ICAP GRAND ROUNDS

A Threat Anywhere Is a Threat Everywhere

Perspectives from the Frontlines of Global Health Security

May 12, 2026

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Jessica Justman, MD
Senior Technical Director
ICAP at Columbia University

Agenda

GHS in the Crosshairs

-- Jessica Justman, MD, Senior Technical Director, ICAP

Rapid Fire Presentations

- ***Development of Epidemic Ready Primary Health Care and Implementation of the 7-1-7 Framework in Sierra Leone***

  -- Susan Michaels-Strasser, PhD, MPH, RN, FAAN, Senior Director, Human Resources for Health (HRH) Development, ICAP

- ***Machine Learning to Predict Outbreaks in Kenya***

  -- Kelvin Ndede, MSc, Strategic Information Advisor, ICAP in Kenya

- ***Diagnostic Innovations in Latin America***

  -- J. Ken Wickiser, PhD, Administrative Director for the Global Alliance for Preventing Pandemics (GAPP), Columbia University

- ***Combatting Antimicrobial Resistance in Ukraine***

  -- Ihor Novykov, MD, Country Representative for ICAP in Ukraine

Q&A

-- Moderated by Suzue Saito, PhD, MIA, MA, Director, ICAP Strategic Information Unit

Reminders:

For questions to the panelists, use the **Q&A box**

The webinar recording and slides will be posted on **www.icap.columbia.edu**

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Global Health Security in the Crosshairs

Jessica Justman, MD

May 12, 2026

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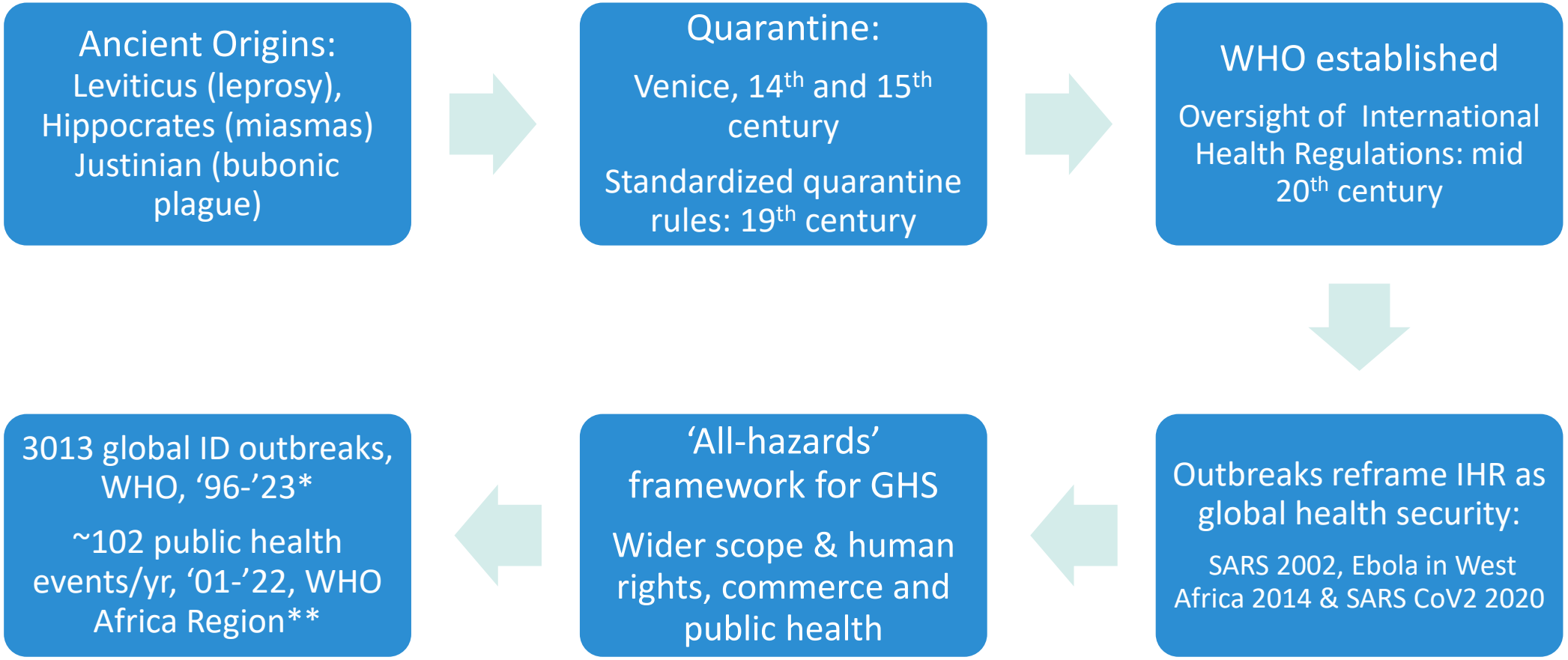
A Brief History of Global Health Security



*Liu Q et al. J Glob Health 2025; **Koua EL et al. BMJ Global Health 2023

Current Status of GHS: a Convergence of Threats

- Weaker public health infrastructure in many countries
- Pandemic vulnerability: most countries remain unprepared according to the 2021 GHS metric
- “All-hazards” strategy: in addition to antimicrobial resistance, climate change & zoonotic diseases, GHS also includes cyber/AI threats and wars/conflicts

GHS in Action: Hantavirus

https://www.cnn.com/2026/05/05/africa/cruise-ship-hantavirus-who-intl

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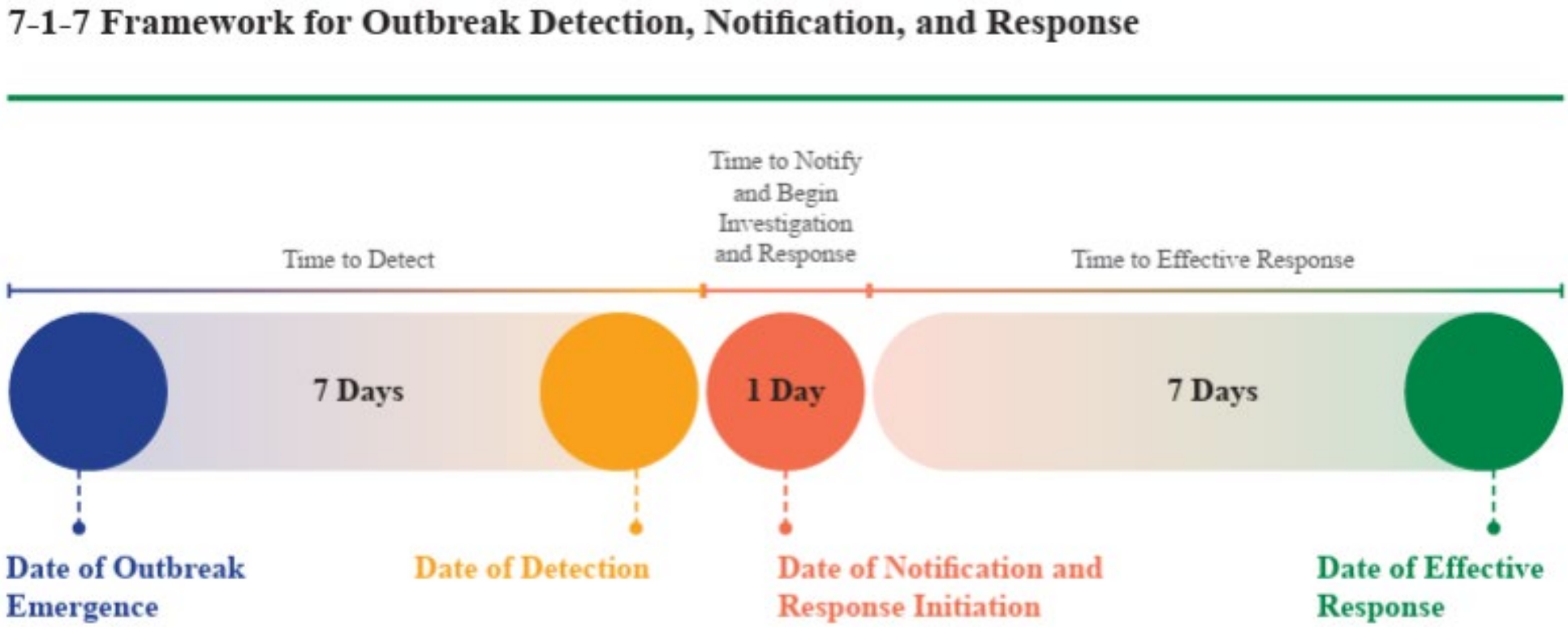
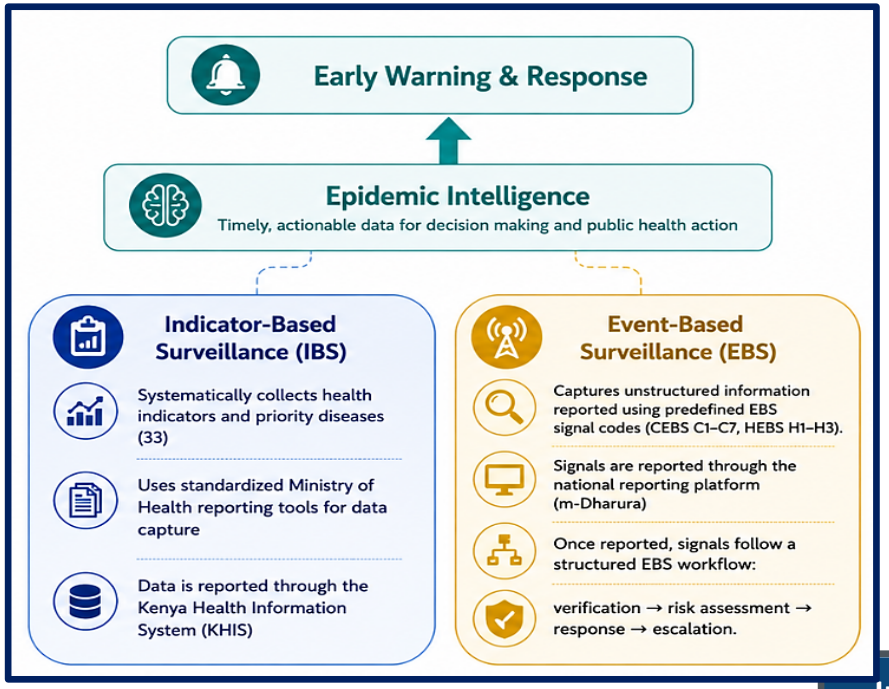
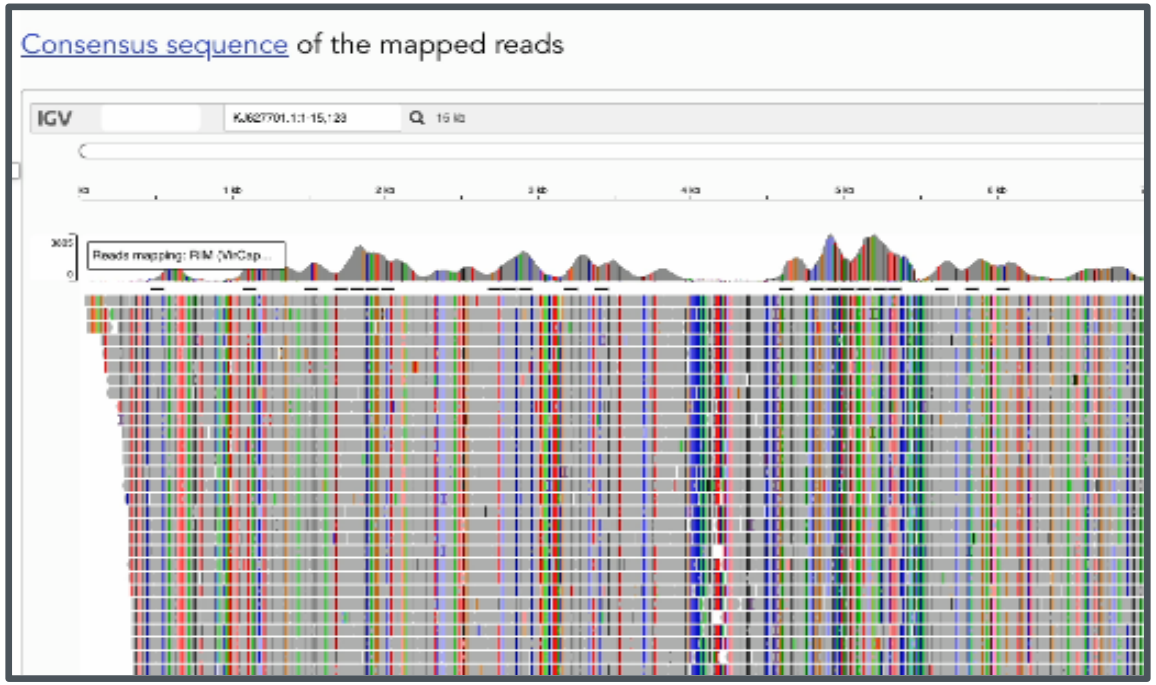
7-1-7: Detect, Report and Respond

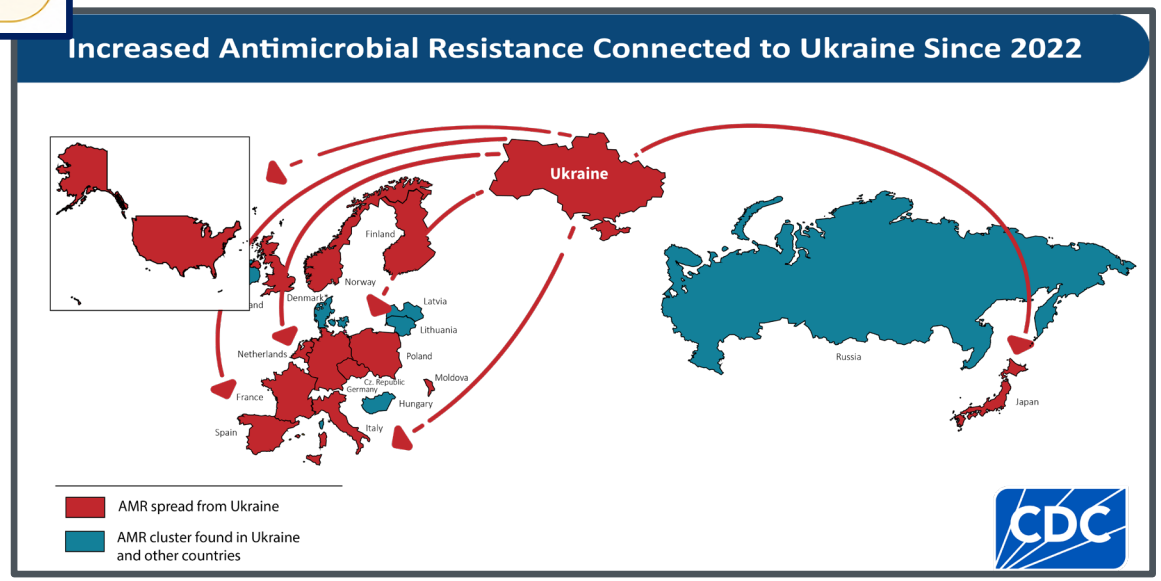


Frieden TR et al. Lancet 2021

Today's talks







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Susan Michaels-Strasser, PhD, MPH, RN, FAAN
Senior Director, Human Resources for Health (HRH) Development
ICAP at Columbia University

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CNN: https://www.cnn.com/2018/05/29/health/ebola-outbreak-2018-response-explainer

The Development of Epidemic-Ready Primary Health Care and the Application of the 7-1-7 Metrics: A Case Study from Sierra Leone

Susan Michaels-Strasser PhD, MPH, MSc., RN

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Global Health Security: The Critical Role of Primary Health Care

Strong PHC. Early Detection. Timely Response. Lives Saved.

1 FIRST LINE OF DEFENSE

PHCs are the first and most frequent point of contact for most people.

2 MISSED OPPORTUNITIES FOR EARLY DETECTION

Many PHC facilities miss early outbreak signals due to limited resources and inadequate training, leading to delays in detection and response.

3 EPIDEMIC-READY PHC (ERPHC)

Clear detection, reporting, and response protocols transform PHC facilities into effective outbreak sentinels.

A strong, well-prepared PHC system is the frontline defense that saves lives and strengthens global health security.

EPIDEMIC READY
PRIMARY HEALTH CARE

Prepared today. Protecting tomorrow.

SPEED

Rapid detection.
Quick decisions.
Fast action.
Every hour counts.

SAFETY

Evidence-based practices.
Infection prevention.
Quality care for all.
Do no harm.

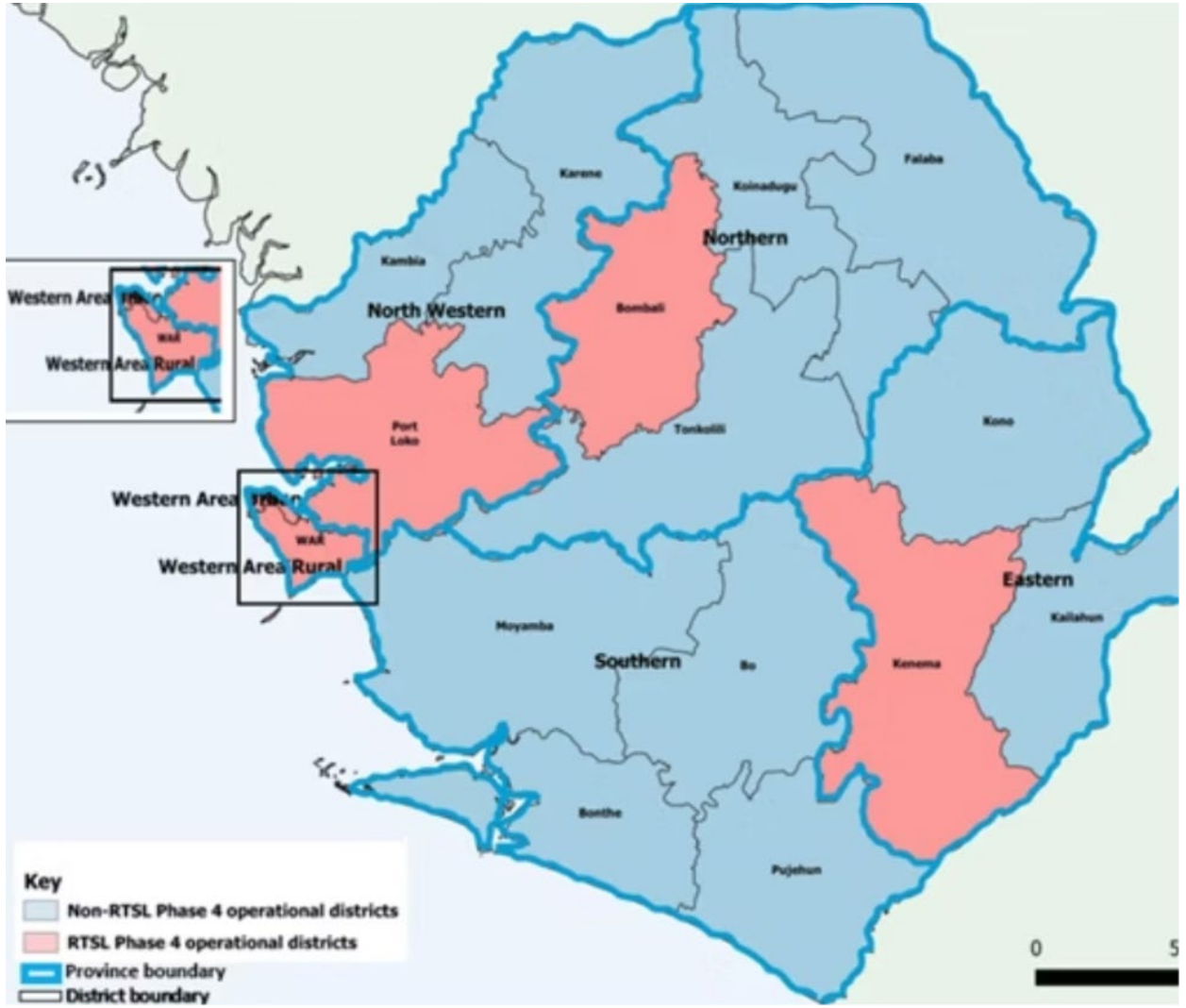
SURGE

Scale up services.
Expand capacity.
Mobilize resources.
Meet demand.

200 Facilities

5 Districts

2M+ Population



ERPHC Interventions

- ❑ IPC Strengthening
- ❑ IDSR Tracking
  - ❑ Seasonal Outbreak Calendar Developed
- ❑ Case Management
  - ❑ The 4 I's - Identify, Isolate, Inform and Initiate Care/Investigate
- ❑ Community Engagement for Outbreak Alerts (CBS)
- ❑ Monthly and Quarterly Readiness Assessments
- ❑ Simulations
- ❑ Outbreak Performance Monitoring
- ❑ On-Site Training and Mentorship

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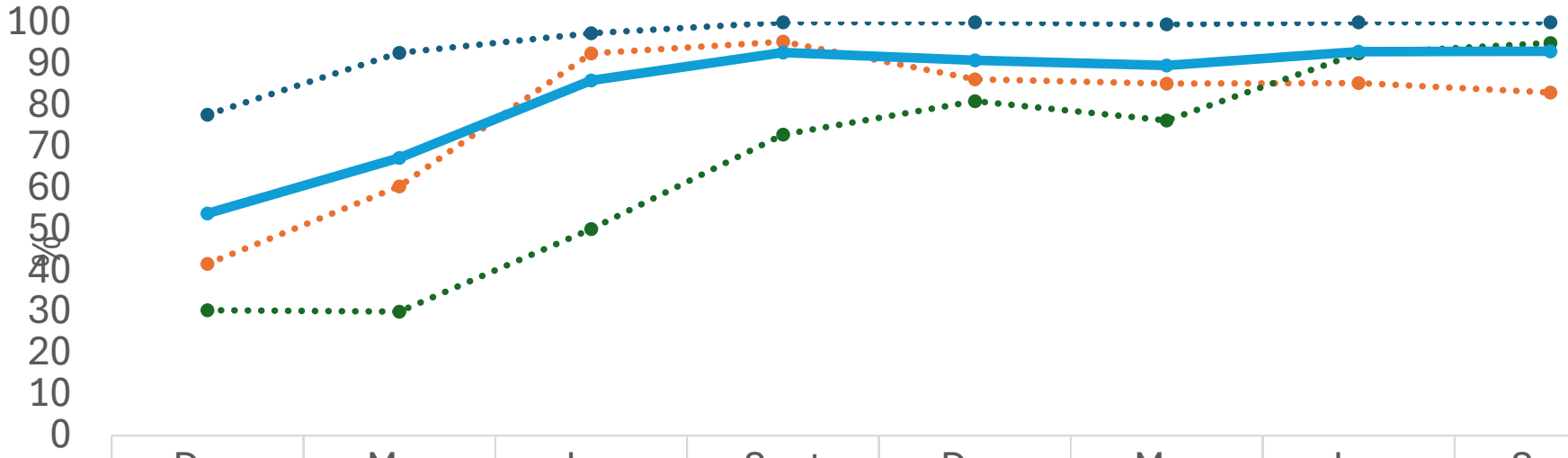
Mean Performance of ERPHC components by months (%)



	Dec	Mar	Jun	Sept	Dec	Mar	Jun	Sept
	2023	2024				2025		
IDSR Performance	78	93	97	100	100	100	100	100
IPC Performance	42	60	93	95	86	85	85	83
Health Facility Preparedness	30	30	50	73	81	76	93	95
Overall ERPHC Performance	54	67	86	93	91	90	93	93

- Consistent upward trajectory demonstrates sustained improvement in facility preparedness across all ERPHC implementation sites

52

Confirmed Cases

Detected and managed March-June 2024

3

Median Detection

Days from symptom onset to detection

4

Facilities Involved

ERPHC sites in two districts

Detection: 98% Within 7 Days

Median detection time of just **3 days** from symptom onset.

Notification: 100% Within 24 Hours

All 52 cases notified to DHMT and NPHA within 1 day using multiple channels: phone calls, SMS, WhatsApp groups ensuring redundancy.

Isolation & Safety: 100% Compliance

Every confirmed case immediately isolated in designated areas. Health workers used correct PPE and followed SOPs without exception.

Surge Readiness: 80% of Actions Met

Facilities implemented majority of surge actions but faced **PPE stockouts** and **referral coordination delays** during peak response.

174

Total Cases

110 ERPHC, 64 non-ERPHC across 4 ERPHC districts

4

Median Detection

ERPHC facilities: 4 days vs 5 days non-ERPHC (p=0.006)

83%

PPE Compliance

ERPHC facilities vs 0% non-ERPHC (p<0.001)

92%

IPC Awareness

ERPHC facilities vs 30% non-ERPHC (p=0.006)

Key Findings

- Superior PPE use and IPC practices
- 100% isolation compliance both types
- Significant geographic variation
- Faster detection at ERPHC sites
- Superior response coordination with DHMTs and NPHA
- Faster documentation, clearer communication protocols

Why ERPHC Facilities Detect Faster

- Active triage systems screening patient using standardized tools
- 4 I's job aids (Identify, Isolate, Inform, Investigate) at entry points
- Staff confidence in recognizing and acting on suspect cases
- Community linkages promoting early care-seeking

Thank you.

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Oliver Eleeza

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Frontline Health Workers & District Staff

Kelvin Ndede, MSc,
Strategic Information Advisor,
ICAP in Kenya

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Using Machine Learning Algorithms to Improve Early Detection and Response to Diarrheal and Respiratory Illnesses in Kenya

ICAP Kenya Team

Ground Rounds

12th May 2026

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Presentation Outline

- Background- IDSR implementation in Kenya
- Predicting priority diseases using EBS signals
- Future applications of the predictive model (E-Bridge)

IDSR Implementation in Kenya

Early Warning & Response

Epidemic Intelligence

Timely, actionable data for decision making and public health action

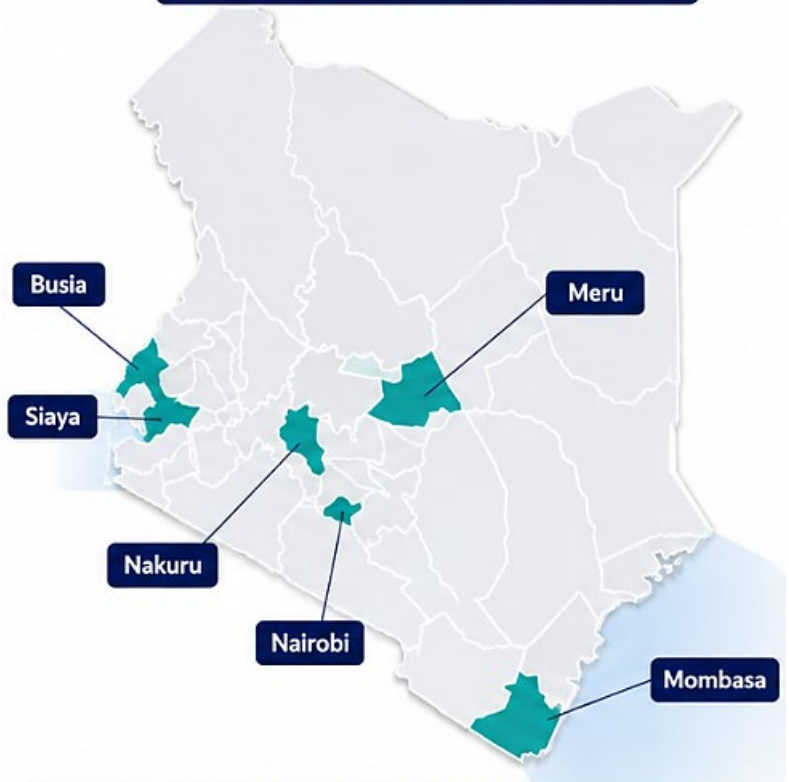
Indicator-Based Surveillance (IBS)

- Systematically collects health indicators and priority diseases
- Uses standardized Ministry of Health reporting tools for data capture
- Data is reported through the Kenya Health Information System (KHIS)

Event-Based Surveillance (EBS)

- Captures unstructured information reported using predefined EBS signal codes (CEBS C1–C7, HEBS H1–H3).
- Signals are reported through the national reporting platform (m-Dharura)
- Once reported, signals follow a structured EBS workflow:
- verification → risk assessment → response → escalation.

ICAP Supported EBS Counties



ICAP has implemented CEBS and HEBS across **six** counties in Kenya.

IBS is supported through **twelve** sentinel surveillance, where priority diseases identified at sentinel sites are reported through the IBS system.

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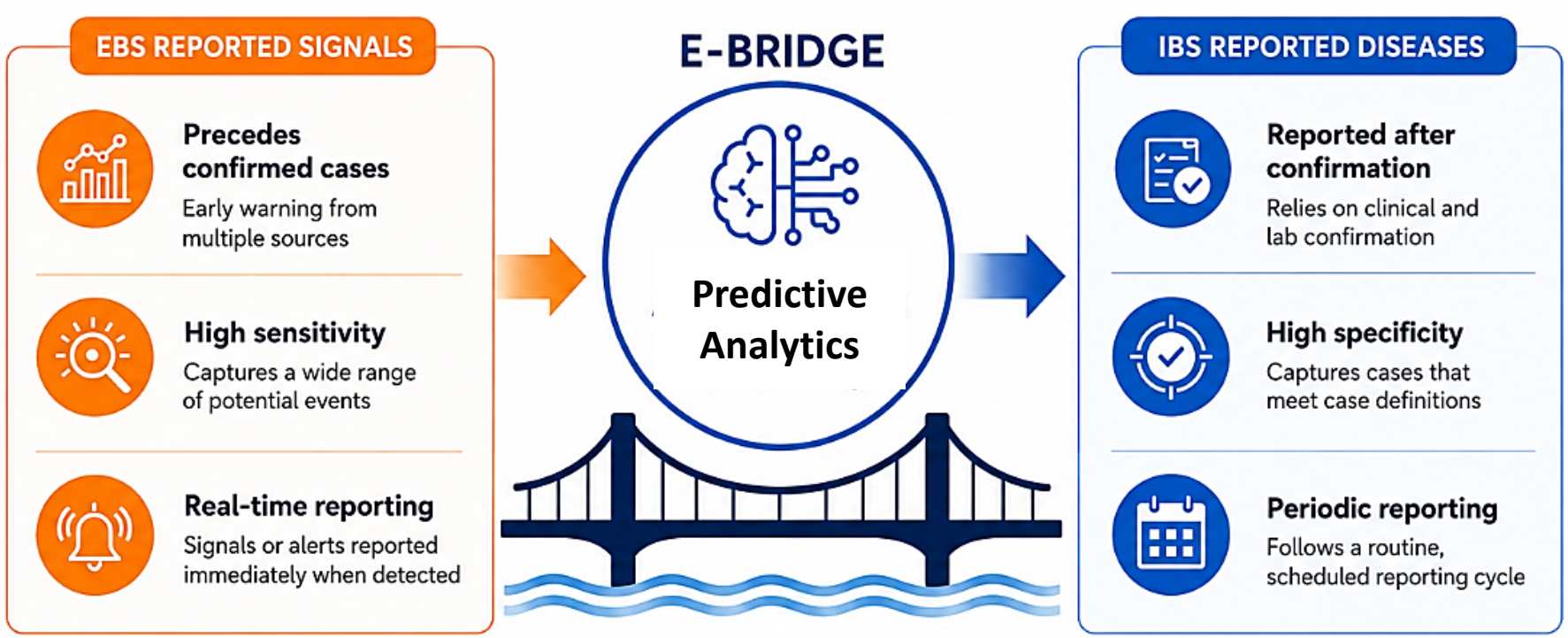
Linking EBS to IBS using predictive analytics (E-Bridge)



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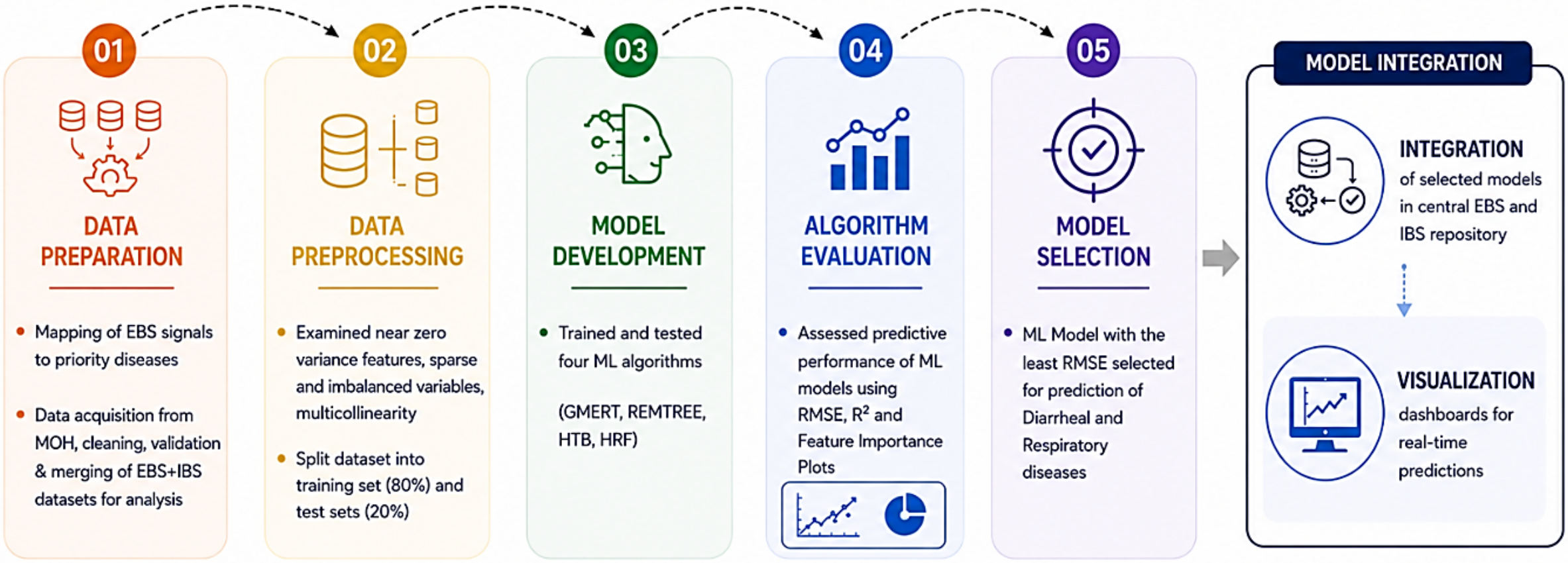
E-Bridge development methodology



NOTES

ML ALGORITHMS: Generalized Mixed Effect Regression Trees (GMERT), Random Effects Expectation Maximization Tree (REEMtree), Historical Tree Boosting (HTB), and Historical Random Forest (HRF)

EVALUATION METRICS: Root Mean Square Error (RMSE), Coefficient of determination (R^2), Feature Importance Plots

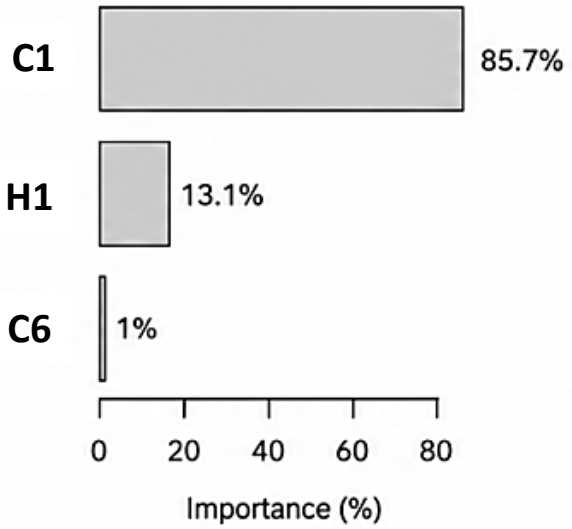
REMTREE is the best performing model for both diarrheal and respiratory illnesses predictions using EBS data.

EBS-IBS Mapping

	EBS Signal	Signal Description	Potential Diarheal Diseases that can be tracked using EBS signals	Potential Respiratory Diseases that can be tracked using EBS signals
CEBS Signals	C1	Two or more people presenting with similar symptoms in a community within a week	Typhoid, Dysentery, cholera,	Pneumonia, URTI, LRTI
	C2	Any death in the community	Typhoid, Dysentery, cholera,	Pneumonia, URTI, LRTI
	C3	Any child under 15 years with sudden weakness of the legs or arms		
	C4	Increase in number of people older than 5 years with lots of watery diarrhea	Typhoid, Cholera,	
	C5	Increased sickness including abortions and/or deaths of animals (wild or domestic and poultry/birds or fish)		Pneumonia, URTI, LRTI
	C6	Any event that causes public health anxiety/concern.	Typhoid, Dysentery, cholera,	Pneumonia, URTI, LRTI
HEBS Signals	H1	Two or more cases with similar symptoms and signs from the same community, social grouping, or function that required hospitalization within a week	Typhoid, Dysentery, Cholera	Pneumonia, URTI, LRTI
	H2	Any healthcare worker who develops signs and symptoms during/after caring for a patient with similar illness	Typhoid, Dysentery, Cholera	Pneumonia, URTI, LRTI
	H3	Any increase in the number of patients (outpatients and inpatients); laboratory requests; prescriptions; etc. at the health facility	Typhoid, Dysentery, Cholera	Pneumonia, URTI, LRTI

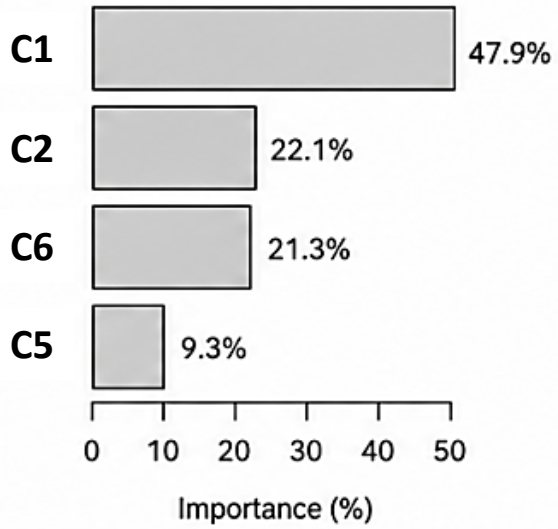
Feature importance plots

Combined Diarrheal Diseases



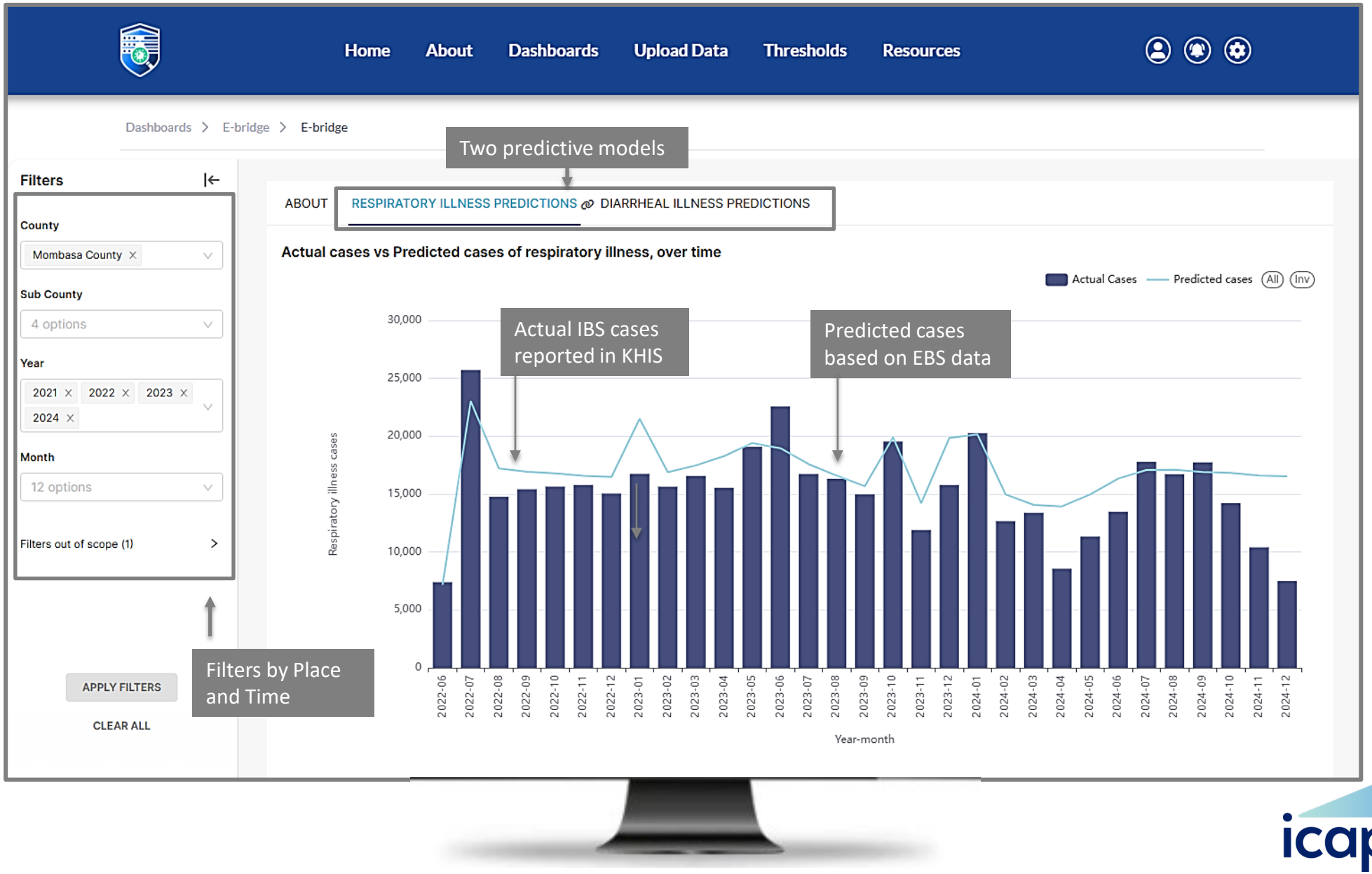
- EBS signals **C1, h1, and C6** were significant predictors of diarrheal illnesses.
- Both signals **C1 and h1** emerge as highly influential, collectively explaining **over 98%** of the predictability of diarrheal syndromes.

Combined Respiratory Diseases



- EBS signals **C1, C2, C5, and C6** were significant predictors of respiratory illnesses.
- Both cases, signals **C1, C2, and C6** collectively account for **over 90%** of the predictability of respiratory syndromes.

Real-time predictions visualized in SHIELD Dashboard



Future applications of predictive model

- **Prediction of other epidemic prone diseases:**

  Expand predictive models beyond diarrheal and respiratory illnesses to predict other priority diseases than can be mapped to EBS signals e.g Ebola

- **Cross-Boarder Disease Monitoring**:

  Use predictive analytics to identify emerging disease patterns across border regions, enabling neighboring countries to coordinate preparedness activities and rapid public health response.

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REPUBLIC OF KENYA

MINISTRY OF HEALTH

CDC

CENTERS FOR DISEASE CONTROL AND PREVENTION

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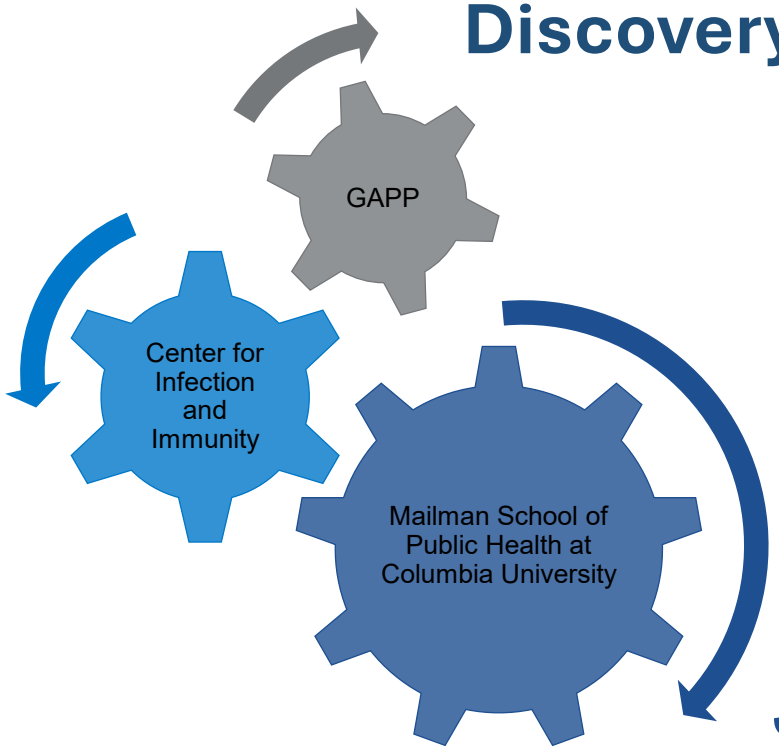
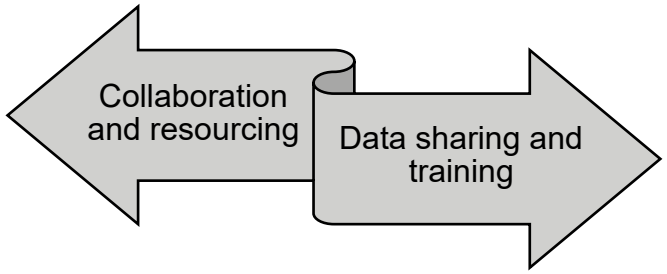
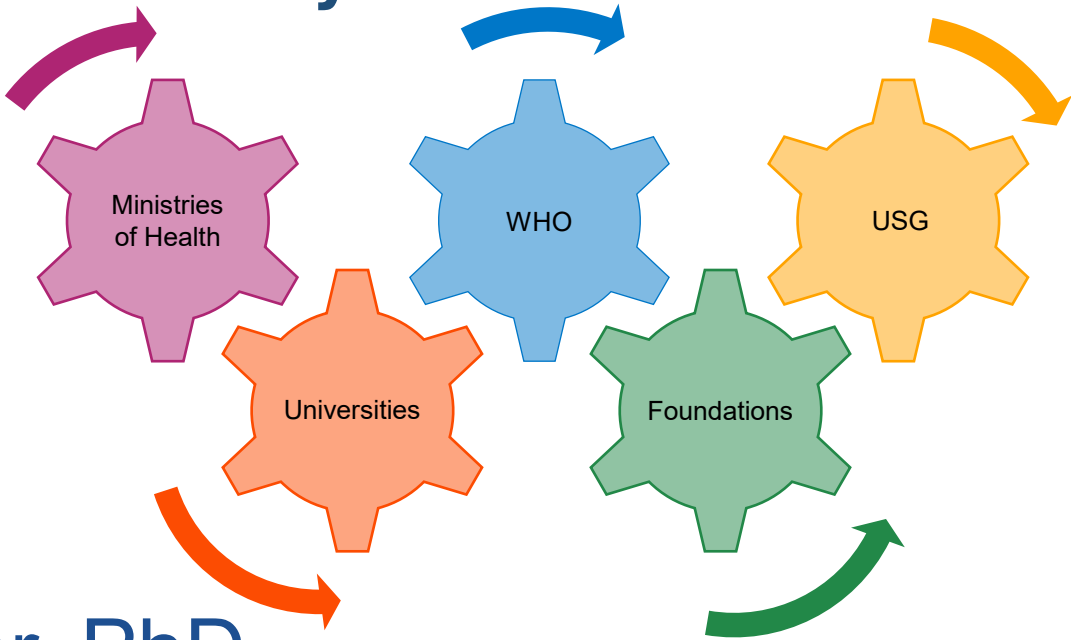
Peru: An In-progress Report

Implementing Pathogen-Focused Metagenomics Tools for Clinical Research, Clinical Care, Surveillance of Knowns, Discovery of Unknowns, and Biosecurity Efforts







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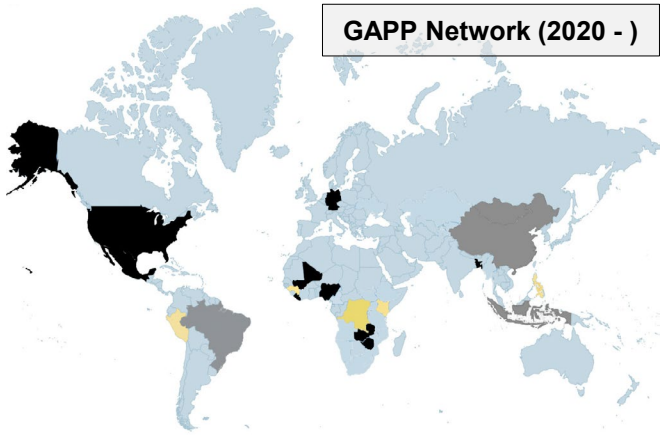
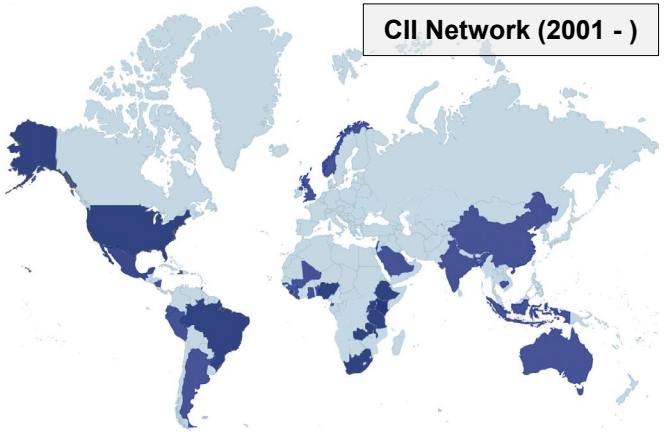
GAPP: Capacity Building

GAPP Network (2020 -)



CII Network (2001 -)



Black: active; grey: inactive; yellow: anticipated

Sequencing and Serology

- Supplies (volume purchasing)
- Computational tools and databases

Training Cohorts:

2021: Liberia 2022: Mali, Zambia

2023: Bangladesh, Germany, Mali, Mexico, Nigeria, US Air Force, Zambia, Zimbabwe

2024: DR Congo, Ecuador, Kenya, Malaysia, Mexico, Netherlands, Nicaragua, South Africa, Sri Lanka, USG (Air Force, Army, CDC)

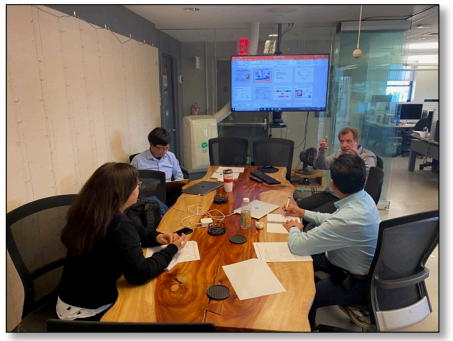
2025: DR Congo, Mali, Mexico, Kenya, South Africa, Zambia, USG (CDC, USAFSAM, USAFA, NAMRU-IP, WRAIR-A, WRAIR-ME-E)

2026: Taiwan, Peru, Côte d'Ivoire, Eswatini, Ethiopia, Guinea, Liberia, Rwanda, Sierra Leone, South Africa; Upcoming: Ghana, Minnesota DOH, Peru, Thailand, Georgia (Tbilisi), West Point

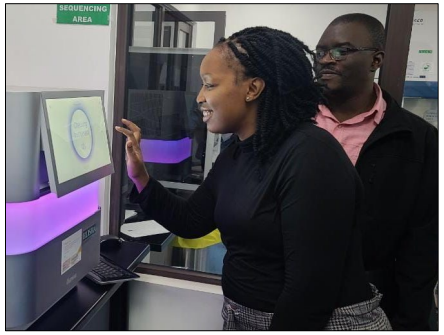
Training at WRAIR-Africa (Kisumu) and in NYC for CDC-KEMRI (Kisumu)

INS-Peru and Peru CDC (MINSA), *February 2026*

Mexico and Germany Cohorts at CII, *February 2023*



In-country training at CHAZ (Zambia), *August 2023*

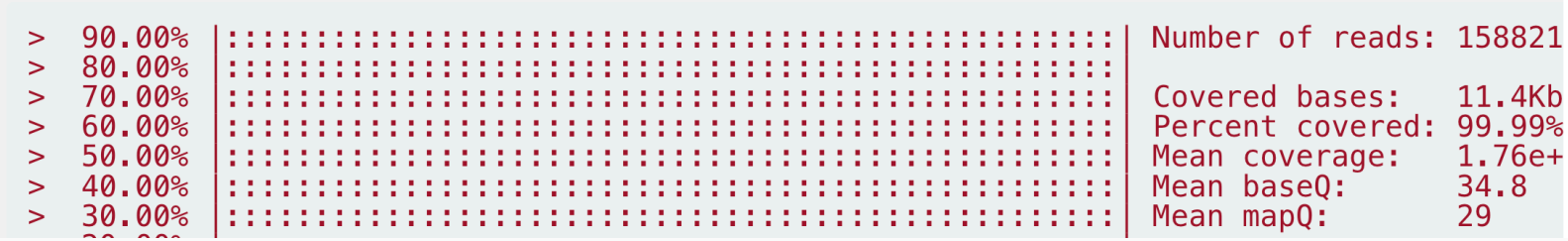


Results

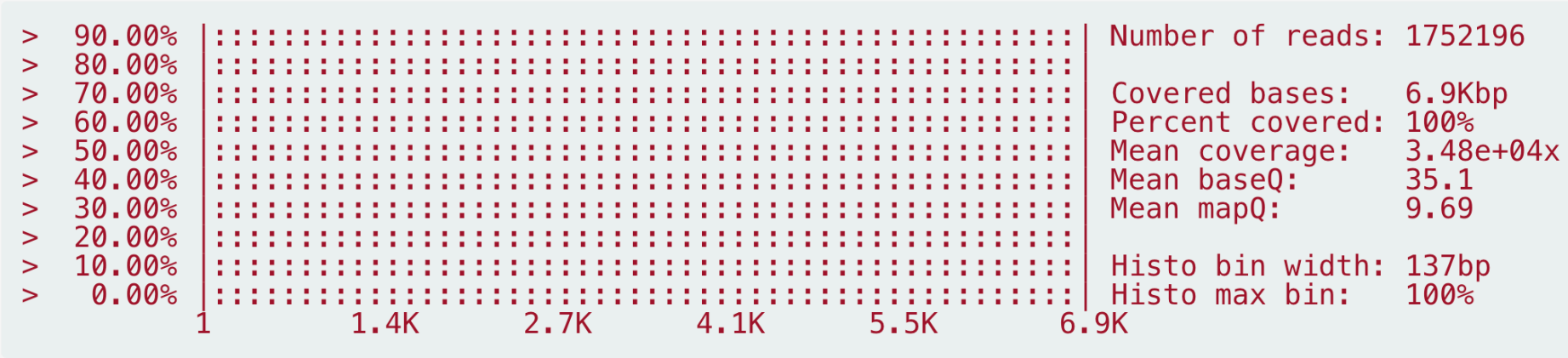
- GAPP team trained 14 lab staff to use VCS to interrogate clinical samples over two weeks in February 2026
- INS-Peru visited remote villages and set up clinics to serve those presenting with fever, respiratory distress, and other symptoms
- Collected NP-Swab and Serum from each participating patient
- Collection teams were deployed for 26 days
- Serum Samples proved to be degraded
- NP-Swab Samples provided excellent results

- **INS Wet Lab and Data Bioinformatics Teams are excellent and now are independently conducting VCS interrogation of clinical samples**

Results

DESCRIPTION	HISTOGRAM
Dengue virus type 3 DENV3/Cuba/2022-03/Yale-DN00831 p (POLY) gene, compl and sfRNA1 lncRNA partial sequence OQ821536.1 (10.7 Pairwise blastn · Rea	
Venezuelan equine encephalitis virus strain VEEV/Homo sapiens/PAN/4840/1961/ID, complete genome KC344506.1 (11.4Kbp) · Pairwise blastn · Reads map-	

data on all ny sample

DESCRIPTION	HISTOGRAM
Oropouche orthobunyavirus isolate 0200178W segment L, complete sequence (Orthobunyavirus oropoucheense) OP244877.1 (6.9Kbp) · Pairwise blastn · Reads mapping species: 3052429|Orthobunyavirus oropoucheense genus: 11572|Orthobunyavirus	
Rhinovirus C32 strai USA/CA/RGDS-201 complete genome MK520815.1 (7.0K Pairwise blastn · Reads mapping subspecies: 1219405|rhinovirus C32 species: 463676|Rhinovirus C genus: 12059|Enterovirus	lomavirus type 85 genus: n/a family: 151340|Papillomaviri-

VCS is comprehensive of all vertebrate viruses: DNA, RNA, ds, ss, segmented, nonsegmented, large, and small

VCS is particularly valuable in co-infections and unexpected pathogens

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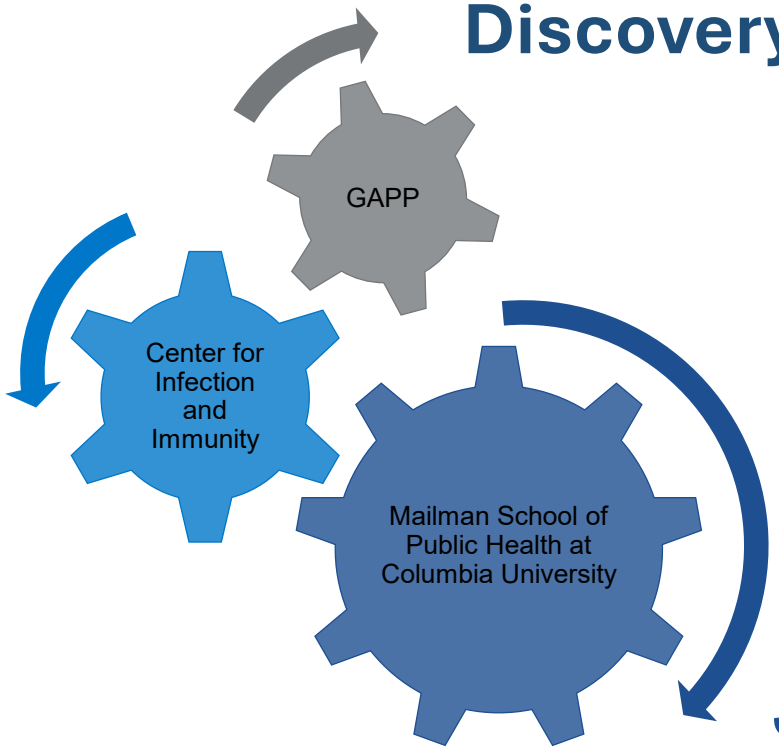
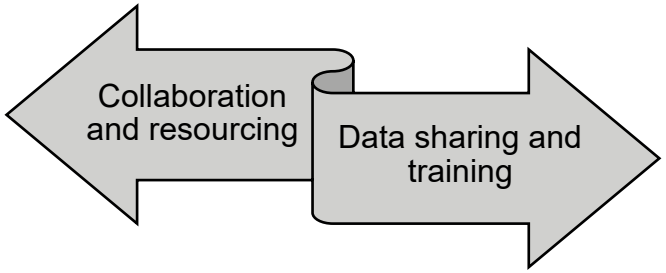
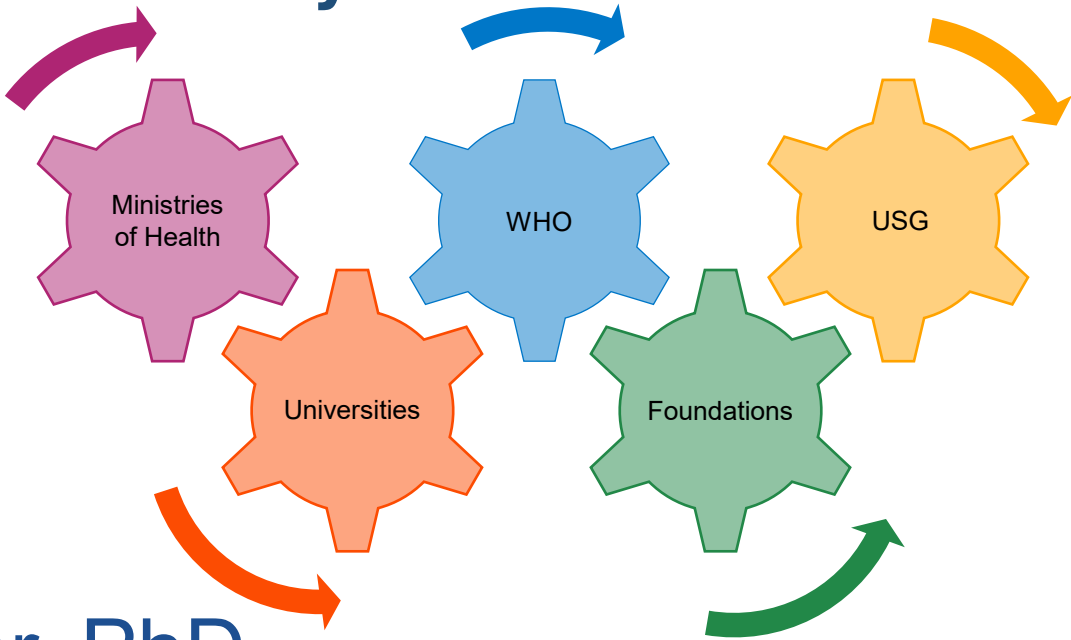
Implementing Pathogen-Focused Metagenomics Tools for Clinical Research, Clinical Care, Surveillance of Knowns, Discovery of Unknowns, and Biosecurity Efforts







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Combatting Antimicrobial Resistance in Ukraine

Ihor Novykov,
Country Representative, ICAP Ukraine

May 12, 2026

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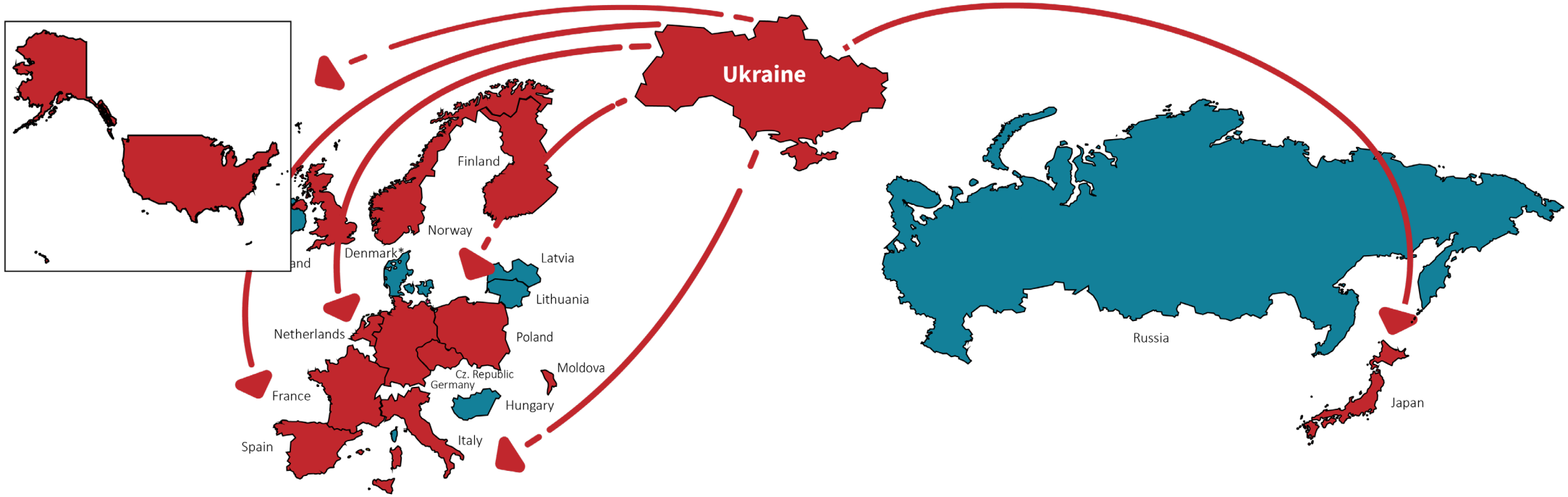
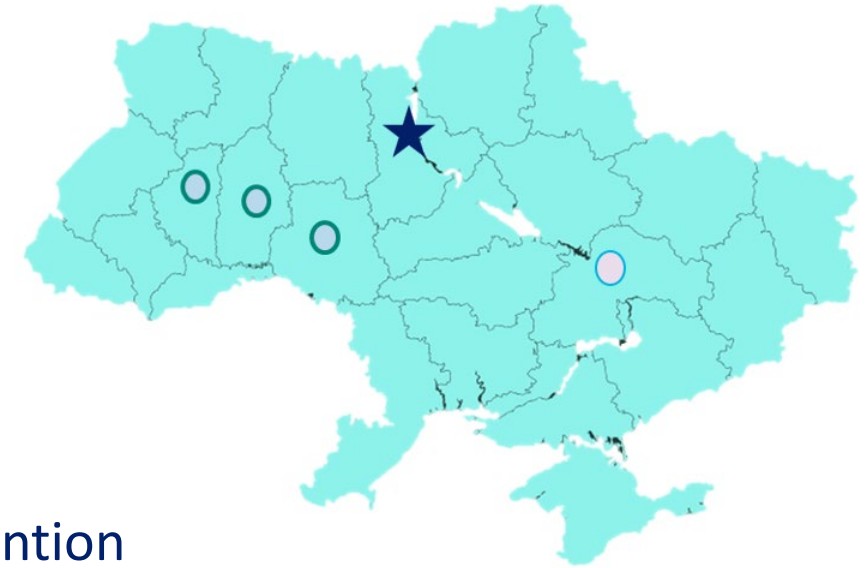
Increased Antimicrobial Resistance Connected to Ukraine Since 2022



AMR: A Global Threat, Predating and Exacerbated by War

- Ukraine: population 31.5 million[1]
- >500,000 military, >56,000 civilian casualties since 2022[2]
- AMR was responsible for >1.27M global deaths in 2019[3]
- Ukraine had high AMR rates prior to war
- AMR is amplified by conflict
- Supported institutions:
- Ukraine Public Health Center
- 4 Regional Centers for Disease Control and Prevention
- 5 Large hospitals



[1]National Academy of Sciences of Ukraine, [2]UN Human Rights Monitoring Mission, [3]Murray CJL et al, Lancet 2022

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AMR Problems, ICAP's Solutions

Lack of microbiological and susceptibility testing data

Overuse of broad-spectrum antibiotics

Poor infection prevention and control practices

Strengthen IPC and HAI surveillance

Reduce infections by strengthening evidence-based best practices, track HAIs

Improve diagnostic capacity

Enhance the speed and quality of testing, ensure appropriate treatment, assist labs to become accredited

Detect and respond to AMR

Advance pathogen characterization; build capacity for epidemiological analysis, genomic surveillance, and response

Strengthen healthcare workforce

Facilitate education and mentorship opportunities; link Ukraine with European and US experts

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Key Achievements

- Implemented 3 **facility-based quality improvement projects**
  - **IPC:** hand hygiene, environmental cleaning, contact precautions
  - **Lab:** blood & wound specimen quality
- Strengthened **IPC tools and systems**
  - **Hand hygiene, environmental cleaning**: trained staff, implemented monitoring
  - Implemented colonization screening
- **Capacitated bacteriology laboratories**
  - Equipped 7 laboratories
  - Supported 3 laboratories to become accredited
  - Enrolled 10 laboratories in quarterly external quality assessment (EQA)
- Established and supported **hospital-based multidisciplinary teams**
  - Created a community of practice with over 70 twinning calls
  - Hosted 27 Ukrainian-language webinars with European experts

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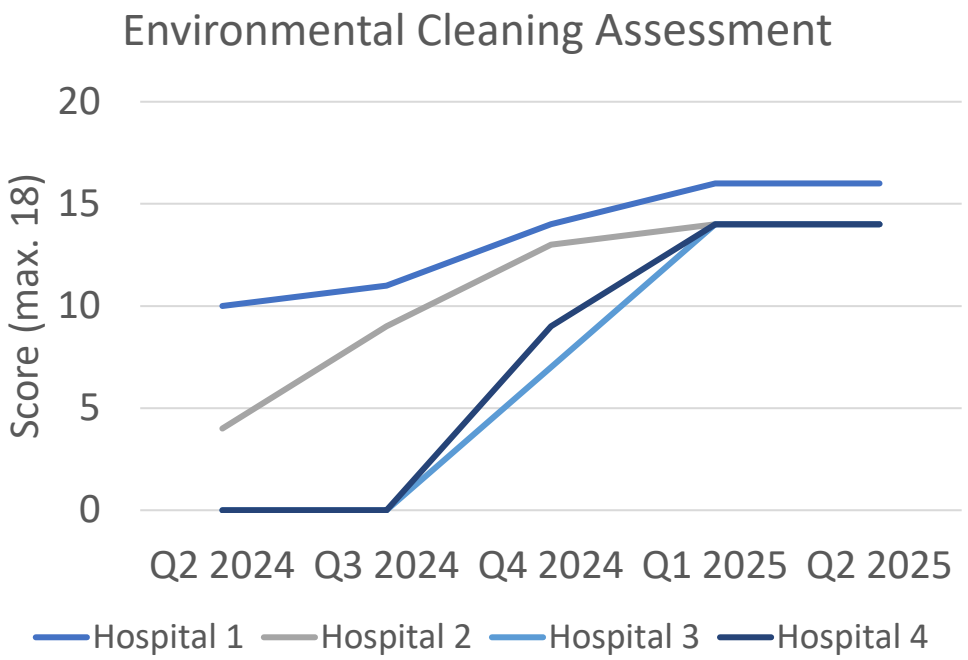
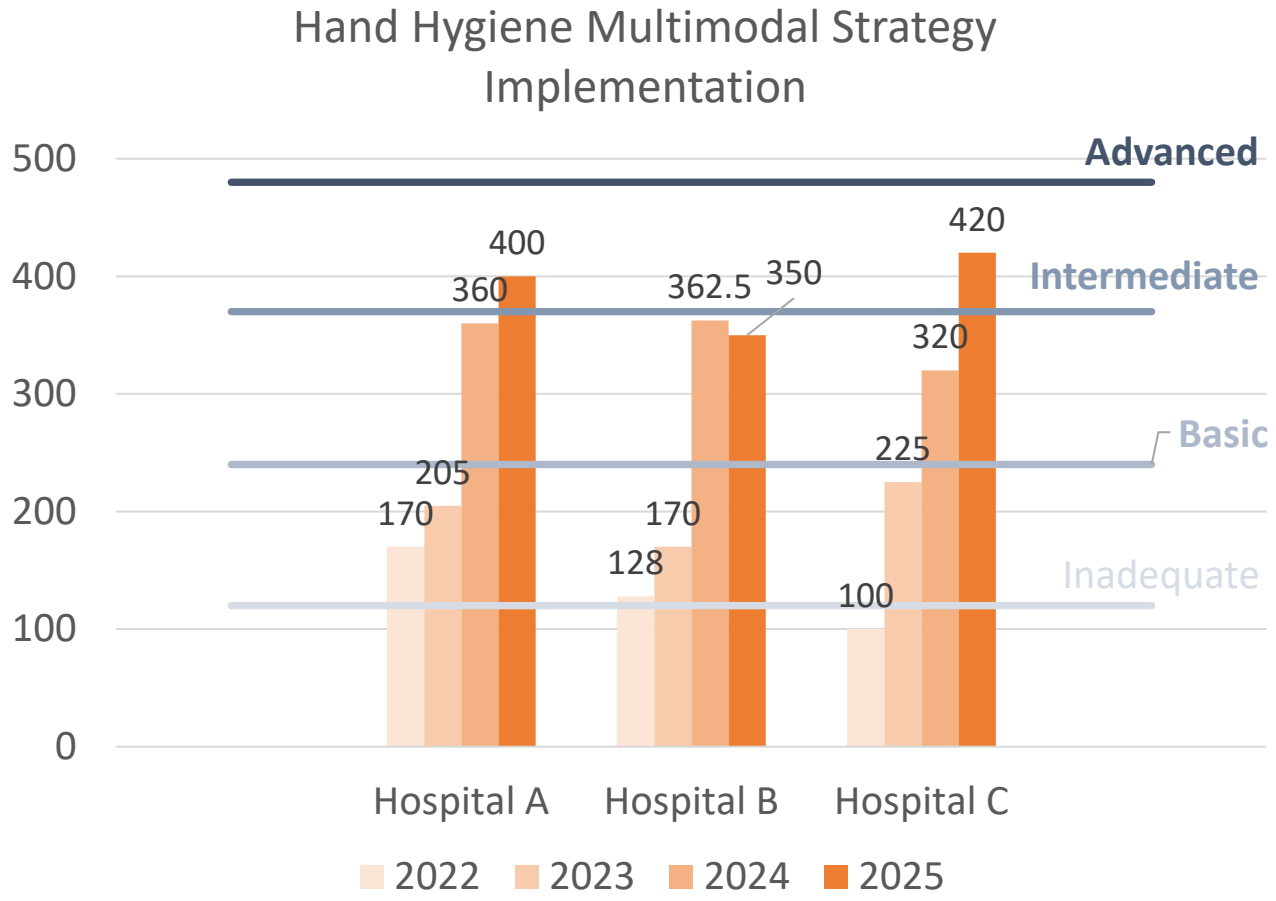
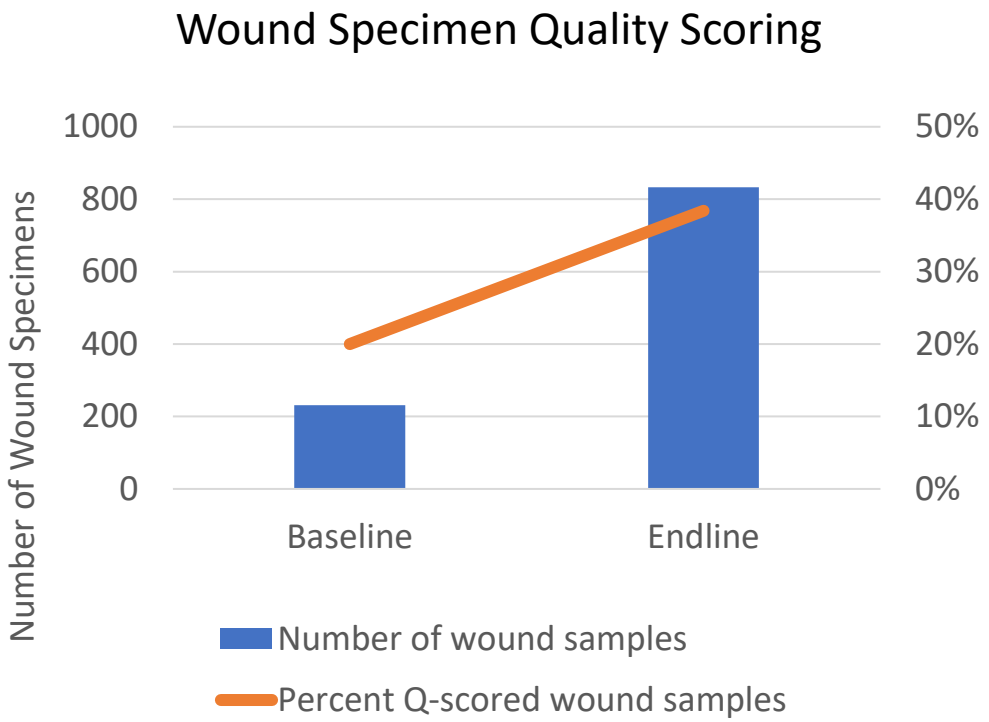
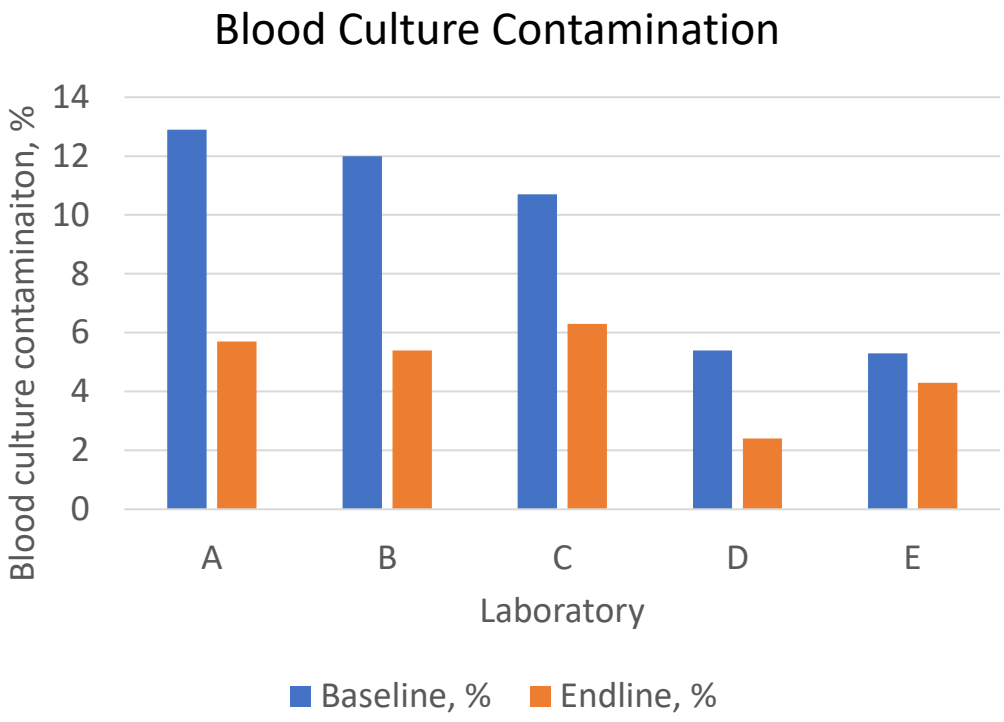
IPC Measures of Improvement





Laboratory Measures of Improvement





Laboratory assessment scores:
from **55% to 92% in 3 years**

Year	Average Score
2022	55%
2023	77%
2024	86%
2025	92%

Planned Activities and Next Steps

- Surgical site infection prevention and surveillance
- Improve wound care management practices
- Further support development of the national tiered laboratory network
- Create a guide for scaling up successful interventions
- Continue screening for CRO colonization
- Implement IPC training programs for postgraduate education in collaboration with medical universities

Thank you

May 12, 2026

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Suzue Saito, PhD, MIA, MA,
Director, Strategic Information Unit
ICAP at Columbia University

Q&A

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This webinar recording and slides will be posted on www.icap.columbia.edu

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Next ICAP Grand Rounds

Tuesday, June 16

Mobile Phone Health Surveys in Low- and Middle-Income Countries

Stay Tuned for Details!

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Thank you

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