PDVAC (virtual) meeting:

Immunization Agenda 2030 and Strategic Priority 7 (Research & Innovation):

Partnering with regions and countries to identify priority pathogens for vaccine development

18th July 2022
### Overview of the agenda

This meeting is being recorded

<table>
<thead>
<tr>
<th>Time (CET)</th>
<th>Topic</th>
<th>Duration</th>
<th>Presenters (TBC)</th>
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<tbody>
<tr>
<td>15.00</td>
<td>1. Introduction to this topic in the context of other activities</td>
<td>10’</td>
<td>Birgitte Giersing</td>
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<tr>
<td>15.10</td>
<td>2. IA2030 and SP7</td>
<td>10’</td>
<td>KP Asante/David Kaslow</td>
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<td>15.20</td>
<td>3. Overview of landscape of existing pathogen priorities</td>
<td>10’</td>
<td>Angela Hwang</td>
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<tr>
<td>15.30</td>
<td>4. Overview of proposed methodology and presentation of demo results</td>
<td>15’</td>
<td>Mateusz Hasso-Agopsowicz</td>
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<td>15.45</td>
<td>5. Next steps &amp; time horizon</td>
<td>10’</td>
<td>Birgitte Giersing</td>
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<tr>
<td>15.55</td>
<td>Open discussion and questions</td>
<td>35’</td>
<td>All</td>
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<tr>
<td>16.30</td>
<td>Closed discussion I</td>
<td>30’</td>
<td>PDVAC, SP7 regional members and RITAG chairs</td>
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<tr>
<td>17.00</td>
<td>Closed discussion II</td>
<td>45’ total</td>
<td>PDVAC ONLY</td>
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<td>17.00</td>
<td>6. Synergy of pathogen prioritization with mRNA-vaccine platform development</td>
<td>15’</td>
<td>Erin Sparrow</td>
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<tr>
<td>17.15</td>
<td>Discussion</td>
<td>30’</td>
<td>PDVAC ONLY</td>
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<td>17.45</td>
<td>Meeting close</td>
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01  Introduction to this topic in the context of other activities
Why do we need ‘a better’ prioritization strategy for new vaccines?

Historically, priority-setting have been set globally top-down and individually by industry and by research funders.

The Past

- Historically, priorities have been set individually by industry and by research funders. Global experts and advocates have also proposed priorities.

- Countries and regions have had little involvement in priority setting. As a result, development and uptake of new vaccines for use in low-income settings has lagged – and uptake of vaccines in these settings occurs several years or more behind licensure and uptake in higher income settings.

- GVAP, the Global Vaccine Action Plan, was seen as a top-down strategy, focused on global goals and targets. Its successor – Immunization Agenda 2030 - places countries and regions at the center of strategy development.

Objectives

1. Establish and strengthen capacity at all levels to identify priorities for innovation, and to create and manage innovation.

2. Develop new vaccines and technologies, and improve existing products and services for immunization programs.

3. Evaluate promising innovations and scale up innovations, as appropriate, based on the best available evidence.

These objectives are overseen by the Strategic Priority 7 Working Group (SP7 WG).
Why do we need to identify ‘priority pathogens’?

To monitor progress in IA2030

IA2030 Research & Innovation Goal
Innovations to increase the reach and impact of immunization programs are rapidly made available to all countries and communities

Objectives

1. Establish and strengthen capacity at all levels to identify priorities for innovation, and to create and manage innovation
2. Develop new vaccines and technologies, and improve existing products and services for immunization programs
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Indicators

SP 7.1 Proportion of countries with national agenda for research on immunization

Monitored through annual Joint Reporting Form process – baselining in progress

Why do we need to identify ‘priority pathogens’?

To monitor progress in IA2030

**IA2030 Research & Innovation Goal**
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**Indicators**

- **SP 7.1** Proportion of countries with national agenda for research on immunization
- **SP 7.2** Progress toward global research and development targets

  Monitored based on a “short list” of global pathogen targets for new vaccines (where vaccines do not yet currently exist, or where a new indication is needed), to be developed by WHO (PDR/PDVAC) and endorsed by SAGE

Priority setting under IA2030 – principles and ways of working

Aim to accelerate vaccine research and innovation in line with country/regional priorities

The Present: Immunization Agenda 2030

IA2030 Vision for Research & Innovation

- Aligned priorities can focus funding and resources, and enable coordination for acceleration

- A robust priority-setting process will build awareness of disease burden, risks and threats, and potential interventions.

- We are seeking to collectively develop an approach to identify regional and country priorities for vaccine development, and a platform or mechanism to support driving progress towards the 3 objectives at the country, regional and global levels

- The first deliverable is “short list” of global pathogen targets for new vaccines (where vaccines do not yet currently exist, or where a new indication is needed),

Source: ImmunizationAgenda2030.org
The impact of Covid in shifting the vaccine investment paradigm from North to South

The moral imperative to address the systemic issue of vaccine inequity and access

Figure 2: Inequity: Share of people who completed the initial vaccination protocol as of 01 May 2022
Total number of people who received all doses prescribed by the initial vaccination protocol, divided by the total population of the country.
Source: Our World in Data

Establishment of a COVID-19 mRNA vaccine technology transfer hub to scale up global manufacturing

Source: Transforming or Tinkering? Inaction lays the groundwork for another pandemic
Transforming or Tinkering? Inaction lays the groundwork for another pandemic (live-the-independent-panel.pantheonsite.io)

Need to link research, development and innovation for sustainability – WHO framework for priority mRNA-vaccines in development
SP7, indicator 7.1 - Proportion of countries with an immunization research agenda

Setting a baseline for IA2030 from the Joint Reporting Process

- Electronic joint reporting forms (eJRF) collect countries’ annual immunization data which helps identify trends and gaps at the country, regional, and global level.
- In 2021, a question was added to report on whether countries had an immunization research agenda
  - As of July 2022, 180 countries/territories (85%) have submitted their 2021 eJRF
  - 20 (11% of responders) did not provide an answer to this question
  - 139 (77% of responders) report that they do not have an immunization research agenda
  - 21 (12%) indicated that they did have a research agenda:
    - 8 (4%) provided a document that could be considered a research agenda (*or development towards one*)
    - 4 provided a document that was not a research agenda
    - 9 answered yes but did not provide further information
Potential elements of a country or regional research agenda (non-exhaustive)

The indicator for objective SP7.2 is related to just one element...

SP 7.2 Progress toward global research and development targets

Monitoried based on a “short list” of global pathogen targets for new vaccines (where vaccines do not yet currently exist, or where a new indication is needed), to be developed by WHO (PDR/PDVAC) and endorsed by SAGE
To aid the prioritisation discussion, IVB is developing a series of vaccine value profiles (VVPs) for pipeline vaccines

1. Chikungunya
2. Cytomegalovirus
3. Enterotoxigenic Escherichia coli (ETEC)
4. Gonococcus
5. Group B Streptococcus (GBS)
6. Herpes simplex virus (HSV)
7. HIV vaccine and mAbs
8. Hookworm
9. Improved influenza vaccines
10. Invasive non-typhoidal salmonella (iNTS)
11. Leishmaniasis
12. Next generation Malaria vaccines and mAbs
13. Norovirus
14. Respiratory Syncytial Virus (RSV) vaccine and monoclonal for maternal immunization
15. Salmonella paratyphi
16. Shigella
17. Schistosomiasis
18. Tuberculosis (adolescent and adult indication)

• ‘Vaccine Value Profiles’ (VVPs) are intended to provide a high-level, holistic assessment of the elements that are currently available to inform vaccine value for pipeline vaccines and vaccine-like products (i.e. monoclonal antibodies) against priority pathogens.

• The list of pathogens for VVP development was identified in discussions with the Gavi policy/VIS team, TDR and STI roadmaps.

• Several vaccines are close to licensure (1-5 years) – possible candidates for Gavi VIS

• Currently does not include R&D Blueprint (pandemic) pathogens

• The value assessments will be published in 2022 and are intended to help support discussions on vaccine prioritisation
Proposed process for research and innovation agenda setting for IA2030 SP7

Proposed Engagement Model

Strategic Advisory Group of Experts on Immunization (SAGE)

PDVAC: R&D priorities including priority pathogens

IA2030 reports

RITAG reports

WHO (global, regional country):
- IVB
- Science & innovation
- R&D blueprint
- TDR; NTD; SRH
- Disease specific programmes
- …..

SP7 WG:
2 members from each region (RITAG or NITAG members)
Core members from WHO, UNICEF, Gavi, NIH, CDC; Wellcome Trust, CEPI

RITAGs
Partner with SP7 WG to shape R,D & I agenda and interface with countries

NITAGS & Country programmes, including input on implementation, operations and suitability/feasibility of innovations

Consultative engagement

Partnership model
How do we create buy-in and operationalize setting pathogen targets for new vaccines (SP7.2)?

Proposed Engagement Model

Continuing feedback

Define criteria and identify priorities

Set R&D targets
March 2023

Adapt R&D strategies

Monitor progress

- SAGE
- PDVAC
- WHO IVB
- NITAGs
- Countries

- Indicator 7.2

- Funders
- Researchers
- Pharma
- Regulators
- WHO
- etc.

- IA2030 M&E
- SP7 WG
How do we identify priorities?

Data-guided, regionally focused, and partnership-based approach

<table>
<thead>
<tr>
<th>Prepare</th>
<th>Q2-Q3 2022</th>
<th>Implement</th>
<th>Q4 2022</th>
<th>Synthesize</th>
<th>Q1-Q2 2023</th>
<th>IA2030 M&amp;E</th>
<th>2024-2030</th>
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<tbody>
<tr>
<td>✓ Landscape review: what priorities have already been established?</td>
<td>✓ Multicriteria Decision Analysis (MCDA): users fill out a survey, making pairwise choices between hypothetical pathogens to show which criteria are most important to them (see slides 12-13)</td>
<td>✓ Aggregate global priorities: describe commonalities and differences in regional priorities, propose a pathogen target “short list” for SP 7.2 M&amp;E</td>
<td>• Ongoing M&amp;E: track progress against priorities by monitoring the vaccine R&amp;D pipeline</td>
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<tr>
<td>✓ Propose criteria to consider when setting priorities. Examples include health burden, economic burden, feasibility, impact on anti-microbial resistance, pandemic potential</td>
<td>✓ Pilot with regional and global partners</td>
<td>✓ PDVAC and SAGE review, refine, and endorse methods and outcomes</td>
<td>• Revisit priorities as warranted: MCDA can be re-run in response to new data or potential shifts in what stakeholders see as important</td>
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<tr>
<td>✓ Identify list of pathogens that could be included in prioritization exercise</td>
<td>✓ Adjust the model based on partner feedback</td>
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<tr>
<td>✓ Develop vaccine value profiles for priority vaccines</td>
<td>✓ Setup the partnership model, including the consultations with regions and RITAGs/Working Groups</td>
<td>• Proposal for partnership on achieving SP7 objectives</td>
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<tr>
<td>✓ Propose the model for partnership on achieving SP7 objectives</td>
<td>✓ Adjust the model based on regional consultation feedback</td>
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Partnership model can be applied to other elements of the IA2030 SP7 agenda

Objectives & anticipated outcomes of this session

• Introduce the IA2030 remit and the SP7 scope and objectives;
• Provide an overview of the landscape of existing/current literature on pathogen priorities;
• Propose an approach and methodology to partner across global/regional/country stakeholders to identify priority pathogen targets for which vaccines do not yet exist;

➢ Understand the feasibility of the proposed model for regional/country partnership to identify priority pathogens for pipeline vaccines, based on collaboration of RITAGs, SP7 and WHO/PDVAC;
➢ Endorsement on the general approach and methodology to identify regional priority pathogens for new vaccine development as basis for the ‘short-list’ to present to SAGE in 2023.
02 Immunization Agenda 2030 and Strategic Priority 7
PDVAC Meeting

18th July 2022

Immunization reaches more people than any other health or social service and is a vital component of primary health care.
# PDVAC Meeting 18 July 2022

## Presentation outline

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<td><strong>3</strong> Proposed role of PDVAC and RITAG within the IA2030 model</td>
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<tr>
<td><strong>4</strong> Questions/Next step (deferred to end of session)</td>
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</table>
IA2030: Built from lessons learned from GVAP; not simply more of the same

- Cooperative design from **bottom up**
- Tailored to **national context**
- Adaptable to changing needs
- Targeted ways to **reduce inequity**
- **Life-course** approach
- Accelerating innovation (**not just new vaccines, but also to increase reach and impact of immunization**)
STRATEGIC PRIORITY 7.

Research & innovation

Goal
Innovations to increase the reach and impact of immunization programmes are rapidly made available to all countries and communities.

Objectives

• Establish and strengthen capacity at all levels to identify priorities for innovation, and to create and manage innovation.

• Develop new vaccines and technologies, and improve existing products and services for immunization programmes.

• Evaluate promising innovations and scale up innovations, as appropriate, on the basis of the best available evidence.
Key areas of focus

**Needs-based innovation:** Strengthen mechanisms to identify vaccine-related research and priorities for innovation according to community needs, particularly for underserved populations, and ensure that the priorities inform innovations in immunization products, services and practices.

**New and improved products, services and practices:** Accelerate the development of new vaccines, technologies and improved products, services and practices, while ensuring continued progress in the development of vaccines for priority targets, including HIV, TB, malaria and emerging infectious diseases.

**Evidence for Implementation:** Shorten the path to maximum vaccine impact by implementation and operational research and through evidence-informed decisions on policy and implementation based on sound evidence of needs, benefits and risks.

**Local innovation:** Build local capacity to address programme challenges and maximize impact by cooperative creation, sourcing, adopting and scaling-up of innovations.
OPERATIONALIZATION
## PDVAC Meeting  18 July 2022

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### IA2030 Working Groups

- **13 ‘Technical’ Working Groups**
- **3 ‘Functional/Cross Cutting’ Working Groups**
- Each Working Group to have a **global-level partner responsible for leading** coordination and functioning of the group.
- Working Groups to have **balanced representation**: North/South, country/region/global, gender, CSOs, ‘free thinkers’.
- Commit to at least one **consultative engagement** with broad stakeholder participation per year
- Drive **M&E cycles** and provide **technical guidance** to drive immunization programmes and learning agendas

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<thead>
<tr>
<th>Focus Area</th>
<th>Lead Partner</th>
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<tr>
<td>SP1: PHC/UHC</td>
<td>USAID</td>
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<td>SP2: Commitment and Demand</td>
<td>WHO/JSI</td>
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<td>SP3: Coverage and Equity</td>
<td>WHO</td>
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<td>SP4: Lifecourse and Integration</td>
<td>CDC</td>
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<td>SP5: Outbreaks</td>
<td>IFRC</td>
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<td>SP5: Emergencies</td>
<td>WHO</td>
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<td>SP6: Supply Security</td>
<td>UNICEF</td>
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<td>SP6: Financial Sustainability</td>
<td>WB</td>
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<td><strong>SP7: Research and Innovation</strong></td>
<td>PATH</td>
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<td>Middle - income countries</td>
<td>WHO</td>
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<td>Data strengthening and use</td>
<td>WHO/Gavi</td>
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<td>Disease Specific Initiatives</td>
<td>WHO/UNICEF</td>
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<td>Measles &amp; Rubella</td>
<td>WHO</td>
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<td>Monitoring &amp; Evaluation</td>
<td>CDC</td>
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<td>Comms &amp; Advocacy</td>
<td>WHO/UNICEF</td>
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<td>Resource Mobilization</td>
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IA2030 global-level partnership – Role of SP7 WG

Leadership
- World Health Assembly
- IA2030 Partnership Council

Country Immunization Programs
- Country & Regional O&A

Consultative Engagement
- RITAG
- SAGE
- NITAG
- PDVAC*
* for SP7.2

IA2030 Working Groups (WGs)
- Functional WGs (e.g., M&E, C&A)
- Technical WGs (per Strategic Priority)

Consultative Engagement
- (countries, regions, CSOs, partners)

Coordination
- IA2030 Coordination Group
- IA2030 Coordination Support (virtual)
Higher-level, longer term (e.g., 2025 and 2030) objectives for SP7 include to:

7.1 Establish and strengthen capacity at all levels, to identify priorities for innovation and to create and manage innovation.

7.2 Develop new vaccines and technologies; and, improve existing products and services for immunization programs.

7.3 Evaluate promising innovations, and scale-up innovations as appropriate based on the best available evidence.

The SP7 Working Group will ensure integration of the 2025 and 2030 objectives with the following initiatives:

- **Gavi 5.0, VIPS** (Vaccine Innovation Prioritisation Strategy), and **VIS** (Gavi Vaccine Investment Strategy renewals)
- **CEPI 2.0**
- **WHO CAPACITI** (Country-led Assessment for Prioritization in Immunization Decision-support Framework)
- **COVAX** and its successor, if any, post-pandemic
- **GVIRF** (Global Vaccine and Immunization Research Fora)
- **WHO AMR VAF** (Anti-Microbial Resistance Value Attribution Framework)
- **WHO R&D Blueprint**
- **WHO mRNA technology transfer hub**
Key Focus Areas and Deliverables 2022-2023

- Accelerate and expand the COVAX R&D agenda for variant- and programmatically-optimized vaccines;
- Support LMICs in expanding, strengthening, and/or establishing local and regional capacities for immunization research and innovation [Obj 7.1 indicator: No. of countries with national agenda for research on immunization];
- Develop a mechanism to align country, regional and global level stakeholders on priority diseases for which new vaccines are needed [Obj 7.2 indicator: (potential) process review at SAGE in Oct 2022; global “short list” of pipeline pathogen targets will be developed by WHO and first iteration endorsed by SAGE in April 2023]
- Establish 2025 and 2030 IA2030 SP7 Working Group objectives to sustain progress, based on country-led R&D priorities.

Membership

- SP7 Co-lead from AFRO region (Dr. Kwaku Poku Asante, Ghana); joint appointment to PDVAC & IA2030 SP7 WG
- Up to **18 members**, with up to **12 independent** members (approx. 2 members / WHO region), and up to **6 ex officio** members from the core IA2030 partners (e.g., WHO, Gavi, CEPI, UNICEF, NIH, Wellcome Trust)

*WHO’s Strategic Advisory Group of Experts on Immunization (SAGE):**
**WHO’s Product Development for Vaccines Advisory Committee (PDVAC):** https://www.who.int/groups/product-development-for-vaccines-advisory-committee

Presenters: Kwaku Poku Asante and David C. Kaslow
Progress so far

• Agreed on WG member recruitment process
  • 2 members (Regional immunization advisor + RITAG Chair) from each region will be approached with formal letters from WHO HQ
  • Ex-officio IA2030 core partner members confirmed
• Joint meeting with PDVAC on 18 Jul 2022
• Formal engagement with WG members in July/August 2022
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The success of this approach is based on a framework for regional engagement

Potential model for discussion

Propose to engage with and leverage the RITAGs, and to establish RITAG working groups to ‘bridge’ between the SP7 WG and regions and countries.

SP7 WG has 2 members from each region; RITAG members

PDVAC*

Recommendations on priority pathogens to SAGE

RITAG WGs would be composed of at least 2 RITAG members, plus other regional experts, including NITAG members.

The RITAG WGs would serve as the interface with countries and provide input to the SP7 WG.
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03 Landscaping Results and Pathogen Scope
Questions

1. **Existing priorities.** Which countries and regional organizations have described their vaccine R&D priorities? What global priorities have been highlighted?

2. **Prioritization Methods.** What approaches to priority-setting have been used by others? What should we use?

3. **Pathogens.** Which pathogens could be included in the prioritization exercise?

4. **Stakeholders.** Who should be involved? How?

- Proposed approach has been designed based on this review
Existing priorities: Global lists

Global Roadmaps & Frameworks
- Partnership for African Vaccine Manufacturing Framework for Action
- R&D Blueprint: Priority pathogens for research preparedness and R&D
- Roadmap for vaccines against sexually transmitted infections...
- Roadmap for NTDs 2021-2030
- Vaccines to tackle drug resistant infections

Investment Strategies
- CEPI: R&D for diseases with epidemic and pandemic potential
- US CDC: Global Immunization Strategic Framework 2021-2030
- Vaccine Investment Strategy (VIS): Priorities for vaccine support programs and learning agenda
- Vaccine Innovation Prioritisation Strategy (VIPS): Priorities for vaccine product innovations

Tools & Guidance
- SMART Vaccines: Tool to prioritize new vaccines for development
- PDVAC: Guidance on vaccine R&D to benefit low- and middle-income countries
- Partnership for African Vaccine Manufacturing Framework for Action
- One Health Zoonotic Disease Prioritisation Process: Facilitated multisectoral process to prioritize and develop next steps and action plans

Many sets of priorities with different scope and purpose
## Existing Priorities: Regional and Country Themes

<table>
<thead>
<tr>
<th>Region</th>
<th>Regional Themes</th>
<th>Country-level Themes (not exhaustive)</th>
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<tbody>
<tr>
<td><strong>Africa</strong></td>
<td>• Evidence-based priority setting</td>
<td>• <strong>South Africa</strong>: specific vaccine R&amp;D targets</td>
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<td></td>
<td>• Capacity for research and vaccine manufacture</td>
<td>• Vaccine introductions or research questions</td>
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<tr>
<td></td>
<td></td>
<td>• Capacity for clinical trials or manufacturing</td>
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<tr>
<td><strong>Americas</strong></td>
<td>• Evidence for decision-making</td>
<td>• <strong>Canada</strong> and the <strong>US</strong>: specific priorities for vaccine R&amp;D</td>
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<td></td>
<td>• Improving delivery of existing vaccines</td>
<td>• Systematic prioritization of health issues</td>
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<td><strong>Eastern Mediterranean</strong></td>
<td>• Ways to improve delivery of existing vaccines, including in emergency contexts</td>
<td>• Evidence-informed policy making</td>
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<td>• Capacity for vaccine manufacturing</td>
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<tr>
<td><strong>Europe</strong></td>
<td>• Evaluating vaccines and/or innovative technologies for implementation</td>
<td>• Capacity for national and regional priority setting</td>
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<td>• Operational, implementation, and formative research</td>
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<tr>
<td><strong>South-east Asia</strong></td>
<td>• Evidence for implementation</td>
<td>• Prioritization for new vaccine introduction</td>
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<tr>
<td><strong>Western Pacific</strong></td>
<td>• Capacity for R&amp;D on new and improved vaccines</td>
<td>• Emerging infectious and zoonotic diseases</td>
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<td></td>
<td>• Delivery innovations</td>
<td>• Antimicrobial resistance</td>
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Priorities relate to research questions or vaccine implementation

Gap in regional and country priority-setting for vaccine R&D

Sources: see backup slides
Prioritization Methods

- **Methods** used include expert consultations, expert surveys, single-criterion analysis, and multi-criteria decision analysis (MCDA)

- **MCDA**
  - IOM’s SMART Vaccines MCDA tool ranks vaccines for development or implementation based on user-entered data
  - CEPI has used MCDA to compare vaccine development proposals. MCDA was chosen to support decision making in the context of multiple trade-offs and diverse stakeholder perspectives

- **PAPRIKA (Potentially All Pairwise Rankings of all possible Alternatives)**
  - The WHO Pathogens Priority List Working Group used the PAPRIKA MCDA tool to prioritize antibiotic-resistant bacteria for R&D.
  - Because the PAPRIKA Preferences Survey asks users to choose between pairs of alternatives, it can be used by non-experts
  - IVIR-AC has endorsed the use of PAPRIKA for this prioritization

- Define priorities through a **consensus-building process** with regional and country stakeholders
- Use the **PAPRIKA tool** to support discussions

Sources: See backup slide
Landscape: Pathogens

Which pathogens could be included in the prioritization exercise?

- Potential pathogens
  - Existing roadmaps, action plans, global strategies, elimination targets
  - Available regional and national R&D strategies
  - ClinicalTrials.gov and ICTRP database
  - Pipeline overviews and investment portfolios
  - WHO Health Topics
  - Web searches
  - Expert advice

- Animal pathogens
  - Eliminate to focus on human health

- Human pathogens
  - With licensed vaccines
    - Eliminate since R&D needs are less acute
  - Without licensed vaccines
    - Not in clinical development
      - Eliminate due to lower probability of success

- With candidates in clinical development

- Group A: Global priorities
  - R&D Blueprint pathogens, those with existing TPPs or VVPs in progress, or part of an existing roadmap

- Group B: Other pipeline pathogens with vaccines in clinical development

---

a. Pathogens where the licensed vaccines do not meet important TPP criteria, such as target population, were retained. Next generation and improved vaccines (such as higher valence or combination vaccines) were not included because their value will depend not only on pathogen characteristics (the focus of this MCDA exercise) but also on the properties of the vaccine.

b. Roadmaps include Vaccines to tackle drug resistant infections, Roadmap for NTDs, and Defeating Meningitis Roadmap

Abbreviations: ICTRP – International Clinical Trials Registry Platform. NTD – neglected tropical disease. TPP – target product profile. VVP – Vaccine Value proposition
### Landscape: Pathogens

Which pathogens could be included in the prioritization exercise?

<table>
<thead>
<tr>
<th>Group A – Focus of Prioritization</th>
<th>Group B – Potential Additional Pathogens (Other pipeline pathogens)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccine Value Profiles</td>
<td>CEPI / Blueprint Priorities</td>
</tr>
<tr>
<td>- Chikungunya</td>
<td>- Crimean-Congo hemorrhagic fever virus</td>
</tr>
<tr>
<td>- Cytomegalovirus</td>
<td>- Lassa fever virus</td>
</tr>
<tr>
<td>- <em>Enterotoxigenic E. coli</em></td>
<td>- Marburg virus</td>
</tr>
<tr>
<td>- Neisseria gonorrhoeae*</td>
<td>- MERS-CoV</td>
</tr>
<tr>
<td>- Group A streptococcus</td>
<td>- Nipah virus</td>
</tr>
<tr>
<td>- Group B streptococcus</td>
<td>- Rift Valley fever virus</td>
</tr>
<tr>
<td>- HIV-1</td>
<td>- SARS-CoV-1</td>
</tr>
<tr>
<td>- Hookworm</td>
<td>- SARS-CoV-2 (broadly protective)</td>
</tr>
<tr>
<td>- HSV 1 and 2</td>
<td>- <em>Zika virus</em></td>
</tr>
<tr>
<td>- Influenza (cross-protective)</td>
<td>- <em>Dengue</em> (for naïve individuals)</td>
</tr>
<tr>
<td>- Leishmania</td>
<td>- <em>Haemophilus influenzae</em> type A</td>
</tr>
<tr>
<td>- Norovirus</td>
<td>- <em>Klebsiella pneumoniae</em></td>
</tr>
<tr>
<td>- <em>Mycobacterium tuberculosis</em> (beyond infancy)*</td>
<td>- Leprosy</td>
</tr>
<tr>
<td>- Respiratory syncytial virus</td>
<td>- Neisseria meningitidis serogroup X</td>
</tr>
<tr>
<td>- <em>Salmonella</em>, non-typhoidal*</td>
<td>- <em>Pseudomonas aeruginosa</em></td>
</tr>
<tr>
<td>- <em>Salmonella paratyphi</em></td>
<td>- <em>Staphylococcus aureus</em></td>
</tr>
<tr>
<td>- Schistosomiasis</td>
<td>- Uropathogenic and other extra-intestinal pathogenic <em>E. coli</em> (UPEC and ExPEC*)</td>
</tr>
<tr>
<td>- <em>Shigella</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* = AMR pipeline analysis available

**Bold** = GBD burden data available
04 Overview of the proposed methodology and presentation of pilot results
How do we identify priorities?

Best practices in risk-ranking exercises

Risk ranking process

Identify diseases for prioritization
- Set criteria for disease identification and selection
- If doing a literature review, use reliable sources
- Describe disease identification and selection

Formulate criteria to assess against
- Ensure that criteria fulfill the objectives of the risk ranking
- Use systematic methods and describe clearly

Weight criteria according to importance (PAPRIKA)
- Provide definitions of criteria and scores
- Consider weighting at a separate time or by a separate group to scoring

Score the diseases against the criteria (PAPRIKA)
- Provide definitions of criteria and scores
- Provide evidence to support decisions
- Consider methods for validating results

Rank diseases based on relative scores (PAPRIKA)
- Relative ranking more informative than scores
- Clearly report risk ranking methodology
- A consultation with end users to ensure validity of results

If using experts, ensure a multidisciplinary panel

Source: Adapted from European Centre for Disease Prevention and Control. Best practices in ranking emerging infectious disease threats. Stockholm: ECDC; 2015
MCDA in practice: example from the AMR world

Example: Prioritizing antibiotic-resistant bacteria for R&D

10 criteria for prioritization
Criteria should be complete, not redundant or overlapping, and independent of one another

Weighting the criteria
Participants complete a survey to show their views on the relative importance of each criterion

20 antibiotic-resistant bacteria
Selected based on surveillance reports, existing priority lists, and expert discussion

Priority ranking
Calculated using the weighted criteria and the attributes of each bacterial species

---

**Bacteria**

**Priorities**

**Criteria**

---

Panorama: WHO priority list for research and development of new antibiotics for antibiotic-resistant bacteria

Multi-drug resistant and extensively-resistant

Mycobacterium tuberculosis

Other priority bacteria
Priority 1: critical
- Acinetobacter baumannii, carbapenem resistant
- Pseudomonas aeruginosa, carbapenem resistant
- Enterobacteriaceae, carbapenem resistant, third-generation cephalosporin resistant

Priority 2: high
- Enterococcus faecium, vancomycin resistant
- Staphylococcus aureus, methicillin resistant, vancomycin resistant
- Helicobacter pylori, clarithromycin resistant
- Campylobacter spp, fluoroquinolone resistant
- Salmonella spp, fluoroquinolone resistant
- Neisseria gonorrhoeae, third-generation cephalosporin resistant, fluoroquinolone resistant

Priority 3: medium
- Streptococcus pneumoniae, penicillin non-susceptible
- Haemophilus influenzae, ampicillin resistant
- Shigella spp, fluoroquinolone resistant

Tacconelli et al, 2018 (link)
Proposing Criteria

What are Best Practices for MCDA Criteria?

A set of criteria should be...

1. **Complete**, capturing all factors relevant to the decision
2. **Non-redundant**. Criteria that do not help discriminate between alternatives should be omitted
3. **Non-overlapping**. Criteria should measure separate attributes. Ones that overlap other criteria should be removed to avoid double-counting
4. **Preference-independent**. Criteria should be independent of one another. Criteria that interact can be combined into a composite criterion

- **Proposed 9 criteria based on relevant precedents**

Definitions for each criterion should be...

1. **Unambiguous**
2. **Comprehensive**, covering the full range of possible consequences
3. **Direct**, relating to fundamental objectives rather than proxy outcomes
4. **Operational**, i.e. the information required are available and it is possible to make value trade-offs
5. **Understandable**

- **Defined 5 levels for each criterion**
## Proposing Criteria

Proposal: 3 quantitative, 6 qualitative criteria

### Quantitative Criteria

<table>
<thead>
<tr>
<th>Metric</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual deaths in children under 5</td>
<td>Deaths attributable to the pathogen in both sexes, &lt; 5 years old</td>
</tr>
<tr>
<td>Annual deaths in people older than 5</td>
<td>Deaths attributable to the pathogen in both sexes, ≥ 5 years old</td>
</tr>
<tr>
<td>Annual DALYs</td>
<td>Disability-adjusted life years (DALYs) lost due to ill-health, disability or premature mortality, in all ages</td>
</tr>
</tbody>
</table>

### Qualitative Criteria

<table>
<thead>
<tr>
<th>Metric</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morbidity</td>
<td>Reflects individual impact other than deaths</td>
</tr>
<tr>
<td>Economic burden</td>
<td>Reflects costs of prevention, health care, and lost productivity</td>
</tr>
<tr>
<td>Contribution to inequity</td>
<td>Reflects disproportionate impact on socially and economically disadvantaged groups, including women</td>
</tr>
<tr>
<td>Contribution to antimicrobial resistance</td>
<td>Reflects the threat of resistance, based on current levels of resistance, contribution to antibiotic use, and designation as an AMR priority</td>
</tr>
<tr>
<td>Health security threat</td>
<td>Reflects threat of causing emergencies or outbreaks, or designation as a priority pathogen by the R&amp;D Blueprint</td>
</tr>
</tbody>
</table>

### Implementation

- **Quantitative criteria**: thresholds will be set based on actual data, segmented by region
- **Qualitative criteria**: levels will be defined, applied to each pathogen, and reviewed by disease experts for accuracy and consistency

  - Economic burden is a qualitative criterion because data are not available for many pathogens, and because the available data have not been generated using comparable methods
  - **Vaccine-dependent attributes**: Probability of technical and regulatory success (PTRS), Access and implementation feasibility, and Public health priority are dependent on technology choices. They will be used to display results, rather than to prioritize pathogens
### Proposed Thresholds for Quantitative Criteria

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Number of deaths &lt;5 years</th>
<th>Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zika virus</td>
<td>0</td>
<td>Very low</td>
</tr>
<tr>
<td>Schistosomiasis</td>
<td>200</td>
<td>Very low</td>
</tr>
<tr>
<td>Leishmaniasis</td>
<td>1'600</td>
<td>Very low</td>
</tr>
<tr>
<td>Paratyphoid fever</td>
<td>2'700</td>
<td>Very low</td>
</tr>
<tr>
<td>Enterotoxigenic E coli</td>
<td>12'400</td>
<td>Low</td>
</tr>
<tr>
<td>Enteropathogenic E coli</td>
<td>15'800</td>
<td>Low</td>
</tr>
<tr>
<td>GAS</td>
<td>27'300</td>
<td>Low</td>
</tr>
<tr>
<td>Influenza</td>
<td>37'100</td>
<td>Medium</td>
</tr>
<tr>
<td>Non-typhoidal Salmonella</td>
<td>39'500</td>
<td>Medium</td>
</tr>
<tr>
<td>Norovirus</td>
<td>43'500</td>
<td>Medium</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>48'900</td>
<td>Medium</td>
</tr>
<tr>
<td>Invasive Non-typhoidal Salmonella (iNTS)</td>
<td>49'900</td>
<td>Medium</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>50'200</td>
<td>High</td>
</tr>
<tr>
<td>Shigella</td>
<td>93'800</td>
<td>High</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>101'200</td>
<td>Very high</td>
</tr>
<tr>
<td>Respiratory syncytial virus</td>
<td>123'800</td>
<td>Very high</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>153'500</td>
<td>Very high</td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>204'400</td>
<td>Very high</td>
</tr>
<tr>
<td>Malaria</td>
<td>356'400</td>
<td>Very high</td>
</tr>
</tbody>
</table>

Next step: Pilot MCDA using these definitions.
<table>
<thead>
<tr>
<th>Criterion</th>
<th>Very Low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morbidity</td>
<td>Infection rarely causes any negative impact on survivors</td>
<td>Infection sometimes causes mild negative impacts on survivors</td>
<td>Infection sometimes causes moderate negative impacts on the lives of survivors</td>
<td>Infection sometimes causes serious negative impacts on the lives of survivors</td>
<td>Infection frequently causes serious negative impacts on the lives of survivors</td>
</tr>
<tr>
<td>Economic burden</td>
<td>The pathogen causes a very low economic burden, including through the costs of prevention, health care, and lost productivity</td>
<td>The pathogen causes a low economic burden, including through the costs of prevention, health care, and lost productivity</td>
<td>The pathogen causes a medium economic burden, including through the costs of prevention, health care, and lost productivity</td>
<td>The pathogen causes a high economic burden, including through the costs of prevention, health care, and lost productivity</td>
<td>The pathogen causes a very high economic burden, including through the costs of prevention, health care, and lost productivity</td>
</tr>
<tr>
<td>Contribution to inequity</td>
<td>The pathogen affects socially and economically privileged groups, including men, all or most of the time.</td>
<td>The pathogen affects all communities equally.</td>
<td>The pathogen affects socially and economically disadvantaged groups, including women, somewhat more often than other groups.</td>
<td>The pathogen affects socially and economically disadvantaged groups, including women, much more often than other groups.</td>
<td>The pathogen affects socially and economically disadvantaged groups, including women, all or most of the time.</td>
</tr>
<tr>
<td>Contribution to antimicrobial resistance</td>
<td>The pathogen has not been highlighted as a priority for AMR, and Very few global isolates are resistant to first-line antimicrobial drugs, and Low antibiotic use is associated with infection by the pathogen</td>
<td>The pathogen has not been highlighted as a priority for AMR, and A low proportion of regional isolates is resistant to first-line antimicrobial drugs, and Moderate or low antibiotic use is associated with infection by the pathogen</td>
<td>The pathogen has been highlighted as a country priority for AMR, or A moderate proportion of regional isolates is resistant to first-line antimicrobial drugs, or High antibiotic use is associated with infection by the pathogen</td>
<td>The pathogen has been highlighted as a regional priority for AMR, or A high proportion of regional isolates is resistant to first-line antimicrobial drugs</td>
<td>The pathogen has been highlighted as a global priority for AMR, or A high proportion of global isolates is resistant to first-line antimicrobial drugs</td>
</tr>
<tr>
<td>Health security threat</td>
<td>The pathogen poses a very low threat of causing emergencies or outbreaks due to patterns of transmission, severity, societal impact, need for specialist surveillance or intervention.</td>
<td>The pathogen poses a low threat of causing emergencies or outbreaks due to patterns of transmission, severity, societal impact, need for specialist surveillance or intervention.</td>
<td>The pathogen poses a medium threat of causing emergencies or outbreaks due to patterns of transmission, severity, societal impact, need for specialist surveillance or intervention.</td>
<td>The pathogen poses a high threat of causing emergencies or outbreaks due to patterns of transmission, severity, societal impact, need for specialist surveillance or intervention.</td>
<td>The pathogen has been highlighted as a priority by the WHO R&amp;D Blueprint</td>
</tr>
<tr>
<td>Current alternatives for prevention and treatment</td>
<td>Effective preventive or treatment interventions do not exist</td>
<td>Preventive or treatment interventions are moderately effective in controlling a pathogen OR they are seldom accessible to those in need</td>
<td>Preventive or treatment interventions are moderately effective in controlling a pathogen is moderate OR they are not always accessible to those in need</td>
<td>Preventive or treatment interventions are highly effective in controlling a pathogen, but are not always accessible to those in need</td>
<td>Preventive or treatment interventions are highly effective in controlling a pathogen and are accessible to those in need</td>
</tr>
</tbody>
</table>

Next step: Pilot MCDA using these definitions
Pilot exercise to evaluate the feasibility of MCDA to prioritise pathogens

- 18 (78%) participants completed the pilot
- 4 (17%) participants started the pilot but not finished
- 1 (5.0%) participant opened the link and not started

- Median time taken to complete the pilot was 20m
- The median number of trade-offs was 42
Pilot exercise to evaluate the feasibility of MCDA to prioritise pathogens

Criteria weights

<table>
<thead>
<tr>
<th>The weight of each criteria among participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic burden: 8.5%</td>
</tr>
<tr>
<td>Number of annual deaths in under 5 years: 16.6%</td>
</tr>
<tr>
<td>Number of annual DALYs (any age): 9.1%</td>
</tr>
<tr>
<td>Health security threat: 9.7%</td>
</tr>
<tr>
<td>Current alternatives for prevention and treatment: 9.9%</td>
</tr>
<tr>
<td>Morbidity: 10.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The average ranking of criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Number of annual deaths in under 5 years</td>
</tr>
<tr>
<td>Contribution to antimicrobial resistance</td>
</tr>
<tr>
<td>Number of annual deaths in over 5 years</td>
</tr>
<tr>
<td>Contribution to inequity</td>
</tr>
<tr>
<td>Morbidity</td>
</tr>
<tr>
<td>Current alternatives for prevention and treatment</td>
</tr>
<tr>
<td>Health security threat</td>
</tr>
<tr>
<td>Number of annual DALYs (any age)</td>
</tr>
<tr>
<td>Economic burden</td>
</tr>
</tbody>
</table>
Pilot exercise to evaluate the feasibility of MCDA to prioritise pathogens

### Ranking of pathogens

<table>
<thead>
<tr>
<th>Participants’ ranking of pathogens</th>
<th>The average ranking of pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shigella spp.</td>
<td>Mean (n=18)</td>
</tr>
<tr>
<td>Respiratory Syncytial Virus (RSV)</td>
<td></td>
</tr>
<tr>
<td>Norovirus</td>
<td></td>
</tr>
<tr>
<td>Invasive non-typhoidal Salmonella (iNTS)</td>
<td></td>
</tr>
<tr>
<td>Hypothetical pathogen A</td>
<td></td>
</tr>
<tr>
<td>Enterotoxigenic E. Coli</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pathogens</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shigella spp.</td>
<td>1.5</td>
</tr>
<tr>
<td>Respiratory Syncytial Virus (RSV)</td>
<td>1.8</td>
</tr>
<tr>
<td>Norovirus</td>
<td>3.6</td>
</tr>
<tr>
<td>Invasive non-typhoidal Salmonella (iNTS)</td>
<td>4.0</td>
</tr>
<tr>
<td>Hypothetical pathogen A</td>
<td>4.6</td>
</tr>
<tr>
<td>Enterotoxigenic E. Coli (ETEC)</td>
<td>5.6</td>
</tr>
</tbody>
</table>
Pilot exercise to evaluate the feasibility of MCDA to prioritise pathogens

Feedback

<table>
<thead>
<tr>
<th>Explanation</th>
<th>Yes, well explained</th>
<th>12</th>
<th>75.0%</th>
<th>The explanations should be improved</th>
<th>4</th>
<th>25.0%</th>
<th>The exercise wasn’t sufficiently explained at all</th>
<th>0</th>
<th>0.0%</th>
<th>Not answered</th>
<th>2</th>
<th>11.1%</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Were the descriptions of criteria and their values clearly described?</th>
<th>Yes, well described</th>
<th>13</th>
<th>76.5%</th>
<th>The descriptions should be improved</th>
<th>4</th>
<th>23.5%</th>
<th>The descriptions weren’t clear at all</th>
<th>0</th>
<th>0.0%</th>
<th>Not answered</th>
<th>1</th>
<th>5.6%</th>
</tr>
</thead>
</table>

Overall, how did you find the exercise (please tick all that apply)?

- Interesting 12 70.6%
- Challenging 8 47.1%
- Confusing 4 23.5%
- Fun 1 5.9%
- Time-consuming 4 23.5%
- Other positive 0 0.0%
- Other negative 0 0.0%
- Not answered 1 5.6%

Overall, do you think that this approach could be scaled-up with a goal to prioritise pathogens for vaccine development?

- Absolutely 6 35.3%
- Yes but with modifications 10 58.8%
- No 1 5.9%
- Not answered 1 5.6%
05 Next steps & time horizon
# Key steps and timeline to prepare for SAGE in March 2023

Assuming buy-in to the engagement and partnership model

<table>
<thead>
<tr>
<th>Meetings</th>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDVAC</td>
<td>July</td>
<td>Jan</td>
</tr>
<tr>
<td>18 July</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities</th>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refine Method: regional and stakeholder input on method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepare Tool: populate tool with criteria and information on pathogens</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outputs</th>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods Brief: Landscaping results Proposed pathogen list and criteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Annex: Pathogen data for agreed-upon criteria</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Key steps and timeline to prepare for SAGE in March 2023

**Assuming buy-in to the engagement and partnership model**

<table>
<thead>
<tr>
<th>Meetings</th>
<th>Activities</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDVAC 18 July</td>
<td>Refine Method: regional and stakeholder input on method</td>
<td>Methods Brief: Landscaping results Proposed pathogen list and criteria</td>
</tr>
<tr>
<td>SAGE – brief update</td>
<td>Prepare Tool: populate tool with criteria and information on pathogens</td>
<td>Data Annex: Pathogen data for agreed-upon criteria</td>
</tr>
<tr>
<td>SEARO RITAG consultation date tbc</td>
<td>Consultations in selected regions on outcomes and deliberations on pathogen priorities</td>
<td>Regional Briefs/Reports: Rationale Methodology PAPRIKA exercise Consultation outcomes</td>
</tr>
<tr>
<td>PDVAC update</td>
<td>Survey and Analysis</td>
<td></td>
</tr>
<tr>
<td>GVIRF</td>
<td>Other RITAG consultations?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>Jan</td>
</tr>
<tr>
<td>August</td>
<td>Feb</td>
</tr>
<tr>
<td>Sept</td>
<td>Mar</td>
</tr>
<tr>
<td>Oct</td>
<td>Apr</td>
</tr>
<tr>
<td>Nov</td>
<td></td>
</tr>
<tr>
<td>Dec</td>
<td></td>
</tr>
</tbody>
</table>

- **Prepare**: Refine Method: regional and stakeholder input on method. Prepare Tool: populate tool with criteria and information on pathogens.
- **Implement**: Consultations in selected regions on outcomes and deliberations on pathogen priorities. Survey and Analysis.
### Key steps and timeline to prepare for SAGE in March 2023

#### Assuming buy-in to the engagement and partnership model

<table>
<thead>
<tr>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>Jan</td>
</tr>
<tr>
<td>August</td>
<td>Feb</td>
</tr>
<tr>
<td>Sept</td>
<td>Mar</td>
</tr>
<tr>
<td>Oct</td>
<td>Apr</td>
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</table>

#### Meetings
- PDVAC 18 July
- SAGE – brief update
- SEARO RITAG consultation date tbc
- PDVAC update
- SAGE presentation
- GVIRF

#### Activities

**Prepare**
- Refine Method: regional and stakeholder input on method
- Prepare Tool: populate tool with criteria and information on pathogens

**Implement**
- Survey and Analysis
- Consultations in selected regions on outcomes and deliberations on pathogen priorities

**Synthesize**
- Synthesize global priorities from regional views, prepare reports

#### Outputs

**Methods Brief:** Landscaping results Proposed pathogen list and criteria
**Data Annex:** Pathogen data for agreed-upon criteria
**Regional Briefs/Reports:** Rationale Methodology PAPRIKA exercise Consultation outcomes
**PDVAC Brief:** Emerging target list Full methodology
**SAGE Brief:** Proposed target list Full methodology
**Manuscripts for publication**

Assuming buy-in to the engagement and partnership model, key steps and timeline to prepare for SAGE in March 2023 are outlined. The timeline includes meetings, activities, and outputs for each month from July 2022 to April 2023.
### Key steps questions to resolve to advance this approach

**Assuming buy-in to the engagement and partnership model**

<table>
<thead>
<tr>
<th>2022</th>
<th>2023</th>
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<tr>
<td><strong>July</strong></td>
<td><strong>August</strong></td>
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<tr>
<td>Meetings</td>
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<tr>
<td>PDVAC 18 July</td>
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<tr>
<td>Activities</td>
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<tr>
<td>Prepare</td>
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<td>Implement</td>
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<td>Survey and Analysis</td>
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<tr>
<td>Consultations in selected regions on outcomes and deliberations on pathogen priorities</td>
<td></td>
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<tr>
<td>Regions that are interested to partner in this exercise—seeking feedback on this in the closed session</td>
<td></td>
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<tr>
<td>Alignment on prioritisation criteria &amp; pathogens to include</td>
<td></td>
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<tr>
<td>Other RITAG consultations?</td>
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<tr>
<td>SEARO RITAG consultation date tbc</td>
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<td>PDVAC update</td>
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<td>SAGE presentation</td>
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</tbody>
</table>

**Synthesize**

- Synthesize global priorities from regional views, prepare reports
Anticipated outcomes of this exercise

How feasible is it to develop a global pathogen priority list by March 2023?

- The success of this approach will depend on the level of interest from and partnership with stakeholders in the various regions;

- To the extent possible, we need to try to ensure consistency in the type of stakeholders involved in each prioritization exercise;

- This approach will provide a more granular view of regional priorities, where commonalities may inform a ‘global list’;

- Even if all regional consultations are not completed by March 2023, this exercise will provide important insights into criteria and priorities to inform an initial prioritization list;

- The exercise could be repeated at the mid-point of IA2030 to assess shifts in criteria and priorities;

- The partnership and engagement model could be applied to other research questions to be developed as part of IA2030 SP7.
Objectives & anticipated outcomes of this session

- Understand the feasibility of the proposed model for regional/country partnership to identify priority pathogens for pipeline vaccines, based on collaboration of RITAGs, SP7 and WHO/PDVAC;

- Endorsement on the general approach and methodology to identify regional priority pathogens for new vaccine development as basis for the ‘short-list’ to present to SAGE in 2023.
Backup
Key questions

• Are the proposed engagement processes adequate at all levels?
• How do we prioritise implementation research? Are there existing programs that can be leveraged to engage?
### Priorities – Regional Sources

<table>
<thead>
<tr>
<th>Region</th>
<th>Regional Sources</th>
</tr>
</thead>
</table>
| **Africa**        | • IA2030: [https://www.afro.who.int/sites/default/files/2021-07/AFR-RC71-7%20Framework%20for%20the%20Implementation%20of%20the%20Immunization%20Agenda%202030%20in%20the%20WHO%20African%20Region.pdf](https://www.afro.who.int/sites/default/files/2021-07/AFR-RC71-7%20Framework%20for%20the%20Implementation%20of%20the%20Immunization%20Agenda%202030%20in%20the%20WHO%20African%20Region.pdf)  
  • AU: [https://au.int/sites/default/files/documents/30357-doc-final_ahs_strategy_formatted.pdf](https://au.int/sites/default/files/documents/30357-doc-final_ahs_strategy_formatted.pdf)  
  • RITAG: [https://iris.paho.org/bitstream/handle/10665.2/54833/PAHOFLIMCOVID-19210038_eng.pdf?sequence=1&isAllowed=y](https://iris.paho.org/bitstream/handle/10665.2/54833/PAHOFLIMCOVID-19210038_eng.pdf?sequence=1&isAllowed=y) |
| **Eastern Mediterranean** | • GVAP: [https://apps.who.int/bitstream/handle/10665/311578/EMROPUB_2019_EN_22331.pdf?sequence=1&isAllowed=y](https://apps.who.int/bitstream/handle/10665/311578/EMROPUB_2019_EN_22331.pdf?sequence=1&isAllowed=y)  
  • Perspective: [https://applications.emro.who.int/emrhj/v26/03/10203397-2020-2603-254-256.pdf?ua=1](https://applications.emro.who.int/emrhj/v26/03/10203397-2020-2603-254-256.pdf?ua=1)  
  • RC: [https://applications.emro.who.int/docs/RC66-R5-eng.pdf](https://applications.emro.who.int/docs/RC66-R5-eng.pdf)  
  • RITAG: [https://apps.who.int/iris/bitstream/handle/10665/334163/WHOEMEPi358E-eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/334163/WHOEMEPi358E-eng.pdf?sequence=1&isAllowed=y) |
| **Europe**        | • IA2030: [https://apps.who.int/iris/bitstream/handle/10665/348002/9789289056052-eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/348002/9789289056052-eng.pdf)  
| **South-east Asia** | • IA2030: [https://apps.who.int/iris/bitstream/handle/10665/343756/sea-rc74-8-eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/343756/sea-rc74-8-eng.pdf?sequence=1&isAllowed=y)  
  • Regional flagship areas: [https://apps.who.int/iris/bitstream/handle/10665/338722/9789290228066-eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/338722/9789290228066-eng.pdf?sequence=1&isAllowed=y) |
## Priorities – Country-level Sources

<table>
<thead>
<tr>
<th>Region</th>
<th>Country-level Sources (not exhaustive)</th>
</tr>
</thead>
</table>
- South Africa: [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6188089/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6188089/)  
- Zambia: [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4580468/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4580468/)  
- Zimbabwe: [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3918272/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3918272/)  
- Morocco: [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2553448/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2553448/)  
- South Africa: [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7788656/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7788656/)  
- South Africa: [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8886403/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8886403/)  
- Tanzania: [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3280346/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3280346/)  |
Prioritization Methods – Sources

Sources

- Expert surveys: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8356130/
- SMART Vaccines tool: https://nap.nationalacademies.org/smartvaccines/#Video
- CEPI: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0246235
- PAPRIKA: Potentially All Pairwise Rankings of all possible Alternatives, https://www.1000minds.com/about/paprika
### Other Pathogens

<table>
<thead>
<tr>
<th>Non-human pathogens</th>
<th>Licensed Vaccines Available</th>
<th>Not in Clinical Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bovine coronavirus</td>
<td>Adenovirus</td>
<td>Acinetobacter baumannii</td>
</tr>
<tr>
<td>Bovine respiratory disease</td>
<td>Bacillus anthracis</td>
<td>Ascaris lumbricoides (roundworm)</td>
</tr>
<tr>
<td>Brucellosis</td>
<td><em>Bordetella pertussis</em></td>
<td>Aspergillus</td>
</tr>
<tr>
<td>Chronic wasting disease</td>
<td><em>Clostridium tetani</em></td>
<td>Burkholderia pseudomallei (melioidosis)</td>
</tr>
<tr>
<td>Coccidiosis</td>
<td><em>Corynebacterium diphtheriae</em> (diphtheria)</td>
<td>Cryptococcus spp</td>
</tr>
<tr>
<td>Contagious Bovine Pleuropneumonia (CBPP)</td>
<td><em>Coxiella burnetii</em> (Q fever)</td>
<td>Cryptosporidium</td>
</tr>
<tr>
<td><em>E. coli</em> (cattle)</td>
<td>Dengue virus</td>
<td>Dracunculus medinensis (Guinea worm)</td>
</tr>
<tr>
<td>Echinococcosis (type not specified)</td>
<td>Ebola virus</td>
<td>Echinococcus granulosus (cystic echinococcosis)</td>
</tr>
<tr>
<td>Foot-and-mouth disease virus</td>
<td>Enterovirus 71 (Hand, foot, and mouth disease)</td>
<td>Echinococcus multilocularis (alveolar echinococcosis)</td>
</tr>
<tr>
<td>Gallid alphaherpesvirus 2 (Marek’s disease in chickens)</td>
<td><em>Haemophilus influenzae</em> type B</td>
<td>Ehrllichiosis</td>
</tr>
<tr>
<td>Peste des petits ruminants (PPR)</td>
<td>Hepatitis A</td>
<td>Enterococcus faecium</td>
</tr>
<tr>
<td>Porcine epidemic diarrhea virus</td>
<td>Hepatitis B</td>
<td>Enterococcus, vancomycin-resistant</td>
</tr>
<tr>
<td>Porcine influenza A</td>
<td>Human papillomavirus</td>
<td>Hepatitis D</td>
</tr>
<tr>
<td>Staphylococcus aureus (dairy cattle)</td>
<td>Influenza (avian, pandemic, and seasonal)</td>
<td>Human T-lymphotropic virus type 1</td>
</tr>
<tr>
<td><em>Taenia solium</em> (pork tapeworm)/Cysticercosis</td>
<td>Japanese encephalitis</td>
<td>Lymphatic filariasis</td>
</tr>
<tr>
<td>Theileria parva (East Coast Fever in cattle)</td>
<td>Junin virus</td>
<td>Mycetoma</td>
</tr>
<tr>
<td>Tick infestation (animals)</td>
<td>Leptospirosis</td>
<td>Mycobacterium ulcerans (Buruli ulcer)</td>
</tr>
<tr>
<td><em>Toxoplasmagondii</em></td>
<td>Measles virus</td>
<td>Onchocerca volvulus</td>
</tr>
<tr>
<td>Acinetobacter baumannii</td>
<td>Mumps virus</td>
<td>Sarcoptes scabiei (scabies)</td>
</tr>
<tr>
<td>Ascaris lumbricoides (roundworm)</td>
<td><em>Mycobacterium tuberculosis</em> (BCG)</td>
<td>Streptococcus mutans (caries)</td>
</tr>
<tr>
<td>Aspergillus</td>
<td><em>Neisseria meningitidis</em> serogroups A, B, C, W, Y</td>
<td>Strongyloides stercoralis (helminth)</td>
</tr>
<tr>
<td>Burkholderia pseudomallei (melioidosis)</td>
<td><em>Plasmodium falciparum</em> (malaria)</td>
<td>Treponema pallidum (syphilis)</td>
</tr>
<tr>
<td>Cryptococcus spp</td>
<td>Polio virus (inactivated and oral vaccines)</td>
<td>Treponema pallidum subspecies pertene (yaws)</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>Rabies virus</td>
<td>Trichomonas vaginalis</td>
</tr>
<tr>
<td>Dracunculus medinensis (Guinea worm)</td>
<td>Rotavirus</td>
<td>Trichuris trichiura (whipworm)</td>
</tr>
<tr>
<td>Echinococcus granulosus (cystic echinococcosis)</td>
<td>Rubella virus</td>
<td>Trypanosoma brucei</td>
</tr>
<tr>
<td>Echinococcus multilocularis (alveolar echinococcosis)</td>
<td><em>Salmonella Typhi</em></td>
<td>Trypanosoma cruzi (Chagas disease)</td>
</tr>
<tr>
<td>Ehrlichiosis</td>
<td><em>Streptococcus pneumoniae</em></td>
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</tr>
<tr>
<td>Enteroctococcus faecium</td>
<td>Tick-borne encephalitis virus</td>
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</tr>
<tr>
<td>Hepatitis D</td>
<td>Varicella zoster virus (chicken pox and shingles)</td>
<td></td>
</tr>
<tr>
<td>Human T-lymphotropic virus type 1</td>
<td><em>Vibrio cholerae</em></td>
<td></td>
</tr>
<tr>
<td>Lymphatic filariasis</td>
<td>Yellow fever virus</td>
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</tbody>
</table>
Landscape: Existing Priorities

Which countries and organizations have described their vaccine R&D priorities?

African Region

Regional

- Strong support for evidence-based priority setting, PAVM has defined regional priorities
  - **Framework for Implementation of IA2030 in the WHO African Region** notes that priorities for innovation should be identified by member states ([link](#)).
  - **Strategic Framework for Research on Immunization (SFRI) in the African Region** describes the innovation ecosystem and recommends priority-setting mechanisms ([link](#)).
  - Partnership for African Vaccine Manufacturing (PAVM) has identified priority pathogens or vaccines for capacity building ([link](#)).
  - RITAG recommendations include R&D and expanded manufacture for SARS-CoV-2 vaccines and novel OPV, and research relating to other vaccines
  - **EDCTP Strategic Research Agenda** defines investment priorities ([link](#)).

Countries

- The few countries that prioritize vaccine R&D generally do not list specific pathogen targets other than HIV, TB, and malaria
  - **Kenya**'s National Research Priorities 2018-2022 calls for prioritizing vaccine development ([link](#)).
  - **Nigeria**'s National Strategic Health Development Plan 2018-2022 notes efforts to revamp vaccine production in the country but does not specify R&D priorities. ([link](#)).
  - **South Africa**'s National Health Research Strategy 2021-2024 systematically prioritizes research topics, including R&D for specific vaccines ([link](#)).
  - **Tanzania** has systematically defined health research priorities and included marginalized groups in priority setting ([link](#)). The NHSP calls for strengthening pharmaceutical manufacturing ([link](#)).
  - **Zambia**'s National Health Research Agenda 2018-2021 calls for vaccine trials to test candidate vaccines for HIV, TB, and malaria ([link](#)).
  - National health research agendas in Ghana, Ethiopia, Niger, Senegal and Uganda do not mention vaccine R&D

Context

- **Addis Declaration on Immunization Roadmap** recommends to “expand and invest in Africa-based research, development, and production of vaccines” ([link](#)).
- African Union Africa Health Strategy 2016-2030 calls for research capacity building ([link](#)).
- Kenya, Nigeria, Senegal, and South Africa are participating in mRNA vaccine technology transfer

Abbreviations: COSTECH – Tanzania Commission for Science and Technology. EDCTP – European and Developing Countries Clinical Trials Partnership. NHSP – National Health Strategic Plan  a. Data collection is ongoing, not exhaustive
Landscape: Existing Priorities

Which countries and organizations have described their vaccine R&D priorities?

American Region

Regional

- Priorities for vaccine R&D have not been established
  - *Reinvigorating Immunization as a Public Good for Universal Health* emphasizes the need for evidence-based decision making ([link](#))
  - GVAP Action Plan focuses on implementation of existing vaccines, rather than new vaccine R&D ([link](#))
  - RITAG recommendations do not highlight unmet needs for new vaccines

Countries \(^a\)

- Some countries have defined R&D priorities
  - Canada has systematically identified a set of priorities for R&D for human and animal vaccines ([link](#))
  - US CDC has defined priority pathogens ([link](#)). NIAID is supporting an extensive portfolio of disease-specific vaccines ([link](#))

Vaccine R&D Priorities

- The US is the world’s leading national donor to global health R&D, ranking 1\(^{st}\) in 2019 funding ([link](#))

Context

Abbreviations: a. Data collection is ongoing, not exhaustive
Landscape: Existing Priorities

Which countries and organizations have described their vaccine R&D priorities?

**Regional**

- Research priorities focus on ways to improve delivery of existing vaccines, including in emergency contexts
  - RITAG recommendations focus on introduction of existing vaccines, and generally do not highlight unmet needs for new vaccines (2017, 2020)
  - EMRO officials recommend research priority setting (link) and the RITAG has recommended that WHO foster regional prioritization exercises and share outcomes for potential use (link)
  - Academic groups defined health research priorities in the region in 2010 and 2021

**Countries a**

- While some countries have defined health research priorities, R&D priorities were not found
  - In Iran, a multidisciplinary group used the CHNRI method to define health research priorities (link)
  - Jordan has defined health research priorities relating to health systems, health services, and COVID-19 response using a nominal group technique (link)
  - Pakistan has defined health research priorities relating to TB, Hepatitis B, typhoid using the CHNRI method (link)

**Eastern Mediterranean Region**

- **Vaccine R&D Priorities**
  - Strong emphasis on systematic prioritization of health issues and on capacity building for evidence-informed policy making
  - Regional Committee resolution EM/RC55/R.5 establishes a framework for action to improve capacity for evidence-informed policy (link)
  - WHO’s *Strategy for the Eastern Mediterranean Region, 2020-2023*, discusses research in terms of the evidence base needed for informed health policy-making (link) The Eastern Mediterranean Advisory Committee on Health Research (ACHR) emphasizes the importance of prioritizing health needs as a basis for identifying research priorities (link)
  - The regional Network of Institutions for Evidence and Data to Policy (NEDIP) recommends that member states and WHO help to identify priority issues at local, national, and regional levels (link)

- **Context**
  - Egypt, Pakistan and the UAE have manufactured COVID-19 vaccines through technology transfers. Morocco is also building COVID-19 vaccine manufacturing capacity.
  - Egypt, Pakistan, and Tunisia are participating in mRNA vaccine technology transfer

Abbreviations: a. Data collection is ongoing, not exhaustive
# Landscape: Existing Priorities

Which countries and organizations have described their vaccine R&D priorities?

## European Region

<table>
<thead>
<tr>
<th>Vaccine R&amp;D Priorities</th>
<th>Regional</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Strong support for national and regional priority setting</td>
<td></td>
</tr>
<tr>
<td>• The European Immunization Agenda 2030 established regional priorities through country surveys and consultations. Research and innovation activities include evaluating vaccines and/or innovative technologies, as well as operational, implementation, and formative research (link)</td>
<td></td>
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<tr>
<td>• ETAGE encourages broad consultations to determine national priorities and develop a regional immunization agenda (link)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Countries a</th>
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<tbody>
<tr>
<td>✓ Investments in vaccine R&amp;D are often channeled through PPPs</td>
</tr>
<tr>
<td>• Germany’s Global Health Strategy highlights their investments in partnerships for product development, such as CEPI, and prioritizes AMR (link)</td>
</tr>
<tr>
<td>• Norway’s funding for vaccine R&amp;D has been channeled through GLOBVAC and CEPI (link)</td>
</tr>
<tr>
<td>• Russian Federation prioritizes improving national capacity for vaccine manufacture and for related activities such as regulatory oversight and surveillance. R&amp;D priorities relate to increasing access to existing vaccines rather than novel vaccine development (link)</td>
</tr>
</tbody>
</table>

## Context

- The UK, European Union, Germany, France, and Norway are major political donors to global health R&D, ranking 2nd to 6th in 2019 funding (link)

Abbreviations: a. Data collection is ongoing, not exhaustive
Landscape: Existing Priorities

Which countries and organizations have described their vaccine R&D priorities?

**Regional Vaccine R&D Priorities**

- Regional research priorities focus on evidence for implementation
  - In the Regional Vaccine Strategic Framework (RSF, link) and draft Implementation Plan (RVIP, link), the key areas of focus for SP7 relate to evidence for implementation
  - SEAR-ITAG recommendations, especially in the context of COVID-19, focus on addressing current priorities rather than R&D for new targets (2019, 2020, 2021)

**Countries**

- Although clinical development is very active in the region; R&D priorities do not appear to have been defined systematically
  - Bangladesh’s icddr,b has described its targets for vaccine R&D (link)
  - India’s Department of Biotechnology (link) and Biotechnology Industry Research Assistance Council (link) have invested in diverse vaccine R&D portfolios
  - Thailand prioritizes domestic research, manufacture, and distribution of vaccines for the sake of vaccine security and self-reliance (link). Thailand hosts multiple vaccine manufacturers, several of which have also developed and/or manufactured COVID-19 vaccines (link)

**Context**

- South-east Asia supplies a significant portion of the world’s vaccines, and regional manufacturers are becoming vaccine innovators
  - In 2017-2019, India ranked second in global vaccine exports, accounting for 25% of doses traded (link)
  - Going beyond technology transfer arrangements, vaccine manufacturers in the region are increasingly advancing the development of novel and next-generation vaccines (link)
  - Experts, noting that South Asia lags other regions in research capacity, and have called for capacity building (link, link)

- Stakeholders in Bangladesh (link), Indonesia (link), and Thailand (link) have prioritized among existing vaccines for introduction
  - Myanmar has defined its Research Agenda for EPI (2018-2020)
  - Bangladesh, India, and Indonesia are participating in mRNA vaccine technology transfer and Bangladesh has announced plans to build state-owned vaccine research and production capacity (link)
  - Indonesia’s national health research agency has recently undergone restructuring to form the National Research and Innovation Agency (link)
  - The WHO Collaborating Centre on Clinical and Translational Research for Innovation and Access to Medical Products is based in Haryana, India. Its Outputs include “Research and development agenda defined and research coordinated in line with public health priorities” (link)

Abbreviations: SEAR-ITAG, South-east Asia Immunization Technical Advisory Group. a. Data collection is ongoing, not exhaustive
## Landscape: Existing Priorities

Which countries and organizations have described their vaccine R&D priorities?

### Western Pacific Region

#### Regional

- Regional Strategic Framework for Vaccine-preventable Diseases and Immunization highlights many vaccine research priorities, including R&D on new vaccines, improvements to existing vaccines, and delivery innovations ([link](#)).

#### Vaccine R&D Priorities

- RITAG recommendations focus on achieving programmatic goals and new vaccine introductions, and note the importance of expanding R&D for vaccine development and production to strengthen vaccine supply ([link](#)).

#### Context

- Robust and expanding capacity for vaccine R&D and manufacturing, providers of technology transfer for vaccine production in other regions
- Strong regional emphasis on emerging infectious and zoonotic diseases and the need to address antimicrobial resistance.

### Countries a

- Prioritization seldom addresses vaccine R&D
  - Japan’s National Plan for AMR includes vaccine R&D, and experts have prioritized research topics to address EIDs ([link](#)).
  - Japan and South Korea have laws identifying priority diseases and pathogens for control and prevention
  - Malaysia has prioritized health research topics ([link](#)).
  - The Philippines uses QALY data to inform priorities in health investments ([link](#)).

- Japan, the Philippines, Singapore, South Korea, and Taiwan are investing in vaccine R&D capacity
- Vietnam is participating in mRNA vaccine technology transfer

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Abbreviations: a. Data collection is ongoing, not exhaustive
Landscape: Existing Priorities

Which countries and organizations have described their vaccine R&D priorities?

**Global Priorities**

**Broad R&D priority lists**

- Vaccine R&D priorities have been established for many health topics using varying methods, including expert consultation to MCDA
  - WHO’s R&D Blueprint for Research and Development in Emergency Contexts currently prioritizes 12 diseases, including COVID-19 and “Disease X”, a pathogen currently unknown to cause human disease. [link] Blueprint priorities are updated regularly, and this list is currently under review
  - The Road Map for Neglected Tropical Diseases 2021-2030 calls for vaccine R&D for dengue, chikungunya, leishmaniasis, leprosy, and schistosomiasis (link)
  - The WHO Priority List of Antibiotic-resistant Bacteria and Tuberculosis prioritizes pathogens based on AMR threat. [link] An evaluation classified these pathogens as critical, high, or medium priority for vaccine R&D. Seven pathogens were classified as “not currently well suited to vaccine development” [link]
  - Sexually transmitted infections prioritized for vaccine development include herpes simplex virus, C. trachomatis, gonorrhea and syphilis (link) Among these, experts viewed gonorrhea and syphilis as the highest priorities for vaccine development (link)
  - Public sector funders such as the US National Institutes of Health, UK Medical Research Council, and European Commission, and private philanthropies such as the Gates Foundation and Wellcome have invested in diverse portfolios for vaccine R&D and related research

**R&D targets**

- Specific targets have drawn focused attention
  - WHO has defined Target Product Profiles (TPPs) or Preferred Product Characteristics (PPCs) for 14 pathogens. [link] Value propositions are in preparation for 19 vaccines
  - Draft global health sector strategies on, respectively, HIV, viral hepatitis and sexually transmitted infections 2022-2030 calls for continued efforts in HIV vaccine R&D (link)
  - WHO Global Leprosy Strategy 2021-2030 calls for research on new vaccines (link)
  - Defeating Meningitis by 2030: a Global Road Map calls for R&D of new group B streptococcus vaccines and additional vaccines against other causes of meningitis (link)
  - The Global Integrated Arboviruses Initiative has been launched to tackle dengue, yellow fever, chikungunya and Zika virus diseases (link)

Abbreviations: AMR, anti-microbial resistance. MCDA, Multi-criteria decision analysis. a. Data collection is ongoing, not exhaustive
Strengths and limitation of the MCDA

**Strengths**
- Identifies weights of criteria independently of pathogens in scope;
- Sets thresholds relative to other pathogens, i.e. robust comparison;
- Establishes a model and platform for continued engagement on prioritisation and other R&D topics such as implementation research agenda;

**Limitations**
- Burden and other data may be limiting
- Threshold setting is on the basis of expert opinion
- Requires profiling of potential value of vaccines against several pathogens (heavy lift)
Questions for discussion

- Overall, how did you find the exercise?
- Was the purpose of the exercise sufficiently explained?
- Were the descriptions of criteria and their values clearly described?
- Do you think that this approach could be scaled-up with a goal to prioritise pathogens for vaccine development?
Vaccine-dependent Attributes

PATHOGEN SEGMENTATION BASED ON ASSESSMENT CREATES CLUSTERS THAT CAN HELP PRIORITISE INTERVENTIONS