HTAi Conference, Oslo June 2015
Global Efforts in Knowledge Transfer: HTA to Health Policy and Practice

Panel Session Report
Assessing the value of vaccines - what is needed to make evidence-based health policy decisions?

Key points

Vaccines are an important public health intervention to protect the population against infectious diseases.

There is currently a significant delay between the licensing of a vaccine and the organisation of a national or regional vaccination programme, which is exacerbated by a range of organisations undertaking assessments, often duplicating effort.

Health technology assessment (HTA) processes, particularly for modelling long-term effects and costs, are a useful tool to inform policy makers about the benefits of different options in a vaccination programme.

The European Network for HTA (EUnetHTA) has shown that it is feasible to work together across Europe to create core information for assessments that can be used to inform national or regional decision-making processes.

Greater collaboration is needed among HTA agencies and with National Immunization Technology Advisory Groups to share expertise and ensure that rapid, coordinated assessments of vaccines are undertaken to expedite decisions about national or regional vaccination programmes.

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About HTAi

Health Technology Assessment international (HTAi) is the global scientific and professional society for all those who produce, use, or encounter HTA. HTAi has members from over 65 countries and embraces all stakeholders, including researchers, agencies, policy makers, industry, academia, health service providers, and patients/consumers. HTAi is the neutral forum for collaboration and the sharing of leading information and expertise.

The HTAi 2015 conference was organized in Oslo in June 2015, gathering around 900 international delegates The theme of the meeting was “Global Efforts in Knowledge Transfer: HTA to Health Policy and Practice**"**. The scientific programme can be accessed at: http://www.htai2015.org/events/2015-htai-annual-conference.

This panel was selected for presentation by an independent review panel.

Status of this report

This report has been approved by all presenters to be presented as a public record of the HTAi panel.

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Karen Facey received a fee from Vaccines Europe, a specialised group within EFPIA to organise this panel and act as rapporteur. Professor Ricciardi was reimbursed travel and conference registration fees by Vaccines Europe.

1. Introduction

Dr Karen Facey acted as moderator for the HTAi 2015 panel about assessing the value of vaccines to inform health policy decisions. She noted how the HTAi 2015 keynote speaker, Professor Richard Horton, had challenged the health technology assessment (HTA) community to go beyond assessment of a single intervention to consider issues related to health systems, which can impact global health. Clearly, one important element of improving global health is the provision of vaccinations and as Richard Horton indicated, the Ebola virus was described in 1976 and results from a test of inactivated Ebola vaccine in guinea pigs were *published in The Lancet* in 1980, but the vaccine was not developed. Now 35 years on we have seen an outbreak of the virus that has been associated with 50% mortality and major loss of life in Africa. Vaccines need to be delivered through well-organized programmes that seek to maximize uptake to create immunity in the population. Optimal organization of an immunization programme is a challenging task that requires an interdisciplinary approach that is linked into health policy decision making.

The issues associated with designing the optimal vaccination programme can be addressed by HTA, but assessment is often done nationally by an independent group, with or without links to HTA. The wide range of speakers on this panel will outline the fascinating challenges of assessing the value of vaccines and discuss how this assessment could be better coordinated to expedite policy decisions about implementation of vaccine programmes.

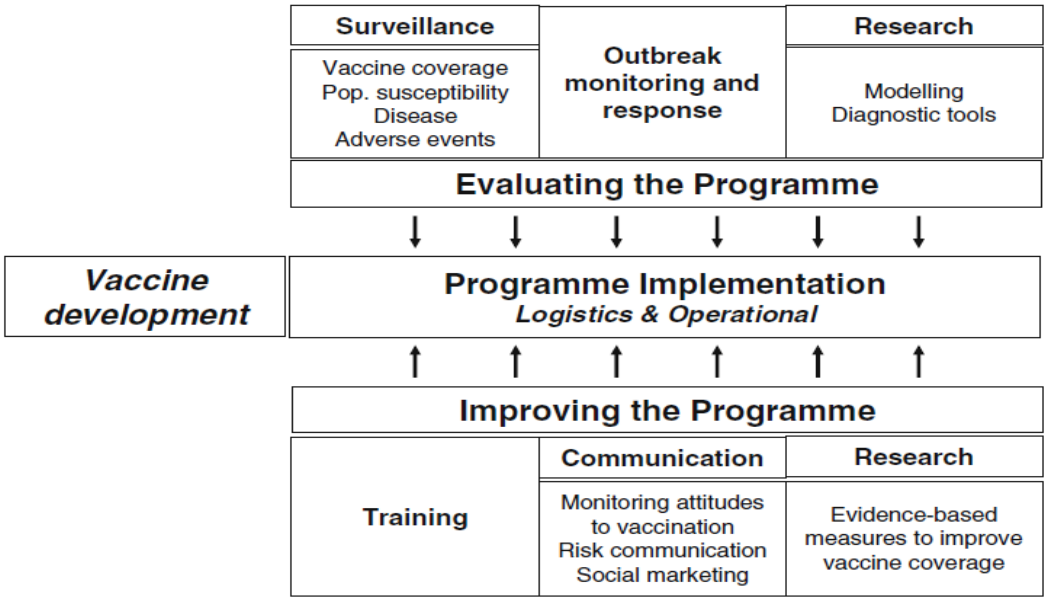
2. Roadmap for sustainable healthcare

Professor Walter Ricciardi, Professor of Hygiene and Public Health, Catholic University of the Sacred Heart, Rome, Italy
Commissioner of the Italian National Institute of Health
Past President of the European Public Health Association

Vaccination is well established as one of the most effective and safe interventions in public health for the primary prevention of infectious diseases. It provides direct benefits to individuals who are vaccinated and indirect benefits to those who are not vaccinated (so-called herd immunity). However, new vaccination challenges are ever present with the continued spread of old and new infectious diseases due to globalization and poor national surveillance systems. To combat these issues technological advancements are supporting development of new complex formulations and combinations. It is hoped that these will lead to new or improved vaccines over the next decade for a wide range of diseases from cholera, the plague and Dengue fever to infections with Helicobacter pylori, hepatitis and HIV. However with these new developments come high costs and public concern about the feasibility of vaccination programmes and acceptability of vaccines.

An immunization programme is even more complicated than a transplantation programme, as it must take account of the epidemiology of the disease, in particular its form of spread, and act within the health system structure to stop that spread. Figure 1 describes the key issues that need to be addressed by the national or regional health systems that may reimburse the use of a vaccine in a coordinated immunization programme.

Figure 1. Main components of an immunization programme

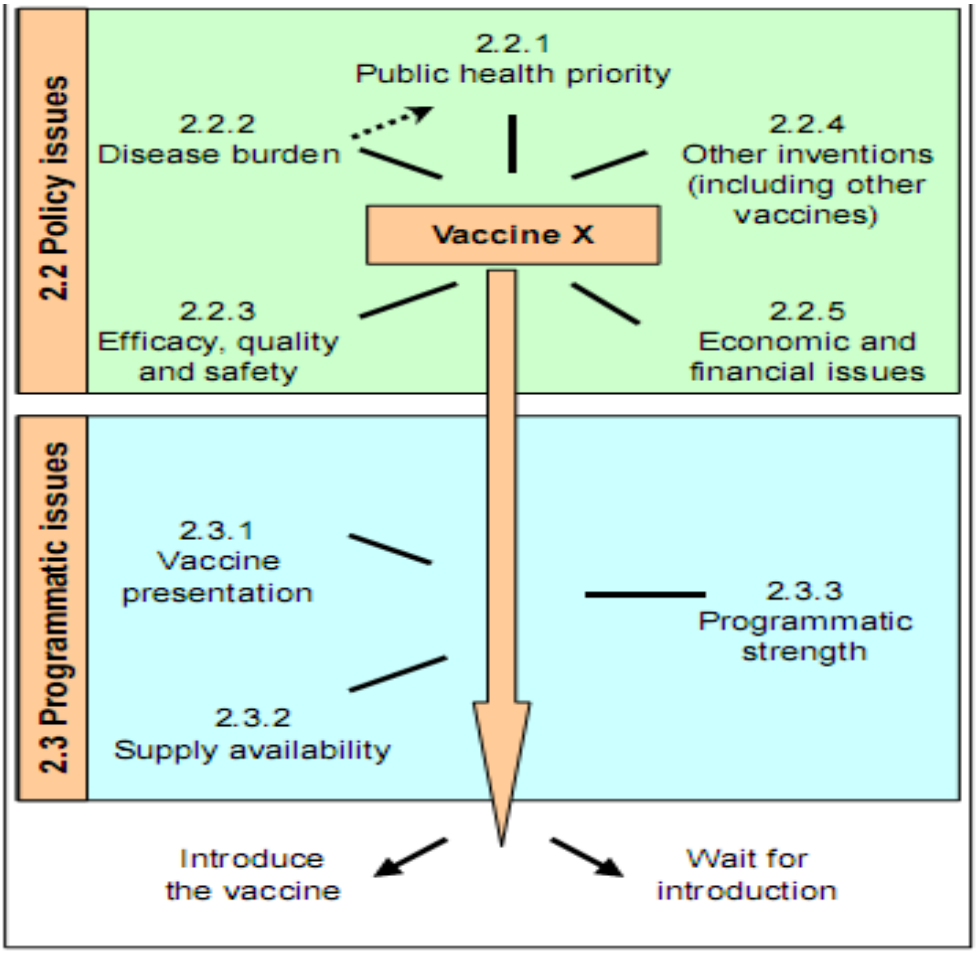


Reproduced with kind permission of Lopalco PL. Improving vaccination programmes in the European Union. J Public Health 2008;16:281–285.

The World Health Organization (WHO) has also issued guidelines about the assessment of new vaccines, covering policy and programmatic (organizational) issues as shown in Figure 2. These frameworks are used by the country/regional groups undertaking assessments of vaccines, the National Immunization Technology Advisory Groups (NITAGs). However, recent research shows that there are a wide range of ways in which this assessment is undertaken in 13 countries in Western Europe, Canada and the

USA[1]. All evaluate disease burden and safety, but consideration of effectiveness, feasibility of programme implementation, cost effectiveness and equity of access vary.

Figure 2. WHO guidelines for the introduction of a new vaccine



WHO - Department of Immunization, Vaccines and Biologicals. Vaccine Introduction Guidelines. Adding a vaccine to a national immunization programme: decision and implementation. World Health Organization. Geneva, 2005

For other technological developments in healthcare (health technologies), HTA is considered a valuable process to inform decision-making and support best stewardship of resources. It uses interdisciplinary content and processes to undertake the collection and synthesis of evidence. In 1995, it was considered to consist of four major areas:

- the technology performance and clinical effectiveness,
- patient aspects (including ethical, legal and social implications),
- cost effectiveness and budget impact,
- health system organizational issues.

However, all authors stress that it is not simply a research activity; it has a policy orientation and is expected to be disseminated widely[2].

[1] Ricciardi G, Toumi M, Weil-Olivier C et al. Comparison of NITAG policies and working processes in selected developed countries.

[2] Ham C, Hunter D, 1995. Battista R, Hodge M. JAMC 1999; Banta H.D. et al. Washington: Office of Technology Assessment 1978; Velasco Garrido M., Busse R. European Observatory on Health Systems and Policies 2005

Although there has been a focus on HTA of medicines in the past decade, the HTA process could provide a valuable framework for assessment of vaccines, but careful consideration is needed to take account of the unique situation of vaccines, which aims to provide a preventative treatment to a specific sector of the population (who don't have the disease) and to create herd immunity[3], [4].

Indeed, the value of HTA was recognized when the human papilloma virus (HPV) vaccine was authorized to reduce the risk of cervical cancer and several HTA agencies undertook assessments. These assessments helped in determining the optimal delivery of the vaccine and HTA reports were shared among agencies in the European network for HTA (EUnetHTA) Project in 2007. In 2011, Torre et al, reviewed the Italian HTA process for the HPV vaccination. He noted that the increasing use of HTA in Italy to assess vaccines was linked to the number of vaccines in development, especially those for non-paediatric populations. They called for standardization and sharing of HTA methods across the disparate regional processes used in Italy and across Member States in Europe.

Given the rigour, transparency and accountability of HTA processes and the efforts towards greater coordination in Europe to standardise methods and coordinate production of evidence for use at a national level, HTA should be promoted for all new health technologies to inform decision making and health policy.

This includes vaccines. For vaccines, HTA needs to:

- develop partnership between manufacturers and HTA agencies to ensure that research and development programmes will answer the policy and programmatic issues that will be addressed in an assessment
- promote accessibility to individual "patient" data to allow monitoring of disease patterns
- encourage collaboration between policy-makers and researchers to allow rational allocation of resources across healthcare that will promote public health.

[3] La Torre G, Chiaradia G, De Waure C et al. Health Technology Assessment of vaccines: new needs and opportunities? IJPH 2007; 5:

[4] La Torre G, De Waure C, Chiaradia G et al. The future of best investing in vaccines: the health technology assessment approach. NEJM 2008; 26:1609-10.

3. Challenges in immunization policy making in Europe – the role of the European Centre for Disease Prevention and Control

Dr Lucia Pastore Celentano, Acting Head of Vaccine-Preventable Diseases Programme, European Centre for Disease Prevention and Control, Stockholm, Sweden.

The European Centre for Disease Prevention and Control (ECDC) was established in 2005 to strengthen Europe's defences against infectious diseases by identifying, assessing and communicating current and emerging threats to human health posed by infectious diseases[5]. European legislation states that ECDC should foster the exchange of best practices and experience with regard to vaccination programmes and coordinate data collection, validation, analysis and dissemination of data, including for vaccination strategies. This implies that not only is data sharing needed, but also sharing and development of vaccination strategies. As a result, ECDC has a specific programme for vaccine-preventable diseases (VPD).

The VPD programme aims to provide robust evidence and high quality technical support to EU member states for the prevention and control of vaccine-preventable diseases. It covers a wide range of diseases (from measles and diphtheria to poliomyelitis and rabies) and includes a range of functions from prevention and control to surveillance, laboratory services, scientific advice and support for coordination among member states. ECDC has been working with the European Medicines Agency (EMA) and the European Commission to strengthen vaccination policy in Europe. As a result of this the European Council published conclusions in December 2014, stating that vaccinations were an effective tool in public health[6]. These conclusions have contributed to the development of a strategic multiannual programme that guides the areas of work in the VPD programme.

This includes a range of services to support Member States in their decision-making about increasing vaccination coverage, with:

- a range of evidence-based products about different aspects of vaccination programmes:
    - Guidance - a systematic review appraised by a scientific expert committee (e.g. giving guidance on priority risk groups for influenza vaccination)
    - Systematic Reviews
    - Expert Opinions
- technical support on communication, best practices, policy, detection of target groups and scientific advances
- provision of evidence on cost-effectiveness
- passive and active monitoring of the direct and indirect effects of vaccination programmes in terms of coverage, effectiveness within sub-populations (e.g. certain serotypes or with comorbidities) and impact using alternative surveillance methods (such as the I-MOVE network on flu vaccine effectiveness and sentinel surveillance of whooping cough).

ECDC is participating in the Innovative Medicine's Initiative Accelerated Development of Vaccine Benefit-Risk Collaboration in Europe (iMi ADVANCE) project. ADVANCE will review, develop and test methods, data sources and procedures. It is hoped that in two to three years this will lead to development of an efficient and sustainable pan-European

[5] http://ecdc.europa.eu/en/aboutus/Pages/aboutus.aspx. Accessed 8 July 2015.

[6] Council of the European Union. Council Conclusions on vaccinations as an effective tool in public health. Employment, Social Policy, Health and Consumer Affairs Council Meeting. 1 December 2014. Brussels.

framework that can rapidly deliver robust quantitative data for the assessment of the benefits and risks of vaccines that are on the market[7].

ECDC also funds the VENICE III project, which seeks to exchange knowledge and best practices in VPD across Member States by:

- sharing information on use of vaccines and impact of new vaccines and national immunization programmes
- implementing methodologies for assessing vaccine coverage at national and regional level
- providing advice to improve the overall performance of immunization systems

The challenges of introducing new vaccines continue to grow, with the need for complex assessment to take account of the unique nature of vaccines, organisational challenges (such as how best to include vaccines into childhood immunization programmes) and optimization of immunization in specific groups, such as pregnant women and the elderly. So the work to improve the overall performance of immunization systems to address these challenges is essential and a framework for data, methodology and resource sharing among NITAGs is needed. The mapping of current practices in NITAGs in the EU[8] has been completed and areas for potential collaboration on immunization policies are now being considered.

It is recognised that collaboration between ECDC, the NITAGs and other groups such as WHO could help minimize duplication of effort (e.g. in terms of systematic reviews of evidence), develop methodologies, enable early detection of signals on safety and effectiveness, share learnings, agree priorities and contribute to the improved sustainability of the system. In particular possible areas for collaboration between ECDC, the NITAGs, WHO and HTA agencies include:

- systematic reviews and evidence based guidance on introduction of new vaccines in national immunization schedules;
- sharing best practices in cost-effectiveness analysis and mathematical modelling before the introduction of a new vaccine in the national immunization schedules (e.g. Meningococcal B vaccine);
- coordination of benefit/risk assessment studies after the licensure of a vaccine, especially in case of new evidence on the safety or effectiveness;
- assessment of the population level impact of vaccination strategies on the burden of VPD;
- sharing evidence based criteria for prioritisation of vaccines to be introduced in the national schedules.

If such meaningful collaboration could be achieved there is a real potential to improve the effectiveness of vaccination programmes.

[7] http://www.advance-vaccines.eu/ Accessed 8 July 2015

[8] ECDC. Current practices in immunization policy making in European countries. Stockholm, 2015.

4. HTA to inform health policy decisions about the extension of the HPV vaccination programme in Norway

Dr Marianne Klemp, Research Director, Norwegian Knowledge Centre for the Health Services, Oslo, Norway and EUnetHTA Work Package 2 Lead

The preventative nature of vaccines that seek to create herd immunity to an infectious disease raises methodological challenges for assessment, including consideration of coverage, resistance, individual vaccination for herd immunity, safety in individuals who don't have the condition being prevented and the need for long term outcomes to assess effectiveness.

The Norwegian Knowledge Centre for the Health Services (NOKC) has undertaken a range of HTAs based on systematic reviews and/or economic modelling relating to aspects of the HPV programme, as shown in Table 1. In addition it has assessed the cost effectiveness of childhood vaccination for rotavirus and is currently assessing influenza vaccination in children.

Table 1. Norwegian HTAs related to HPV vaccination

Assessment	Year
Prophylactic vaccines against human papillomavirus	2007
Cost-effectiveness of human papillomavirus (HPV) vaccination	2007
Ethical challenges with implementing prophylactic vaccines against human papilloma virus (HPV)	2008
Estimating uncertainties of hpv16/18 vaccination a dynamic modelling	2008
HPV catch-up vaccination for young females (aged 13-26 years)	2014
HPV vaccination of 12 year old boys	2015

The recent HTAs relating to HPV sought to inform decisions about how the effective national immunization programme, which vaccinates 12 year old girls, may be extended to either older girls and young women, or 12 year old boys. The HTAs were based on a systematic review of the literature[9],[10], meta-analysis and cost effectiveness modelling[11],[12] and each considered the comparator to be the current immunization programme.

For the cost effectiveness analyses, there was a lack of information in Europe on which to build the economic models, but a US model from the Center for Disease Control was found[13]. This model was adapted with use of:

- Norwegian epidemiological data

[9] http://www.kunnskapssenteret.no/en/publications/effect-of-catch-up-hpv-vaccination-of-young-women Accessed 8 July 2015
[10] http://www.kunnskapssenteret.no/en/publications/Effect+of+HPV-vaccination+of+boys Accessed 8 July 2015
[11] http://www.kunnskapssenteret.no/en/publications/cost-effectiveness-of-a-hpv-vaccination-catch-up-program-for-females-aged-26-years-or-younger-in-a-norwegian-setting Accessed 8 July 2015
[12] http://www.kunnskapssenteret.no/en/publications/Cost-effectiveness+of+HPV-vaccination+of+boys+aged+12+in+a+Norwegian+setting Accessed 8 July 2015
[13] Chesson H, Ekwueme D, Saraiya M et al. The cost-effectiveness of male HPV vaccination in the United States. Vaccine. 2011; 29: 8443-50.

- a systematic review to identify the clinical effect of HPV and quality of life loss per HPV-related outcome (a range of cancers, precancerous lesions, genital warts, conization related premature deliveries, serious adverse effects)
- Norwegian healthcare costs for HPV-related outcomes
- 4% discount rates for costs and benefits.

The Norwegian cost effectiveness modelling showed that if the vaccination programme was extended to girls and young women, from a health budget perspective there was an incremental cost effectiveness ratio (ICER) of US$96,399 per Quality Adjusted Life Year (QALY), or from a societal perspective US$92,282/QALY. This modelling showed that if the cost of a dose of the vaccine was reduced from US$168 to US$125, this reduced the health service ICER to US$69,610/QALY and a reduction to US$83 per dose led to an ICER of US$44,221/QALY.

Extending the vaccination programme to boys resulted in an ICER of US$226,515/QALY from the health service perspective and only if the cost of the vaccine dose was reduced to US$32 did the ICER reach US$44,554/QALY. An additional analysis also considered the incremental effect of undertaking vaccination of boys compared to the extended programme for older girls and young women. This resulted in an ICER of US$482,923/QALY.

These analyses helped inform the decision that resources would be better used extending the programme to older girls and young women, rather than vaccinating boys.

These HTAs demonstrated the importance of providing decision makers with robust cost effectiveness analyses modelling different scenarios. For vaccines in particular, it is important to explain areas of uncertainty and issues relating to organizational and ethical aspects, but these must be performed early before the establishment of a national immunization programmes and so robust modelling is key.

Another lesson is that economic models from other countries can be adapted for use. In this example a US model could be adapted for use in a Norwegian setting. This suggests that more work should be undertaken to develop generic economic models, at least at an EU level, that could be adapted for national or regional use.

5. Developing a specific and coordinated approach to vaccines assessment in Europe

Andrea Rappagliosi, Vice President, Market Access, Health Policy and Medical Affairs, Sanofi Pasteur MSD and President of Vaccines Europe

As Dr Celentano has indicated, the EU Council has concluded that vaccines are an effective public health intervention and in fact they contribute to the efficiency and sustainability of healthcare systems. Despite this, access to vaccines is slow and heterogeneous, not just between Europe and other continents, like Africa, but also within Europe. It has been shown that it takes a median of 6.5 years from EU regulatory approval of a vaccine, to its implementation in a national or regional vaccination programme[14]. This delay is occurring due the complexity of agreeing an optimal vaccination programme and due to the range of organizations involved in assessment (regulatory, public health (e.g. NITAGs), HTA and payer), which can create duplication, overlap and delay. This duplication occurs not only among EU Member States, but within one country or region, a vaccine may be assessed by different agencies in different ways and quite different programmes may be implemented. For example, in the UK, all adults over the age of 65 are actively called for influenza vaccination by their own healthcare professional, who is incentivized to give the vaccination. This led to 75% coverage in the UK in 2014. However, in France and Italy, where the same target groups are invited, but in a more opportunistic manner, there was only 50% coverage. As a consequence, a higher percentage of deaths due to influenza was observed in these countries (2014-2015 season figures).

The use of HTA to assess vaccines varies widely across Member States. For example, in the UK, the NITAG (the Joint Committee on Vaccination and Immunization), is a long-standing public health committee that is not part of the formal HTA structure, but which uses methodologists (such as economists) who have HTA expertise. However, in Italy, there are various HTA agencies and teams advising on vaccine recommendations and funding and it has been shown in Norway that dynamic modelling in HTA is used to inform decisions about the structure of the vaccination programme.

Furthermore, in the Member States where vaccines undergo HTA, current HTA processes are focused on medicines and devices. Few HTA Agencies consider the preventative nature of vaccines and the value of a vaccine as bringing benefits to individuals and populations over a long time horizon. Also assessment of the organizational issues related to the vaccination programme to achieve high uptake is key.

As Dr Meyer will outline there is work underway in EUnetHTA to reduce some of the duplication of HTAs in Europe and share methodologies. Furthermore, at policy level the HTA Network is seeking to ensure that the joint work produced by EUnetHTA is used in decision-making by Member States.

As part of the current EUnetHTA Joint Action, in 2013, a rapid Relative Effectiveness Assessment (REA) was performed on a vaccine, Zostavax. This vaccine is highly innovative, providing individual prevention of a subsequent disease (shingles) in the adult and senior population who have been previously infected with varicella virus. It is the only example of a joint assessment of a vaccine and it will be interesting to see whether the next EUnetHTA Joint Action will include any assessments of vaccines that are intended to create herd immunity and how those assessments would be used by Member States. Furthermore, it would be helpful if EUnetHTA could consider their role in helping to alleviate duplication in assessment of vaccines and encouraging standardized methodologies that are specific to vaccines, perhaps creating vaccines HTA guidelines.

[14] Blank P et al. Population access to new vaccines in European countries. Vaccine 2013; 31:2862-7.

A specific framework for HTA of vaccines might include considerations such as:

1. scoping: determination of immunization strategy at population level, taking account of infection transmission and herd-immunity
2. effectiveness: population-based modelling for initial REA, with subsequent use of real world evidence for monitoring
3. wider societal perspective: vaccines being a public health intervention that impacts the whole society and health care system (beyond vaccinated individuals)
4. communication and stakeholder involvement: essential to achieve high vaccination uptake (see Twitter #iamtheherd).

To move forward on discussion of these issues we need better stakeholder coordination:

- at EU level:
  - dialogue with EMA and assessment authorities
  - coordination of the work of NITAGs & HTAs' to create a "Joint Scientific Evaluation"
  - agreement on process and requirements for monitoring/additional evidence generation;

- at Member State level:
  - use of the "Joint Scientific Evaluation" to inform decision-making
  - economic evaluation using agreed model constructs (as outlined by Dr Klemp)
  - consideration of local ethical, organisational, legal & social aspects using a standard framework and involving appropriate expertise (such as ethicists and citizen's representatives)
  - commitment to dialogue and coordination across Europe to generate real world evidence for monitoring.

Furthermore, it is clear that these issues are not only of interest to Europe, but internationally. So, as the role of HTAi is to develop and promote HTA and we have been challenged at this conference to consider issues that will impact global health, HTAi could play a key role in bringing stakeholders together to discuss these methodological and policy issues and perhaps a new HTAi Interest Sub-Group should be formed to further these discussions.

It is essential that all these opportunities to coordinate assessment of vaccines are seized to ensure that the public health value of vaccines is rewarded, so that vaccines don't become the "next antibiotic", where there has been withdrawal of research and development and disinvestment due to lack of reward. Vaccines are slowly, but surely following the same trend, with fewer companies engaged in vaccines research, development and production than in the past, leading to supply shortages against a context of increasing worldwide demand.

6. EU collaboration on value and assessment – HTA and immunization policy making

François Meyer MD, Advisor to the President Haute Autorité de Santé (HAS) and EUnetHTA Work Package 7 Lead

There is a need for better European collaboration as technologies become more "international" and as patients become more "European" (crossing borders for healthcare). For HTA, this means we need to reduce the duplicative efforts that are apparent in national and regional HTA assessments. This is a particular issue for those technologies that undergo HTAs at the point of the common European licensing, when the clinical evidence available for assessment will be the same for all Member States. There is also a need to increase consistency in the method and approach of HTA assessments, whilst recognizing that these assessments must be acted upon within the national or regional context, where pathways of care may be very different – meaning that reimbursement decisions will always be made at the national/regional level by the payer.

To address these challenges, EUnetHTA is nearing completion of its second three-year Joint Action of 28 Member States. Its aims have been to:

- produce common assessment reports (Core HTA information)
    - for full HTA (including ethical, legal and social issues)
    - for Rapid REA(see Appendix 1), with template for the submission of data by industry
- develop methodological guidelines
- improve quality and adequacy of the development of new products
    - Early dialogues (Scientific Advice on the design of studies to meet the needs of HTA)
    - Disease specific guidelines
- coordinate requests for additional data collection using a common core protocol.

The work to produce structured core information for use in Rapid REAs has involved 10 pilots in pharmaceuticals (including Zostavax, which was the first pilot) and will include approximately four non-medicines technologies. These reports are developed by two HTA agencies using standardised methodologies, reviewed by a wide range of agencies and issued for public consultation, including the manufacturer. It is then hoped that the final report will be used in national/regional decisions. In France, the EUnetHTA report is used by HAS assessors alongside published literature and manufacturer submissions to create their own Assessment Report, which then goes to the HAS Specialist Committee. For vaccines, HAS assessors would also include the NITAG opinion in their assessment. Other countries will use the EUnetHTA reports in different ways and will interact with NITAGS in different ways for the assessment of vaccines.

In the third EUnetHTA Joint Action a simplified REA model will be used and further work will be undertaken to document how EUnetHTA reports are used in national/regional decision making. It is unclear yet whether these assessments will include vaccines. Zostavax was a vaccine that was only intended to give benefit to the individual (to prevent shingles infection). In this situation, rapid REA was appropriate. However, when collective benefits are sought from a vaccine as has been the focus of today's panel, full HTA may be required taking account of the international context, public health goals and policy decisions about vaccination programmes.

7. Panel discussion

Who should be leading the assessment of the value of vaccines – NITAGs or HTAs?

- Meyer: In France there is good cooperation between the NITAG (CTV) and the economic evaluation committee at HAS (CEESP), but more progress could be made nationally. There is clearly an opportunity to improve European collaboration among NITAGs across Europe and with HTA.
- Celentano: There are a wide range of stakeholders involved so this is a complex issue. We need both NITAGS and HTAs as they can look at the issues from different perspectives. We need to develop coordination across Europe, but also outside Europe, particularly in countries where there is a lack of capacity.
- Ricciardi: Political leadership is weak for global health issues. We cannot afford to duplicate efforts in a time of economic crisis. Collaboration is paramount to enhance expertise in both political and scientific issues.
- Klemp: Modelling is key to informing good policy decisions and even the US is now performing good dynamic modelling.
- Rappagliosi: Collaboration is an enabler of increased efficiency in assessment. If an assessment can be simplified and accelerated it would then be more useful to inform timely decisions at national/regional level. However, we need an assessment approach that considers the unique nature of vaccines and we need to agree what we need to measure to determine value.
- Celentano: There are delays of many years before a vaccine is made available and as seen with recent meningococcal vaccine, the same evidence can lead to different decisions nationally. This needs to be better coordinated and explained. HTA can provide excellent tools, but all domains of assessment are needed. HTA can be adapted to meet the needs of vaccines, but there needs to be a clear statement that NITAGs will not be dissolved. It is essential that we agree who does what to avoid duplication of activities.
- Rappagliosi: There needs to be a linear process, with the role of each organisation clearly delineated and seamless links between the organisations. This should overcome duplication of efforts and time delays. This process must use a customized assessment of the value of vaccines that takes account of their unique characteristics.
- Celentano: We need further clarification of the ways of working of NITAGs and consider what can be done to improve efficiency by avoiding duplication in assessments done after licensing (recognising that national/local decisions need to be made that take account of the health system setup and priorities).
- Facey: Need to remember citizens' issues. Many members of the public are well educated and are concerned about safety and effectiveness, particularly in relation to vaccination of children. Hence, it is essential to provide clear information to maximize uptake.

What is needed to make evidence-based decisions about vaccines?

- Ricciardi – leadership and courage
- Celentano – share methodologies and develop further collaboration
- Klemp – perform evidence based assessment before implementing programmes
- Rappagliosi – viruses don't recognise borders, we need joint work and collaboration
- Meyer – voluntary but strong collaboration.

8. Conclusion

Vaccination programmes are an important public health tool to help prevent infectious diseases. Vaccines are often considered as a standard pharmaceutical and assessed accordingly, but they have their own unique aspects that must be considered to determine value, including definition of the best target population, safety in these individuals who do not have the disease in question but may have other comorbidities, organization of a programme to achieve highest uptake in a setting where the benefit is collective and not individual.

ECDC seeks to provide support to NITAGs by provision of scientific advice, support to specify the target population, cost effectiveness analysis and monitoring effectiveness. As the HTA speakers showed, these are all areas that are addressed by HTA and in which coordination across Europe has begun. Therefore it would seem that there could be more collaboration amongst those involved in vaccines assessment to share best practices in modelling, assessment and evidence generation to make effective vaccines available more rapidly.

Appendix 1. EUnetHTA model for Rapid Relative Effectiveness Assessment (REA) of pharmaceuticals