Development and Validation of a Framework for Comprehensive Vaccine Value Assessment: A Modified Delphi Study

1. Search Strategy

Supplementary Table S1. Medline search strategy

#	Search terms
1	(Assess* or Evaluat*).ti,ab. or Technology Assessment, Biomedical/ (7811099)
2	Framework*.ti,ab.
3	(value* or benefit* or impact).ti.
4	(vaccin* or immuni$ation*).ti.
5	1 and (2 or 3) and 4 (3861)
6	((value adj2 framework) or 'value framework').ti,ab,mp.
7	5 or 6
8	limit 7 to english language
9	limit 8 to yr="2010 - 2025"
10	limit 9 to humans

Supplementary Table S2. EMbase search strategy

#	Search terms
#1	biomedical technology assessment'/exp OR 'biomedical technology assessment' OR assess*:ti,ab OR evaluat*:ti,ab
#2	framework:ti,ab
#3	value*:ti OR benefit*:ti OR impact:ti
#4	vaccin*:ti OR immuni$ation*:ti
#5	#1 AND (#2 OR #3) AND #4
#6	(value NEAR/2 framework) OR 'value framework'
#7	#5 OR #6
#8	#7 AND ([english]/lim OR [chinese]/lim)
#9	#8 AND 'conference abstract'/it
#10	#9 AND 2009:py
#11	#8 NOT #10 (5,823)
#12	#11 AND [medline]/lim NOT ([embase classic]/lim AND [medline]/lim) (3,640)
#13	#11 NOT #12
#14	#13 AND (2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py OR 2023:py OR 2024:py OR 2025:py)

Supplementary Table S3. PubMed search strategy

((((framework[Title/Abstract]) OR (value*[Title] OR benefit*[Title] OR impact[Title])) AND ((Assess*[Title/Abstract] OR Evaluat*[Title/Abstract]) OR (technology assessment, biomedical[MeSH Terms]))) AND (vaccin*[Title] OR immunization*[Title] OR immunisation*[Title])) OR ("value assessment framework"[All Fields] OR "value framework"[All Fields]) AND (2010:2025[pdat]) AND "pubmednotmedline"[Filter]

Supplementary Table S4. CNKI search strategy

((TI='疫苗' OR TI='免疫') OR (KY='疫苗' OR KY='免疫')) AND ((TI='价值' OR TI='获益') OR (KY='价值' OR KY='获益')) AND (SU='评价体系' OR SU='评价标准' OR SU='评价指标' OR SU='评价方法' OR SU='评价研究')
时间：2000 年 1 月 1 日-2024 年 12 月 31 日

Supplementary Table S5. Wanfang search strategy

(题名或关键词:("疫苗") or 题名或关键词:("免疫规划")) and (题名或关键词:("价值") or 题名或关键词:("获益")) and (主题:(“评价体系”) or 主题:(“评价标准”) or 主题:(“评价指标”) or 主题:(“评价方法”) or 主题:(“评价研究”))
时间：2000 年 1 月 1 日-2024 年 12 月 31 日

Supplementary Table S6. Grey literature sources

Organization	**Link**
Institute of Health Economics	http://www.ihe.ca/index.php?/publications
World Health Organization Publication Repository	https://apps.who.int/iris/searchfilter?field=subject
Health Technology Assessment International	https://htai.org/
ISPOR	https://www.ispor.org
International Health Economics Association	https://www.healtheconomics.org/
National Immunization Technical Advisory Groups Resource Center	https://www.nitag-resource.org/
ImmunizationEconomics.org	http://immunizationeconomics.org/
Advisory Committee on Immunization Practices (ACIP)	https://www.cdc.gov/vaccines/acip/index.html
Office of Health Economics	https://www.ohe.org/
European Commission Public Health	https://health.ec.europa.eu/index_en
中国疾病预防控制中心免疫规划中心	https://www.chinacdc.cn/nip/ywdt/zcyj/

2. Published vaccine frameworks summary

Supplementary Table S7. Vaccine frameworks summary

Framework	Purpose	Vaccines	Peer review	No. of Category	Name of Category	Nation
Ingeborg M.[1] 2016	To first identify economic impacts to vaccinated individuals and, second, assess the relative importance of these economic impacts.	General	Yes	4	1.Health related benefits to vaccinated individuals 2.Short-term and long-term productivity gains 3.Community or health systems externalities 4. Broader economic indicators	Netherlands
Amanda L.[2] 2024	To identify broader value elements and measurement guidance that may be useful for capturing the full value of vaccination.	General	Yes	2	1. Conventional value elements 2. Broader value elements	USA
Ekkehard Beck[3] 2022	To focus on health technology assessment systems to identify relevant value concepts in order to improve current EE of non-pandemic vaccines	Non pandemic vaccine	Yes	3	1. conventional concepts and elements from a healthcare payer perspective 2. conventional concepts and elements from a societal perspective 3. novel concepts and elements from a societal perspective	Global
Ulf Persson[4] 2022	To examine and discuss what type of consequences are relevant for a health economic analysis of vaccines and which consequences are considered by HTA agencies.	General	Yes	2	1.Healthcare 2.Societal	Sweden
Liv Nymark[5] 2020	To bring together this literature, together with the broader literature on internalities and externalities to propose a comprehensive approach for analysts to identify and characterize all unintended consequences in economic evaluations.	General	No	3	1. Biology 2. Demand-side 3. Supply-side	Netherlands
Till Bärnighausen[6] 2008	Argue that in addition to the health benefits of vaccinations, their effects on education and income3 and their benefits for unvaccinated community	General	Yes	2	1.Narrow 2.Broad	South Africa

	members can be considerable and should therefore be included in calculations to establish the value of vaccinations					
David E. Bloom[7] 2017	To assess the extent to which the literature has empirically captured (e.g., through measurement or modeling) the full benefits of adult pneumococcal vaccination	Pneumococcal vaccine	Yes	2	1.Narrow 2.Broad	UK
Ozawa S[8] 2012	To assist policy decisions today and potential investments in the future	General	Yes	2	1.Narrow 2.Broad	LMICs
Bärnighausen T[9] 2014	To conceptualize the full benefits of vaccination, including avoided medical care costs, outcome-related productivity gains, behavior-related productivity gains, community health externalities, community economic externalities, and the value of risk reduction and pure health gains.	General	Yes	2	1.Narrow 2.Broad	USA
Bärnighausen T 2013[10]	To discuss a framework for the broader value of vaccination	Dengue vaccine	No	2	1.Narrow 2.Broad	Brazil
Bärnighausen T[11] 2012	To introduce a general framework to account for a full range of vaccination benefits.	Human papillomavirus vaccine	No	2	1.Narrow 2.Broad	USA
Bärnighausen T[12] 2011	To review conventional methodologies for evaluating the value of the Hib vaccine and to propose a broader set of value elements for its assessment.	Hib vaccine	No	2	1.Narrow 2.Broad	USA
Bloom DE[13] 2017	To discuss potential data sources, methodologies, and unresolved research questions for evaluating the broad value of vaccines.	General	Yes	4	1. Individual Health-related Impacts 2. Individual Productivity Impacts 3. Community/System Impacts 4. Broad Macroeconomic Impacts	USA
Stawasz A[14] 2020	To broaden the understanding of analysts and policymakers regarding the scope and potential magnitude of overall vaccination benefits.	Meningococcal B vaccine	Yes	4	1. Internalized Health Benefits 2. Internalized Nonhealth Benefits 3. Externalized Health Benefits 4. Externalized Nonhealth Benefits	USA
Bloom DE[15] 2020	To propose an alternative socioeconomic evaluation framework incorporating broader benefits beyond conventional health outcomes.	Pneumococcal vaccine	Yes	4	1. Internalized Health Benefits 2. Internalized Nonhealth Benefits 3. Externalized Health Benefits	USA

					4. Externalized Nonhealth Benefits	
Simon B[16] 2020	To develop a framework for evaluating whether specific vaccines generate value exceeding traditional dimensions.	General	Yes	4	1. Health effects 2. Productivity related impact 3. Community or health system externalities 4. Health system economic impact	UK
Deogaonkar R[17] 2012	To provide a comprehensive understanding of vaccine value by measuring broader, long-term impacts on productivity and externalities.	General	Yes	3	1. Health-related benefits 2. Productivity-related benefits 3. Community externalities	Global
Jit M[18] 2015	To establish a conceptual framework delineating the pathways between immunization and its broader economic benefits.	General	Yes	4	1. Health-related benefits to vaccinated individuals 2. Productivity-related benefits 3. Community or health systems externalities 4. Broader economic indicators	Global
Angelis A[19] 2021	To identify the essential elements required for evaluating the broader value of vaccines.	Covid-19 vaccine	No	5	1. Disease 2. Quality and manufacturing 3. Clinical 4. Economic 5. Societal	UK
Wilder-Smith A[20] 2017	To propose an expanded scope of methodologies, metrics, and outcomes to assess the effectiveness and public health impact for evidence-based decision-making.	General	No	2	1.Health outcomes 2.Nonhealth outcomes	Global
Di Fusco M[21] 2023	To propose a conceptual framework for capturing broader value elements and identify methodologies to quantify those not routinely considered in htas.	Covid-19 vaccine	Yes	5	1. Narrow health effects 2. Broader health effects 3.Effect on public finances 4.Societal and economic effects 5.Uncertainty value	Global
Bell E[22] 2022	To describe the gaps between theoretical value elements and those recognized in 9 developed markets, and to provide consensus-based recommendations to overcome barriers.	General	Yes	4	1. Narrow health effects 2. Broad health effects 3. Health system economic effects 4. societal economic effects	UK
Luyten J[23]	To identify key indicators for the evaluation of vaccine	General	No	2	1. Medical aspects of disease and	Belgium

2020	value				vaccine 2. Socio-economic aspects of disease and vaccine	
Barocchi MA[24] 2016	To define multi-criteria frameworks for decision-making in vaccine research and development	General	No	2	1. Narrow 2. Comprehensive	Global
Brassel S[25] 2021	To design a framework aimed at capturing the expanded value of vaccination from a prospective perspective.	General	Yes	4	1. Health effects 2. Productivity related impact 3. Health system and community health impact 4. Health system economic impact	UK
Gebreselassie N[26] 2020	To construct a health economic evaluation model to inform decision-making in tuberculosis vaccine development.	TB vaccines	No	6	1. Health gains 2. Value for money 3. Equity and financial risk protection impact 4. Economic impact 5. Global health security impact 6. Market	Global
Calabro' GE[27] 2022	To provide a novel value-based approach to immunization by synthesizing available scientific evidence.	General	Yes	4	1. Personal Pillar 2. Allocative Pillar 3. Technical Pillar 4. Societal Pillar	Italy
El Banhawi H[28] 2024	To summarize and map evidence regarding the value of selected adult immunization programs across ten different countries.	Adult vaccines	Yes	3	1. Population health 2. Healthcare systems 3. Society	UK

3. Summary of expert response on each value category, value element and value item.

Supplementary Table S8. Summary of the Second Round of Expert Consultation on Value Categories

Value Category	Importance			Association			Uniqueness			Evidence/Data Accessibility			Evidence/Data Quality			Method Accessibility		
	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)
Cat. 1	4.38	12.82	41.00	4.55	11.12	55.00	4.21	14.73	31.00	4.31	10.92	31.00	4.55	11.12	55.00	4.52	12.72	55.00
Cat. 2	4.24	13.6	31.00	4.62	12.15	66.00	3.52	16.33	3.00	4.59	10.93	59.00	4.41	14.22	48.00	4.69	10.04	69.00
Cat. 3	3.59	13.98	0.00	3.55	16.11	0.00	3.97	20.75	28.00	3.52	16.33	3.00	3.21	22.64	3.00	3.79	16.34	10.00
Cat. 4	3.9	24.1	34.00	4.34	17.7	52.00	3.17	38.67	17.00	4.17	22.25	41.00	3.69	25.2	21.00	4	22.16	31.00
Cat. 5	2.59	40.71	3.00	2.9	34.95	7.00	2.03	46.41	0.00	2.52	43.28	3.00	2.41	43.62	0.00	2.62	43.76	3.00

Abbreviation: CV= coefficient of variation; FSR=full score rate.

Supplementary Table S9. Summary of the Second Round of Expert Consultation on Value Elements

Value Element	Importance			Association			Uniqueness			Evidence/Data Accessibility			Evidence/Data Quality			Method Accessibility		
	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)
A	4.97	3.74	96.55	4.97	3.74	96.55	3.90	22.06	27.59	4.52	11.26	51.72	4.48	12.82	51.72	4.34	12.72	37.93
B	4.76	9.15	75.86	4.52	14.03	58.62	3.45	16.60	0.00	4.17	18.20	34.48	4.34	14.13	41.38	4.31	14.01	37.93
C	5	0	100.00	4.55	11.12	55.17	3.79	21.58	20.69	4.55	11.12	55.17	4.14	14.04	24.14	4.14	15.45	27.59
D	4.55	13.88	62.07	4.48	12.82	51.72	3.17	32.70	10.34	4.31	17.65	44.83	4.38	15.46	48.28	4.03	21.45	31.03
E	4.41	12.87	44.83	4.17	18.20	34.48	3.31	18.24	0.00	4.24	19.58	44.83	4.10	15.06	24.14	4.28	15.18	37.93
F	3.62	17.17	6.90	3.34	18.35	0.00	3.00	23.57	0.00	3.17	30.46	6.90	2.93	20.25	0.00	2.55	26.88	0.00
G	3.21	17.44	0.00	2.72	21.71	0.00	2.28	28.52	0.00	2.69	20.13	0.00	2.79	14.76	0.00	2.69	17.5	0.00
H	4.1	15.06	24.14	3.48	25.01	6.90	3.03	16.44	0.00	4.17	17.03	34.48	3.72	23.69	20.69	3.76	18.34	13.79
I	4.03	16.87	20.69	3.07	22.93	0.00	2.69	31.58	0.00	3.79	19.14	17.24	3.21	21.05	0.00	2.97	27.75	3.45
J	4.03	15.51	20.69	3.21	19.33	0.00	3.07	22.93	0.00	3.31	14.22	0.00	3.38	20.03	3.45	2.86	18.02	0.00

K	2.76	31.62	3.45	2.62	27.77	0.00	2.41	30.36	0.00	2.66	32.27	0.00	2.21	32.90	0.00	2.21	30.59	0.00
L	3.00	21.82	0.00	2.41	23.53	0.00	2.62	25.83	0.00	2.59	24.27	0.00	2.83	23.29	0.00	2.52	25.17	0.00
M	4.38	15.46	48.28	3.66	18.32	10.34	3.28	28.14	3.45	3.97	17.16	20.69	3.66	16.79	6.90	3.21	21.05	3.45
N	3.28	16.10	0.00	3.55	22.05	10.34	3.00	23.57	0.00	3.79	21.58	20.69	3.28	19.81	0.00	3.41	24.15	6.90
O	4.17	15.78	31.03	4.17	15.78	31.03	3.52	20.98	6.90	3.97	17.16	20.69	3.76	16.91	10.34	3.59	17.5	3.45
P	2.48	27.70	0.00	2.00	18.90	0.00	2.21	30.59	0.00	2.66	23.12	0.00	2.62	21.43	0.00	2.31	23.43	0.00
Q	4.03	15.51	17.24	3.24	17.79	0.00	3.48	19.75	6.90	3.62	22.65	17.24	3.38	31.05	10.34	3.62	22.65	13.79
R	3.10	24.88	0.00	2.79	22.19	0.00	2.48	27.70	0.00	2.83	19.07	0.00	2.72	29.26	0.00	2.76	33.08	0.00
S	3.14	23.67	0.00	2.59	24.27	0.00	2.79	24.17	0.00	3.21	17.44	0.00	2.83	23.29	0.00	2.52	29.31	0.00
T	2.45	33.80	0.00	2.48	25.52	0.00	2.10	23.24	0.00	2.86	20.30	0.00	2.66	27.15	0.00	2.24	32.99	0.00
U	2.72	27.57	3.45	2.31	26.13	0.00	1.97	16.56	0.00	2.72	16.70	0.00	2.52	25.17	0.00	2.17	34.95	0.00

Abbreviation: CV= coefficient of variation; FSR=full score rate.

Supplementary Table S10. Summary of the Second Round of Expert Consultation on Value Items

Value Item	Importance			Association			Uniqueness			Evidence/Data Accessibility			Evidence/Data Quality			Method Accessibility		
	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)	Mean	CV	FSR (%)
A1	5.00	0.00	100.00	4.97	3.74	96.55	4.28	17.56	44.83	4.83	7.96	82.76	4.41	15.46	51.72	4.00	13.36	13.79
A2	5.00	0.00	100.00	4.93	5.23	93.10	4.55	11.12	55.17	4.86	7.22	86.21	4.28	13.83	34.48	4.41	11.36	41.38
A3	5.00	0.00	100.00	4.69	10.04	68.97	4.62	10.69	62.07	4.66	10.39	65.52	4.83	7.96	82.76	4.45	12.87	48.28
A4	5.00	0.00	100.00	4.83	7.96	82.76	4.72	9.63	72.41	4.59	13.69	65.52	4.62	12.15	65.52	4.48	12.82	51.72
A5	5.00	0.00	100.00	4.90	6.33	89.66	4.72	9.63	72.41	4.79	8.60	79.31	4.34	14.13	41.38	4.28	15.18	37.93
A6	5.00	0.00	100.00	5.00	0.00	100.00	4.52	12.72	55.17	4.90	6.33	89.66	4.55	11.12	55.17	4.10	18.81	31.03
A7	5.00	0.00	100.00	4.93	5.23	93.10	4.41	11.36	41.38	4.55	11.12	55.17	4.69	10.04	68.97	3.28	16.10	3.45
A8	5.00	0.00	100.00	5.00	0.00	100.00	4.76	9.15	75.86	3.76	16.91	6.90	4.59	10.93	58.62	4.66	10.39	65.52
A9	5.00	0.00	100.00	4.45	11.38	44.83	4.34	15.41	44.83	4.21	17.26	34.48	4.52	12.72	55.17	4.52	11.26	51.72
A10	4.00	0.00	0.00	4.76	9.15	75.86	4.10	23.79	44.83	4.34	15.41	44.83	3.86	19.23	17.24	4.76	9.15	75.86
A11	4.00	0.00	0.00	4.03	4.60	3.45	3.86	25.64	31.03	4.90	6.33	89.66	4.59	12.39	62.07	4.38	12.82	41.38

A12	5.00	0.00	100.00	3.97	12.58	10.34	4.03	21.45	34.48	4.62	10.69	62.07	4.31	14.01	37.93	4.03	18.12	27.59
A13	4.97	3.74	96.55	4.97	3.74	96.55	4.45	17.61	58.62	4.48	14.13	55.17	4.28	13.83	34.48	4.00	18.90	27.59
B1	4.97	3.74	96.55	4.76	9.15	75.86	4.59	12.39	62.07	3.59	21.75	6.90	4.00	16.37	20.69	3.79	26.72	31.03
B2	5.00	0.00	100.00	4.72	9.63	72.41	4.45	14.20	51.72	4.31	15.32	41.38	3.72	26.75	20.69	4.55	11.12	55.17
B3	4.90	6.33	89.66	4.41	12.87	44.83	4.34	17.70	51.72	4.14	15.45	27.59	4.28	15.18	37.93	3.93	16.56	17.24
B4	4.90	6.33	89.66	4.76	9.15	75.86	4.48	12.82	51.72	4.10	18.81	34.48	3.24	22.81	0.00	3.83	26.19	31.03
B5	4.79	8.60	79.31	4.38	11.28	37.93	4.62	12.15	65.52	4.79	8.60	79.31	4.55	11.12	55.17	4.55	16.17	65.52
B6	4.66	10.39	65.52	4.72	9.63	72.41	4.24	21.51	55.17	4.17	15.78	31.03	3.28	21.43	3.45	3.48	14.60	0.00
B7	4.17	11.22	20.69	3.79	23.77	24.14	4.62	12.15	65.52	4.38	14.20	44.83	4.17	18.20	34.48	3.66	27.63	24.14
C1	5.00	0.00	100.00	4.79	8.60	79.31	4.24	14.98	34.48	4.76	9.15	75.86	4.28	16.41	41.38	4.14	20.14	37.93
C2	5.00	0.00	100.00	4.97	3.74	96.55	4.17	14.42	27.59	4.62	10.69	62.07	4.66	10.39	65.52	4.72	9.63	72.41
C3	3.00	0.00	0.00	4.00	16.37	20.69	3.17	18.97	0.00	4.72	9.63	72.41	4.24	13.60	31.03	4.59	13.69	65.52
C4	4.00	0.00	0.00	3.14	16.44	0.00	2.83	28.46	0.00	4.62	12.15	65.52	3.86	16.56	10.34	4.55	15.07	62.07
D1	4.69	10.04	68.97	4.97	3.74	96.55	4.62	10.69	62.07	3.66	19.72	6.90	4.41	15.46	51.72	3.90	25.06	31.03
D2	4.45	11.38	44.83	4.69	10.04	68.97	4.14	22.12	41.38	3.79	26.72	31.03	4.28	15.18	37.93	4.52	12.72	55.17
E1	4.45	12.87	48.28	4.31	19.71	51.72	4.38	14.20	44.83	4.45	12.87	48.28	4.38	14.20	44.83	4.00	11.57	10.34
E2	4.28	17.56	44.83	3.10	23.34	3.45	3.90	18.59	17.24	4.66	11.87	68.97	4.17	18.20	37.93	3.86	17.94	17.24
E3	4.41	14.22	48.28	4.31	17.65	48.28	3.90	14.30	10.34	4.34	14.13	41.38	2.86	29.12	3.45	4.14	15.45	27.59
F1	3.17	18.97	0.00	2.00	35.36	0.00	1.86	34.34	0.00	3.28	24.33	6.90	2.55	24.75	0.00	2.55	30.69	0.00
F2	1.97	25.38	0.00	3.24	25.62	6.90	2.07	36.38	0.00	3.38	30.03	13.79	2.69	20.13	0.00	2.90	33.71	3.45
G1	3.83	21.03	24.14	3.90	18.59	20.69	3.34	21.55	3.45	2.66	23.12	0.00	2.90	25.01	3.45	2.17	37.05	0.00
G2	2.90	25.01	0.00	3.07	30.08	3.45	2.66	41.84	3.45	2.66	20.81	0.00	3.03	22.42	0.00	2.48	27.70	0.00
G3	2.24	30.76	0.00	3.83	18.56	17.24	3.21	22.64	0.00	2.90	16.87	0.00	2.34	30.74	0.00	1.86	37.22	0.00
G4	2.59	39.37	3.45	3.10	26.33	3.45	2.03	42.53	0.00	3.97	20.75	24.14	3.07	22.93	0.00	1.62	41.76	0.00
G5	2.76	20.90	0.00	3.24	17.79	0.00	2.24	35.08	0.00	2.34	34.71	0.00	3.93	19.15	24.14	3.17	26.73	3.45
H1	4.66	10.39	65.52	3.83	25.24	27.59	4.24	16.26	37.93	3.69	26.22	20.69	3.66	24.55	20.69	2.97	22.95	0.00
H2	3.93	19.15	24.14	4.28	15.18	37.93	3.55	16.11	3.45	1.72	30.60	0.00	3.03	24.09	0.00	3.48	23.80	10.34
H3	3.10	30.26	6.90	3.76	15.34	3.45	3.07	24.52	3.45	3.07	28.79	6.90	3.59	28.40	13.79	3.45	21.35	6.90
H4	3.24	21.27	3.45	3.14	20.38	0.00	3.00	23.57	0.00	4.34	14.13	41.38	3.69	16.36	6.90	3.69	16.36	6.90

H5	3.07	30.08	3.45	3.00	30.86	6.90	2.31	38.55	0.00	3.86	16.56	13.79	4.24	17.43	41.38	3.21	19.33	0.00
I1	2.76	34.46	3.45	1.79	34.57	0.00	2.17	39.04	0.00	4.41	16.60	55.17	4.14	17.95	34.48	3.10	27.70	6.90
I2	3.83	15.72	10.34	3.48	23.80	6.90	3.59	19.03	3.45	2.38	30.58	0.00	3.17	22.40	0.00	3.79	23.77	24.14
I3	2.10	23.24	0.00	2.21	35.06	0.00	2.45	30.07	0.00	2.86	22.34	0.00	3.07	21.21	0.00	2.86	27.58	0.00
I4	2.90	21.33	0.00	3.38	16.62	3.45	2.45	30.07	0.00	3.93	19.15	24.14	3.72	17.43	10.34	4.17	15.78	31.03
I5	2.07	36.38	0.00	1.52	33.52	0.00	2.83	21.28	0.00	2.66	28.96	3.45	3.86	24.68	31.03	3.28	25.67	6.90
J1	2.97	16.82	0.00	1.97	28.79	0.00	2.72	19.37	0.00	2.48	27.70	0.00	2.17	32.71	0.00	2.90	16.87	0.00
J2	4.14	10.66	17.24	4.00	18.90	27.59	3.45	27.50	10.34	1.86	27.70	0.00	3.21	19.33	3.45	2.86	30.58	0.00
J3	3.97	4.68	0.00	4.03	18.12	24.14	2.69	33.11	0.00	2.48	45.19	6.90	3.76	15.34	6.90	3.45	24.00	10.34
K	3.03	29.85	6.90	3.76	16.91	10.34	3.52	16.33	3.45	3.10	19.91	0.00	2.48	35.08	0.00	2.38	28.45	0.00
L1	3.28	19.81	3.45	2.34	23.57	0.00	3.03	32.34	3.45	2.66	20.81	0.00	2.62	29.58	3.45	2.90	33.71	3.45
L2	2.72	21.71	0.00	2.62	25.83	0.00	2.00	35.36	0.00	2.69	22.45	0.00	2.72	32.39	0.00	2.14	29.91	0.00
L3	2.55	19.83	0.00	2.48	36.70	0.00	1.93	33.71	0.00	2.83	23.29	0.00	2.62	21.43	0.00	3.24	25.62	6.90
M1	4.90	6.33	89.66	3.79	14.74	3.45	4.17	19.29	37.93	4.62	12.15	65.52	3.00	19.92	0.00	2.07	25.61	0.00
M2	4.10	15.06	24.14	2.97	26.25	0.00	3.66	24.55	20.69	3.59	26.37	13.79	3.79	20.40	17.24	4.55	11.12	55.17
M3	3.90	22.06	27.59	4.07	17.29	27.59	3.93	24.45	34.48	2.52	22.82	0.00	3.52	14.46	0.00	2.93	15.61	0.00
M4	4.00	17.68	20.69	3.90	14.30	10.34	4.28	16.41	41.38	3.14	18.51	0.00	4.07	17.29	27.59	2.48	20.48	0.00
M5	4.14	19.08	34.48	3.00	26.73	0.00	3.69	33.28	34.48	3.34	22.99	3.45	3.72	20.17	13.79	3.79	19.14	13.79
N1	4.83	7.96	82.76	3.97	19.63	27.59	4.07	17.29	24.14	3.38	28.97	10.34	2.28	25.99	0.00	3.62	23.82	17.24
N2	4.31	15.32	41.38	3.24	19.61	0.00	3.21	21.05	3.45	1.72	26.38	0.00	3.21	19.33	0.00	1.66	33.39	0.00
O1	4.03	19.29	27.59	3.86	15.04	10.34	3.62	23.82	17.24	4.34	14.13	41.38	3.79	20.40	13.79	3.14	20.38	0.00
O2	3.03	20.62	0.00	3.69	19.31	13.79	3.28	18.05	0.00	3.21	17.44	0.00	3.10	15.75	0.00	2.86	34.59	3.45
O3	4.66	10.39	65.52	3.72	17.43	6.90	4.10	18.81	31.03	4.03	21.45	34.48	4.14	16.75	31.03	3.97	20.75	27.59
O4	3.10	17.95	0.00	2.34	36.54	3.45	2.93	30.15	3.45	4.59	12.39	62.07	3.17	23.93	3.45	3.72	22.58	20.69
P1	3.52	22.31	10.34	4.83	7.96	82.76	4.31	14.01	37.93	3.03	16.44	0.00	2.21	18.68	0.00	2.28	23.18	0.00
P2	3.10	23.34	0.00	3.69	17.90	10.34	3.93	22.48	31.03	1.17	32.79	0.00	2.55	22.43	0.00	2.97	21.10	0.00
P3	3.93	20.32	24.14	3.17	18.97	0.00	2.66	18.22	0.00	2.69	17.50	0.00	2.31	28.58	0.00	2.41	28.27	0.00
Q1	4.52	11.26	51.72	4.00	20.04	27.59	4.03	18.12	27.59	3.07	28.79	3.45	3.86	19.23	17.24	3.69	20.62	13.79
Q2	2.97	31.84	10.34	4.17	14.42	27.59	3.31	18.24	0.00	3.66	27.63	24.14	3.83	30.49	34.48	3.10	26.33	3.45

R	2.07	34.01	0.00	2.41	20.77	0.00	2.17	27.70	0.00	2.45	23.38	0.00	2.76	30.10	0.00	2.00	37.80	0.00
S	3.28	18.05	0.00	4.07	17.29	27.59	3.59	19.03	6.90	2.90	21.33	0.00	3.17	20.75	3.45	2.10	19.46	0.00
T1	2.90	29.68	3.45	2.86	27.58	0.00	2.34	34.71	0.00	2.48	23.14	0.00	3.55	24.48	13.79	2.76	31.62	0.00
T2	4.03	16.87	24.14	3.76	26.28	24.14	2.17	39.04	0.00	2.69	20.13	0.00	2.72	29.26	0.00	2.86	29.12	6.90
T3	2.10	34.43	0.00	3.24	24.26	3.45	2.48	33.39	0.00	2.03	24.52	0.00	2.72	29.26	0.00	2.69	31.58	0.00
T4	2.07	34.01	0.00	3.03	20.62	3.45	2.17	27.70	0.00	1.97	28.79	0.00	1.93	36.44	0.00	1.86	37.22	0.00
U	3.17	23.93	0.00	2.21	22.26	0.00	2.72	19.37	0.00	1.07	24.12	0.00	1.79	34.57	0.00	1.00	0.00	0.00

Abbreviation: CV= coefficient of variation; FSR=full score rate.

4. Sensitivity analysis on the consensus status

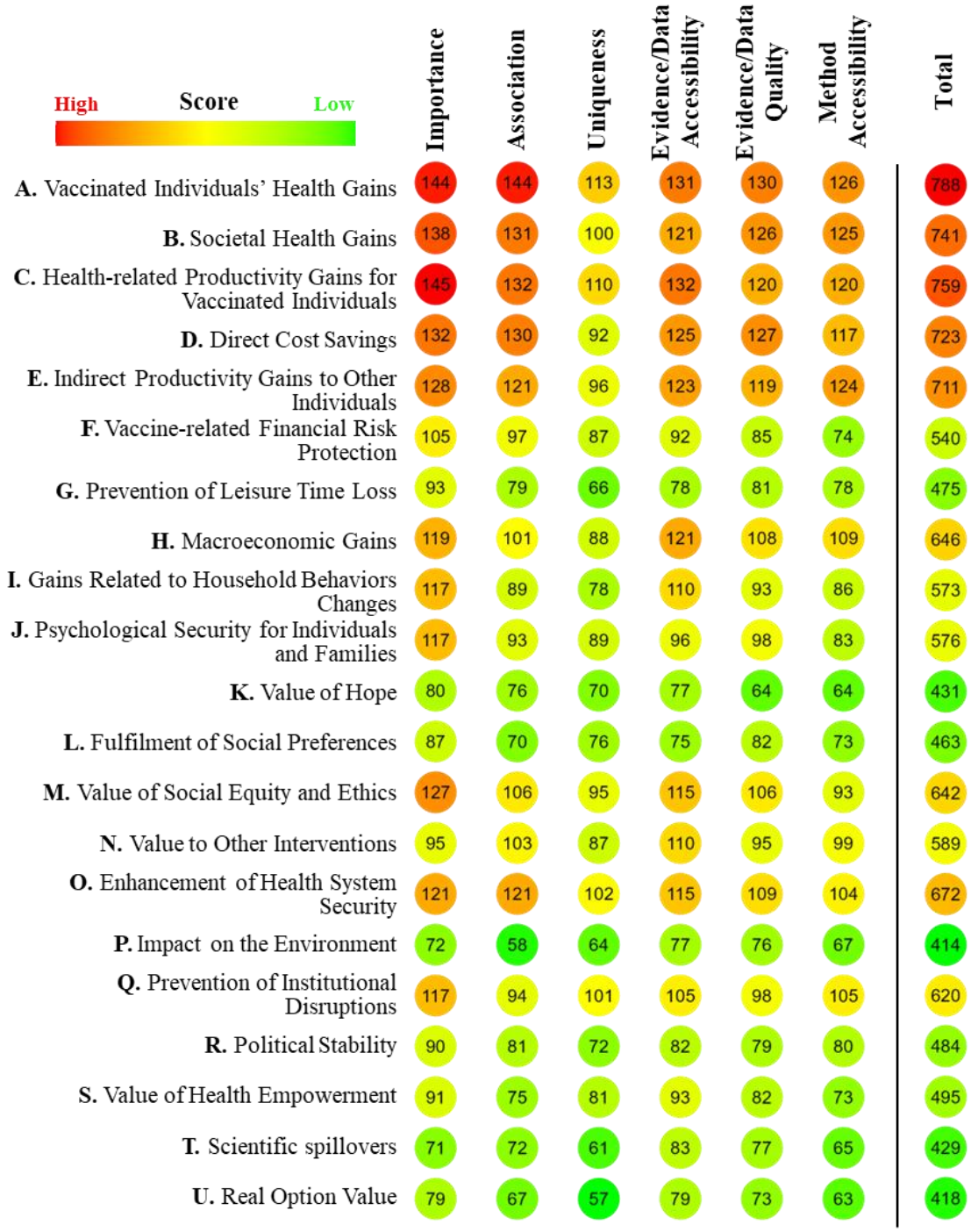


Supplementary Figure S1. Consensus on each value element post 2nd round consultation with 62% threshold.

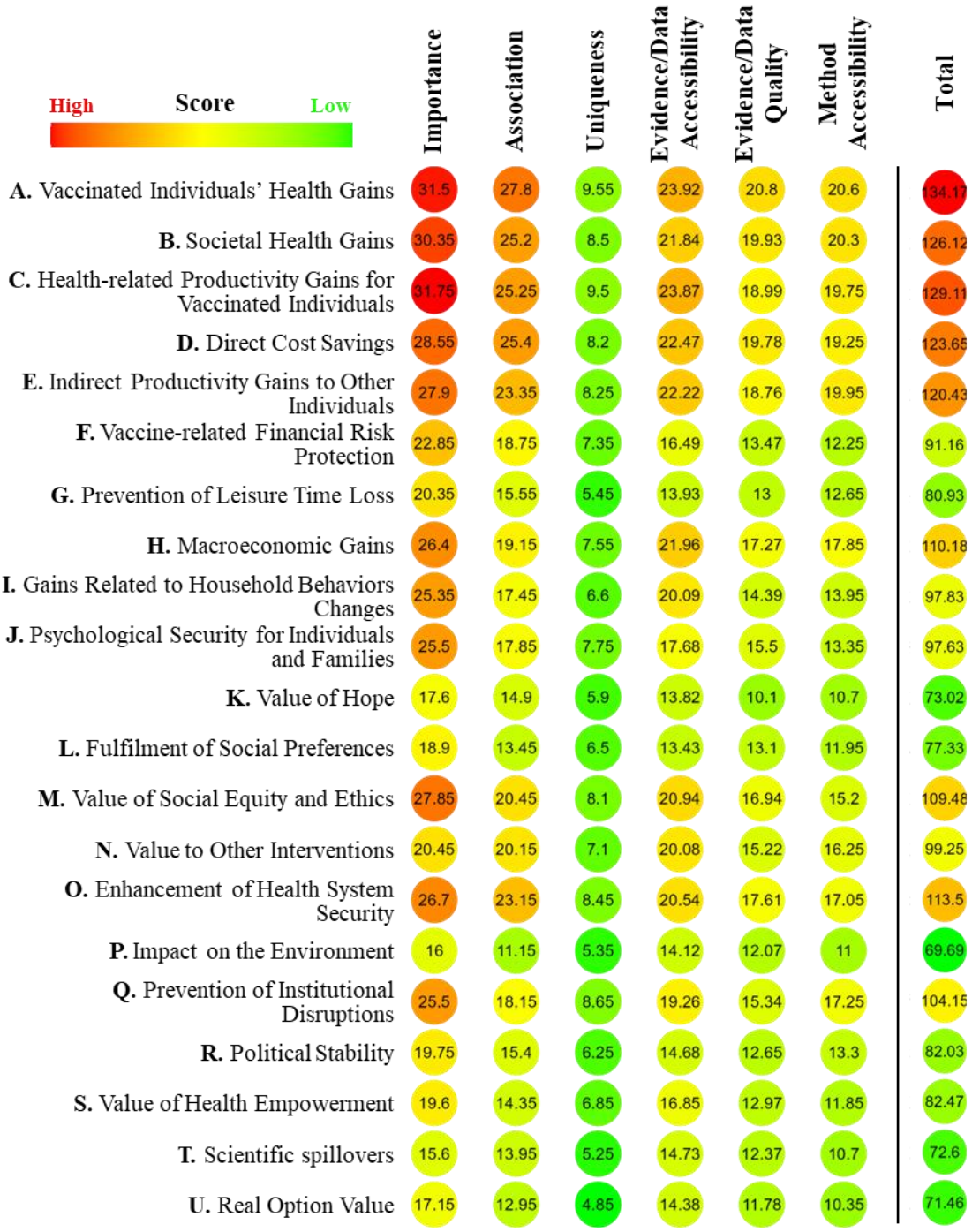


Supplementary Figure S2. Consensus on each value element post 2nd round consultation with 73% threshold.

5. Prioritization analysis of vaccine value element



Supplementary Figure S3. Raw scores of value elements on each criterion post 2nd round consultation.



Supplementary Figure S4. Weighted scores of value elements on each criterion post 2nd round consultation.

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