

Grant Agreement No.:	801495
Start Date:	01/08/2018
End Date:	31/07/2021
Project title	European Joint Action on Vaccination — EU-JAV
WP number	WP7
Deliverable number	D34
Title	Annual list of research priorities on vaccination, extending from pilot vaccines to cover most vaccines used in the EU
Responsible partner No.	1
Organisation	Inserm
Name	Marie-Paule Kieny and Jean-Daniel Lelièvre
E-mail address	marie-paule.kieny@inserm.fr and jean-daniel.lelievre@inserm.fr
Nature	
R-report	R
O-other (describe)	
Dissemination Level	
PU -public	PU
CO -only for consortium members	
Delivery Month Planned	M36
Actual Delivery Date (dd/mm/yyyy)	31/07/2021

Annual list of research priorities on vaccination, extending from pilot vaccines to cover most vaccines used in the EU, and for which research might provide insights on how to maximize coverage.

The content of this document represents the views of the author only and is his/her sole responsibility; it cannot be considered to reflect the views of the European Commission and/or the Consumers, Health, Agriculture and Food Executive Agency (CHAFAEA) or any other body of the European Union. The European Commission and the Agency do not accept any responsibility for use that may be made of the information it contains.

Contents

LIST OF ABBREVIATIONS	3
I. Context.....	4
II. Participants' list.....	5
III. Methods.....	5
1.1. Preliminary steps to the meeting	5
1.2. Methodology for the meeting	6
III. Results: final list of research priorities on vaccination	7
Tier 1 TOP priority list (not in order of priority)	7
Tier 2 MEDIUM priority list (not in order of priority)	8
Tier 3: Not a priority and/or out of scope research questions*	9
Questions that have been already addressed by the scientific community.....	9
IV. Discussion	10
V. Conclusion.....	10
REFERENCES	11
ANNEXES	12
1. Initial list of 35 questions	12
2. Final list of 27 questions.....	16
3. Initial individual ranking obtained through the survey.....	19
4. First (2020) priority list of research questions	32
Tier 1 priority list.....	36
Tier 2 priority list.....	37
Out of scope research questions.....	37
Tier 3 priority list.....	38

LIST OF ABBREVIATIONS

EU-JAV: European Joint Action on Vaccination

HCW: Health Care Workers

HPV: Human Papilloma Virus

MCDA: Multiple Criteria Decision Analysis

I. Context

The research funding system in Europe is very complex and involves many actors (1,2). With the great diversity of possible topics, in a context of limited resources, prioritizing research questions becomes a necessity. In the specific context of the EU Joint Action on Vaccination (EU-JAV), this selection process must be transparent, evidence-based and carried out rigorously, in accordance with best practices.

The objective of WP7.1 is to implement a process leading to evidence-based and transparent definition of research priorities in Europe in the field of vaccination research, focusing initially on four “pilot” pre-selected vaccines (pertussis, measles-containing combination vaccines, influenza and HPV), then expanding to all vaccines used in the EU for which research might provide insights on how to maximize coverage, including against COVID-19. For documentation, the first (2020) list of priorities is presented as Annex 4.

This process focused on public health research aiming at improving vaccine coverage, and not on development of novel vaccines. Many of the subjects to be prioritized therefore concerned epidemiology, human and social sciences, as well as implementation research.

Based on review of the literature, the EU-JAV WP7 team decided to use a **multi-criteria decision analysis** methodology inspired by the Child Health and Nutrition Research Initiative (CHNRI). The overall methodology is presented in the Annex.

It followed several steps:

1. Selection of managers of the process
2. Scope definition of the process
3. Identification of key health research questions
4. Pre-selection of research options
5. Choice of criteria
6. Weighting of criteria
7. Final ranking during a face-to-face meeting

The description of steps 1 to 6 above has already been described in Deliverable 33. The present document refers to step 7 above and to the outcome of the face-to-face (through videoconference) meeting of experts, which allowed the preparation of a second ranked list of research priorities on vaccination. This meeting took place via Zoom in two different sessions: June, 16th, and July, 13th, 2021.

II. Participants' list

Participating experts: Richard Bergtrom (Sweden), Antonietta Fila (Italy), Nadia Khelef (France), Deborah Khursigara (Canada), Daniel Levy-Bruhl (France), Hannah Nohynek (THL, Finland), Agnès Saint-Raymond (France), Charlie Weller (England)

WP7.1 team: Jean-Daniel Lelièvre, Marie-Paule Kieny, Florence Francis, Sandor Bozoki, Zsombor Szadoczki

Observers: Anne-Marie Yazbeck (EC), Si Mehand Massinissa (WHO)

III. Methods

All details concerning the method used were described in Deliverable 33.

1.1. Preliminary steps to the meeting

- The survey for question generation was circulated to European NITAGs, JAV partners, Vaccelerate project partners, the French advisory committee on Covid vaccine, and the French strategic operational committee for Covid vaccination. Questions were requested which were either applicable to all vaccines used in the EU or particular to COVID-19 vaccines. Among the questions received, 8 questions corresponded to the former and 27 to the latter.
- Some of the submissions were comments more than research questions and were therefore screened out. This resulted into an initial list of 35 questions (Annex 1). The WP7.1 team sorted out the questions, merged those who were mostly similar and edited the language when necessary for harmonization purposes. A final list of 27 questions was then available for review and prioritization by experts (Annex 2).
- After previous year's ranking meeting, a decision was made to remove the criteria regarding epidemiology of disease because it led to confusion.
- New weights for the 7 remaining criteria were attributed by scaling up remaining criteria in a linear way.
- The same survey as the previous year, developed by the SZTAKI Institute was filled by experts individually before the final consensus meeting. The survey asked them to attribute for each research question a mark (from 0 to 3) for each of the 7 criteria considered. The mark was to be interpreted as follows: 0: very bad / 1: rather bad / 2: rather good / 3: very good, with respect to the criterion considered. The individual responses were consolidated for each question.

- The ranked list of research question was circulated at the beginning of the meeting. Below a bar graph showing the consolidated rating of all research proposals. Annex 3 presents the anonymized individual ratings for each question.



- Experts discussed the results of the individual ratings in order to reach a consensus (Table 1).

1.2. Methodology for the meeting

The objective of the meeting was to classify the research proposals submitted into three tiers. After review of the 8 highest-ranked questions, the lowest scored questions were addressed, and finally all remaining questions were discussed.

- Agreement was reached to review the ranking of the questions and group them in a final discussion according to their level of priority into three tiers (top priority, medium priority, no priority), without ordering for questions within a tier;
- Participants agreed to start discussing individual questions by order of ranking, based on the results of the survey (starting from the question ranked 1st).
- Finally, experts agreed by consensus on the final priority list.

III. Results: final list of research priorities on vaccination

The 27 questions sorted into three tiers are presented in Table 1 below. The invited observer confirmed at the end of the meeting that due process had been followed.

Table 1: List of ranked research questions (not presented in order of priority)

Tier 1 TOP priority list (not in order of priority)

- Study whether – as compared with other new vaccines – the centralized purchasing and distribution method used in the EU for COVID-19 vaccines has helped to reduce inequalities or access difficulties among and within countries and should therefore be generalized in case of a new pandemic.
- Generate evidence to optimize vaccine strategies for people with underlying conditions including immunodeficiency (additional dose, double dose, cocooning) – COVID-19
- Study which are the appropriate diagnostic tests to track persistence/decline of immunity, and guide re-immunization policy in subsequent years? – COVID-19
- Analyze the efficiency of strategies used in Europe to immunize marginalized and vulnerable populations – COVID-19
- Analyze the different vaccination strategies implemented in European countries and model these strategies in terms of impact (on mortality, hospitalisation, economic indicators). – COVID-19
- Analyze and detail the determinants of Covid-19 vaccine hesitancy and to assess whether they are different from those identified for other vaccines

Tier 2 MEDIUM priority list (not in order of priority)

- Document, analyze and evaluate interventions to address social inequalities in vaccination with COVID-19 in various EU-countries.
- Study the propensity of the various vaccine types to lead to appearance of escape mutants – COVID-19
- Study the impact of refusal of vaccination by health professionals (by category) on the general population's choice to be vaccinated – COVID-19
- Analyze in various EU countries the perception and acceptability of the concept of benefit-risk balance: understanding, acceptability thresholds, according to the type of adverse effect, type of benefit (direct or indirect), age, etc. – COVID-19
- Study the influence of a future "vaccine passport" on the acceptance of vaccination (by type of population) – COVID-19
- Model the impact of non-vaccination of various percentages of health professionals on COVID-19 nosocomial infections.
- Evaluate the impact of digital health solutions to support access to vaccination.
- Model the clinical, financial and social HTA (Health technology assessment) of existing and future COVID-19 vaccines, with subgroup analysis (pediatrics, elderly, citizens with chronic disease) among the EU Member States over time.
- Explore among EU-countries, the reasons for changing vaccination refusal to acceptance – COVID-19
- Analyze the impact on uptake of different strategies by European MS (dedicated vaccination centers, hospitals, general practitioners, pharmacists, others) – COVID-19
- Analyze the acceptability and preferences around COVID-19 vaccination among adolescents, children less than 18, parents of adolescents or children, and young people aged 18-29 years.

- Analyze the impact of compulsory COVID-19 vaccination for various populations on vaccine coverage, number of cases, transmission, morbidity, nosocomial infection, mortality for different types of population in the light of the experience in Europe for other vaccines.
-

Tier 3: Not a priority and/or out of scope research questions*

- Analyze the relevance and feasibility of performing vaccine serologies either post or pre vaccination COVID19.
 - Analyze the disadvantages in terms of compliance (analyzed by age-group) of 2-dose regimens in regard to coverage, compared to vaccines requiring only a single-dose – COVID-19
 - Analyze social preferences which have been used in Europe to decide on whom to prioritize for COVID-19 vaccination? Analyze the impact on decisions of health vs economic considerations?
 - Model the impact on vaccine availability and on the cost-effectiveness of the campaign of potential SARS-CoV-2 seropositivity testing before vaccination (with the objective of identifying people to whom only a single dose should be given or those who should receive a third dose).
 - Study whether non-parenteral vaccine administration (e.g. nasal, oral, patch) might increase vaccine uptake in Europe.
 - Study whether the multimodal approach of WHO is an effective strategy to improve infection control safety/quality and vaccination coverage in Long term care facilities?
-

Questions that have been already addressed by the scientific community

- Study what types of messages and communication strategies improves vaccine coverage in migrants – COVID-19

- Model the impact of vaccination of children (by age group) on the evolution of the pandemic taking into consideration various levels coverage in adults – COVID-19

IV. Discussion

This process described above allowed the WP7.1 team to establish a second list of European priorities regarding vaccination research. The framework developed in D33 was followed, with minor changes to improve the process: e.g. through greater attention to target those likely to propose research questions, better explanation of the prioritization criteria.

It is to be noted that this second exercise was impacted by the Covid-19 crisis: fewer research questions were obtained, and a majority of them were related to Covid-19 vaccines, attesting of the focus of the scientific community on the pandemic.

Due to the high international priority given to Covid-19 vaccines, some questions had already been addressed during the time between the collection of proposals and the meeting.

The final meeting was conducted through two videoconferences, which proved more challenging for the purpose of reaching a consensus than a real face-to-face meeting.

V. Conclusion

After a pilot process, the prioritisation framework designed by the WP7.1 team was used successfully to establish a second list of research priorities to increase vaccine coverage. Experts defined 6 top-priorities, 12 medium-priorities and 6 lower-priorities.

The prioritisation framework for establish research priorities in Europe was therefore validated and might be used in the future for similar purposes.

The list of top priorities was submitted through the **'Stakeholders' Targeted Consultation on EU4health related priorities, strategic orientations and needs'** survey. The ranked priorities will moreover be disseminated through EU-JAV channels.

REFERENCES

1. Walshe K, McKee M, McCarthy M, Groenewegen P, Hansen J, Figueras J, et al. Health systems and policy research in Europe: Horizon 2020. *Lancet Lond Engl.* 24 août 2013;382(9893):668-9.
2. McCarthy M, Conceição C, Grimaud O, Katreniakova Z, Saliba A, Sammut M, et al. Competitive funding and structures for public health research in European countries. *Eur J Public Health.* nov 2013;23 Suppl 2:39-42.
3. Hughes SL, Bolotin S, Khan S, Li Y, Johnson C, Friedman L, et al. The effect of time since measles vaccination and age at first dose on measles vaccine effectiveness – A systematic review. *Vaccine.* 16 janv 2020;38(3):460-9.

ANNEXES

1. Initial list of 35 questions

General questions

1. Evaluate the impact of digital health solutions to support access to vaccination
2. Study the impact of refusal of vaccination by health professionals (by category) on the population's choice to be vaccinated
3. Study whether non-parenteral vaccine administration (e.g. nasal, oral, patch) might decrease vaccine rejection in Europe
4. Is the multimodal approach of WHO an effective strategy to improve infection control safety/quality and vaccination coverage among the Long term care facilities? (*LTCFs*) and vaccination strategies. To implement the WHO core components for quality and safety improvement in health care (Core components of infection prevention and control programmes in health care) in LTCFs, with multimodal strategies to promote infection control and vaccination promotion in LTCFs against the pandemic/ other infectious diseases (influenzas, pneumococcus). Assess Pre- and post- intervention vaccine coverage among LTCFs.
5. Can education and screening improve vaccine coverage in immigrants? “Screening” of importing contagious diseases and vaccinations from immigrants of developing countries through major mediators in Europe. Surveillance and electronic data capture (registry) on different Immigrants groups assess social and educational level of Immigrants. Promote educational seminars among different migrant population to promote vaccination in difficult to reach facilities/ groups. Assess Pre- and post- intervention vaccine coverage among different immigrant groups.
6. How can we improve and harmonize the EU vaccine deployment plan? *Improvement and Harmonization of EU COVID-19 vaccine deployment infrastructure. Critical infrastructure to enable efficient distribution, dose administration, supply, distribution, and vaccination sites, locally and regionally.*
7. *How can we increase the EU citizens trust for vaccination –the role of local liaisons.* Increase public confidence in vaccines and vaccination educational programmes to achieve widespread and general acceptance locally and regionally (the importance of local liaison engagement). Promoting increased vaccination coverage of existing vaccines (e.g. H1N1, COVID-19) by local campaigns and engagement of local/regional liaisons (e.g. general practitioners)

8. OSHA and vaccination in high risk workers. *in Promoting tetanus booster dose in specific high risk workers*

COVID-19 vaccine questions

Social and human sciences

9. Analyse social preferences which have been used in Europe to decide on whom to prioritize for COVID-19 vaccination? Analyse the impact on decisions of health vs economic considerations?
10. Analyse the different vaccination strategies implemented in European countries and evaluation of these strategies in terms of impact (on mortality, hospitalisation, economic indicators)
11. Analyse the efficiency of strategies used in Europe to immunize marginalized and vulnerable populations
12. Analyse the disadvantages of 2-dose regimens in regard to coverage, compared to vaccines requiring only a single-dose?
13. Explore reasons to explain vaccination refusal? Was refusal definitive? If not, what motivated a change of decision?
14. Model the impact of vaccination of children (by age group) on the evolution of the pandemic
15. Model the impact of non-vaccination (of all, of health professionals) on COVID-19 herd immunity
16. Analyse the pros/cons of compulsory COVID-19 vaccination (general or for HCWs) in the light of the experience acquired in Europe for other vaccines
17. Study the influence of a future "vaccine passport" on the acceptance of vaccination (by type of population)
18. Study whether determinants of Covid-19 vaccine hesitancy are the same or different from those usually identified for other vaccines
19. Analyse the impact on the efficacy of the vaccination of the use of different strategies by European MS (dedicated vaccination centres, hospitals, general practitioners, pharmacists, others)

20. Study whether – as compared with other new vaccines - the centralized purchasing and distribution method used in the EU has helped to reduce inequalities or access difficulties among and within countries?
21. Analyse the impact of the non-fault compensation systems on the vaccine uptake and vaccine confidence in the EU MS. The research could focus on the analysis and comparison of the uptake of vaccination and the level of vaccine confidence in EU MS that introduced the non-fault compensation systems.
22. What the clinical financial and social HTA (Health technology assessment) assessment of the existing and future COVID-19 vaccines? Social-Economic analysis of vaccines and immunization programs benefits on the society. Health technology assessment-clinical and cost comparative effectiveness of COVID-19 vaccines. To implement HTA clinical and cost-effectiveness reports with subgroup analysis (pediatrics, elderly, citizens with chronic disease) among the Member States over time to assess the comparative effectiveness including against the COVID-19 variants of concern (VOCs).
23. Analyze the perception and acceptability of the concept of the benefit-risk balance: understanding, acceptability thresholds, according to the type of adverse effect, type of benefit (direct or indirect), age, etc.
24. Analyze the acceptability and preferences around COVID-19 vaccination (initial and long-term) among adolescents, parents of adolescents and young people aged 18-29 years.
25. Document, analyze and evaluate interventions to address social inequalities in vaccination (COVID-19)

Biological sciences

26. Investigate the optimal use of booster shots to maximize protection and minimize adverse effects: interval between administrations, booster with a different product (same or different platform)
27. Study how long does vaccine-induced protection last, including against VOC? Does this protection involve protection against infection, or protection against mild disease, or protection against severe disease requiring hospitalisation? Is this protection similar across risk and age groups?
28. Study the propensity of the various vaccines types to lead to appearance of escape mutants, and whether these actually present a public health hazard
29. Investigate the safety of COVID vaccines in children

30. Study whether there any evidence of a deleterious interaction leading to enhanced disease when natural infection is acquired subsequent to vaccine-induced immunity, and if so, over what timescale? (months/year/years)
31. Study which are the appropriate diagnostic tests to track persistence/decline of immunity, and guide re-immunisation policy in subsequent years?
32. Model the impact on vaccine availability and on the cost of the campaign of potential SARS-CoV-2 seropositivity testing before vaccination (with the objective of identifying people to whom only a single dose should be given or those who should receive a third dose)
33. Analyze heterologous vaccine regimens either with different platforms or by combining vaccines from the same platform (notion of interchangeability of mRNA vaccines for example)
34. Analyze the relevance and feasibility of performing vaccine serologies either post or pre vaccination COVID19
35. Define European guidelines to precisely define the different types of immunodeficiency states and their impact on the vaccine strategy (additional dose, double dose, cocooning)

2. Final list of 27 questions

General questions

1. Evaluate the impact of digital health solutions to support access to vaccination.
2. Study the impact of refusal of vaccination by health professionals (by category) on the general population's choice to be vaccinated.
3. Study whether non-parenteral vaccine administration (e.g. nasal, oral, patch) might increase vaccine uptake in Europe.
4. Study whether the multimodal approach of WHO is an effective strategy to improve infection control safety/quality and vaccination coverage in Long term care facilities?

COVID-19 vaccine questions

Social and human sciences

5. Analyse social preferences which have been used in Europe to decide on whom to prioritize for COVID-19 vaccination? Analyse the impact on decisions of health vs economic considerations?
6. Analyse the different vaccination strategies implemented in European countries and evaluation of these strategies in terms of impact (on mortality, hospitalisation, economic indicators).
7. Analyse the efficiency of strategies used in Europe to immunize marginalized and vulnerable populations.
8. Study what types of messages and communication strategies improves vaccine vaccine coverage in migrants.
9. Analyse the disadvantages in terms of compliance (analysed by age-group) of 2-dose regimens in regard to coverage, compared to vaccines requiring only a single-dose?
10. Explore potential differences among EU countries in reasons to explain vaccination refusal? Was refusal definitive? If not, what motivated a change of decision?
11. Model the impact of vaccination of children (by age group) on the evolution of the pandemic taking into considerations various levels coverage in adults.

12. Model the impact of non-vaccination of various percentages of health professionals on COVID-19 nosocomial infections.
13. Analyse the pros/cons of compulsory COVID-19 vaccination (general or for HCWs) in the light of the experience in Europe for other vaccines.
14. Study the influence of a future "vaccine passport" on the acceptance of vaccination (by type of population)
15. Model the impact on vaccine availability and on the cost-effectiveness of the campaign of potential SARS-CoV-2 seropositivity testing before vaccination (with the objective of identifying people to whom only a single dose should be given or those who should receive a third dose).
16. Study whether determinants of Covid-19 vaccine hesitancy are the same or different from those usually identified for other vaccines.
17. Analyse the impact on the efficacy of the vaccination of the use of different strategies by European MS (dedicated vaccination centres, hospitals, general practitioners, pharmacists, others).
18. Study whether – as compared with other new vaccines - the centralized purchasing and distribution method used in the EU has helped to reduce inequalities or access difficulties among and within countries?
19. Analyse the impact of the non-fault compensation systems for Covid-19 vaccines on vaccine confidence in EU MS compared to influenza vaccine where this mechanism doesn't exist.
20. Model the clinical, financial and social HTA (Health technology assessment) of existing and future COVID-19 vaccines, with subgroup analysis (pediatrics, elderly, citizens with chronic disease) among the EU Member States over time.
21. Analyze in various EU countries the perception and acceptability of the concept of benefit-risk balance: understanding, acceptability thresholds, according to the type of adverse effect, type of benefit (direct or indirect), age, etc.
22. Analyze the acceptability and preferences around COVID-19 vaccination among adolescents, parents of children 12-18, parents of adolescents, and young people aged 18-29 years.
23. Document, analyze and evaluate interventions to address social inequalities in vaccination with COVID-19 in various EU-countries.

Biological sciences

24. Study the propensity of the various vaccines types to lead to appearance of escape mutants.
25. Study which are the appropriate diagnostic tests to track persistence/decline of immunity, and guide re-immunisation policy in subsequent years?
26. Analyze the relevance and feasibility of performing vaccine serologies either post or pre vaccination COVID19.
27. Generate evidence to optimize vaccine strategies for people with underlying conditions including immunodeficiency (additional dose, double dose, cocooning).

3. Initial individual ranking obtained through the survey

The best and worst marks are highlighted in green and red, respectively.

Q18	Study whether – as compared with other new vaccines - the centralized purchasing and distribution method used in the EU has helped to reduce inequalities or access difficulties among and within countries?							
	Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility
1.	3	3	3	3	2	2	2	18
2.	1	3	3	3	3	3	3	19
3.	3	3	2	2	3	2	2	17
4.	2	1	2	1	0	3	1	10
5.								
6.	3	2	3	3	2	2	3	18
7.	3	3	3	3	3	3	3	21
8.	3	3	3	3	3	3	2	20
9.	3	3	3	3	3	3	3	21
average score	2,625	2,625	2,750	2,625	2,375	2,625	2,375	18
average difference from the average score	0,563	0,563	0,375	0,563	0,781	0,469	0,625	
maximal score	3	3	3	3	3	3	3	
minimal score	1	1	2	1	0	2	1	
maximal difference between experts' scores	2	2	1	2	3	1	2	

Q27	Generate evidence to optimize vaccine strategies for people with underlying conditions including immunodeficiency (additional dose, double dose, cocooning).							
	Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility
1.	3	3	3	3	3	2	3	20
2.	2	3	3	3	3	3	3	20
3.	3	2	2	2	2	2	2	15
4.	3	2	3	3	1	2	3	17
5.	3	3	3	3	3			21 (15)
6.	2	2	2	2	2	1	2	13
7.	2	3	2	2	2	2	2	15
8.	3	3	3	3	3	3	3	21
9.	2	3	3	2	2	3	2	17
average score	2,556	2,667	2,667	2,556	2,333	2,250	2,500	17,53
average difference from the average score	0,494	0,444	0,444	0,494	0,593	0,563	0,500	
maximal score	3	3	3	3	3	3	3	
minimal score	2	2	2	2	1	1	2	
maximal difference between experts' scores	1	1	1	1	2	2	1	

Q7		Analyse the efficiency of strategies used in Europe to immunize marginalized and vulnerable populations.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	3	3	2	3	2	3	3	19	
2.	3	2	2	3	3	3	3	19	
3.	3	3	2	3	2	2	2	17	
4.	2	2	1	3	2	1	2	13	
5.									
6.	3	3	3	3	3	2	3	20	
7.	2	3	3	3	3	3	3	20	
8.	2	2	2	3	2	2	2	15	
9.	2	2	1	2	1	2	2	12	
average score	2,50	2,50	2,00	2,88	2,25	2,25	2,50	16,88	
average difference from the average score	0,50	0,50	0,50	0,22	0,56	0,56	0,50		
maximal score	3	3	3	3	3	3	3		
minimal score	2	2	1	2	1	1	2		
maximal difference between experts' scores	1	1	2	1	2	2	1		

Q6		Analyse the different vaccination strategies implemented in European countries and evaluation of these strategies in terms of impact (on mortality, hospitalisation, economic indicators).							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	3	3	2	3	3	3	3	20	
2.	3	2	3		3		3	19,6 (15)	
3.	3	2	2	1	1	3	2	14	
4.	3	3	2	1	3			16,8 (15)	
5.									
6.	3	3	3	3	3	3	3	21	
7.	3	3	3	3	3	3	3	21	
8.	1	1	1		2	2	2	10,5 (16)	
9.	1	2	2	2	1	1	1	10	
average score	2,500	2,375	2,250	2,167	2,375	2,500	2,429	16,60	
average difference from the average score	0,750	0,625	0,563	0,833	0,781	0,667	0,653		
maximal score	3	3	3	3	3	3	3		
minimal score	1	1	1	1	1	1	1		
maximal difference between experts' scores	2	2	2	2	2	2	2		

Q23		Document, analyze and evaluate interventions to address social inequalities in vaccination with COVID-19 in various EU-countries.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	3	3	3	3	2	1	2	17	
2.	2	3	2	3	3	1	2	16	
3.	3	2	2	3	1	2	2	15	
4.	1	2	1	3	1	1	2	11	
5.	2	3	3	3	3			19,6 (15)	
6.	2	2	2	3	2	1	2	14	
7.	2	2	1	2	2	2	2	13	
8.	3	3	2	3	3	3	3	20	
9.	3	3	3	3	3	2	2	19	
average score	2,333	2,556	2,111	2,889	2,222	1,625	2,125	15,86	
average difference from the average score	0,593	0,494	0,593	0,198	0,691	0,625	0,219		
maximal score	3	3	3	3	3	3	3		
minimal score	1	2	1	2	1	1	2		
maximal difference between experts' scores	2	1	2	1	2	2	1		

Q16		Study whether determinants of Covid-19 vaccine hesitancy are the same or different from those usually identified for other vaccines.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	0	0	2	2	1	1	8	
2.	3	3	2	3	3	1	3	18	
3.	3	2	2	2	1	2	2	14	
4.	2	1	1	1	1	0	1	7	
5.	3	3	3	3	3			21 (15)	
6.	3	3	3	3	2	2	3	19	
7.	3	3	2	2	2	2	3	17	
8.	3	3	2	3	2	3	3	19	
9.	3	3	3	2	2	2	2	17	
average score	2,778	2,333	2,000	2,333	2,000	1,625	2,250	15,32	
average difference from the average score	0,346	0,889	0,667	0,593	0,444	0,719	0,750		
maximal score	3	3	3	3	3	3	3		
minimal score	2	0	0	1	1	0	1		
maximal difference between experts' scores	1	3	3	2	2	3	2		

Q21		Analyze in various EU countries the perception and acceptability of the concept of benefit-risk balance: understanding, acceptability thresholds, according to the type of adverse effect, type of benefit (direct or indirect), age, etc.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	2	2	2	2	2	3	15	
2.	3		2	1	3	1	3	15,16 (16)	
3.	3	1	1	1	0	2	1	9	
4.	2	3	3	1	3	2	2	16	
5.	3	3	3	3	3			21 (15)	
6.	2	2	2	2	1	1	2	12	
7.	2	2	2	1	2	2	2	13	
8.	3	3	3	3	3	3	3	21	
9.	2	2	3	3	3	3	3	19	
average score	2,444	2,250	2,333	1,889	2,222	2,000	2,375	15,51	
average difference from the average score	0,494	0,563	0,593	0,790	0,864	0,500	0,625		
maximal score	3	3	3	3	3	3	3		
minimal score	2	1	1	1	0	1	1		
maximal difference between experts' scores	1	2	2	2	3	2	2		

Q14		Study the influence of a future "vaccine passport" on the acceptance of vaccination (by type of population).							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	3	2	1	3	2	3	16	
2.	2	2	2	1	2	1	3	13	
3.	3	3	2	1	2	3	2	16	
4.	2	2	3	1	0	1	2	11	
5.	2							14 (11)	
6.	2	2	2	2	2	1	2	13	
7.	3	3	3	2	3	2	3	19	
8.	3	3	3	2	2	3	3	19	
9.	2	2	2	2	2	2	2	14	
average score	2,333	2,500	2,375	1,500	2,000	1,875	2,500	15,08	
average difference from the average score	0,444	0,500	0,469	0,500	0,500	0,656	0,500		
maximal score	3	3	3	2	3	3	3		
minimal score	2	2	2	1	0	1	2		
maximal difference between experts' scores	1	1	1	1	3	2	1		

Q12		Model the impact of non-vaccination of various percentages of health professionals on COVID-19 nosocomial infections.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	3	3	3	3	1	2	17	
2.	1	2	2	1	1	1	3	11	
3.	3	2	2	1	1	2	2	13	
4.	2	1	2	1	1	1	1	9	
5.	3		3					21 (12)	
6.	2	2	2	2	2	2	2	14	
7.	3	2	2	2	2	2	2	15	
8.	3	3	3	3	3	3	3	21	
9.	2	3	3	3	3	2	2	18	
average score	2,333	2,250	2,444	2,000	2,000	1,750	2,125	14,90	
average difference from the average score	0,593	0,563	0,494	0,750	0,750	0,563	0,438		
maximal score	3	3	3	3	3	3	3		
minimal score	1	1	2	1	1	1	1		
maximal difference between experts' scores	2	2	1	2	2	2	2		

Q20		Model the clinical, financial and social HTA (Health technology assessment) of existing and future COVID-19 vaccines, with subgroup analysis (pediatrics, elderly, citizens with chronic disease) among the EU Member States over time.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	1	1	2	0	2	1	1	8	
2.	3	2	3	2	3	1	3	17	
3.	2	2	3	2	1	2	2	14	
4.	2	1	2	1	2	2	2	12	
5.	3	3	3	3	3			21 (15)	
6.	3	3	3	3	2	2	3	19	
7.	3	3	3	3	3	3	3	21	
8.	3	3	2	3	3	2	2	18	
9.	1	1	1	1	1	1	1	7	
average score	2,333	2,111	2,444	2,000	2,222	1,750	2,125	14,99	
average difference from the average score	0,741	0,790	0,617	0,889	0,691	0,563	0,656		
maximal score	3	3	3	3	3	3	3		
minimal score	1	1	1	0	1	1	1		
maximal difference between experts' scores	2	2	2	3	2	2	2		

Q10	Explore potential differences among EU countries in reasons to explain vaccination refusal? Was refusal definitive? If not, what motivated a change of decision?							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum
1.	2	3	3	3	3	1	2	17
2.	1				1	1		7 (13)
3.	3			1	1	2	2	12,6 (15)
4.	2	2	1	2	1	1	1	10
5.	3		3	3				21 (13)
6.	3	3	2	3	2	2	3	18
7.	2	3	3	3	1	2	2	16
8.	3	3	3	2	3	3	3	20
9.	0	1	1	1	1	0	1	5
average score	2,111	2,500	2,286	2,250	1,625	1,500	2,000	14,27
average difference from the average score	0,790	0,667	0,816	0,750	0,781	0,750	0,571	
maximal score	3	3	3	3	3	3	3	
minimal score	0	1	1	1	1	0	1	
maximal difference between experts' scores	3	2	2	2	2	3	2	

Q17	Analyse the impact on the efficacy of the vaccination of the use of different strategies by European MS (dedicated vaccination centres, hospitals, general practitioners, pharmacists, others).							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum
1.	3	3	2	3	3	3	2	19
2.	1	3	2	3	3	1	3	16
3.	2	1	2	1	2	2	2	12
4.	2	2	1	2	1	2	2	12
5.								
6.	2	2	2	2	1	1	2	12
7.	2	3	2	1	2	2	2	14
8.	3	3	3	3	3	3	3	21
9.	1	2	2	2	1	1	2	11
average score	2,000	2,375	2,000	2,125	2,000	1,875	2,250	14,63
average difference from the average score	0,500	0,625	0,250	0,656	0,750	0,656	0,375	
maximal score	3	3	3	3	3	3	3	
minimal score	1	1	1	1	1	1	2	
maximal difference between experts' scores	2	2	2	2	2	2	1	

Q15		Model the impact on vaccine availability and on the cost-effectiveness of the campaign of potential SARS-CoV-2 seropositivity testing before vaccination (with the objective of identifying people to whom only a single dose should be given or those who should receive a third dose).							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	1	2	0	1	2	1	2	9	
2.	2	3	3		3	2	3	18,67 (16)	
3.	2	3	2	2	3	3	2	17	
4.	3	3	2	1	0	1	2	12	
5.									
6.	3	3	3	3	2	2	3	19	
7.	2	3	2	1	2	2	2	14	
8.	3	3	3	2	2	3	3	19	
9.	1	1	1	1	1	1	1	7	
average score	2,125	2,625	2,000	1,571	1,875	1,875	2,250	14,32	
average difference from the average score	0,656	0,563	0,750	0,653	0,688	0,656	0,563		
maximal score	3	3	3	3	3	3	3		
minimal score	1	1	0	1	0	1	1		
maximal difference between experts' scores	2	2	3	2	3	2	2		

Q22		Analyze the acceptability and preferences around COVID-19 vaccination among adolescents, parents of children 12-18, parents of adolescents, and young people aged 18-29 years.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	0	1	1	2	2	1	2	9	
2.	3	2	2	1	1	1	3	13	
3.	3	2	2	2	1	2	2	14	
4.	2	2	2	1	0	2	3	12	
5.	3	3	3	3				21 (14)	
6.	3	3	3	3	2	2	3	19	
7.	2	2	1	2	2	2	2	13	
8.	3	3	2	2	2	3	3	18	
9.	2	2	2	2	2	2	2	14	
average score	2,333	2,222	2,000	2,000	1,500	1,875	2,500	14,43	
average difference from the average score	0,741	0,519	0,444	0,444	0,625	0,438	0,500		
maximal score	3	3	3	3	2	3	3		
minimal score	0	1	1	1	0	1	2		
maximal difference between experts' scores	3	2	2	2	2	2	1		

Q3		Study whether non-parenteral vaccine administration (e.g. nasal, oral, patch) might increase vaccine uptake in Europe.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	3	3	3	3	2	3	3	20	
2.	1		2	2	3	2	2	14 (16)	
3.	2	1	1	1	3	2	3	13	
4.	3	1	1	2	0	3	2	12	
5.									
6.	2	2	2	2	2	2	2	14	
7.	3	2	1	1	2	2	2	13	
8.	2	1	2	2	3	2	2	14	
9.	3	3	3	2	2	2	2	17	
average score	2,375	1,857	1,875	1,875	2,125	2,250	2,250	14,61	
average difference from the average score	0,625	0,735	0,656	0,438	0,656	0,375	0,375		
maximal score	3	3	3	3	3	3	3		
minimal score	1	1	1	1	0	2	2		
maximal difference between experts' scores	2	2	2	2	3	1	1		

Q13		Analyse the pros/cons of compulsory COVID-19 vaccination (general or for HCWs) in the light of the experience in Europe for other vaccines.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	3	1	3	2	2	2	15	
2.	1	1	2	1	2	1	1	9	
3.	2	2	2		3	3	3	17,5	
4.	2	2	2	2	1	0	3	12	
5.	3				3			21 (12)	
6.	3	3	3	3	3	2	3	20	
7.	2	2	2	1	1	2	2	12	
8.	3	3	3	2	2	3	3	19	
9.	1	1	2	2	1	1	2	10	
average score	2,111	2,125	2,125	2,000	2,000	1,750	2,375	14,49	
average difference from the average score	0,593	0,656	0,438	0,571	0,667	0,813	0,625		
maximal score	3	3	3	3	3	3	3		
minimal score	1	1	1	1	1	0	1		
maximal difference between experts' scores	2	2	2	2	2	3	2		

Q8		Study what types of messages and communication strategies improves vaccine coverage in migrants.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	3	2	3	2	2	2	16	
2.	3	3	2	3	3	1	3	18	
3.	2	3	2	2	1	2	2	14	
4.	2	2	2	3	2	2	1	14	
5.	2	2	2	3				15,75 (14)	
6.	2	2	2	3	2	1	2	14	
7.	2	2	2	3	2	1	3	15	
8.	2	2	1	3	2	2	2	14	
9.	1	1	1	2	1	1	1	8	
average score	2,000	2,222	1,778	2,778	1,875	1,500	2,000	14,15	
average difference from the average score	0,222	0,519	0,346	0,346	0,438	0,500	0,500		
maximal score	3	3	2	3	3	2	3		
minimal score	1	1	1	2	1	1	1		
maximal difference between experts' scores	2	2	1	1	2	1	2		

Q11		Model the impact of vaccination of children (by age group) on the evolution of the pandemic taking into consideration various levels coverage in adults.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	2	2	3	3	2	3	17	
2.	3	3	2	1	1	1	3	14	
3.	3	2	2	1		2	2	14 (16)	
4.	3	2	3	2	1	1	3	15	
5.				3				21 (11)	
6.	2	2	3	2	2	2	3	16	
7.	3	3	2	2	2	2	2	16	
8.	2	2	2	2	2	2	2	14	
9.	1	1	1	1	1	0	1	6	
average score	2,375	2,125	2,125	1,889	1,714	1,500	2,375	14,10	
average difference from the average score	0,625	0,438	0,438	0,593	0,612	0,625	0,625		
maximal score	3	3	3	3	3	2	3		
minimal score	1	1	1	1	1	0	1		
maximal difference between experts' scores	2	2	2	2	2	2	2		

Q4		Study whether the multimodal approach of WHO is an effective strategy to improve infection control safety/quality and vaccination coverage in Long term care facilities?							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	1	1	2	2	2	2	12	
2.	2	2	1	2	3	1	2	13	
3.									
4.	0							0 (11)	
5.									
6.	3	3	3	3	3	3	3	21	
7.	2	2	2	1	2	1	2	12	
8.	1	1	2		2	2	1	10,5 (16)	
9.	3	3	3	3	3	3	3	21	
average score	1,857	2,000	2,000	2,200	2,500	2,000	2,167	14,72	
average difference from the average score	0,776	0,667	0,667	0,640	0,500	0,667	0,556		
maximal score	3	3	3	3	3	3	3		
minimal score	0	1	1	1	2	1	1		
maximal difference between experts' scores	3	2	2	2	1	2	2		

Q9		Analyse the disadvantages in terms of compliance (analysed by age-group) of 2-dose regimens in regard to coverage, compared to vaccines requiring only a single-dose?							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	3	2	3	3	1	2	3	17	
2.	0	0	0		0	0	0	0 (16)	
3.	3	2	2	2	1	2	2	14	
4.	1	1	1	2	2	3	2	12	
5.	3	3	3	3	3			21 (15)	
6.	2	3	3	3	2	2	2	17	
7.	2	2	0	1	0	2	2	9	
8.	3	3	3	2	3	3	3	20	
9.	2	2	2	2	2	2	2	14	
average score	2,111	2,000	1,889	2,250	1,556	2,000	2,000	13,81	
average difference from the average score	0,790	0,667	1,037	0,563	0,938	0,500	0,500		
maximal score	3	3	3	3	3	3	3		
minimal score	0	0	0	1	0	0	0		
maximal difference between experts' scores	3	3	3	2	3	3	3		

Q5		Analyse social preferences which have been used in Europe to decide on whom to prioritize for COVID-19 vaccination? Analyse the impact on decisions of health vs economic considerations?							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	3	2	2	3	3	3	1	17	
2.	0							0 (11)	
3.	3	1	3	1	0	2	2	12	
4.	1	1	2	2	1	2	3	12	
5.									
6.	3	3	3	3	3	3	3	21	
7.	2	3	3	3	3	3	3	20	
8.	1	1	1		1	1		7 (15)	
9.	1	1	2	2	2	1	1	10	
average score	1,750	1,714	2,286	2,333	1,857	2,143	2,167	14,25	
average difference from the average score	1,000	0,816	0,612	0,667	1,020	0,735	0,833		
maximal score	3	3	3	3	3	3	3		
minimal score	0	1	1	1	0	1	1		
maximal difference between experts' scores	3	2	2	2	3	2	2		

Q2		Study the impact of refusal of vaccination by health professionals (by category) on the general population's choice to be vaccinated.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	3	2	1	2	1	2	1	12	
2.	1	1	1	1	1	1	1	7	
3.	2	2	2	1	3	2	2	14	
4.	3	1	2	3	2	3	2	16	
5.	2	3			2			16,33 (13)	
6.	2	2	2	2	2		2	14 (16)	
7.	3	2	1	1	0	1	2	10	
8.	3	3	3	3	3	3	3	21	
9.	1	2	2	2	2	1	1	11	
average score	2,222	2,000	1,750	1,875	1,778	1,857	1,750	13,23	
average difference from the average score	0,691	0,444	0,563	0,656	0,741	0,735	0,563		
maximal score	3	3	3	3	3	3	3		
minimal score	1	1	1	1	0	1	1		
maximal difference between experts' scores	2	2	2	2	3	2	2		

Q19		Analyse the impact of the non-fault compensation systems for Covid-19 vaccines on vaccine confidence in EU MS compared to influenza vaccine where this mechanism doesn't exist.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	1	2	2	3	2	1	13	
2.	2	2	3	2	3	2	3	17	
3.	3	2	3	1	3	2	2	16	
4.	1	1	2	0	0	2	0	6	
5.									
6.	2	2	2	2	1	1	2	12	
7.	2	2	1	1	2	2	2	12	
8.	2	2		3			2	15,75 (14)	
9.	1	2	1	1	2	1	2	10	
average score	1,875	1,750	2,000	1,500	2,000	1,714	1,750	12,59	
average difference from the average score	0,438	0,375	0,571	0,750	0,857	0,408	0,625		
maximal score	3	2	3	3	3	2	3		
minimal score	1	1	1	0	0	1	0		
maximal difference between experts' scores	2	1	2	3	3	1	3		

Q1		Evaluate the impact of digital health solutions to support access to vaccination.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	2	2	2	2	2	2	2	14	
2.	3	3	2	1	3	1	3	16	
3.	2	2	3	2	3	3	2	17	
4.	1	3	1	1	2	1	3	12	
5.	3	3		2	2			17,5 (14)	
6.	3	2	2	2	2		3	16,33 (16)	
7.	3	3	3	2	3	2	3	19	
8.	2	2	2		3	2	2	15,17 (16)	
9.	2	2	1	2	1	1	1	10	
average score	2,286	2,429	1,833	1,714	2,143	1,600	2,333	14,95	
average difference from the average score	0,612	0,490	0,556	0,408	0,490	0,720	0,667		
maximal score	3	3	3	2	3	3	3		
minimal score	1	2	1	1	1	1	1		
maximal difference between experts' scores	2	1	2	1	2	2	2		

Q26		Analyze the relevance and feasibility of performing vaccine serologies either post or pre vaccination COVID19.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	0	1	1	1	1	1	1	6	
2.	1			1	3		3	14 (14)	
3.	2	2	2	1	1	2	2	12	
4.	1	1	3	1	0	2	2	10	
5.									
6.	2	1	1	1	1	2	2	10	
7.	2	2	2	1	2	2	2	13	
8.	3	3	3	2	3	3	3	20	
9.	2	2	2	2	2	2	2	14	
average score	1,625	1,714	2,000	1,250	1,625	2,000	2,125	12,34	
average difference from the average score	0,719	0,612	0,571	0,375	0,875	0,286	0,438		
maximal score	3	3	3	2	3	3	3		
minimal score	0	1	1	1	0	1	1		
maximal difference between experts' scores	3	2	2	1	3	2	2		

Q24		Study the propensity of the various vaccines types to lead to appearance of escape mutants.							
Expert	1. Answerability	2. Effectiveness	3. Deliverability	4. Equity	5. Generalization	6. Territory	7. Accessibility	Unweighted sum	
1.	3	3	3	1	3	2	2	17	
2.	0	2	2	1	1	1		8,16 (16)	
3.	2	2	2	1	1	2	2	12	
4.	1	2	2	0	0	2	3	10	
5.	3	3	2					18,66 (13)	
6.	1	1	1	1	1	1	1	7	
7.	2	2	2	1	2	2	2	13	
8.	3	3	3		2	3	3	19,83 (16)	
9.	1	1	1	1	1	1	1	7	
average score	1,778	2,111	2,000	0,857	1,375	1,750	2,000	11,87	
average difference from the average score	0,914	0,593	0,444	0,245	0,719	0,563	0,571		
maximal score	3	3	3	1	3	3	3		
minimal score	0	1	1	0	0	1	1		
maximal difference between experts' scores	3	2	2	1	3	2	2		

4. First (2020) priority list of research questions

EU-JAV WP7.1

Milestone 34

**First annual report on vaccine and vaccination
research priorities in Europe to increase
vaccination coverage.**

17 February 2020

The following work is part of Work package 7 - task 7.1 (WP7.1) of EU-JAV which aims to define and apply a concept framework for decision-making on research priorities for vaccines and immunization.

1. Context

The research funding system in Europe is very complex and involves many actors at both National and Commission level. With the great diversity of possible topics, in a context of limited resources, prioritizing research questions becomes a necessity. Moreover, this selection process must be transparent, evidence-based and carried out rigorously, in accordance with best practices.

2. Scope and objective

The objective of WP7.1 is to define research priorities in Europe in the field of vaccination research, focusing initially on four pre-selected pilot vaccines (pertussis, measles containing vaccines, influenza and HPV).

This process focuses on public health research aiming at improving vaccine coverage, and not on development of novel vaccines. Many of the subjects to be prioritized will therefore, among others, most likely concern epidemiology, human and social sciences as well as implementation research.

The work presented in this report corresponds to the pilot phase which concentrates on four vaccines (measles-containing, pertussis, HPV and influenza vaccines) as determined through consultation of EU-JAV stakeholders; the prioritization exercise will be conducted again on all vaccines during 2020.

3. General methodology

In order to perform the prioritization exercise, the first step was to choose a methodology. With this objective, the WP7.1 team conducted the following activities:

- a scoping literature review on Web of Science
- a review of the grey literature (reports on previous experiences etc)
- interviews with experts of research prioritization processes.

A total of 40 articles were selected for in-depth review. It appeared from this review that use of robust health priority setting processes is recommended on ethical grounds and to assure transparency. Since 2010, the number of priority setting exercises in health research is increasing. Each exercise is performed in a different context and has its own specificities. Therefore, although there is no gold standard, good practices are emerging.

Based on the above analysis, the WP7.1 team decided to use a **multi-criteria decision analysis** methodology inspired by the Child Health and Nutrition Research Initiative (CHNRI), as described below.

The determination of priorities follows several steps.

- Selection of managers of the process
- Definition of the scope of the process
- Identification of key health research questions
- Consolidation of the list of research questions
- Choice of criteria
- Weighting of criteria
- Final ranking of research questions during a face-to-face meeting

In order to ensure that no bias is introduced in the prioritization process by the same experts participating in more than three of the last steps listed above, it was necessary to constitute three groups of independent experts with the right competencies.

4. Implementation of the prioritization process

Once the managers of the process were selected (the WP7.1 team, an expert mathematician from Hungary to work on the algorithms necessary for the prioritization and an observer from the WHO) and the scope was defined, the following tasks were performed:

Task	Timing
Send email to EU-JAV partners asking them to provide names of experts	09.01.2019
Selection of three independent lists of experts (groups 1, 2 and 3) for the three last steps of the process, as indicating above. All the other experts would be asked to provide their key research questions.	24.01.2019
Preparation of the synopsis of the Priority-setting framework	24.03.2019
Web survey sent through email to experts to ask for their key research questions	03.04.2019
First analysis of the responses to the survey and broadening of the outreach	06.05.2019
Determination by expert group 1 of the list of 8 criteria to be used for next steps, through teleconference	22.07.2019
Determination by expert group 2 of the weight for each of the criteria selected by expert group 1, through teleconference after individual voting through a web interface	12.11.2019
Consolidation of the list of 27 research question	17.12.2019
Face to face meeting of expert group 3 to prioritize the research questions for the pilot vaccines, based on individual voting through a web interface attributing a score to each of the 27 questions for the 8 criteria	15.01.2020
Presentation of the results to the EC Steering Group on Health Promotion and Prevention	24.01.2020
Finalization of the final list of research questions for the pilot vaccines	31.01.2020

5. Results of the prioritization process for the four pilot vaccines

On January 15th, 2020, the WP7.1 team organized a face to face meeting with experts group 3 : Marco Cavaleri (Italy and EMA) Daniel Floret (France), Bruce Gellin (USA), Nadia Khelef (France), Hanna Nohynek (Finland), Lill-Iren Schou-Trogstad (Norway) Annick Opinel (France). Bruce Gellin and Hanna Nohynek were present by videoconference. Also present were

- i) the members of WP7.1: Jean-Daniel Lelièvre, Marie-Paule Kieny, Florence Francis
- ii) Sandor Bozoki, who developed the algorithms and the web-based tools,
- iii) Massinissa Si Mehand (WHO) who server as observer to the prioritization process,
and
- iv) Rita Figueira (EC) who represented the European Commission.

The list of 27 research questions to be prioritized had previously been sent to the group of experts who provided individual scores to the research questions for each of the 8 criteria through a web tool developed by Sandor Bozoki. This preliminary step resulted in the consolidated rating and ranking of the 27 research questions.

During the meeting, participants agreed that the questions with the lowest scores would be classified as Tier 3, unless any of the experts proposed to discuss any of them specifically. Questions with high and intermediate scores were discussed in order to reach consensus on whether they would be categorized under Tier 1 or 2. Six questions were thus classified as Tier 1, four as Tier 2 and 15 as Tier 3 (see the three lists below).

Two questions were considered as very important but did not bear relevance with vaccination coverage. It should be noted that, in agreement with all the participating experts, 7 questions were reworded. The Tier 1 questions addressed each of the 4 pilot vaccines and included medical, epidemiological and social science aspects.

Tier 1 priority list

- Assess and compare strategies for systematic measles vaccination catch-up in adolescence/adulthood for people who missed vaccination during childhood, in view of increasing immunity against measles in the population
- Perform a review of evidence and impact of various social media interventions on the perception of HPV vaccination in adolescents and their close adult relatives
- Explore the acceptability of the systematic use of tetravalent (DTPolio +Pertussis) vs trivalent (DTPolio) for revaccination during adulthood.
- Investigate the effectiveness of various influenza vaccine formulations and products (LAIV, high-dose, adjuvanted, QIV vs TIV, cell-based vaccines, recombinant vaccines) in

key target groups, i.e. (very) young children, individual >65, frail and institutionalized older persons.

- Evaluate the effectiveness in children of various ages, on protecting vulnerable persons (in particular elderly family members) against influenza
- Investigate across European countries whether and how much authorizing pharmacists to administer seasonal influenza vaccine to the general population increases influenza vaccination coverage.

Tier 2 priority list

- Conduct cluster randomized trials of various (including AIMS) methods for vaccine conversations in countries in which the HCW who is the main source of vaccine information (either GPs and paediatricians, or nurses) is trained and evaluated. Outcome measures (using standardized and validated scales) would include HCW competencies, HCW acceptance and self-perceived efficacy in advocating vaccination and influencing attitudes in the general population.
- The objective of the research is to decipher the basis of the current disparities in terms of acceptability (for girls and boys and their parents) of HPV vaccination between different European countries in order to help optimizing policies and communication.
- “The objective of the research is to study through an intervention study (RCT or cluster randomized) whether different types of pertussis vaccines can induce herd immunity or have an impact on carriage of the pathogen.”
- Investigate and compare in various European cultural contexts the best learning methods to teach children, youth and other target populations about infectious diseases and vaccines as to develop scientific critical thinking and digital literacy. Serious games or other types of games or applications should be investigated.

Out of scope research questions

- Investigate the impact of vaccination (e.g. influenza, pertussis, pneumococcal disease) in preventing unwarranted use of antibiotics and in combating anti-microbial resistance.
- Conduct seroepidemiological studies of measles immunity and surveys of measles containing vaccines acceptance (including in countries with different vaccination schedules) in HCWs, starting from those at close contact with susceptible infants and immunocompromised patients to understand: i) their immune status against measles; ii) their attitude vs measles vaccination; and iii) potential interventions to improve measles immunity in Europe. This study could be complemented by comparing results obtained

in countries with different policies on measles HCW vaccination (e.g. Finland introduced mandatory measles vaccination in 2018 for all HCW taking care of vulnerable patients).

All experts agreed that the other proposed research questions were falling into Tier 3.

Tier 3 priority list

- Further research the role of “moral values” (e.g. cleanliness, liberty, purity) in vaccine acceptance. Develop value focused messages and evaluate the efficiency of the approach. Studies ideally would be designed as a combination of analytic and interventional research, for example combining qualitative methods and discrete choice experiments to identify and pretest optimized communication content and randomized controlled studies to test them. Studies must include population subgroups in terms of age, socio economic status and vaccine hesitancy, and could be conducted in parallel in several countries.
- Investigate the journey of women through the health system during child-bearing ages in various European countries, identifying the main stakeholders involved in pre-and post-natal care, their knowledge gaps/education needs, as well as barriers and attitude of the different actors regarding vaccination programs relevant to pregnant women (e.g. dT_p, influenza, rubella). Identifying and sharing the best practices will provide guidance to decision makers/governments on most effective modes of increasing knowledge about the value of vaccination among pregnant women, HCWs (GPs, practice nurses, OBGYN, midwives, pharmacists) and medical societies to increase trust in vaccines and confidence in health systems.
- Investigate how the sources of funding (public vs private) provided for vaccine evaluation, and more broadly suspicion of conflicts of interest, influence HCW and/or population trust in vaccine recommendations and drive vaccine hesitancy.
- The objective of the research is to understand determinants of the low acceptability of influenza vaccine by comparing it to the tetanus vaccine (which has good acceptability). This should include -among others -the analysis of parameters such as the age at vaccination, perception of disease severity, the real or perceived safety of the vaccines and their effectiveness. In order to not only study the intention to vaccinate but actual rationale of having made the decision and agreeing to the action, the survey should identify those who ended up taking the vaccine vs. those who did not.
- Evaluate in various European settings the acceptance and preferences of parents to vaccinate children of different ages against influenza, with the goal to provide indirect protection to vulnerable persons (in particular elderly family members).

- Investigate the impact of seasonal flu vaccination (using various influenza vaccine formulations, e.g. inactivate, adjuvanted, live attenuated vaccine) of very young children on imprinting their immune responses to different influenza subtypes and assess whether such imprinting might render them more susceptible towards pandemic influenza. This should best be done in countries with access to register linkage as the sample size needs are most likely very large.
- The objective of the research is to study vaccine coverage and effectiveness in high risk population (ie patients with lung diseases, immunosuppressed patients, ...). Vaccines under consideration are pertussis (if numbers allow), influenza and pneumococcal disease.
- The objective of the research is to perform a comprehensive review of the different vaccine schedules for measles vaccination used in Europe in term of acceptability, immunogenicity and impact on disease incidence. This study should be inspired by a very recent systematic review on this (Hughes et al 2019 in press).
- The objective of the study is to perform a comprehensive review of measles transmission from vaccinated individuals.
- The objective of the research is to decipher the mechanisms of MCV vaccine failure.
- Based on the fact that HPV is more immunogenic in younger age groups and that immunogenicity decreases with sexual debut, the objective of the research is to perform behavioural research to assess acceptability of HPV vaccination in the 9-10y age group.
- The objective of the research is to assess the effectiveness of HPV vaccination as part of the routine early childhood immunisation schedule.
- The objective of the study is to define the best age group for introducing HPV vaccination (e.g. balance between - the age of first sexual intercourse and the age at which an individual can decide for himself; - the immunogenicity of the vaccine, which is better the younger one gets it; - association with various functional disorders, which tend to be less when given at younger age).