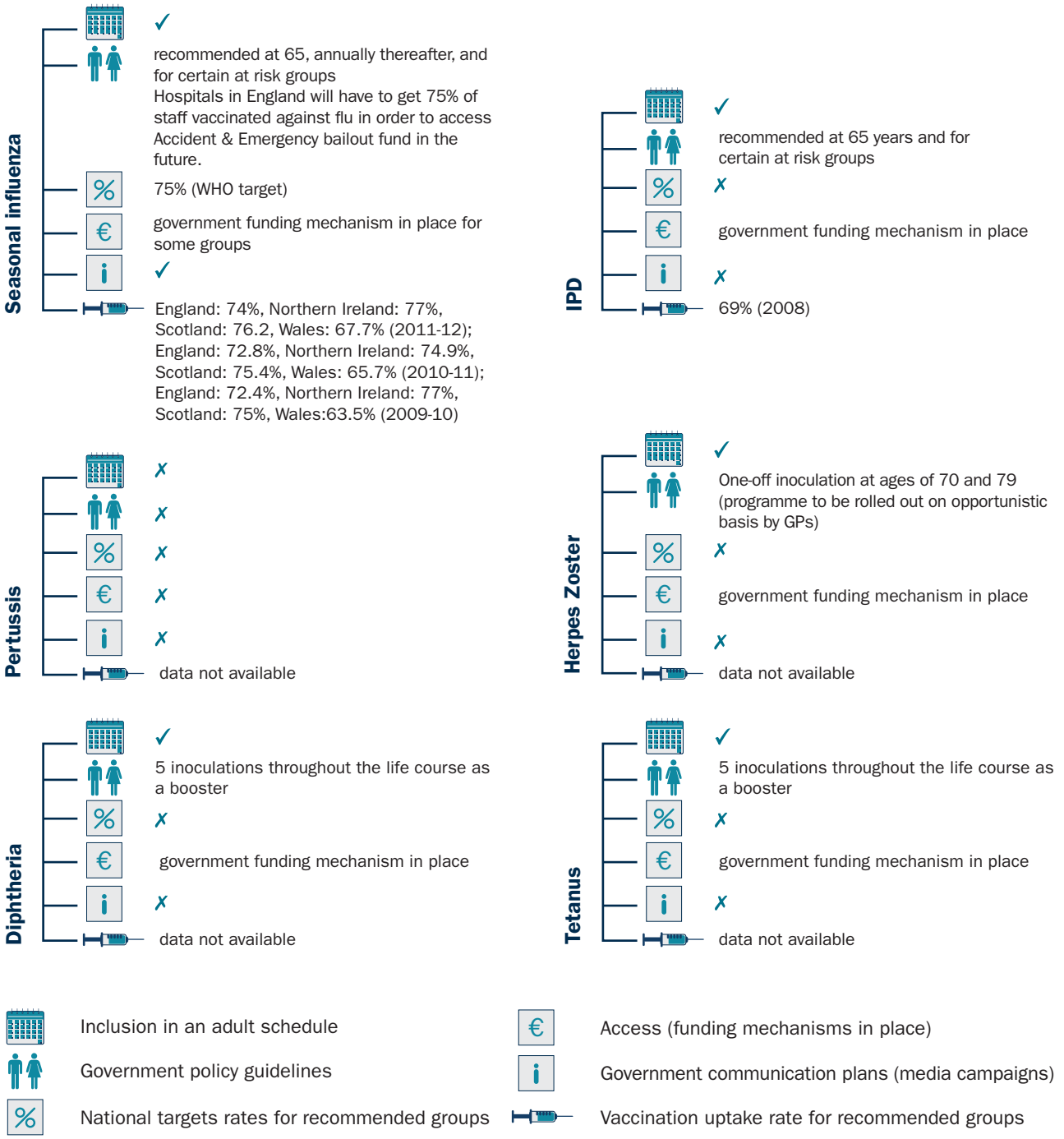
IMMUNISATION AS PART OF HEALTHY AGEING POLICIES

While a strong governmental emphasis has been placed on healthy ageing policies in the last decade, there remains a gap between aspiration and implementation [Age UK]. The National Service Framework for Older People was established in 2001 [Department of Health 2001]. Since 2010 however, this policy objective is one of those that Primary Care Trusts can decide to prioritise [Age UK]. In 2009, Lord Darzi (Parliamentary Under-Secretary of State in the Department of Health) undertook a comprehensive review of the National Health Service (NHS) in which he called on the NHS to work with local partners to deliver improved prevention and he suggested that health checks should be offered to everyone aged 40-74, over a 2-year period [Department of Health 2008]. Furthermore, in late November 2010, the Coalition Government published the whiter paper *Healthy Lives, Healthy People: Our strategy for public health in England,* focusing on preventative measures and tackling the wider social determinants of health. In 2013, a radical reorganization of the NHS in England has created a more locally accountable service with greater management power for medical staff [HM Government 2010]. Public health has moved into the control of Local Government and vaccination policy and delivery is now overseen by a tripartite agreements between the Department of health, Public health England and NHS England. Scotland, Wales and Northern Ireland have autonomy over health policy and each operates its own healthy ageing policy. Vaccination policy is determined at a UK level on the advice of the Joint Committee on Vaccination and Immunisation (JCVI). To date the devolved administrations (Scotland, Wales and Northern Ireland) have followed JCVI recommendations, although implementation of policy has in some cases varied.

ADULT VACCINATION POLICY

The *Green Book* is the national summary document which outlines all adult vaccinations [Department of Health 2013]. The JCVI is an independent Departmental Expert Committee, and a statutory body. The JCVI utilises the expert knowledge of its members to formulate recommendations that seek to provide the greatest public health utility from the most appropriate vaccination and immunisation strategies. Any policy recommendations provided by the JCVI must be cost-effective. In addition, several disease-specific medical societies and patient advocacy groups, such as the former is British HIV Association, which has issued comprehensive guidance for the vaccination of HIV-infected individuals, issue guidance [Geretti 2008].

The UK adult vaccination programme operates enviable monitoring systems which assess the implementation of the seasonal influenza programme: Public Health England; Health Protection Scotland; Public Health Agency (Northern Ireland). In England, there is close to real time data of uptake in order to allow the Department of Health to intervene where low uptake amongst specific groups can be observed [ILC-UK 2011]. Uptake of seasonal influenza and IPD is monitored among people aged over 65. In the case of IPD, an annual survey is conducted through the collaboration of GPs. Vaccine uptake amongst specific at-risk groups is undertaken. The government follows the WHO target of 75% seasonal influenza coverage for people aged over 65. For at-risk groups under the age of 65, the Ministry of Health wishes to reach 60% of uptake for the 2012-13 influenza season, as a first step to achieving uptake of 75% by the 2013-14 season [Chief Medical Officer 2011]. Coverage results from 2009-10 revealed that uptake rates among clinical at-risk groups under 65 stood at 50.3%. Results pertaining to pregnant women as of February 2011 stood at 37.7% [Chief Medical Officer 2011].



At risk groups: Seasonal influenza: chronic respiratory disease and sufferers of serious asthma, chronic heart disease, chronic renal disease, chronic liver disease, chronic neurological disease, diabetes, immunosuppression, pregnant women, those living in long stay residential care homes or other long-stay facilities, those in receipt of a carers' allowance, or those who are the main carer of an older or disabled person whose welfare may be at risk if the carer falls ill and frontline health and social care workers. **IPD:** asplenia or disfunction of the spleen, chronic respiratory disease, chronic heart disease, chronic kidney disease, chronic liver disease, diabetes, immunosuppression, individuals with cochlear implants, individuals with cerebrospinal fluid leaks.

APPENDIX

APPENDIX 1: AT-RISK GROUPS FOR INFLUENZA AND IPD

	Seasonal Influenza								Invasive Pneumococcal Disease (IPD)								
	Chronic pulmonary disease	Chronic cardiovascular disease	Chronic kidney diseases	Haematological or metabolic diseases	Immunodeficiencies	Pregnant women	Health care professionals	Long-term residents of care facilities	Asplenia or dysfuntion of the spine	Chronic respiratory disease	Chronic heart disease	Chronic kidney disease	Chronic liver disease	Diabetes	Immunosupression	Individuals with cochlear implants	Individuals with cerebrospinal fluid leaks
Austria	✓	✓	✓	✓	✓	✓	✓			✓	✓				✓		
Belgium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓
Bulgaria	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		
Cyprus	✓	✓	✓	✓	✓	✓	✓	✓									
Czech Republic	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓			
Denmark	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		✓		
Estonia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Finland	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	
France	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		
Germany	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		
Greece	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		
Hungary	✓	✓	✓	✓	✓	✓	✓	✓									
Ireland	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓			✓		
Italy	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	
Latvia	✓	✓	✓	✓	✓		✓	✓									
Lithuania	✓	✓	✓	✓	✓	✓	✓	✓									
Luxembourg	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	
Malta	✓	✓	✓	✓	✓		✓	✓									
Netherlands	✓	✓	✓	✓	✓		✓	✓		✓	✓		✓				
Poland	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Portugal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	
Romania	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
Slovakia	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓				✓		✓
Slovenia	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓
Spain	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Sweden	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓		
United Kingdom	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	27	27	27	27	27	22	26	24	17	19	19	17	10	14	19	10	7

☐ ☐ no at-risk groups identified

G = Government funding
P = Partial funding

Note:
***Belgium:** government funding only in Flemish communities
* **Greece, Ireland:** for some groups only

APPENDIX 3: EXAMPLES OF ADULT VACCINATION SCHEDULES

US SCHEDULE

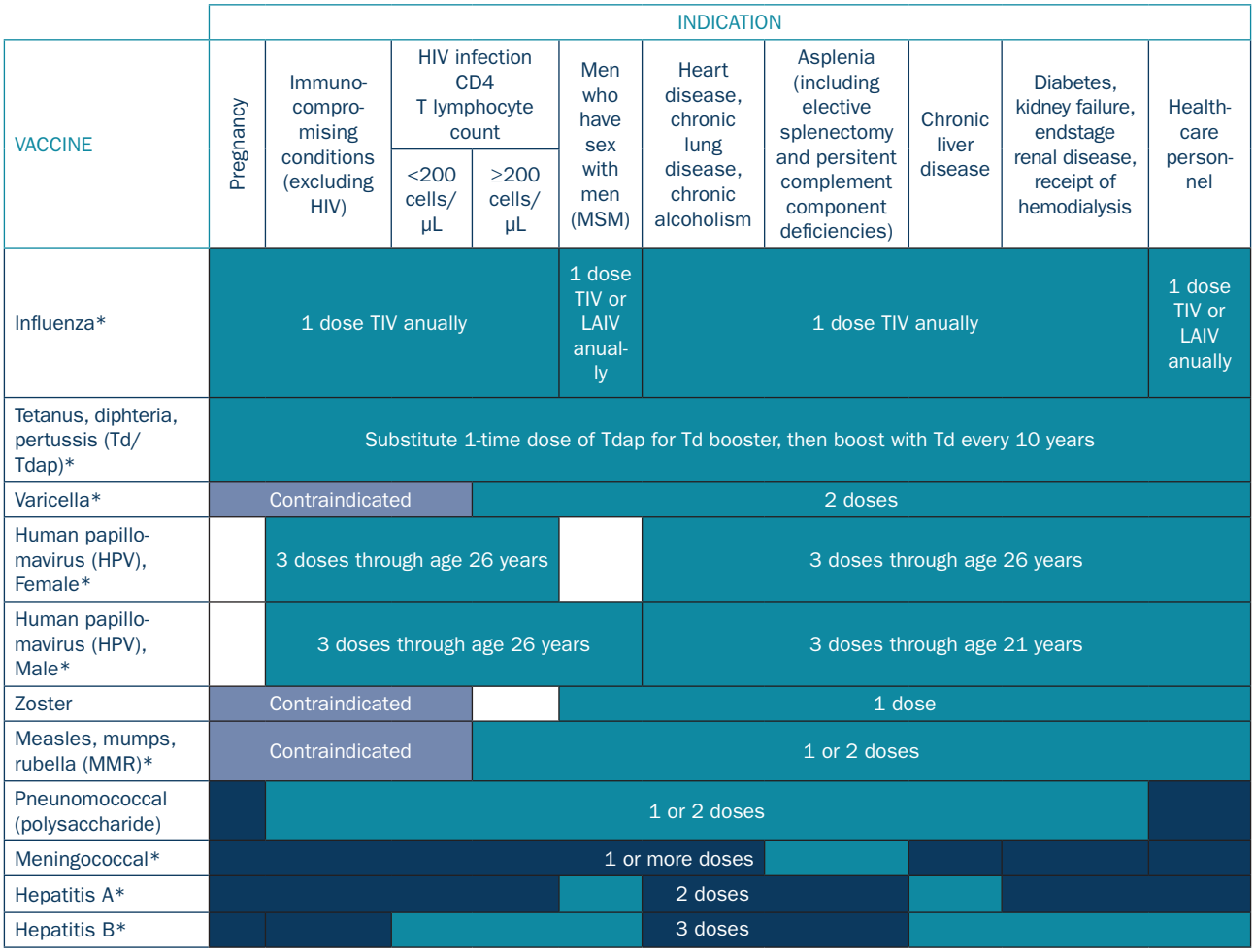
Figure 1: Recommended adult immunisation schedule, by vaccine and age group1 - United States, 2012

	AGE GROUP					
VACCINE	19-21	22-26	27-49	50-59	60-64	≥65
Influenza*	1 dose anually					
Tetanus, diphteria, pertussis (Td/Tdap)*	Substitute 1-time dose of Tdap for Td booster, then boost with Td every 10 years					Td/Tdap
Varicella*	2 doses					
Human papillomavirus (HPV), Female*	3 doses					
Human papillomavirus (HPV), Male*	3 doses					
Zoster					1 dose	
Measles, mumps, rubella (MMR)*	1 or 2 doses				1 or 2 doses	
Pneunomococcal (polysaccharide)	1 or 2 doses					1 dose
Meningococcal*	1 or more doses					
Hepatitis A*	2 doses					
Hepatitis B*	3 doses					

*Covered by the Vaccine Injury Compensation Program

- For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection
- Recommend if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle or other indications)
- Tdap recommend for ≥65 years if contact with <12 month old child. Either Td or Tdap can be used if no infant contact
- No recommendation

Figure 2: Vaccines that might be indicated for adults, based on medical and other indications - United States, 2012



*Covered by the Vaccine Injury Compensation Program

For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection

Recommend if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle or other indications)

Contraindicated

No recommendation

PROPOSED EUGMS AND IAGG-ER VACCINE PROGRAMME FOR THE ELDERLY

By the seventh decade/retirement age (after clinical assessment of vaccine status)
TdaP or Td vaccine
Influenza vaccine
Pneumococcal vaccine
Herpes Zoster vaccine

Each year after retirement age (after assessment of vaccine status)
Influenza vaccine

New medical/injury event (after assessment of vaccine status)
Td or TT vaccine

Multiple hospital stays (after assessment of vaccine status)
Pneumococcal vaccine

By the ninth decade of age/admission into Nursing Home
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.

CURRENT RECOMMENDATIONS FOR ADULT VACCINATION (WHOLE POPULATION) IN CEVAG COUNTRIES

	Adolescent/young adult vaccination	All adults	Eldery
Bulgaria	dTap included in quadrivalent vaccine at 6 since 2007	dT booster every 10 years for those aged >26 years	Influenza & pneunomococcal: >65 years
Croatia	12 years: hepatitis B catch-up 13 years: BCG given to TST non-reactors 14 years: dT + IPV 18 years: dT	None (tetanus booster advised for all surgically treated wounds)	Tetanus ≥ 60 years
Czech Republic	10-11 years: Tdap-IPV 12 years: hepatitis B catch-up	T booster every 10-15 years for <60 years, every 10 years for ≥ 60 years for all surgically treated wounds HPV catch-up for 18-26 years TBE Influenza	Influenza: >60 years Pneunomococcal: >65 years
Estonia	dTap booster will replace dT in 2012 12 years: hepatitis B catch-up 12 years: HPV Hepatitis A: >1 year Influenza: >6 months TBE: >1 year living in academic areas Varicella: susceptible >12 years HBV: not previously vaccinated	dT booster: every 10 years Hepatitis A: >1 year Influenza: >6 months TBE: >1 year living in endemic areas Varicella: susceptible >12 years HBV: not previously vaccinated	dT booster: every 10 years Seasonal influenza: >65 years Zoster: >50 years
Hungary	dTap booster replaced dT in 2009	T booster every 10 years Hepatitis B haemodialysis patients	Seasonal influenza: >65 years
Latvia	12 years: HPV = 3 doses at 0, 1, 6 months MMR is given to all previously unvaccinated girls. Girls who have been vaccinated only once before are revaccinated ("catch-up" vaccination) 14 years: combined dT-IPV Hepatitis B: 3 doses recommended to all non-vaccinated adolescents ("catch-up" vaccination) Rabies: post-exposure vaccination TBE: for all adolescents in country endemic regions	Influenza: 50% reimbursement for the risk groups TBE, hepatitis B, yellow fever, rabies for persons employed in specific occupations and belonging to increased risk groups TBE recommended dT booster every 10 years for ≥ 26 years Influenza: >65 years or patients with chronic diseases regardless of age Rabies: post-exposure vaccination	Influenza: >65 years, 50% reimbursement
Lithuania	dT booster every 10 years for >26 years Influenza: all patients with chronic diseases Rabies: post-exposure vaccination HPV for girls	dT booster every 10 years for >24 years Influenza yearly	dT booster every 10 years Influenza: >65 years Pneunomococcal polysaccharide: >65 years
Romania	dT at 14 HPV: Girls >9-12 years: 3 doses 0, 2, 6 months Non-vaccinatinated girls 13-26 years Influenza from >6 month: yearly	dT booster: every 15 years	Influenza: >65 years
Slovakia	dTap+IPV booster at 13 years	dT booster: every 15 years	Seasonal influenza: >59 years Pneunomococcal : >59 years
Slovenia	Catch-up: MMR, IPV, dT Girls: HPV	TBE recommended	
Turkey	dT: every 10 years between 15-49 years Influenza and pneumonococcal polysaccharide: > 65 years		

Recommendation and full reimbursement

Recommendation, vaccine cost paid by patient

Recommendation, vaccine paid by employer

APPENDIX 4: SUMMARY OF THE COST-EFFECTIVENESS RESULTS REPORTED FOR VACCINE-PREVENTABLE DISEASES IDENTIFIED BY HERON IN A TARGETED LITTERATURE REVIEW

HERPES ZOSTER	
Belgium	A vaccination strategy compared to no-vaccination resulted in an ICERs of €6,799/QALY gained over the lifetime of a 60+ year population, under a third-party payer perspective (includes only direct healthcare costs covered by the Belgian National Institute for Health and Disability Insurance; RIZIV-INAMI). It was estimated that the probability of the ICER remaining below a commonly accepted €30k/QALY threshold (was 94% for the 60+ years age group, confirming the cost effectiveness of vaccination). [Annemans 2010]
	Under assumptions most in favour of vaccination (i.e. assuming the number of HZ-related deaths equalled all registered deaths with HZ as a possible cause, without the ones for which at least four experts agreed they were not due to HZ), vaccination was cost-effective with an ICER less than €5500 per QALY gained for all ages (60 -85 years) years if the price was €90 per dose. At a vaccine price of about €45 per dose, vaccination would likely be considered cost-effective (i.e. incremental cost per QALY gained <€30,000) in Belgium for age cohorts 60–64, under a scenario least in favour of vaccination (i.e. assuming no deaths due to HZ). [Bilckea 2012]
The UK	The base-case model with vaccination at 65 years of age resulted in an ICER of around £20,400 per QALY gained (with wide credibility intervals) versus no vaccination. Vaccination at either 65 or 70 years (depending on assumptions of the vaccine action) is most cost-effective. Including a booster dose at a later age was unlikely to be cost effective. [Van Hoek 2009]
	When compared to the strategy of no vaccination, a vaccination strategy lead to an ICER of £13,077 per QALY gained for those aged above 50 years from a NHS perspective. The most cost-effective age group was 60-69 years. [Moore 2010]
	Using a cut-off definition of £10,000 per QALY gained, the model predicted that provided initially 70% were protected via vaccination and this lasted 10 years or more (on average) then at £80 per course, vaccination of 60 year olds was cost-effective, and vaccination of older age groups was even more cost-effective. [Edmunds 2001]
	At a cost effectiveness threshold of £30,000 per QALY there was approximately a 59% of a vaccination strategy being cost effective compared to no vaccination alternative .for 60 year olds. Vaccination at 75 years was marginally more cost effective than other years. [Van Hoek 2012]
Germany	From a third party payer perspective, the ICER for a vaccination strategy (versus no vaccination) for those aged above 60 years was estimated to be €20,139 per QALY gained. [Wasem 2009]
	When targeting a cohort aged 50-54 years, preventing one herpes zoster case costed approximately €400 from a third party payer's perspective and approximately €280 from a societal perspective. Increasing the target-age to 85+ year olds resulted in ICERs of 3,646€ (payer's perspective) and 3,634€ (societal perspective) per adverted herpes zoster case, respectively, thereby indicating a lower cost-effectiveness of vaccination in this age-cohort. [Ultsch 2012]
The Netherlands	The most optimal cost-effectiveness ratio for vaccination was found for those aged 70 years with an ICER of €21,716 per QALY gained. [Lier 2010]
Switzerland	A vaccination strategy compared to a no-vaccination for adults aged 70–79 years resulted in a lifetime incremental cost-effectiveness ratio of 25,538 CHF (23,646 USD) per QALY gained under a third-party payer perspective The ICER was within the commonly accepted threshold in Switzerland (€30,000 per QALY gained). [Szucs 2011]
France	The cost effectiveness of vaccinating 20% of individuals aged 70-79 was estimated to be €9,693 per QALY gained from a national health care perspective. [Bresse 2012]. Vaccination policy targeting other cohorts, such as people aged 65 years-old was also found cost-effective, with an ICER estimated at €7,217/QALY gained.

INFLUENZA	
Italy	Vaccination reduced the incidence of influenza in vaccinated individuals by approximately 6 percent which translated into a cost–benefit ratio of 8.22 and in a saving per vaccinated subject of €110.20. [Gasparini 2002]
	The economic advantage of extending public influenza vaccination to healthy adult workers (aged 50-64 years) was uncertain and was mainly related to the indirect costs of productivity losses thereby making the extension strategy more a labour than a health issue. [Garattini 2011]
	For a population of greater than 65 years of age, compared to a non-vaccination strategy, the standard vaccination programme produced a direct cost increase of about 50 million Euro (+4.6%) and a 26.9% reduction in influenza like illness (ILI) whereas the MF59 adjuvanted vaccine provided an estimated saving of about 74 million Euro (-6.8%) and a 35.8% reduction in ILI cases. Further, cost savings were mainly related to hospital admissions avoided in the older population (≥ 65 years of age). [Iannazzo 2011]
The UK	For the general population, it was estimated that the vaccination programme was likely to be cost-effective at an willingness to pay threshold of £20k-30k, and "very cost-effective" according to the threshold of gross domestic product per capita (about £23,000 in 2011) recommended by the WHO, provided the vaccine was well matched to the circulating strains. [Baguelin 2012]
	A vaccination strategy compared to a no-vaccination for adults aged 50-64 years resulted in an incremental cost per QALY of £6174 from a NHS perspective. [Turner 2006]
	Incremental NHS cost per life-year gained was estimated to be £244,000; whereas incremental NHS cost per QALY gained was £304,000. The analysis suggested that influenza vaccination in population aged 65-74 years would not be cost-effective. [Allsup 2004]
	Of the strategies involving extending vaccination beyond high-risk individuals, extending vaccination to the low-risk adults over 64 years appeared least likely to be cost-effective. Vaccinating either 0–4 year olds or 5–14 year olds appeared to be more cost effective than vaccinating older adults. [Baguelin 2010]
Poland	The study reported that in Poland, the introduction of the public funding of influenza vaccination for people aged greater than 65 years would be very cost effective compared with the current situation of a low 13.9% vaccine coverage rate of the older people (2007-08 season) with an incremental cost-effectiveness ratio (ICER) of PLN26,118/QALY, which is below the 2009 yearly gross domestic product (GDP) per capita. [Brydak 2012]
The Netherlands	The costs of influenza were estimated to be €31 million for the influenza season 1995/96 in The Netherlands (EUR1» $US1.1). For the extended programme that covered all older population, the cost-effectiveness ratio was estimated at EUR1820 per life-year gained in 1997/98. Subgroup analysis demonstrated that the programme had more favourable cost effectiveness among the chronically ill older population (cost saving) than among the rest of the older population (EUR6900 per life-year gained). [Postma 1999]
Spain	A strategy of vaccinating all adults between the ages of 50-64 years compared to the current recommendation of vaccination for people aged 65 or over and younger individuals with risk factors for influenza complications resulted in ICERs of € 14,919 per quality-adjusted life-year (QALY) gained and €9731 per life-year gained from a third party payer perspective.. From societal perspective, the corresponding results were €4149 per QALY and €2706 per life-year gained. [Aballea 2007]
France	When comparing standard vaccination with MF59 adjuvanted vaccine – an adjuvanted trivalent influenza vaccination – in the high-risk older population, adjuvanted trivalent vaccination resulted in fewer deaths and hence more life years gained than standard vaccination. This was achieved with relatively little extra cost. At an attack rate (defined as the proportion of people who would be infected if there were no vaccination or other preventive medication) approaching 10%, adjuvanted vaccination was a dominant strategy implying a reduction in costs and increase in benefits. [Piercy 2004] The difference between adjuvanted and conventional vaccines was somewhat smaller in the general older population (65 years and above). However, in spite of the lower relative benefits, adjuvanted vaccination remained cost-effective. Using a transfer rate of 100% (defined as transfer of benefits of case reduction to benefits in reduction of downstream consequences), cost per life year gained was €13,101 for type B influenza, and it was cost saving for influenza A/H3N2 at attack rates of only 5%.
	In the total population influenza vaccination prevented, on average, 368,500 hospitalisations and 86,000 deaths, about 2.5 times as many as therapeutic treatment with oseltamivir. However, the direct cost of preventing a death by vaccination was twice as high (€8500 compared with €3500). If an effective vaccine was available before a pandemic reached France then the results confirmed that the best option was to give the vaccine to the general population. [Doyle 2006]

Multi-country	The study concluded that vaccination strategies were most cost-effective across England and Wales, Germany and France for an older population (for this analysis, the older populations were defined in the UK and France as those aged 65 years and over, whilst in Germany the older population was defined as those aged 60 years and over). With the comprehensive vaccination strategy the costs per day of morbidity averted were €5.2 in France and €9.2 in Germany and the strategy was cost-saving (€0.6) in England and Wales. It was observed that depending on coverage rates, substantial reductions in morbidity and mortality can be achieved with vaccination strategies that cannot be obtained from any of the other strategies considered. [Scuffham 2002]
	In a scenario of a future influenza pandemic, the most cost effective strategy of vaccination not only differed across the pandemic scenarios but also between countries. Specifically, when the vaccine was available early in the pandemic and there was no pre-existing immunity, in Germany it would be most cost effective to vaccinate older people (€940 per QALY gained), whereas it would be most cost effective to vaccinate high transmitters (5-19 years) in both the Netherlands (€525 per QALY gained) and the UK (€163 per QALY gained). This difference in optimal strategies was due to differences in the demographic characteristics of the countries: Germany has a significantly higher proportion of elderly people compared with the Netherlands and the UK. [Lugner 2012]
	Incremental cost-effectiveness ratios of intradermal vaccination versus intramuscular vaccine were estimated to be €12,852/QALY in Slovakia and €10,375/QALY in Czech Republic. These values were below three yearly GDP per capita in these 2 countries and therefore intradermal vaccination could be seen as acceptable for health authorities. [Reygrobellet 2009]
	Comparing a new strategy of-extending vaccination strategy to all adults aged 50-64 years the current policy of only vaccinating 'high risk' individuals in this age group, the estimated mean costs per QALY gained were R$4,100, €13,200, €31,400 and €15,700 for Brazil, France, Germany and Italy, respectively. Assuming a cost-effectiveness threshold ratio of €50,000 per QALY gained, the probabilities of the new policy being cost-effective were 94% and 95% for France, 72% and near 100% for Germany, and 89% and 99% for Italy, from the third-party payer and societal perspectives, respectively. [Aballea 2007]
INVASIVE PNEUMOCOCCAL DISEASE (IPD)	
Belgium	Vaccinating 1,000 adults between the ages of 18 and 64 years gained approximately 2 life-years in comparison with the no vaccination option. However, to realise these additional health benefits required additional costs of 11,800 European Currency Units (ECU; 1995 values) per life-year saved. Vaccinating 1,000 older people (≥65 years) led to greater than 9 life-years gained as well as a small monetary benefit of ECU1250. [Graeve 2000]
The UK	When compared to no vaccination, the incremental CE ratio (ICER) of the PPV23 vaccine was estimated at £14,813 and £13,497/QALY gained, from the third party payer and the societal perspective, respectively. [Jiang 2012]
	Under the scenario that all deaths among patients that were admitted to hospital who had a discharge diagnosis including any IPD codes were assumed to have died of IPD, the current UK recommendation, which consists of vaccinating all high risk older people (greater than 65 years) with PPV resulted in a cost per life year gained of £9,477. Vaccinating all 65+ years old, with or without high-risk conditions, resulted in being the dominating option with a lower cost per life year gained of (£8504) under base-case assumptions. [Melegaro 2004]
	It was estimated that adult vaccination with PCV13 instead of PPSV23 was cost-effective at the current NHS list price, with the incremental cost per QALY gained estimated to be £10,689 for the 65+ age group. [Charos 2012]
Germany	Vaccinating German at-risk adults and the older people (aged 60 or over) with PCV13 at current vaccine uptake resulted in an undiscounted net budget impact (NBI) of €239 million in the base case, which is 22% higher than vaccinating with PPV23. This analysis hinted that PCV13 was likely to result in a significant impact on the healthcare budgets. [Jiang 2011]
The Netherlands	Pneumococcal vaccination in the older people was not found to be cost saving. At baseline, stochastic and univariate sensitivity analysis resulted in net costs per life year gained to be between 6,000 and 16,000 euro (EUR) [EUR1 = 1.1 US dollars; cost level 1995]. A scenario analysis on alternative age-dependent vaccination strategies indicated even higher net costs per life year gained, up to EUR 28,000 for vaccinating only those elderly aged 85 years and over. [Postma 2001]
Italy	In a cost-effectiveness of a hypothetical vaccination campaign of 65+ year olds in the Lazio region (Italy), baseline net costs per event averted and life-year gained, at 2001 prices, were estimated to be €34,681 (95%CI: €28,699 to €42,929) and €23,361, respectively (95%CI: €16,419 to €38,297). [Merito 2007]
Spain	Implementation of a PCV13 vaccination programme for HIV population would be a cost saving measure due to IPD cases averted. It was estimated that over the study period, PCV13 would prevent 646 IPD cases and 162 related deaths. [Guijarro 2012]
Multi country	There was a substantial variation in the cost-effectiveness ratios for individual countries; for persons ≥65 years of age, they ranged from €9,239 for Denmark to €23,657 for Sweden. In the eight countries for which CERs for the three age groups could be calculated, the CERs generally increased for older age groups. [Evers 2007]

PNEUMONIA	
France	For an older population of greater than 65 years the pneumococcal vaccination strategy was cost saving from a third party payer's perspective, assuming that the pneumococcal vaccination was given at the same time as the flu vaccination without increasing vaccination costs. [Amazian 2002]
The UK	An economic analysis of a pneumococcal vaccine (compared with no vaccination) in a hypothetical cohort aged over 64 years resulted in a cost effectiveness ratio of £3,365 per year of life gained health-sector perspective without a booster, and £4,646 and £5,507 per year, respectively, with a booster at 5 years, assuming a an efficacy of 50% against illness and death from bacteraemia, with no effect on pneumonia. [Mangtani 2005]
Germany	For an older population (aged 60 and over) and from a third party payer's (TPP) perspective, incremental costs of a PPV23 vaccine strategy versus no vaccine strategy were estimated at €28 million and the ICER was €17,700/QALY gained. From the societal perspective, PPV23 was associated with an increment of €14 million, and the ICER was estimated to €8,579/QALY gained. [Jiang 2011]
The Netherlands	The ICER for vaccination (versus no vaccination) remained below €80,000/LYG for a hypothetical cohort of adults aged ≥65 years, except when the vaccine was assumed to protect only against bacteremic pneumonia, with a relatively low effectiveness (40%) in combination with a high vaccine price (€65), and indirect effects of serotype replacement would largely offset the direct effect of vaccination. In this model analysis of a hypothetical cohort in the Netherlands, vaccination with PCV-13 might be considered cost-effective, both for the total population and for the high-risk population aged ≥65 years, from a societal perspective, and for over a 5-year time horizon. [Rozenbaum 2010]
	Allowing for some uncertainty regarding key variables such as the vaccine efficacy and the hospital admission rate, the study reported that the vaccination of all individuals above the age of 65 years is comparable in terms of cost-effectiveness to many existing health care interventions. Comparing against no vaccination, vaccinating all individuals above the age of 55 years yielded an ICER of - ECU 3300 per life-year saved and vaccinating all individuals above die age of 65 years a CER of - ECU 1,500 per life-year saved (1 ECU = 2.07 Dutch guilder). [Baltussen 1997] The cost-effectiveness of vaccinating all individuals increased with age.
Poland	Considering a 50% reimbursement of a 23-valent polysaccharide vaccine (PPV23) by the public health care payer versus no vaccination, the incremental cost per QALY gained for vaccination in all older people (65 and older) was estimated to be PLN 3382.y. Ratios were even lower when actual in- and out-patients' costs instead of reimbursed costs were considered Cost effectiveness ratios estimated in the base case and the sensitivity analyses, were well below the gross domestic product (GDP) per capita (i.e. PLN 37,055). [Grzesiowski 2011]
Spain	It was estimated that the introduction of the vaccination programme for adults aged sixty and over costed US$ 97,593,663. Over the subsequent five years, with a basal rate of 3 pneumococcal pneumonias per 1000 person-years and a 66% vaccine efficacy- the programme resulted in a net benefit of US $127, 142, 481, a benefit/cost ratio of 2.3 and a benefit per case prevented of US $ 2,656. Benefit/cost ratios above 1 were obtained for incidences above 1.5 cases per 1000 person years. [Jimenez 1996]
Finland	The vaccination of adults over 50 years of age considered to be at moderate or high risk for PDs due to the underlying chronic medical conditions with PCV13 provided an estimated net budget savings of about €218 million compared to the current no-vaccination situation over five years. Among the risk groups considered, the largest net savings (€66.2 million) were expected to be obtained by vaccinating people with heart disease due to its high prevalence in the target population. [Martikainen 2012]
MIXED DISEASE	
Multi-country-Belgium, France, Scotland, Spain, and Sweden	To prevent invasive pneumococcal disease in persons aged >65 years, ICERs varied from >11,000 ecu per QALY for Spain to <33,000 ecu per QALY for Sweden when comparing against no vaccination. Assuming a common incidence (50 cases per 100,000) and mortality rate (20%–40%) for invasive disease, the cost-effectiveness ratios were 12,000 ecu per QALY in all 5 countries. The age-specific results showed no clear pattern of increasing or decreasing cost-effectiveness; whereas increases in incidence, mortality rates, and hospital resource use in older age groups appeared to cancel out declining vaccination effectiveness observed with increasing age. [Ament 2000]

APPENDIX 5: SURVEILLANCE SYSTEMS: DISEASE-SPECIFIC CHALLENGES:

INVASIVE PNEUMOCOCCAL DISEASE

There is a wide heterogeneity in IPD surveillance and reporting systems, and variations are associated with case definitions, type of surveillance and coverage.

- Most countries have a passive surveillance system except Czech Republic and Slovakia
- Reporting of cases is compulsory in most countries
- Some EU countries have no surveillance
- The majority of countries have national coverage

Inconsistencies persist despite enhancements in surveillance since 2010. Following enhancement of surveillance in 2010, 24 EU/EEA countries reported data, resulting in a higher number of reported cases compared with 2009. The confirmed case rates still ranged from 0.34 to 17.35 per 100 000, reflecting not only variation in incidence, but the persistence of significant differences in surveillance systems, diagnosis and medical practices (e.g. regarding blood culturing).

The ECDC must continue to work together with the Member States to support harmonisation and standardisation of laboratory methods for diagnostics, characterisation (serotyping) and antimicrobial susceptibility testing of *S. pneumoniae.*

SEASONAL AND PANDEMIC INFLUENZA

EU annual surveillance efforts are vital for assessing influenza vaccine uptake and estimating vaccine effect. European Influenza Surveillance data is collected by ECDC each week for most European countries.

- A weekly report is published giving details of the level of influenza activity in Europe
- Accurate epidemiological and virological information is available to governments, health professionals and the public.

Despite the availability of this data, the ECDC points out the need for improvements:

- Routine seasonal influenza surveillance in hospitals needs to be strengthened
- Surveillance should be coordinated at the European level to allow adaptation of systems that are currently working well, rather than developing a system de novo during a public health emergency
- Surveillance for development of resistance to antiviral drugs should be improved
- Surveillance systems for influenza in animals, particularly poultry and pigs, should be developed.

PERTUSSIS

Pertussis is monitored by ECDC and has a dedicated surveillance in Europe. Incidence data are collected centrally and crude rates are published in ECDC annual reports.

- Data are mostly based upon laboratory confirmed cases
- Most countries report a passive surveillance system except Czech Republic and Slovakia
- Reporting of cases of pertussis is required in most countries
- The majority of countries report that they have national coverage.

Although pertussis has reasonable incidence data over a range of EU countries, there is wide disparity between countries and the comparability of the data is difficult to judge. The variation may be due to:

- Different national vaccination policies
- Different levels of awareness in the clinical symptoms and case definitions
- Reporting or surveillance issues and procedures
- Different levels of disease incidence

In addition, pertussis is still not routinely reported (or under surveillance) by some Member States:

- Only 19 EU/EEA countries have a national pertussis reference laboratory
- Methods used for laboratory confirmation of pertussis differ widely and there is a great heterogeneity of the reference laboratories and functions

Standardisation and harmonisation of laboratory methods are needed to evaluate the effect of different pertussis immunisation programmes in Europe [He 2012].

HERPES ZOSTER

Herpes Zoster is not notifiable in most EU-27 Member States. Comparative data must be interpreted with extreme caution because variable case definitions are used and some countries appear to be reporting varicella combined with herpes zoster.

The European network for surveillance of vaccine preventable diseases (EUVAC.Net) revealed that in 2010 only 14 countries in Europe had a surveillance system for herpes zoster. EUVAC.Net recommended:

- Adoption of an EU case definition for herpes zoster

- Use of this definition by countries when reporting cases to the EU
- Reporting of both clinically defined and laboratory confirmed cases.

DIPHTHERIA AND TETANUS

Since 2010, the European **diphtheria** surveillance system distinguishes between *C. diphtheriae* and *C. ulcerans*. The former pathogen is transmitted between humans and causes true diphtheria, while the latter is contracted from animals and causes a diphtheria-like illness. Previously, these data were grouped together. Regular seroprevalence studies would be beneficial in the EU in order to identify and address gaps in population immunity against diphtheria.

Incidence data on tetanus are collected centrally in Europe and crude rates are published in ECDC annual reports. Data are based on laboratory confirmed cases, although surveillance systems use data from different sources.

- Most countries have a passive surveillance system, except Czech Republic and Slovakia
- Reporting of tetanus cases is compulsory in most countries
- Data are mostly collected nationally through laboratories
- The majority of countries have national coverage.

In 2006-11, tetanus was reported in 25 countries – Germany and Finland did not report data. Discrepancies are often seen between the nationally reported data and those published by ECDC.

The information in this Appendix is derived from the research on the burden of key vaccine-preventable diseases in the EU-27 performed by the International Prevention Research Institute (iPRI). More information on this research can be found in the methodology section.

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WHO. Seasonal influenza. Fact sheet N°211 (2009). Available at: http://www.who.int/mediacentre/factsheets/fs211/en/

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DATA SOURCES FOR THE COUNTRY PROFILES:

Official UN population data is used within each country profile. Available at: http://www.un.org/esa/population/
Retirement age data for each EU country is taken from the Employment, Social Affairs and Inclusion division of the European Commission. Available at: http://ec.europa.eu/social/main.jsp?catId=858&langId=en

METHODOLOGY

METHODOLOGY

This report consolidates existing research on the incidence of the main vaccine-preventable diseases in Europe and brings new evidence on the benefits of life-course immunisation and on the current level of implementation of adult vaccination policies across Europe. A significant amount of research has been conducted to form the basis of this report and to bridge some of the gaps in the evidence-base currently available to decision-makers. This Appendix details the methodologies used by the research organisations contracted to gather the various pieces of research that form the basis of this report.

RESEARCH ON THE BURDEN OF KEY VACCINE-PREVENTABLE DISEASES IN THE EU-27 PERFORMED BY THE INTERNATIONAL PREVENTION RESEARCH INSTITUTE (IPRI)

The International Prevention Research Institute (iPRI) is an independent research institute with a staff of demonstrated world-class excellence and leadership. iPRI has unparalleled experience in epidemiological research and macro health planning with a record of delivering real health and economic value to a range of public and private sources including governments, universities, research institutes, non-governmental organisations and large multi-national concerns.

Methodology:

Data sources on the burden of the main vaccine-preventable diseases looked at in the report (seasonal influenza, pneumococcal diseases, pertussis, herpes zoster, diphtheria and tetanus) were identified within each EU Member State by:

- Exploring websites and reports of institutions gathering data on infectious disease surveillance in the EU (e.g., ECDC, WHO-Europe). National institutions that provide official data to supranational bodies have been identified in the course of this process.
- Exploring websites and reports of national institutions gathering surveillance data, including public and private institutions, epidemiological, medical and research facilities.
- Using PubMed searches to identify relevant peer-reviewed publications which have published summary data on vaccine-preventable diseases.
- ECDC was contacted directly to obtain influenza cases per year (after 2007) and per age group for each EU Member State.

Limitations of the research:

The report presents summary data for a large number of EU Member States based on ECDC and WHO databases. These databases make an attempt to provide a standard definition which is more likely to be comparable over EU Member States. A unique case definition for communicable diseases was defined in Europe in 1998 (Directive 2119/98/EC). However, in many cases it was not possible to verify unambiguously that the agreed definition had been used and this is a limitation of the data presented in this section.

There is no guarantee that the data gathered from national sources are comparable from country to country or even from publication to publication within a country. Often nationally reported data differ slightly from the national data reported to WHO or ECDC or one of the other networks. This can be a result of slightly different definitions, use of laboratory confirmed data as opposed to solely clinical definitions, time scale and reporting delays, and missing values on age and gender.

The summary of European data does not provide information on the burden of each disease by age group and gender. Only total population rates and counts are available.

RESEARCH ON THE COST-EFFECTIVENESS OF ADULT IMMUNISATION STRATEGIES PERFORMED BY HERON

HERON is an evidence-based life sciences consultancy providing commercial decision support throughout the product/portfolio lifecycle. With expertise and methodologies that align evidence development and economic evaluation with pricing, reimbursement, and market access planning.

Methodology:

To ensure a comprehensive review of published evidence on cost-effectiveness of immunisation across the seven disease areas, a number of sources were searched in October 2012:

Databases

- Medical Literature Analysis and Retrieval System Online (MEDLINE®)
- Excerpta Medica Database (Embase®)
- Cochrane Economic Evaluation Database (NHS EED) and
- Technology Assessment database

Conference proceedings

- Conference abstracts were hand-searched to retrieve the latest studies which have not yet been published in journals as full text articles or supplement results of previously published studies.

The following list of conferences was searched for the current review:

- ISPOR-International (2011-12)
- ISPOR-Europe (2010-11)

Other sources

- Bibliographic searching of included evidence was conducted to address data gaps in relevant disease areas for EU-27 Member States.

Any study designs reporting cost-effectiveness evidence for adult immunisation strategies for the seven key vaccine-preventable diseases for patients aged ≥50 years of any race and gender were included within the scope of this structured literature search. Further studies assessing cost-effectiveness of immunisation strategies in high risk adult populations and in health care workers or laboratory staff at risk of exposure were also included if data were reported for older adults ≥ 50 years of age. With respect to the country settings, the primary focus was to consider data from EU Member States. Studies reporting different immunisation strategies including different schedules and doses were included. Lastly, studies were limited to those published from 1990 to 2012 and in English language alone. The quality of the included studies was assessed using the Drummond checklist for critical appraisal of cost-effectiveness studies [Drummond 1997].

A total of 2,154 studies were retrieved through the structured searches. Following the removal of duplicate citations and examination of the titles and abstracts of the remaining studies, 211 potentially relevant citations were retrieved for a more detailed inspection. Of these, 165 studies were excluded after double-screening and 46 studies were included for the purpose of this report.

MODELLING OF THE FISCAL IMPACT OF ADULT IMMUNISATION (CASE STUDY IN THE NETHERLANDS) PERFORMED BY GMAS

Global Market Access Solutions (GMAS) is a specialist consulting firm that provides a range of market access services to pharmaceutical, biotechnology and medical device companies.

Quantitative analytic methods:

A cohort model was developed in order to simulate the lifetime of a vaccinated and an unvaccinated cohort of 50 year old Dutch individuals. The survival of an average cohort was simulated based on the current Dutch life-tables (**http://statline.cbs.nl/**).

Epidemiological inputs

Epidemiological evidence was collected, for the scope diseases, from the published literature. Specifically, the age-specific incidence and mortality of each disease was collected and applied to the simulation using the survival tables for Dutch 50-year old cohort. **Table 1** illustrates the annual age-specific incidence and mortality employed in the model. Subsequently, annual infection cases were estimated for a period of 50 years. Similarly, the annual fraction of deaths attributable to each disease was estimated. The health economics literature was also searched to identify direct medical cost estimates for each of the scope infections. In addition, estimates of sick-days per disease were identified. Finally, estimates from the literature were obtained for the disability cases resulting from infection and the associated costs.

Table 1: Epidemiological inputs

Age	Influenza[1]	Pneumonia[1]	IPD[1]	Pertussis[2]	Diphtheria[1]	Herpes zoster[3]	Tetanus[1]
AGE-SPECIFIC INCIDENCE							
50-55	0.011000	0.008500	0.000110	0.000117	0.00000	0.005110	0.00000
55-60	0.013000	0.009500	0.000150	0.000117	0.00000	0.005110	0.00000
60-65	0.014500	0.011000	0.000260	0.000117	0.00000	0.006580	0.00000
65-70	0.012000	0.013500	0.000400	0.000117	0.00000	0.006450	0.00000
70-75	0.012500	0.019000	0.000550	0.000117	0.00000	0.007200	0.00000
75+	0.013000	0.025500	0.000680	0.000117	0.00000	0.007750	0.00000
AGE-SPECIFIC MORTALITY							
50-55	0.000050	0.000447	0.00001	0.00000	0.00000	0.00000	0.00000
55-60	0.000050	0.000748	0.00001	0.00000	0.00000	0.00000	0.00000
60-65	0.000050	0.001614	0.00004	0.00000	0.00000	0.00000	0.00000
65-70	0.000304	0.002718	0.00008	0.00000	0.00000	0.00000	0.00000
70-75	0.000304	0.006772	0.00020	0.00000	0.00000	0.00000	0.00000
75+	0.004178	0.019268	0.00051	0.00000	0.00000	0.00000	0.00000

Sources: 1. http://statline.cbs.nl/ 2. De Greeff et al 2008 3. Van lier et al 2010

Vaccine efficacy and health economics

The efficacy assumptions for each of the scope vaccinations were obtained from published cost-effectiveness analyses in the Netherlands. The same sources were used to identify vaccination coverage rates as well as the vaccination schedule per scope disease. A 77% coverage rate was applied to all vaccinations based on historical Dutch evidence for the coverage of the adult annual influenza vaccination programme. Vaccination unit costs originated from the list vaccine prices in the Netherlands. Institutional costs per vaccine dose were also included in the analysis. **Table 2** summarises the health economics, vaccine efficacy and coverage assumptions used in the cohort model.

Table 2: Health economics and vaccination inputs

	Influenza[1,6]	Pneumonia[2]	IPD[2]	Pertussis[3,8]	Diphtheria	Herpes zoster[5]	Tetanus
HEALTH ECONOMIC VARIABLES							
Direct per case medical cost	87	1,462	1,541	1,031	0	179	0
Sick-days per case	3.25	5	5	5.98	0	10.1	0
Disability cases	0%	1.5%	1.5%	0%	0%	0%	0%
VACCINES' EFFICACY AND COST							
RRR incidence	27%	11%	97%	89%	0%	67%	0%
RRR mortality	42%	11%	97%	89%	0%	0%	0%
Vaccination coverage	77%	77%	77%	77%	77%	77%	77%
Vaccination cost per immunization[7]	12.35	137.12	137.12	18.30		77.00	
Institutional costs per immunization	5.95	11.90	11.90	5.95	0.00	5.95	0.00

Sources: 1. Jefferson et al 2005 2. Rosenbaum et al 2010 3. De Vries et al 2010 4.Tacken et al 2009 5. Van lier et al 2010 6. Postma et al 2007 7. http://www.medicijnkosten.nl/ 8. McGarry et al 2012

Earnings, productivity and tax

The national statistics were researched to identify age-specific earnings which were, in turn, adjusted for unemployment based on the current age-specific unemployment rates. The household surveys were used to quantify the age-specific level of earnings, disposable income and direct tax paid by an average individual over his or her lifetime. A proportion of the disposable income was considered to be indirect tax paid in the form of VAT. Age-specific earnings were also used to quantify the losses associated with sick-days. In particular, the analysis included the fraction of the cost which is paid by the national insurance system in order to reimburse employees for a sick-day based on the existing local labour legislation. An average expected retirement age of 67 years was assumed.

Model's assessments

For each cohort the present value (PV) of total lifetime direct and indirect tax was calculated. In order to quantify the fiscal benefit of vaccinations the model quantified the incremental PV of total direct and indirect tax between the vaccinated and the unvaccinated cohorts. In addition, the model quantified the PV of the direct medical cost-saving resulting from the reduction of morbidity as well as the prevented disability costs. Moreover, the model quantified the indirect benefit of reducing the sick-days cost burden for the national insurance. Finally, the model quantified the PV of vaccination costs. Cost and benefits were discounted at the long-term (10-year) bond rate of the European Central Bank (1.8%). Furthermore, costs and earnings were inflated at 2% to reflect future cost-inflation and productivity changes. Vaccination costs were deducted from the total benefits of vaccinations to calculate the Net Present Value of investing in an adult vaccination programme. The Benefit-Cost ratio was estimated to reflect the rate of return from investing in vaccinations from the perspective of the Dutch government (**Table 3**).

Table 3: Model's assessments

$$\text{Vaccination benefits} = \sum_{t=1}^{Le} \frac{(\text{Incremental Tax} + \text{Incremental Health Cost} + \text{National insurance benefits})}{(1+r)^{t}}$$

$$\text{Vaccination cost} = \sum_{t=1}^{Le} \frac{Cov_{tj} \times Cost_{tj} \times S_{t}}{(1+r)^{t}}$$

NPV = Vaccination benefits – Vaccination cost
ROI = Vaccination benefit/Vaccination cost

where r: discount rate; t: year; j: Vaccine type; Cov: Vaccination coverage rate; Cost: Vaccine cost; S_t: Number of survivors in year t

RESEARCH ON ADULT IMMUNISATION STRATEGIES IN THE EU PERFORMED BY THE INTERNATIONAL LONGEVITY CENTRE-UK (ILC-UK)

The **International Longevity Centre-UK** is the leading think tank on longevity and demographic change. It is an independent, non-partisan think-tank dedicated to addressing issues of longevity, ageing and population change. We develop ideas, undertake research and create a forum for debate. Much of our work is directed at the highest levels of government and the civil service, both in London and Brussels. We have a reputation as a respected think tank which works, often with key partner organisations, to inform important decision-making processes. We are aided in this work by our Chief Executive, Baroness Sally Greengross, former director-general of Age Concern and now a cross-bench peer. Our policy remit is broad, and covers everything from pensions and financial planning, to health and social care, housing design, and age discrimination. We work primarily with central government, but also actively build relationships with local government, the private sector and relevant professional and academic associations.

Methodology:

The data for this audit was recorded and collated through comprehensive desk research conducted between April and September 2012. Sources consulted over this period include relevant grey and academic literature that was identified through the application of systematic search terms.

In addition to the desk research, a series of interviews were conducted with SAATI partners, who were requested to review initial data finding regarding their respective countries and provide comment on accuracy provide assistance in the case of data gaps. Stakeholder experts were also contacted to verify data. All interviews were conducted in English.

The data collected through desk research and interviews was taken for a further round of review in 2013 with SAATI partners and Pfizer country representatives.

Limitations of the research:

This audit is by no means the culmination of a scientific report. Rather, the results that have been collected and reported in this document, represent the current policy framework for the six vaccine-preventable diseases that were examined, that could best be established through desk research and stakeholder interviews.

Multiple data sources were utilised and in many instances, the same data source was not applicable across all EU countries. In such instances, a hierarchy of sources was established in order to ensure as great a level of consistency as possible: wherever available, government and official policy statements were adopted over secondary literature; where official policy statements were lacking, recourse was made to stakeholder views and relevant grey and academic literature.

In the interest of streamlining the report, to allow for meaningful and manageable analysis, some analytical items were not examined, for instance:

- In relation to vaccine funding, the research did not seek to measure funding arrangements that included financial assistance from employers or health insurers, rather assessing funding through broader analytical categories.

- The full range of at risk groups for which vaccination can be recommended have not been captured within this analysis, rather the research has sought to capture the most consistently recommended at risk groups. Inconsistent availability of data with regards to at risk groups for certain diseases (e.g. pertussis, diphtheria and tetanus) limit the research results further.

Recognising that there may have been new developments in some countries since this audit was carried out, or that there may be need for further explanation and clarification of some country profiles, interested parties are invited to contact SAATI.

RESEARCH ON PUBLIC AWARENESS AND EDUCATION AROUND ADULT IMMUNISATION PERFORMED BY HILL+KNOWLTON STRATEGIES

Hill+Knowlton Strategies is a global communications consultancy offering a full range of public affairs and corporate communications services to local and global clients. H+K offers senior counsel, insightful research and strategic communications planning throughout the world.

Methodology:

A series of one-to-one interviews with a core group of Supporting Active Ageing Through Immunisation (SAATI) partners has been performed from November 2012 to January 2013 to gather expert views around the knowledge gap pertaining to adult immunisation and the need to change attitudes and beliefs, as well as the fundamental role played by healthcare professionals, and to a lesser extent other third parties (e.g. the media, patients' organisations, religious authorities, employers, etc.).

List of interviewees:

- Dr. Ian Banks, President of the European Men's Health Forum and of the England and Wales Men's Health Forum
- Ms Katharina Braun, Project Manager, Health Unit and Mobility, German National Association of Senior Citizens' Organisations (BAGSO – Bundesarbeitsgemeinschaft der Senioren-Organisationen)
- Dr Daphne Holt, Vice President of the Confederation of Meningitis Organisations (CoMO)
- Univ. Prof. Dr. med. Ursula Kunze, Institute of Social Medicine, Centre of Public Health, Medical University Vienna (European Centre for Disease Prevention and Control - Competent Body)
- Ms Michele Lawrence, Consultant nurse Health protection, Company Director MMIDAS
- Prof. Dr. Endre Ludwig, Head of Department of Medicine and Infectology, Director for Research and Education of the Szent László Teching Hospital
- Ms Christine Rolland, Vice President of EFA (the European Federation of Allergy and Airways Diseases)
- Mr David Sinclair, Assistant Director of Policy and Communications, International Longevity Centre-UK
- Ms Hildrun Sundseth, Board Member of the European Institute of Women's Health
- Prof. David Taylor, Professor of Pharmaceutical and Public Health Policy, University of London School of Pharmacy

BIOGRAPHIES: **SAATI PARTNERS**

Prof. Dr. Javier Garau, Chair

(Spain) **Dr. Javier Garau** is the former President of the European Society of Clinical Microbiology and Infectious Diseases (ESCMID), Associate Professor of Medicine at the University of Barcelona and former Head of the Department of Medicine at Hospital Universitari Mutua de Terrassa in Barcelona. His research includes community-acquired bacterial infections, antibiotic resistance and new antimicrobials. Dr. Garau has authored more than two hundred peer-reviewed articles of clinical microbiology and infectious diseases publications. He is an American Board of Internal Medicine and American Board of Infectious Diseases diplomat and an active member of numerous medical committees, professional societies and editorial boards of peer-reviewed journals. Dr. Garau served as the president of La Sociedad Espanola de Enfermedades Infecciosas y Microbiologia Clinica from 1990 to 1992 and as vice-president of the Spanish Society of Chemotherapy from 1988 to 1990. He also served as the ESCMID education officer.

Mr David Sinclair

(United Kingdom) **Mr Sinclair** is responsible for the policy and research activities of the International Longevity Centre-UK. David sits on a number of Government and voluntary sector working groups and was the former Vice-Chair of the Consumer Expert Group for Digital Switchover. He is Vice-Chair of the pan-European Age Platform expert group on ICT and Transport. David is a trustee of a small older people's charity called Open age. He is also a member of the Editorial Board for “Working with Older People” and the NESTA Ageing Advisory Board. David has presented on ageing issues across the world. Mr Sinclair sits on a number of government and voluntary sector working groups and was the former Vice-Chair of the Consumer Expert Group for Digital Switchover. He is Vice-Chair of the pan-European Age Platform expert group on ICT and Transport. He is a trustee of a small older people's charity called Openage. He is also a member of the Editorial Board of Working with Older People and the National Endowment for Science, Technology and the Arts Ageing Advisory Board. Mr Sinclair has a particular interest in financial services, older consumers, active ageing, and the role of technology in an ageing society. Prior to joining the ILC-UK, David worked as Head of Policy at Help the Aged where he led a team of 8 policy advisors. David has also worked for environmental and disability organizations in policy and public affairs functions. His other experience includes working as a VSO volunteer in Romania and working in the UK Parliament for a Member of Parliament and various backbench committees.

Dr. Ian Banks

(United Kingdom) **Dr. Ian Banks** is a member of the Council of the British Medical Association (BMA) and has been awarded the BMA accolade, the Association Medal. He has also worked on the BMA Developing Patient Partnerships (DPP formerly Doctor Patient Partnership) for six years. He is the official spokesman on men's health issues for the BMA, president of the European Men’s Health Forum and the England & Wales Men's Health Forum, medical editor for The Men's Health Magazine since six years, and former deputy editor of the Men’s Health Journal, and the former vice president of the International Society for the Study of Men’s Health (ISMH). The BBC book 'The Trouble with Men' was written by Dr. Banks in 1996 to accompany the television series of the same name. He is also the author of an NHS Direct Healthcare Guide and related portion of the Web site. Dr. Banks was appointed visiting professor of men’s health in Europe by Leeds Metropolitan University in 2005 and awarded the Royal Society of Health Gold Medal for public health in 2007. The City of Vienna and the International Society of Men’s Health honoured Ian with their award for public health in September 2007.

Ms Katharina Braun

(Germany) **Ms Braun** is Project Manager in health unit and mobility of the German National Association of Senior Citizens’ Organisations (BAGSO – Bundesarbeitsgemeinschaft der Senioren-Organisationen) since 2007. She is moreover an Honorary Member of Alliance for Patient Safety since 2010. Ms Braun holds a degree in Sociology from the University of Trier, Germany.

Prof. Dr. Roberto Bernabei

(Italy) **Roberto Bernabei** is a Professor of Internal Medicine at the Catholic University of the Sacred Heart, and Chief of the Department of Geriatrics, Neurosciences and Orthopaedics at the A Gemelli University Hospital in Rome. He is Past President of the Italian Society of Gerontology and Geriatrics and, until 2011, Executive Vice President of interRAI (a collaborative network of researchers in over 30 countries committed to improving health care for persons who are elderly, frail, or disabled.). Professor Bernabei also serves as a Board Member of the European Academy for Medicine of Ageing (EAMA), and is a Visiting Associate Professor in the Department of Community Health at Brown University School of Medicine. In 2011, He was appointed by the Ministry of Health as President of the Network Italia Longeva, the Italian Agency for elderly-related issues. His main research interests are in geriatric assessment, models of health services for elderly care and geriatric pharmacoepidemiology. He has authored over 250 papers in peer-reviewed journals, eight books and 15 book chapters.

Dr. Daphne Holt

(EU) **Daphne Holt** PhD, MBA, joined the Meningitis Trust (UK) in 1999 after 30 years in medical research and education, first with the Medical Research Council (UK) and then at the Karim Centre for Meningitis Research, Imperial College, London. Her initial brief for the Meningitis Trust was to develop an education initiative that focused on computer-aided and e-learning. In 2009 she was seconded from the Meningitis Trust to the Confederation of Meningitis Organisations (CoMO) to become its first executive director and to establish CoMO as a registered organisation in Perth, Western Australia. During her career in science and as a charity manager she has published and presented on meningococcal disease, especially in the newborn. She also served on the WHO Working Group on the terms of reference for the International Coordinating Group (ICG) on Vaccine Provision for Epidemic Meningitis Control. Daphne retired from the Meningitis Trust and as Executive Director of CoMO in March 2010 and now lives in France. She was invited to join the Governing Council of CoMO, which has members across the World, and is now Vice President.

Univ. Prof. Dr. med. Ursula Kunze

(Austria) **Univ. Prof. Dr. Med. Ursula Kunze** graduated from the Medical School at the University of Vienna in 1995 and received her postdoctoral lecturer qualification from the University of Vienna in 2000. She was a Research Assistant at the Institute of Tumor Biology and Cancer Research and at the Institute of Social Medicine of the University of Vienna. Since 2001, she is Associate Professor at the Institute of Social Medicine of the Centre of Public Health of the Medical University of Vienna. Her expertise encompasses public health and vaccinations, with a specific focus on influenza and tick borne encephalitis, social marketing and public health, and the epidemiology of infectious diseases. She has contributed to more than a 100 scientific publications and numerous articles in the general and specialised press.

Prof. Dr. Hartmut Lode

(Germany) **Professor Lode** was Head of the Division of Chest Diseases and Chemotherapy at the Medical Department of Klinikum Steglitz, Berlin, and Chief of the Department of Chest and Infectious Diseases in the City Hospital Berlin-Zehlendorf, which is affiliated with the Teaching Hospital to the Freie Universität (FU) Berlin. He received his Doctorate (MD) at the Institute of Pharmacology at the FU Berlin as a magna cum laude, received qualification as a Specialist in Internal Medicine at the Medical Department of Klinikum Steglitz and was a Professor of Internal Medicine at FU Berlin. Since 1989 he has been chief of the department for Chest and Infectious Diseases at Hospital Heckeshorn in Berlin; since 2006 he is the head of the Research Center for Medical Studies (RCMS), which is affiliated to the Charitè – Universitätsmedizin Berlin / Institute for Clinical Pharmacology. Professor Lode was President of the Paul-Ehrlich-Society for Chemotherapy from 1992 to 1993; a Member of the Executive Committee of the European Society for Clinical Microbiology and Infectious Diseases from 1993 to 1999; and was President of 9th ECCMID, Berlin, in 1999. He was also Vice Chairman of the Approval Commission of the German Institute for Drugs (BIFRAM) in 2002, and President of the 7th Congress for Infectious and Tropical Diseases (KIT) in Berlin, 2003. He is the author of more than 500 scientific publications and 700 lectures; a member of 15 national and international scientific societies; and editor or co-editor of 8 scientific journals in the field of infectious and respiratory diseases.

Ms Christine Rolland

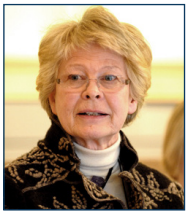
(France) **Christine Rolland** is General Director of the French National Asthma & Allergy Association (AAA) and is responsible for managing and implementing the overall strategy of the organisation. She is also EFA (European Federation of Allergy and Airways Diseases Patients' Associations) Vice-President since 2010, and is EFA board lead in EU project HealthVent, Health Based Ventilation Guidelines for Europe and in membership raising. Christine is also a founding member of the French Federation of Allergology. Before joining AAA in 1995, Christine started her career with a French pharmaceutical company where she was in charge of marketing and advertising. She studied at the Catholic University of Paris and holds a master in intercultural management. Being a daughter of a severe asthmatic mother and mother of an allergic child, her special interests are prevention and patients' education.

Prof. John J Roord

(Netherlands) **Prof. Roord MD PhD,** paediatric infectiologist, has been professor of Paediatrics at VU University Medical Centre Amsterdam from 1997-2013. He has been Head of the Pediatrics Department and Chair of Division III at the VU University Medical Center, Amsterdam, the Netherlands (1997- 2011) and was vice-dean of Education at the same university (1998-2001). In Januari 2012, he joined the Oude Gracht Groep Beheer as Executive Consultant/Interim Manager.
Prof. Roord has held several professional posts in the Netherlands, including President of the Central College of Medical Disciplines, and positions within the Dutch Society in Paediatrics. He is currently Vice-Chair of the Dutch National Vaccination Programme, part of the National Health Council. He sits on the board of several foundations, among others the Foundations Papageno, Infectiology, White Matter Diseases, Medical Specialists for Children, and Child and Host Defence. Prof. Roord is (co-)author of more than 200 publications, gave more than 300 lectures by invitation in the field of paediatric infectious diseases and vaccinology and has been actively involved in training the next generation of paediatricians and scientists. Since 1997 he has organised yearly continuous postgraduate medical education events in paediatrics, public health, vaccinology and in infectious diseases. John Roord has acted as the initiator and driving force behind two charitable works for vulnerable children – the VU Children's Town in collaboration with the Ronald McDonald Children Foundation, and Doctors 2 Doctors.

Prof. Dr. Jean-Paul Stahl

(France) **Jean-Paul Stahl** is Head of the Department of Infectious Diseases at University Hospital, Grenoble, and has been a Professor of Infectious Diseases since 1983. Professor Stahl's primary research interests include neurological infectious diseases (meningitis and encephalitis) and determining the most suitable use of anti-infective agents. He is a board member and former president of the Société de Pathologie Infectieuse de Langue Française (SPILF).



Ms Hildrun Sundseth

(Germany) **Hildrun** is a **Board Member of the European Institute of Women's Health (EIWH)** where she is advocating for an equitable and gender-sensitive approach in health policy, research, prevention, treatment and care. Her special interests are reducing inequalities in health, in particular due to gender and age and focusing on reducing the chronic disease burden by taking a lifespan approach to prevention. She is involved in various initiatives of the European Medicines Agency's dialogue with patients and consumers. As **Head of Policy for the European Cancer Patient Coalition,** Hildrun was instrumental in uniting the patient's voice from over 200+ different cancer groups for making cancer a priority for EU action. Following a 4-year campaign, the Commission launched the European Partnership – Action against Cancer, a joint initiative including member states and key stakeholders in the cancer field. The Cancer Partnership aims to reduce new cancer cases by 15% by the year 2020. As a collaborating partner, the EIWH focus is on prevention as the most cost-effective strategy. In support, Hildrun has organised several European Parliament Roundtables on cervical cancer prevention through a twin approach of screening and vaccination. She is the co-author of the patient chapter in the Slovenian EU Presidency book on 'Reducing the Burden of Cancer'.

Prof. David Taylor

(United Kingdom) **David Taylor** is Professor of Pharmaceutical and Public Health Policy at The UCL School of Pharmacy, University of London. Between 2000 and February 2009 he was Chair of Camden and Islington NHS Foundation Trust. He subsequently became a non-executive director of the Camden Primary Care Trust.
David's previous posts include Associate Director of Health Studies at the Audit Commission for England and Wales, a King's Fund Fellowship, and Director of Public and Economic Affairs at the Association of the British Pharmaceutical Industry. During the 1980s and early 1990s he was also chair of Lambeth, Southwark and Lewisham FPC/Family Health Services Authority.
He has published extensively on issues relating to health. For example, at the Audit Commission he researched and wrote the national study Dear to our Hearts? and the national audit which accompanied it. These were forerunners of the National Service Framework on coronary heart disease. David's current work includes studies on public health and pharmaceutical policy formation and the future global development of pharmacy, the pharmaceutical industry and health care provision.

Prof. Roman Prymula, MD, PhD

(Czech Republic) **Roman Prymula, MD, PhD,** is director of University hospital in Hradec Kralove and former Dean of the Faculty of Military Health Sciences and Chair of the Department of Epidemiology at the University of Defence in Hradec Králové, Czech Republic. He graduated from Military Medical School and Charles University School of Medicine in Hradec Králové, Prague, with medical degree. Roman Prymula has completed an International Certificate in Hospital Management, at the University of Birmingham in the United Kingdom in 1995. He received an associated professor degree in Epidemiology and in 2007 he became full Professor of hygiene, epidemiology and preventive medicine. He earned a PhD from Purkyne Military Medical Academy in Hradec Králové and holds specialization degrees in Hygiene and Epidemiology, Public Health, and Medical Microbiology. He is involved in various research activities in preventive medicine, including clinical development of new vaccines, such as those for pneumococcus; rotavirus; measles, mumps, rubella (MMR); and human papillomavirus. In addition to his active research and teaching activities, he serves as a consultant for several national and international organizations. He is a member of the European Centre for Disease Prevention and Control (ECDC) management board, Chairman of the Central European Vaccination Awareness Group, Chairman of the Czech Advisory Board for Epidemiology, and Chairman of the Czech Vaccinological Society. He is also on the editorial board of several scientific journals and serves as a consultant for several national and international organizations. He has published numerous articles and book chapters on vaccine preventable infectious diseases and monographs on bioterrorism and severe acute respiratory syndrome (SARS).

Prof. Endre Ludwig MD, PhD

(Hungary) Trained as a medical doctor at the Semmelweis Medical University, Budapest, with a specialization in internal medicine, clinical pharmacology and infectology, **Prof. Ludwig** is Head of Department of Medicine and Infectology, Director for Research and Education of the Szent László Teaching Hospital in Budapest. He was previously Head of Division of Infectology at the Semmelweis Medical University, Budapest, Department of Internal Medicine No II. Prof. Ludwig is a member of the Hungarian College of Infectologists since 1994 and the former Head of the College (2004-2011). He has published and contributed to over 250 publications on clinical pharmacology of antimicrobials (effect of age on the kinetics of antimicrobials, effect of impaired renal and hepatic function, drug interactions of antimicrobials in particular of fluoroquinolones, dosing of antimicrobials), treatment of nosocomial bacterial infections (in particular in ICU patients), treatment of UTI-s in special patient groups, antibiotic stewardship, respiratory tract infections, evolution of bacterial resistance. Impact of antibiotic use and vaccination and pneumococcal vaccines. Prof. Ludwig wrote his Ph.D. thesis on the effect of the aging process on the pharmacokinetics of antibiotics.

Dr. Vytautas Usonis MD, PhD

(Lithuania) **Vytautas Usonis** is currently the head of the Vilnius University Clinic of Paediatrics. In 1974, he graduated from Vilnius University Faculty of Medicine as a paediatrician. He obtained his PhD at the 2nd Moscow Institute of Medicine in 1981. Since 1991 he has been professor of paediatrics at Vilnus University. He was a board member of the European Society of Paediatric Infectious Diseases (ESPID) from 2005 to 2008. He is chairman of the National Committee for Poliomyelitis Eradication Certification in Lithuania and a board member of the National Board on Immunisation of Lithuania. Prof. Usonis has been chair of the Board of the Baltic Immunoprophylaxis Association since 2009. He was president of the Lithuanian Paediatric Society (1998-2007), president of the UNICEF National Committee of Lithuania (1997-2003). He is an expert on vaccine-related issues and he has been invited as a speaker to many international scientific events. He has published more than 100 papers on paediatric infectious diseases, vaccine preventable diseases and vaccinology in English, Russian and Lithuanian. Prof. Usonis has also been a tutor of Oxford University's Postgraduate Diploma in Paediatric Infectious Diseases.

Dr Yves van Laethem, MD

(Belgium) **Dr. Van Laethem** is Chief of the Travel Clinic and Senior Physician at the Department of Infectious Diseases of the Saint Pierre University Hospital in Brussels. He is a member of several commissions of the Belgian Ministry of Public Health. Dr Van Laethem is a member and co-founder of the "Groupe d'Etude Scientifique de la Médecine des Voyages" (co-ordination of activities advises to travellers) and has been a member of the American Society for Microbiology since 1991. In addition, he is a member of various Belgian societies: Belgian Society of Infectiology and Clinical Microbiology, Belgian Society of Internal Medicine. From 1990 to 2006, Dr Van Laethem was Deputy Chief of the Infectious Diseases Department at the Saint Pierre University Hospital. Since 1978, Dr Van Laethem holds a diploma of MD with great distinction from the Free University of Brussels (ULB). Furthermore, he specialised in Tropical Medicine at the Tropical Institute of Antwerp and holds a certificate in Hospital Hygiene from the ULB (1990).

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