International Pathogen Surveillance Network

WHO IPSN Overview of Global Pathogen Genomics Toolkit & Use Cases

Pathogen Genomics Priorization and Implementation Workshop

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The rapid expansion of pathogen genomics since 2019 presents an opportunity to build truly global coverage

Genomic sequencing technology has rapidly developed in recent years allowing lower cost, higher volume pathogen analysis

COVID-19 provided an important test case, leading to a rapid build-out of capacity worldwide

There is now an opportunity to create an interlinked network of high-quality pathogen genomics systems, reducing the burden of future pandemics and endemic diseases

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The IPSN is a global network bringing together the pathogen genomic community to improve public health decision making

Vision

Every country has equitable access to sustained capacity for genomic sequencing and analytics as part of its public health surveillance system.

Mission

Engage a mutually supportive global network of genomic surveillance actors that amplifies and accelerates the work of its members to improve access and equity.

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The IPSN increases pathogen genomic surveillance harmonization, scale and political attention

What will the IPSN deliver?

Increased harmonization and innovation in pathogen genomics

Increased scale and efficiency of country capacity building efforts

Increased political attention and financing coordination and sustainability

What impacts will the IPSN have?

Stronger national, regional and international surveillance systems better able to detect and characterize new threats and reduce disease burden

Health systems are better able to coordinate rapidly during an outbreak to detect and respond to emerging threats

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What the IPSN is

- New global network
- Focused on pathogen genomics
- Bringing together pathogen genomic actors
- Supporting countries by engaging all relevant stakeholders
- Convening, facilitating, enabling and supporting countries to plan
- Supporting the development of bioinformatics tools by partners

What the IPSN is not

- Replicating other stakeholder activities
- Limiting its engagement to WHO staff and member states
- Actively implementing PGS programs
- Training country lab staff
- Funding delivery of genomic surveillance systems
- Housing data or developing software

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The IPSN convenes technical, policy and financing communities together to deliver on global priorities

Who is the IPSN?

A network of pathogen genomic communities, including:

- ✓ National and regional public health systems
- ✓ Animal and environmental sectors
- ✓ Policy makers and donors
- ✓ Academic groups
- ✓ Private sector business associations
- ✓ Civil society
- ✓ International standard organizations

What does the IPSN do?

- Communities of Practice to solve common challenges
- Country Scale-up Accelerator to enable exchange & amplify country voices
- Catalytic grant fund to support member projects
- Advocacy & communications to keep pathogen genomics high on the agenda
- Convene partners to share progress and innovations

Convened and supported by a Secretariat led by the WHO Pandemic Hub

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The IPSN aims to amplify and accelerate the work of its members

IPSN members are already leading many critical pieces of work…

Work at the country level

- Surveillance system planning and budgeting
- Day-to-day running of surveillance systems
- Public health decision making
- National research and innovation programs

Work at the regional level

- Networks to share best practices and pool resources
- Support for country planning and decision making
- Regional reference labs, data analysis support

Global programs

- Global disease programs
- Academic programs
- Standard setting initiatives e.g. PHA4GE, GA4GH
- Bilateral, multilateral and philanthropic funders

… which IPSN aims to amplify and accelerate

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The IPSN's operational bodies advance pathogen genomic surveillance

	Country Scale-Up Accelerator	COP pathogen genomic data	COP environmental and vector genomic surveillance
Purpose	*Focusing on creating global goods to support country capacity and promote network exchange*	*Communities of practice are established to bring together groups of IPSN partners to work together on common challenges*	
Areas of focus	• Country capacity framework • Global investment case for pathogen genomic surveillance • Use-case definition and prioritization • Coordinate action to avoid duplication • Secretariat brokers new relationships	• **Data principles & standards** to foster trust among data stakeholders and enhance data connectivity for better analysis • **Data sharing** to implement agreements on data production, sharing, and utilization • **Data analytics** to define an open bioinformatics ecosystem and explore data-analytics interoperability	• Harmonize data with technical innovation • Provide technical support for standards • Define cost-effective use cases in public health surveillance • Investigate ethical sampling and data use • Encourage intersectoral collab. with One Health approach

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The Country Scale-Up Accelerator focuses on global goods and innovation to tackle challenges in country capacity

Challenge	Current efforts and gaps
Resources insufficient and may not be sustainable	• Domestic and donor budgets have grown but still too few countries have well-developed systems to properly coordinate funding • Countries may not always see sufficient value in maintaining investments in “peacetime”
Country Investments not always optimally coordinated	• Hardware procurement has often moved faster than human capital, or sequencing volumes have overtaken bioinformatics
Many trainings but limited attention to career paths	• NPHIs have many trainings to chose from, but limited focus in strengthening the workforce i.e., addressing the workforce competency gaps
Unharnessed ‘supply’ of peer-to-peer support	• A range of skilled actors, esp. in LMICs, are willing and able to support other NPHIs but may require support brokering connections, and small amounts of funding

Impact areas

1

Global goods that can benefit countries and development actors, including:

a. A **country capacity framework** outlining different archetypes that countries inhabit across diverse budgetary levels

b. A **global investment case** for pathogen genomic surveillance

c. Use-case models that demonstrate the optimal use of genomics – and the ROI – in different country contexts

2

Supporting delivery:

a. Coordinated action for target countries, aligning existing actors and ensuring no overlap or gaps

b. Secretariat provides **brokering function** to **establish** new **relationships**

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24 organizations have agreed to be partners to the IPSN Country Scale-up Accelerator

Inter/governmental / governmental

- African Centers for Disease Control & Prevention
- ANLIS Malbrán
- Asia Pathogen Genomics Initiative
- Fiocruz
- Food and Agricultural Organization
- Korea Disease Control and Prevention Agency
- Nigeria Centre for Disease Control and Prevention
- Robert Koch Institute
- Rwanda Biomedical Centre
- UK Health Security Agency
- UK Department of Health and Social Care
- US Centers for Disease Control and Prevention

Academic institutions

- American University of Beirut
- Asia-Pacific Pathogen Genomics Network
- Centre for Epidemic Response and Innovation
- Chan Zuckerberg Biohub
- Institute of Genomics and Integrative Biology
- Duke NUS Medical School
- Medical Research Council Unit The Gambia, LSHTM
- Peking University
- Tata Institute for Genetics and Society

Non-governmental organizations

- Infectious Disease Institute, Makerere University
- Wellcome Connecting Sciences
- Wellcome Sanger Institute

WHO regional offices involved in CSUA

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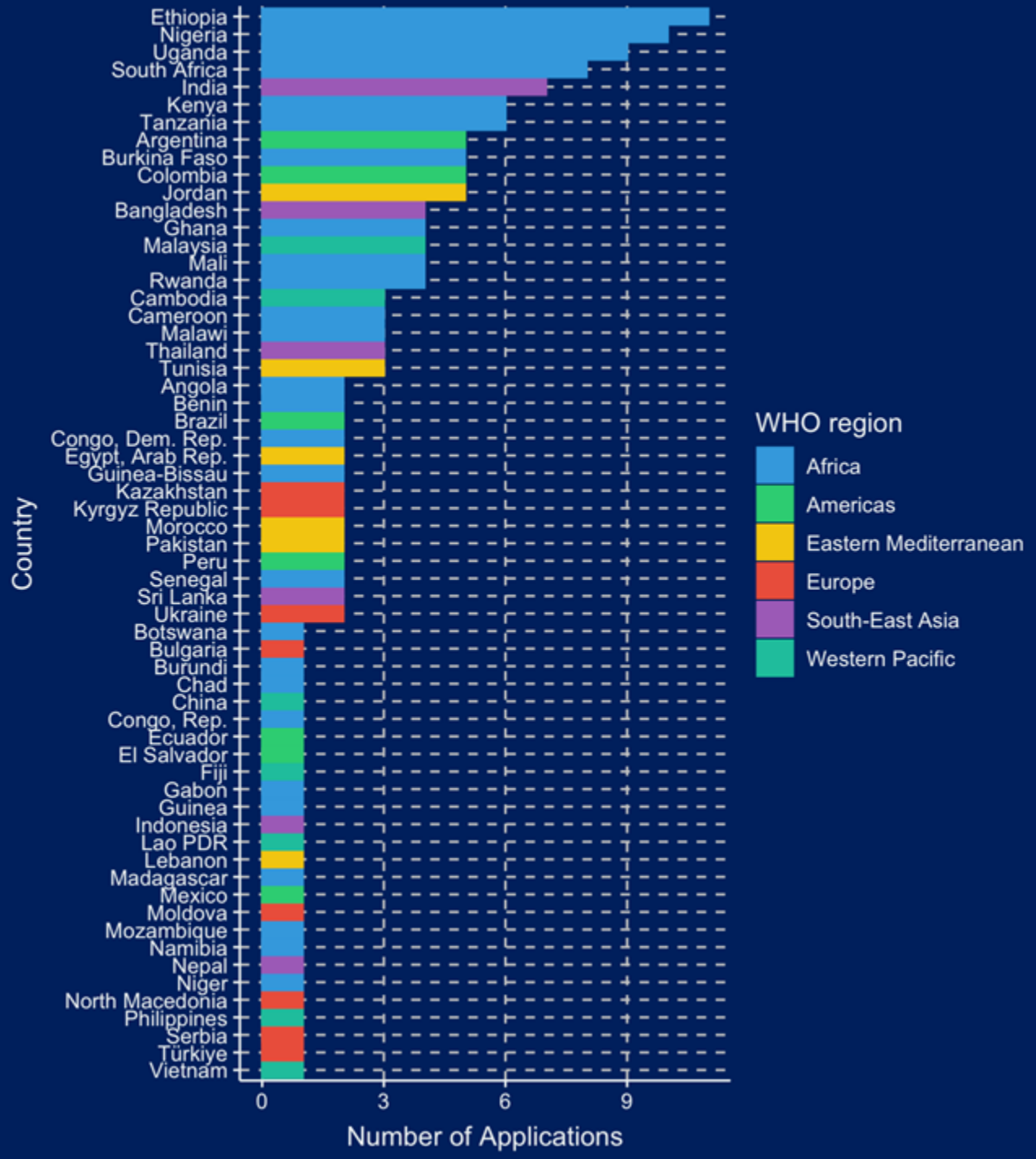
Catalytic Grants Fund

166 eligible* concept notes from 61 countries

WHO Region	n
AFR	93
SEAR	18
AMR	17
EMR	15
WPR	12
EUR	11

More eligible applications from AFRO than from all the other regions combined.



The IPSN Funders Forum can maximize the impact of the IPSN by providing catalytic support and increasing coordination

Challenge	Current efforts and gaps
Country capacity remains uneven; efforts are increasing but uncoordinated	• Too few countries can do sequencing at scale • Bioinformatics and links to public health decision making often lag behind sequencing output • Donor support efforts have limited coverage • Risk to sustainability of domestic and donor financing
Lots of innovation and good practices but limited knowledge sharing	• Limited sharing btw human, environmental & animal health systems, disease areas, academia & public health • Attempts to work across siloes within more limited geographies (e.g., US CDC AMD, ACDC IPG) • No global connector to support harmonization
Data sharing burdened by problems at all levels (technical, political, bureaucratic)	• Insufficient incentives to share data internationally • PIP* was positive step for flu but in many countries & disease areas there remains no agreed framework • Need for WHO as global normative body to ensure trust & global scope of sharing

Areas of work for the Funders Forum

1. Catalytic grant funding to support the activities of the IPSN and ensure there is equity of participation
2. Identify and coordinate around larger funding opportunities

* PIP : Pandemic Influenza Preparedness Framework

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A suite of tools elaborated by IPSN in collaboration with members and partners, and partner-led tools supported by IPSN

As next steps, the IPSN toolkit will be consulted on with regions and countries

Process and next steps:

Draft technical documents to accompany frameworks are developed

Draft technical documents are refined with feedback and input by regions

Products are tested by pilot countries and feedback is incorporated

Products are finalized and prepared for publication

What we will be asking:

- Which countries do you suggest for piloting ?
- How can the products be used in your region?
- Do they help to increase equitable and sustainable access to PGS?
- How can the products be improved to better serve country needs?

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The IPSN Global Partners Forum 2024 will bring partners together to discuss the biggest issues in pathogen genomics

Objectives

Bring together IPSN partners to:

- Showcasing the toolkit of various products developed by the IPSN Secretariat
- Announcement of the first funding round of the IPSN's catalytic grant fund
- Reflecting on the journey of the IPSN from launch to delivery and the growth pathway ahead

Format

Week-long event with plenaries, breakout sessions, and workshops including:

- Global Partners' Forum over 1.5 days
- Competency and Training Workshop over 2 days
- Costing Tools Workshop 2.0 over 1.5 days

Logistics

- Location: Bangkok
- Dates: 21-22 November 2024

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Pathogen Genomics Uses

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The IPSN is developing key global goods defined as priorities by its members

The Country Capacity Framework

A framework that lays out the different archetypes that countries can occupy at different budget levels, to ensure equitable access to PGS as part of their public health system

The Global Investment Case

A powerful, fact-based case for the investment needed in pathogen genomic surveillance at the global level, based on analysis of the additional costs required, and the impact of these investments

PGS Uses

A comprehensive definition of the uses for pathogen genomic surveillance to identify patterns, gaps and examples that support country-level implementation and advocacy

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Pathogen genomics uses framework addresses several objectives

1. Gives a comprehensive view of how PGS may and is being used
   - Scope incl. pathogens with pandemic potential **&** endemic diseases
   - Providing a list of pathogens for experts to **see** how their expertise can support all others, and create synergies
   - From single- to agnostic pathogen surveillance

2. Comprehensive and vertical view allows for interpretation of patterns across pathogens
   - Allows to see patterns across genomic objectives and pathogens, and contribute to more efficient planning and deployment of PGS use

3. Contributes to advocacy efforts
   - The framework can be leveraged for building products such as investment cases
   - Can be used for communications and advocacy for national and international funding

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The framework uses a wide but not exhaustive list of WHO priority pathogens and pathogen-agnostic approaches

Pathogens with pandemic potential (from R&D Blueprint)

1 Disease X
2 SARS-CoV-2
3 MERS-CoV and SARS
4 Crimean-Congo haemorrhagic
5 Ebola and Marburg diseases
6 Lassa fever
7 Nipah and henipaviral diseases
8 Rift Valley fever
9 Arbovirus Zika
10 Arbovirus yellow fever
11 Arbovirus dengue
12 Arbovirus chikungunya

Endemic pathogens endemic & those integrated in programs

13a Influenza, seasonal
13b Influenza, avian & zoonotic
14 AMR bacteria (GLASS priority list)
15 AMR fungus (GLASS priority list)
16 HIV
17 Malaria
18 Tuberculosis (TBx)
19 Cholera
20 Meningitis
21 Rubella
22 Measles
23 Polio
24 Mpox
25 Food-borne pathogens

Pathogen-agnostic approaches

26 Environmental surveillance
27 Water surveillance (incl.
28 Air surveillance
29 Meta-genomics

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The UCF considers 11 different surveillance objectives for the use of genomics

Routine Public Health Practice

1 Early-detection	2 Pathogen characterization	3 Pathogen genetic epidemiology & transmission patterns	4 Contact tracing	5 Outbreak investigation (detection or management)	6 Pathogen elimination surveillance

Special studies

Clinical

7 Diagnostics, Vaccines and Therapeutics: Research and Development	8 Diagnostics, Vaccines and Therapeutics: Monitoring and Evaluation	9 Non-Pharmacological Countermeasures: Monitoring and Evaluation	10 Clinical Severity Assessment	11 Clinical management (at patient level)

Estimations on Genomics contribution to PH

Genomics contribution for PH decision	
1	low contribution
2	medium contribution
3	high contribution

- To what extent does genomics contribute to surveillance and public health?

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The levels of contribution of genomics per pathogen and surveillance objectives for public health decision-making

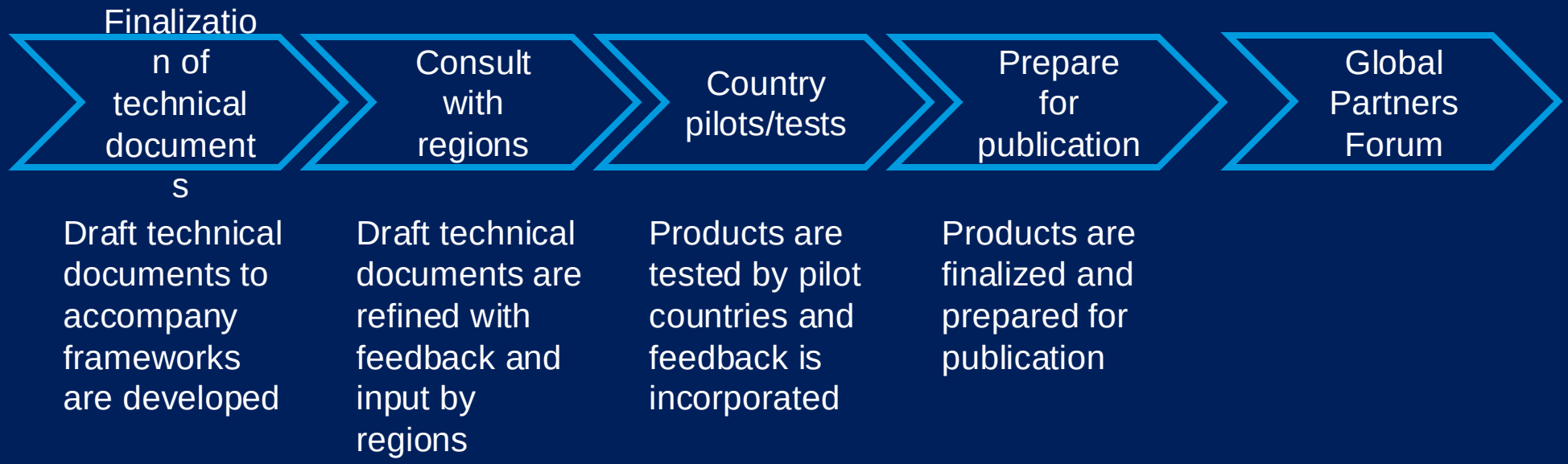
Pathogens / surveillance objectives	Public Health Surveillance						Special Studies				Clinical Mangement
	1 Early detection	2 Pathogen characterization	3 Pathogen genetic epidemiology & transmission patterns	4 Contact tracing	5 Outbreak investigation (detection or management)	6 Pathogen elimination surveillance	7 Diagnostics, Vaccines and Therapeutics: Research and Development	8 Diagnostics, Vaccines and Therapeutics: Monitoring and Evaluation	9 Non-Pharmacological Countermeasures: Monitoring and Evaluation	10 Clinical Characterization and Severity Assessment	11 Clinical management (at patient level to guide individual patient treament)
Pathogens or pathogen groups											
Pathogens with pandemic potential (from R&D Blueprint)											
Disease X	3	3	3	3	3		3	3	3	3	2
SARS-CoV-2	3	3	3	3	3		3	3	3	3	2
MERS-CoV and SARS	2	3	3	1	3		3	3	2	2	1
Crimean-Congo haemorrhagic fever	1	3	2	1	2		3	1	1	2	1
Ebola and Marburg diseases	2	3	1	1	3		3	3	1	2	1
Lassa fever	1	3	2	1	2		3	1	1	2	1
Nipah and henipavíral diseases	1	3	1	1	1		3	1	1	2	1
Rift Valley fever	1	3	2	1	1		3	1	1	2	1
Arbovirus Zika	2	3	2	1	3		3	2	2	3	1
AMR bacteria (GLASS priority list)	1	3	3	2	3		2	2	2	2	2
AMR fungus (GLASS priority list)	1	3	3	2	3		2	2	2	2	1
Endemic pathogens with epidemic potential											
Chikungunya Arbovirus	2	3	2	1	3		3	3	2	2	1
Cholera	1	1	3	1	1	2	1	1	1	1	1
Dengue Arbovirus	1	3	3	1	3		3	3	2	2	1
Food-borne pathogens	1	3	3	1	3		1	1	1	1	2
Hepatitis (C or B)	2	3	2	1	3		3	2	2	2	1
HIV	1	3	2	2	3		3	3	2	3	3
Influenza, avian & zoonotic	3	3	3	2	3		3	3	2	3	2
Influenza, seasonal	1	3	3	1	3		3	3	2	2	1
Malaria	2	1	1	1	1		2	3	1	1	1
Measles	1	3	3	2	3	3	1	2	2	1	1
Meningitis	2	3	3	2	2	1	2	2	2	2	1
Mpox	1	3	3	1	2	3	3	2	2	1	1
Neisseria gonorrhoeae	2	3	3	2	3		3	3	2	3	2
Polio	2	3	3	2	3	3	2	3	2	2	1
Rubella	1	3	3	2	3		1	2	2	1	1
Tuberculosis (TBx)	2	3	2	2	2		3	2	1	1	3
Yellow fever Arbovirus	1	1	1	1	2		2	2	1	1	1
Pathogen-agnostic surveillance											
Environmental surveillance	2	3	3	1	2		3	1	1	1	1
Water surveillance (incl. wastewater)	2	3	3	1	2		3	1	1	1	1
Air surveillance	1	3	3	1	2		3	1	1	1	1
Meta-genomics	3	3	3	1	2	3	1	1	1	2	2

Genomics contribution for PH impact	
1	low contribution
2	medium contribution
3	high contribution

Vertical, horizontal and diagonal read-outs

As next steps, the IPSN toolkit will be consulted on with regions and countries

Process and next steps:

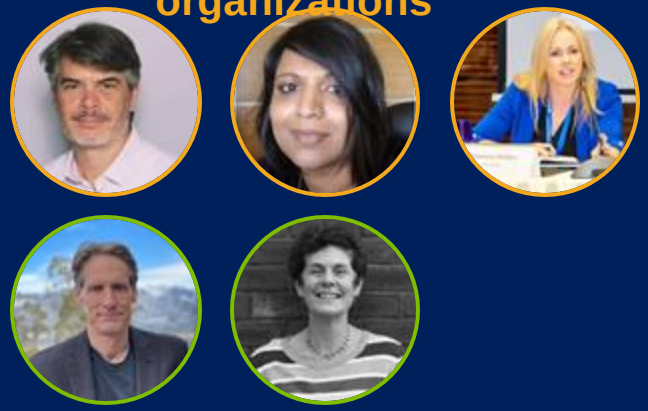


The Secretariat, encompassing core staff and partners

Internal WHO External

The IPSN Secretariat team has expanded to support a larger ongoing scope of work

The IPSN Secretariat is supported by technical advisors from across WHO and partner organizations



Informal technical working groups have been formed with partners for select projects

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Become a member ?

1 Sign your organization up online

- Go to who.int/initiatives/international-pathogen-surveillance-network
- Fill in the form to apply for your organization to join the IPSN as an official member

2 Provide further organizational information

- *Depending on your organization type*, you might need to provide more information on your organization background

3 Become an official member

- The IPSN Secretariat will confirm your organization's official membership

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