



TECHNICAL REPORT

Vaccine-preventable diseases and immunisation Core competencies

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Core competencies



This report of the European Centre for Disease Prevention and Control (ECDC) was coordinated by Ida Czumbel.

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Abbreviations

DG	Directorate-General
ECDC	European Centre for Disease Prevention and Control
EEA	European Economic Area
ESCO	European skills, competences, qualifications and occupations
EPHO	Essential Public Health Operations
EPIET	European Programme for Intervention Epidemiology Training
EU	European Union
MPH	Master in Public Health
PH	Public health
PHT	Public Health training
VPD	Vaccine-preventable diseases
VPD&I	Vaccine-preventable diseases and immunisation

Glossary

ESCO	ESCO is the multilingual classification of European skills, competences, qualifications and occupations. ESCO is part of the Europe 2020 strategy. The European Commission launched the project in 2010. Directorate-General (DG) for Employment, Social Affairs and Inclusion, and DG Education and Culture coordinate the development of ESCO. Stakeholders are closely involved. The ESCO classification identifies and categorises skills, competences, qualifications and occupations relevant for the EU labour market and education and training. It systematically shows the relationships between the different concepts. The first version of ESCO was published on 23 October 2013. The classification will be completely revised and improved up to 2017, and the final product launched as ESCO v1.
Mid-career professional	Is defined as having five years' experience with a Masters in Public Health (PH) diploma or equivalent, or higher degree in PH, or 10 years' experience in PH with a high school diploma, bachelor, or non-public health graduate degree.
Core	As applied to the subject of this report, it is defined as being necessary for public health mid-career professional working in vaccine-preventable diseases prevention and control.
Competence	Refers to a knowledge, skills and attitude that an individual person possesses.
Competency	Refers to a person's behaviour or action, when they use their competence (knowledge, skills and attitudes) into practice. Describes the skills/knowledge that are required in order to achieve the state of 'competence'.
Competencies	A set of skills or characteristics necessary in order to be able to perform a certain task or job effectively. Someone with the proven ability to apply one or more competencies, such that they are able to perform satisfactorily the task or job to which the competencies are relevant is considered to have the necessary competence (or to be 'competent')

Executive summary

This report outlines the development of a competency framework covering key knowledge, skills and attitudes critical for the prevention and control of vaccine-preventable diseases and immunisation (VPD&I). This allows for training needs analysis and the development of curriculum and training materials for train the trainers.

The competency framework should be relevant for mid-career public health professionals carrying out tasks of prevention and control of VPD&I and also for a broader audience in the field.

Highly specialised competencies are relevant, but not intended to be incorporated in this model. The proposed framework should integrate the multidisciplinary nature of VPD&I aspects. The competencies are set out in a matrix, so the same competency can belong to several domains. However, this competency framework does not address different public health functions and organisational levels that might exist in Member States of the EU (European Union).

In the framework of this project, the European Centre for Disease Prevention and Control (ECDC) developed a set of suggested core competencies to be discussed in consultation with VPD&I experts from the EU/(European Economic Area (EEA) Member States. The literature mapping and expert input allowed for the framing of a first set of domains, subdomains and core competencies incorporated in a knowledge domain hierarchy covering core knowledge, skills and attitudes.

The expert working group indicated five areas for the main domains to cover: the immune system and vaccines, immunisation programme management, vaccine logistics management, research and science, and communication and behavioural science related to VPD&I. These five domains were further divided into 18 subdomains consisting of 82 competencies. The complexity of the topic revealed the multidisciplinary nature of the model. In using the set of competencies, cross-cutting domains and inter-sectorial activities should be considered. Additional adaptations by country may also be required.

The report indicates a high interest from European Member States for VPD&I competencies. A majority of the countries (n=17) contributed by volunteering to be part of the workshop or by commenting on the draft set of competencies. To maintain the level of VPD&I expertise in the Member States, the developed model should be used by the stakeholders, and be subject to ongoing review and improvement.

The list of competencies is accessible to registered users of FemWIKI¹.

Key outcomes

- Systematic approach and expert input allowed for the framing of a first set of core competencies for prevention and control of VPD&I in the EU.
- The report is a competency framework. However, it does not address different public health functions and organisational levels that might exist in the European Member States.
- The complexity of the topic revealed the multidisciplinary nature of the model. In using the set of competencies, cross-cutting domains and inter-sectorial activities should be considered. Additional adaptations by country may also be required.
- The report indicates high interest from European Member States for VPD&I competencies. A majority of the countries (n=17) contributed by volunteering to be part of the workshop or by commenting on the draft set of competencies.
- Workshop experts indicated five areas for the main domains to cover (the immune system and vaccines, immunisation programme management, vaccine logistics management, research and science, and communication and behavioural science related to VPD&I). These five domains were further divided into 18 subdomains consisting of 82 competencies.
- The list of competencies is accessible to registered users of FemWIKI.
- To maintain the level of VPD&I expertise in European Member States, stakeholders should use the developed model, and updates to the model should be planned.

¹ FEMWiki - <https://wiki.ecdc.europa.eu>

Background

The European Centre for Disease Prevention and Control (ECDC) is a European Union (EU) agency with a mandate to 'enhance the capacity of the scientific expertise in the Member States with regard to the prevention and control of communicable diseases, epidemiological surveillance and training programmes and to foster the exchange of best practices and experience with regard to vaccination programmes' (Regulation (EC) No 851/2004 of the European Parliament and of the Council).

Strengthening capacity is a key component to ensure a high-level public health security and protection in the European Union (Regulation (EC) No 1082/2013 of the European Parliament and of the Council). This requires professionals to have a minimum competency for effective control of vaccine-preventable diseases (VPD) in an era of evolving science and changing epidemiology.

ECDC has developed core competencies for professionals working in field epidemiology (2008), public health microbiology (2013) and infection control and hospital hygiene (2013) in the EU.

The field of prevention and control of vaccine-preventable diseases and immunisation (VPD&I) depends on sound epidemiology and public health microbiology, and requires a multidisciplinary approach that is not fully covered by the competency domains already developed by ECDC. Professional competence requirements for the public health workforce are determined at national level.

In writing this report, ECDC aimed to provide a competency framework covering key knowledge, skills and attitudes critical for the prevention and control of VPD&I. This allows for training needs analysis and training and career planning using a standard tool.

The ultimate aim is to have a skilled European public health workforce competent in the functions that are relevant, not only to the public health system in the EU Member States, but also to those that relate to the ECDC mandate and have added value at the EU community level.

In order to ensure European level context, the European skills, competences, qualifications and occupations (ESCO) model for classifying competences was also considered. Additionally, the project falls well within the World Health Organization Essential Public Health Operations.²

This document is not a guideline nor does it provide guidance. The set of core competencies is not a regulatory document, but rather a reference model for different groups of users and for a variety of uses. Since public health structures and functions are diverse in EU Member States, the model should be updated and tailored for use at a national level.

Use and users

This document can be considered as a reference for mid-career public health professionals with responsibilities in vaccine-preventable diseases and immunisation in EU Member States, performing tasks as specified in their national structure regardless of organisational level (national, regional or local).

Due to the substantial variability of public health systems in the EU, the current model would not involve a hierarchical framework for the set of competencies. However, regardless of roles and functions, each professional should have a basic knowledge of how the immune system and vaccines work, immunisation programme and vaccine supply principles, the science behind vaccines and immunisation, and how this knowledge can be communicated.

Mid-level workers may or may not directly conduct all the listed VPD&I related public health activities as part of their daily job and as such, each organisation may decide whether to apply a particular set of competencies within their structure.

Independent of education, years of experience or role, the model can be used by public health institutes, universities, hospitals, and other healthcare organisations, other professionals and training programmes.

² Essential Public Health Operation (EPHO) 5: Disease prevention, including early detection of illness - <http://www.euro.who.int/en/health-topics/Health-systems/public-health-services/policy/the-10-essential-public-health-operations/epho5-disease-prevention,-including-early-detection-of-illness2>

Competence-related descriptions

A mid-career public health professional may have responsibilities beyond the standard definition. This may include prevention and control of vaccine-preventable diseases through surveillance, immunisation programmes, vaccine logistics management, scientific activities (i.e. evidence-based medicine, vaccine effectiveness or vaccine safety studies, scientific writing and guideline development etc.), communication and behavioural science.

The main domains, subdomains and relevant competencies are set out in a matrix. The proposed model intends to integrate the multidisciplinary nature of VPD&I and therefore the same competency can belong to several domains. Highly specialised competencies are relevant, but not intended to be incorporated in this model. The competencies for specific tasks by functions and roles need to be established at a national level.

Materials and methods

Literature mapping

Exploratory literature evidence mapping was conducted using searches in Pubmed³ and Embase⁴ for articles of any study type discussing core competencies relevant to immunisation, or to public health or healthcare. The search strategies were submitted 29–30th August 2013 combining controlled vocabulary (MeSH and Emtree terms) and natural vocabulary to represent the concepts. The results were limited to records published in English and no restriction on date was applied. To broaden the results, websites of leading institutions were also searched for the key parameters. The results were also accompanied by a manual search and grey literature findings. The literature mapping served as a basis for developing the first version of the competency framework, which was presented to an ECDC internal working group for further discussion and development.

Model development

Initial model development (I)

Through a series of interactive sessions, ECDC expert group participants (see Annex 4) discussed previous experience of the organisation in the development of core competencies [7–9]. They proposed a preliminary model that included the proposed domains and subdomains based on the literature mapping results. The experts were asked to define the target group of this document and its core nature, and to develop subject-related domains, subdomains and related competencies. The proposed domains, subdomains and competencies were distributed by e-mail for internal review by 14 VPD experts during April–May 2014 (see Annex 3). In accordance with Bloom's taxonomy⁵, six levels of learning were included in the framework: knowledge, comprehension, application, analysis, evaluation and creation.

Expert working group first review (II)

Continuing initial development of the model, all EU/EEA Member States with nominated national focal points for VPD&I were contacted. They were invited to apply to Public Health training (PHT) Summer School where 15 seats were reserved for this project [14].

The first workshop, which consisted of a survey, was carried out in June 2014 and involved volunteer internal and external experts from the ECDC network, both in the areas of public health training and VPD&I, who worked together in groups to discuss the proposed domains, subdomains and related competencies. The working methodology was based on working group discussions, with four to five persons in each working group. A rapporteur was nominated for each group before starting the activity. The target audience and their core aspects were reconsidered. Participants reviewed the proposed set of competencies in light of the proposed objectives, paying special attention to the list of competencies, which could be considered elective or optional. A Likert scale was used for assessing the level of agreement regarding the relevance of each proposed competence (1=strong disagreement; 2=disagreement; 3=neutral; 4=agreement; 5= strong agreement). To avoid complication, the group referred to the core competencies of mid-career public health professionals with responsibilities in VPD. It was stressed that some competencies are related to one knowledge domain, while a number of 'cross-cutting' competencies relate to more than one. A list of suggested additional 'inter-sectorial' domains was provided, e.g. immunisation in different settings (school/hospital), immunisation of population requiring special consideration (e.g. immuno-compromised), immunisation in travellers, and clinical management of anaphylaxis, microbiology, and ethics. In order to complete the model effectively, all participants were provided with a list of action verbs (see Annex 2).

In order to complete the tables and, if necessary, for further consideration, the working material was sent to those who were not able to finalise the exercise during the workshop. The results from the questionnaire-based survey were collected and analysed internally.

Expert working group halfway review (III)

The selection of contributors for the halfway review was based on their participation in the first VPD&I workshop. In addition, the expert working group also included European professionals with training expertise and

³ PubMed - <https://www.ncbi.nlm.nih.gov/pubmed>

⁴ Embase - <https://www.embase.com/>

⁵ Bloom's taxonomy - <http://www.bloomstaxonomy.org/>

responsibility for the VPD module that is part of the ECDC Fellowship Programme⁶. Participants were updated on any results and challenges identified during the previous development phases, and the updated set of domains and core competencies was shared and discussed.

The main discussion points during the halfway review focused on how to translate the tool from science to practice and on how to increase the usefulness of the model in light of the complexity of the system. The proposed objectives and target audience of the project were also reflected upon. Similarly, the group discussed the creation of a web-based survey to be centred on the latest draft set of domains, subdomains and competencies. The content and format of the online platform was proposed, along with the profile of the potential stakeholders to be involved in the development process (e.g. policy makers, researchers, professional organisations etc.). Due to the limited response using a Likert scale in the previous exercise, the system was simplified by asking participants to comment on the existing model and to state if the competence should be listed. If not, the reason why was stated along with any proposed changes. The participants were able to review and comment on the suggested model and working paper of this halfway review. In view of other similar efforts on this topic in the EU, the ESCO model was considered as a reference for our exercise [13].

Final review (IV)

The model was further improved by another round of reviews and input from workshops, teleconferences and online consultations with experts. In addition, an online survey was conducted in FemWIKI, addressing a broader range of stakeholders with different profiles, such as decision makers, researchers, professional organisations who have expertise and interest in the VPD&I field, training, or in the competencies development process.

In order to access FemWIKI, those experts who were not yet members of the FemWIKI community were invited to join the network. Nevertheless, the list of competencies and the background paper was available upon request. The link and instructions to access FemWIKI were sent to the national focal points for VPD, PHT and to other invited experts, plus a summary of the previous activities and a working paper.

You can learn more about the development process in Annex 3.

⁶ ECDC Fellowship Programme is a two-year programme offer to epidemiologists and public health microbiologists.
www.ecdc.europa.eu

Results

Literature mapping

The literature search identified 400 references which were first screened for relevancy by title and abstract (n=37), and those selected for full text review further screened (n=21) for eligibility. A total of six references with relevant information on competencies of various roles and functions in different settings of the healthcare were included [1–6].

No article was found describing core competencies in VPD&I for mid-career professionals in public health.

Unspecified and varying terminology and structure was evident throughout the reviewed competence sets. The results of the review were improved with manual search and grey literature findings [10–12,15].

Model development

Based on the previous outcomes from literature mapping and expert opinion, a competency framework incorporated in a knowledge domain hierarchy covering core knowledge, skills and attitudes for VPD&I was developed. The expert working group listed five main domains to be covered: the immune system and vaccines, immunisation programme management, vaccine logistics management, research and science, and communication and behaviour science related to VPD&I. These five domains were divided into 18 subdomains consisting of 82 competencies. The results are presented in the Annex 1. The competency framework is accessible in FEMWiki for registered users who are approved members of the Vaccine_Epi community.

ECDC plans to use this model as an assessment tool for specific training needs in EU Member States and as a basis for developing curricula and training materials.

Conclusions and discussion

This was the first disease-specific competence set development under the auspices of ECDC, and the exercise involved participants from most EU Member States. A questionnaire with a suggested set of competencies was presented and then later circulated to the experts at the workshop. Additional information from the Member States was gathered via VPD and PHT national contact points.

The expert input received from Member States allowed for the framing of a first set of competencies for prevention and control of VPD&I. Overall results were encouraging, as reflected in the high number of countries already having such a set in place. The proposed set of core competencies should be adapted at the national level due to the diversity of public health structures and functions across the EU.

The results of this survey will play a significant role as a tool for any training needs assessment exercise. In addition, they will contribute to the facilitation of a common understanding between ECDC and Member States regarding the key functions to be performed by professionals when dealing with prevention and control of VPD&I. It will be feasible for ECDC to develop relevant training for the Member States.

The model is on FemWIKI and available for revision and improvement. As science evolves, proposals for an updated set of competencies are welcome.

Next steps

Based on available resources, the proposed set of core competencies will be revisited in due course to determine whether they should be changed. Information on the progress of significant updates will be integrated in the document and posted on the ECDC website. The use of the document will be monitored through stakeholders and the experience will be used to improve the revised version. Annual meetings of the network could serve to discuss these topics face-to-face in a more specific context including the recent developments in this disease-specific field, and the specific needs of countries.

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Annex 1. Results: proposed domains, subdomains and competencies

Domain	Subdomain	Competencies
1. The immune system and vaccines	1.1 Vaccine immunology	<p>1.1.1 Familiarity of basics of vaccines immunology–cell types involved in immune response of vaccines. Main effectors of vaccine responses.</p> <p>1.1.2 Describe how the vaccines mediate protection: Cell-mediated and humoral immunity in response to natural infection and vaccination.</p> <p>1.1.3 List the main host immunological factors and medical conditions that affect the immune response</p> <p>1.1.4 Describe the difference between the primary- and memory-induced immunity.</p> <p>1.1.5 Debate vaccine-induced immunity versus naturally-gained immunity</p> <p>1.1.6 Describe the difference in the immune response between a primary series and a booster/revaccination</p> <p>1.1.7 Be familiar with kinetics of vaccine-induced antibodies.</p>
	1.2 Types of immunising agents, their composition and use	<p>1.2.1 Describe the different type of vaccines, immunoglobulins and other immunising agents.</p> <p>1.2.2 Describe the vaccine types in use including advantages and disadvantages (nature of antigen, combination, adjuvants, and routes of administration).</p> <p>1.2.3 Describe how the vaccines induce immunity (killed, inactivated live pathogens, genetic engineering, recombinant methods, and synthetic peptide vaccines).</p> <p>1.2.4 Be familiar with interaction between live and inactivated vaccines.</p> <p>1.2.5 Demonstrate knowledge on the presentation of vaccines (glass vial and pre-filled syringe) and special concerns regarding storage and handling.</p>
	1.3 Vaccine preventable diseases and Population based prevention	<p>1.3.1 Describe the clinical presentation of vaccine-preventable disease (carriage, complication, diagnostic tests).</p> <p>1.3.2 Demonstrate the basic of dynamics of vaccine-preventable diseases in the population.</p> <p>1.3.3 Be familiar with the concept of control, elimination and eradication.</p> <p>1.3.4 Understand the principles and benefit of immunisation.</p> <p>1.3.5 Describe the effect of vaccination to the community as whole (herd immunity).</p> <p>1.3.6 Be familiar with the immunisation needs of special risk groups in the population (travellers, migrants, vulnerable population, immunocompromised host, healthcare worker, high risk population for underlying conditions).</p>
2 Vaccine logistics management	2.1 Cold chain, storage and logistics	2.1.1 Demonstrate sound knowledge on vaccine management including vaccine supply/shortage, cold chain, storage and logistics

Domain	Subdomain	Competencies
		<p>2.1.2 Collaborate with health centres in order to supply, deliver and store the vaccines in the best way.</p> <p>2.1.3 Elaborate storage, handling and monitoring plans/guidelines for routine and emergency vaccination.</p> <p>2.1.4 Promote innovative approach to build and apply a public-private partnership model for vaccine cold chain, storage and delivery to ensure the best available economical approach.</p>
	2.2 Documentation	<p>2.2.1 Settles that client records/ immunisation registries (paper or e-records) are kept secure and confidential and maintained consistent with national standards (guidelines/policies)</p> <p>2.2.2 Provide technical expertise in the methods of immunisation information through introduction of electronic immunisation registers.</p>
	2.3 Administration of vaccines	<p>2.3.1 Prepare/ outline the periodical meeting with the vaccinators related to routine vaccination/pre vaccination campaigns, to inform them on the main technical and organizational updates.</p> <p>2.3.2 Provide a checklist for the vaccinators for the patient / client assessment including precautions, contraindications and indications for rescheduling.</p> <p>2.3.3 Establish/make available for vaccinators the steps involved in vaccine preparation, including reconstitution, administration and discarding.</p> <p>2.3.4 Develop waste management procedures.</p> <p>2.3.5 Demonstrate knowledge on the appropriate vaccine administration (route, hygiene, preparation, and reconstitution).</p>
3 Communication and behaviour science related to vaccine preventable disease and immunisation	3.1 Communication of VPD&I related information	<p>3.1.1 Use effective communication skills including written, verbal and non-verbal skills.</p> <p>3.1.2 Use culturally appropriate communication methods and techniques for specific settings and risk groups.</p> <p>3.1.3 Be knowledgeable about communication and be able to be involved in it.</p> <p>3.1.4 Use information technology and other media to receive and disseminate VPD&I-related information.</p>
	3.2 Advocacy	<p>3.2.1 Raise awareness and influence public opinion on VPD&I through stakeholder involvement.</p> <p>3.2.2 Engage with and influence stakeholders to develop and sustain public health action in the area of VPD&I.</p> <p>3.2.3 Collect relevant information from appropriate stakeholders about community needs in the area of VPD&I and advocate for them.</p>
	3.3 Behavioural science	<p>3.3.1 Be familiar with behavioural science principles to understand the more effective ways to influence and change behaviour on vaccination.</p> <p>3.3.2 Develop, implement and evaluate behavioural change strategies in the area of VPD&I.</p> <p>3.3.3 Build and be able to maintain trust in groups whose confidence is of collective importance: the public, health workers and political and policy stakeholders.</p>
	3.4 Social marketing	<p>3.4.1 Increase awareness of and understand what social marketing can bring to PH projects in the VPD area</p>

Domain	Subdomain	Competencies
		3.4.2 Contribute to social marketing approaches in terms of design, implementation and evaluation in the area of VPD&I
4 Research and science	4.1 Immunisation programme evaluation	<p>4.1.1 Develop and conduct a plan to evaluate an immunisation programme.</p> <p>4.1.2 Contribute to and monitor vaccine efficacy, effectiveness and impact of vaccines.</p> <p>4.1.3 Present conclusions to stakeholders in order to prioritise programme activities based on the results collected.</p> <p>4.1.4 Be familiar with the concept of cost-effectiveness and cost-benefit.</p>
	4.2 Vaccine safety	<p>4.2.1 Be familiar with the licensing process at European and national level</p> <p>4.2.2 Be familiar with the concept of plausibility and causality in relation to adverse events.</p> <p>4.2.3 Provide scientific evidence for protection level and vaccine safety related concerns.</p> <p>4.2.4 Appreciate the difference in safety outcome in pharmaco-vigilance vs. clinical trials (understand that clinical trial databases allow for detection of common adverse events while uncommon events may occur when vaccine is used in real-life in a large population).</p> <p>4.2.5 Be familiar with aspects of live attenuated vaccines such as shedding, transmission of the attenuated agents to close contacts, risk for pregnant women and reversion to virulence.</p> <p>4.2.6 Perform analysis of adverse event following injection based on the core variables</p> <p>4.2.7 Conduct research to test the hypothesis generated by the post-marketing surveillance and investigations.</p> <p>4.2.8 Produce technical report with conclusions and recommendations based on the results of investigations and data analysis.</p> <p>4.2.9 Conduct analysis focussed on identifying gaps in immunisation programme as it will lead to operational and policy decisions by management.</p> <p>4.2.10 Assess immunisation uptake and its determinants.</p>
	4.3 Evidence based medicine	<p>4.3.1 Critical appraisal, judging validity and applicability of a study (including ability to see the limitation of the study).</p> <p>4.3.2 Evaluating evidence, levels of evidence and strength of recommendations.</p> <p>4.3.3 Translate the study implications into the population.</p>
	4.4 Science and guideline development	<p>4.4.1 Provide up-to-date information on immunisation science.</p> <p>4.4.2 Develop and enhance immunisation strategies/programmes/immunisation-related guidelines when required using evidence-based principles.</p> <p>4.4.3 Ensure adequate professional development and in-service training for all staff.</p> <p>4.4.4 Demonstrate the appropriate techniques for vaccination if available by preparing short demo films.</p>

Domain	Subdomain	Competencies
		4.4.5 Develop operation guideline for vaccination services
5 Immunisation programme management	5.1 Legislation	<p>5.1.1 Demonstrate thorough knowledge of national health legislation related to vaccines and immunisation programmes.</p> <p>5.1.2 Can discuss the ethical issues arising from mandatory versus voluntary immunisation, individual rights, privacy, informed decision and informed refusal.</p> <p>5.1.3 Describe the national immunisation programme.</p> <p>5.1.4 Be able to give advice on the organisational aspects of the vaccination programme in the country.</p> <p>5.1.5 Demonstrate capability of cooperation and collaboration among multidisciplinary institutions with possible involvement and responsibilities in VPD&I.</p>
	5.2 Vaccine resource management	<p>5.2.1 Contribute to the functionality of immunisation services by proposing immunisation programme budget and estimating resource needs.</p> <p>5.2.2 Ensure the optimal quantity of vaccine based on population data in the area of supply and jurisdiction.</p>

Annex 2. Action verbs

Action Words for Bloom's Taxonomy*					
Knowledge	Understand	Apply	Analyze	Evaluate	Create
define	explain	solve	analyze	reframe	design
identify	describe	apply	compare	criticize	compose
describe	interpret	illustrate	classify	evaluate	create
label	paraphrase	modify	contrast	order	plan
list	summarize	use	distinguish	appraise	combine
name	classify	calculate	infer	judge	formulate
state	compare	change	separate	support	invent
match	differentiate	choose	explain	compare	hypothesize
recognize	discuss	demonstrate	select	decide	substitute
select	distinguish	discover	categorize	discriminate	write
examine	extend	experiment	connect	recommend	compile
locate	predict	relate	differentiate	summarize	construct
memorize	associate	show	discriminate	assess	develop
quote	contrast	sketch	divide	choose	generalize
recall	convert	complete	order	convince	integrate
reproduce	demonstrate	construct	point out	defend	modify
tabulate	estimate	dramatize	prioritize	estimate	organize
tell	express	interpret	subdivide	find errors	prepare
copy	identify	manipulate	survey	grade	produce
discover	indicate	paint	advertise	measure	rearrange
duplicate	infer	prepare	appraise	predict	rewrite
enumerate	relate	produce	break down	rank	role-play
listen	restate	report	calculate	score	adapt
observe	select	teach	conclude	select	anticipate
omit	translate	act	correlate	test	arrange
read	ask	administer	criticize	argue	assemble
recite	cite	articulate	deduce	conclude	choose
record	discover	chart	devise	consider	collaborate
repeat	generalize	collect	diagram	critique	collect
retell	give examples	compute	dissect	debate	devise
visualize	group	determine	estimate	distinguish	express
	illustrate	develop	evaluate	editorialize	facilitate
	judge	employ	experiment	justify	imagine
	observe	establish	focus	persuade	infer
	order	examine	illustrate	rate	intervene
	report	explain	organize	weigh	justify
	represent	interview	outline		make
	research	judge	plan		manage
	review	list	question		negotiate
	rewrite	operate	test		originate
	show	practice			propose
	trace	predict			reorganize
	transform	record			report
		schedule			revise
		simulate			schematize
		transfer			simulate
		write			solve
					speculate
					structure
					support
					test
					validate

* Source: *Taxonomy of Educational Objectives* by Benjamin S. Bloom. Downloaded from internet at <https://www.cte.cornell.edu/documents/Assessment%20-%20Blooms%20Taxonomy%20Action%20Verbs.pdf>

Annex 3. Timetable of development process

Event	Date
ECDC VPD internal consultation	April 2014
ECDC VPD Internal working team set up	May 2014
Working methodology set up with the ECDC experts	May 2014
Call for the external volunteers sent out	May 2014
Selection of the external candidates	May 2014
Development of the workshop background papers including clearance process	May 2014
Working background materials sent to the selected participants	June 2014
First expert consultation/ workshop on the VPD&I CC	11 June 2014
Send questionnaire and spreadsheet to all participants	July 2014
Feedback collecting period and feedback implementing	October-November 2014
Assessment of the expert consultation results	November-December 2014
Update the extended list of experts	October 2014
Working paper update	October 2014
Internal clearance of the working paper	October 2014
Invitations for the second expert consultation/workshop sent out	December 2014
Preparation for the second expert consultation/workshop started	January 2015
Teleconference on the scientific content of the agenda of the second expert consultation	February 2015
Second expert consultation workshop on the VPD&I CC	March 2015
Feedback collecting period	April 2015
Analysis and adaptation of the working paper based on the experts feedback	May 2015
Preparation of the model to be shared with the stakeholders (FemWIKI)	June- August 2015
Model and survey sent to the extended stakeholders	September 2015
Poster preparation for ESCAIDE including internal clearance process	September 2015
Presentation of the proposed model in ESCAIDE	October 2015
Feedback from the stakeholders collected	November 2015
Analysis of the feedbacks and finalizing the document	December 2015

Annex 4. Participants by country

	Country	Contact person	Institute
1	Czech Republic	Zuzana Vacková	National Institute of Public Health, Prague, Czech Republic
2	Estonia	Natalia Kerbo	National Institute of Public Health, Tallinn, Estonia
3	Spain	Noemi Lopez Perea	National Centre of Epidemiology, Madrid, Spain
4	Germany	Anja Hauri	Hessisches Landesprüfungs- und Untersuchungsamt im Gesundheitswesen in Dillenburg (HLPUG), Germany
		Helmut Uphoff	Hessisches Landesprüfungs- und Untersuchungsamt im Gesundheitswesen in Dillenburg (HLPUG), Germany
5	Finland	Hanna Nohynek	National Institute for Health and Welfare (THL), Helsinki, Finland
6	Italy	Paolo D'Ancona	Instituto Superiore di Sanità, Department of Infectious, Parasitic and Immunomediated Diseases, Roma, Italy
7	Lithuania	Rasa Liausediene	National Public Health Surveillance Laboratory, Vilnius, Lithuania
		Nerija Kupreviciene	National Public Health, Vilnius, Lithuania
8	Poland	Aleksandra Porada	National Institute of Hygiene, National Institute of Public Health, Warsaw, Poland
9	Romania	Aurora Stanescu	National Centre for Communicable Disease Surveillance, Bucharest, Romania
10	Slovenia	Marta Vitek	National Institute of Public Health, Ljubljana, Slovenia
11	United Kingdom	Richard Pebody	Public Health England. London, United Kingdom
		Androulla Efstratiou**	Public Health England, London Respiratory & Systemic Infection Laboratory, Microbiology Services Division: Colindale, UK

* Nomination was done through the Member State competent body based on the on the Summer School application process

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