Revolutionizing Informal AMR Data Sources vs. Traditional Interfaces

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Program for Monitoring Emerging Diseases -Antimicrobial Resistance (ProMED-AMR)

International Society for Infectious diseases (ISID)

Munich, 21 April 2026

ESCMID Global

Congress of the European Society of Clinical Microbiology and Infectious Diseases

The Escalating Global Threat of AMR

An estimated 1.91 million deaths attributable to AMR and 8.22 million deaths associated with AMR could occur globally in 2050.

Mortality Projections (2050)

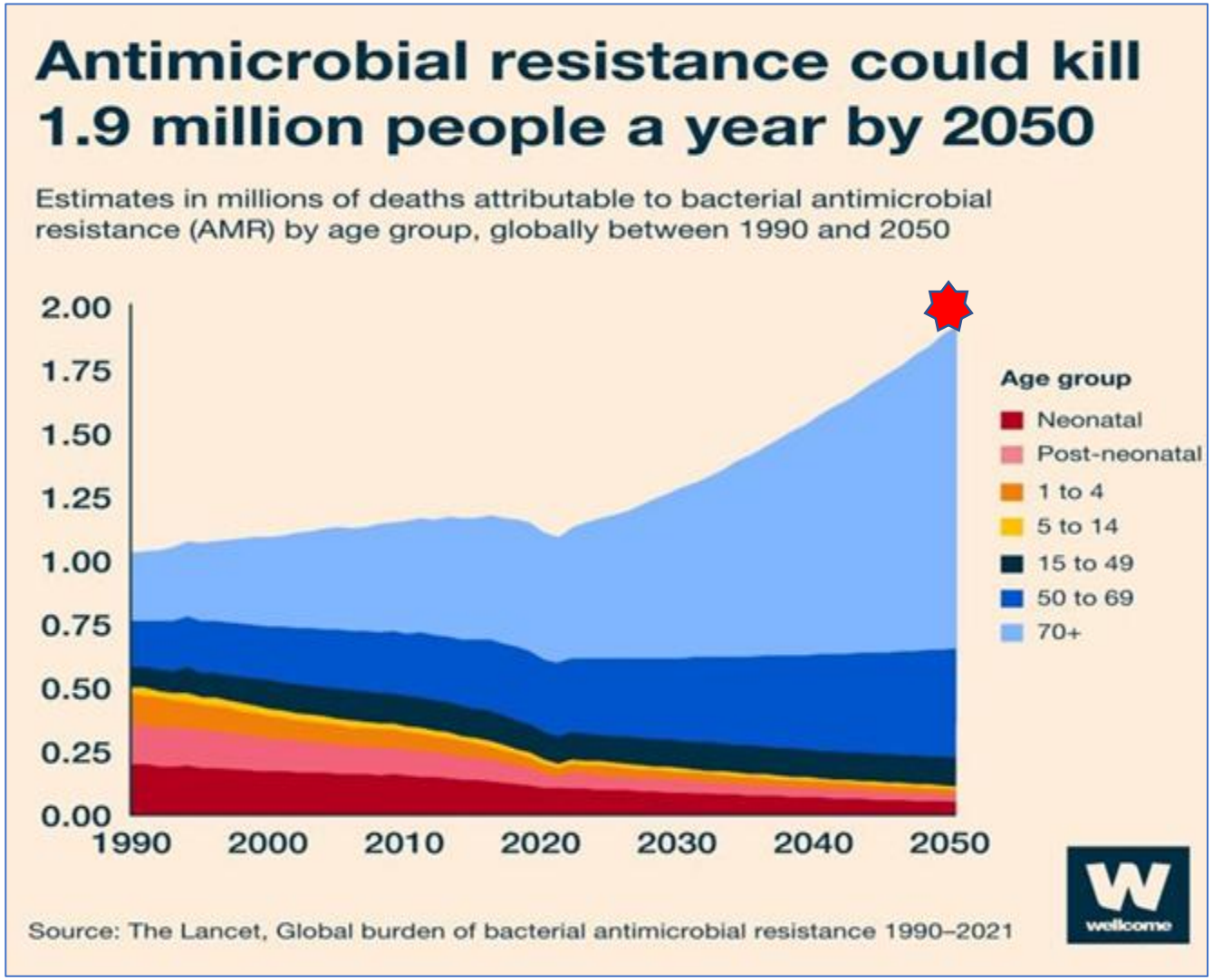
AMR attributable deaths

1.91 million

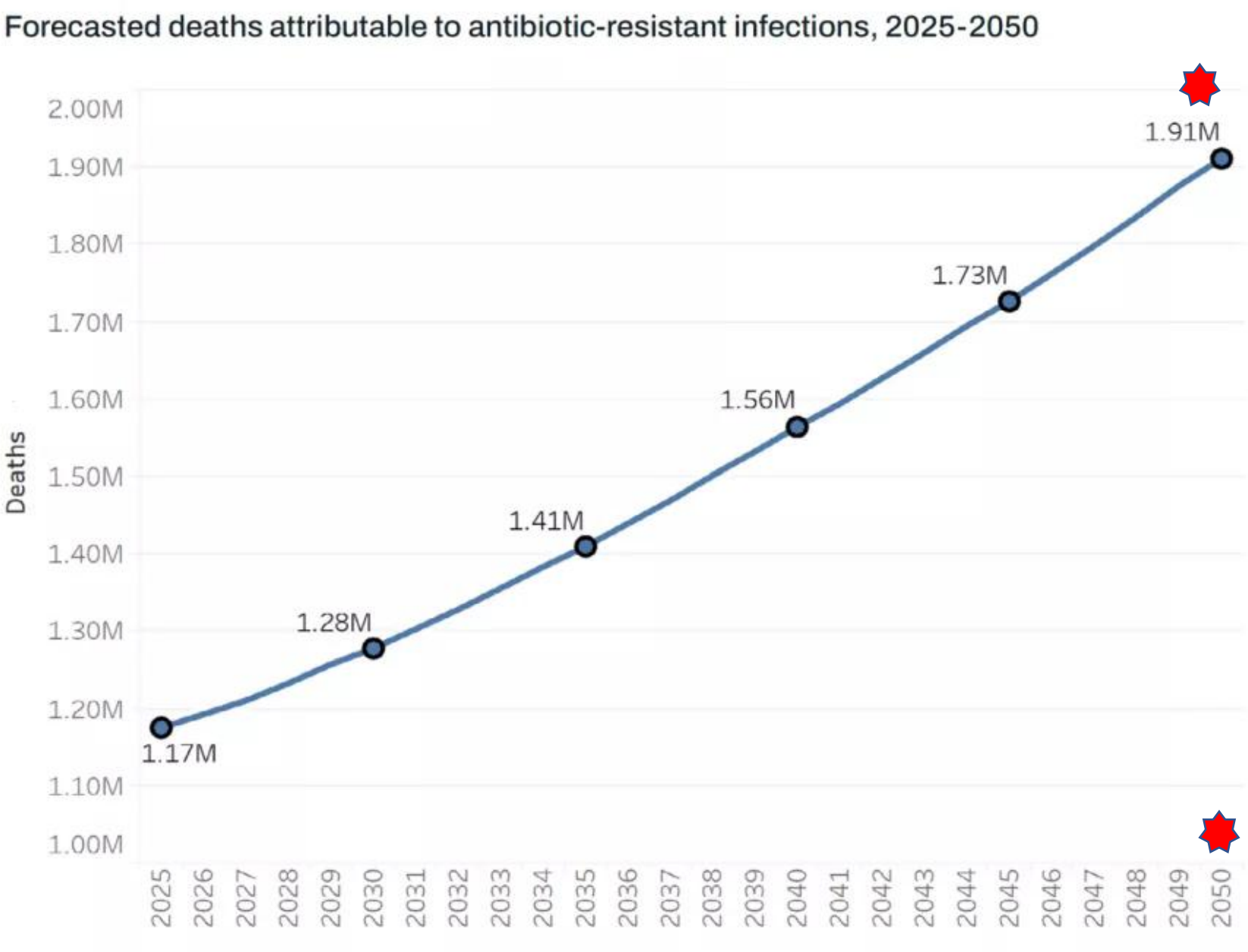
- Neonatal/Post-neonatal deaths
- Elderly (>70 years)

Associated AMR deaths

- **8.22 million**



https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(24)01867-1.pdf

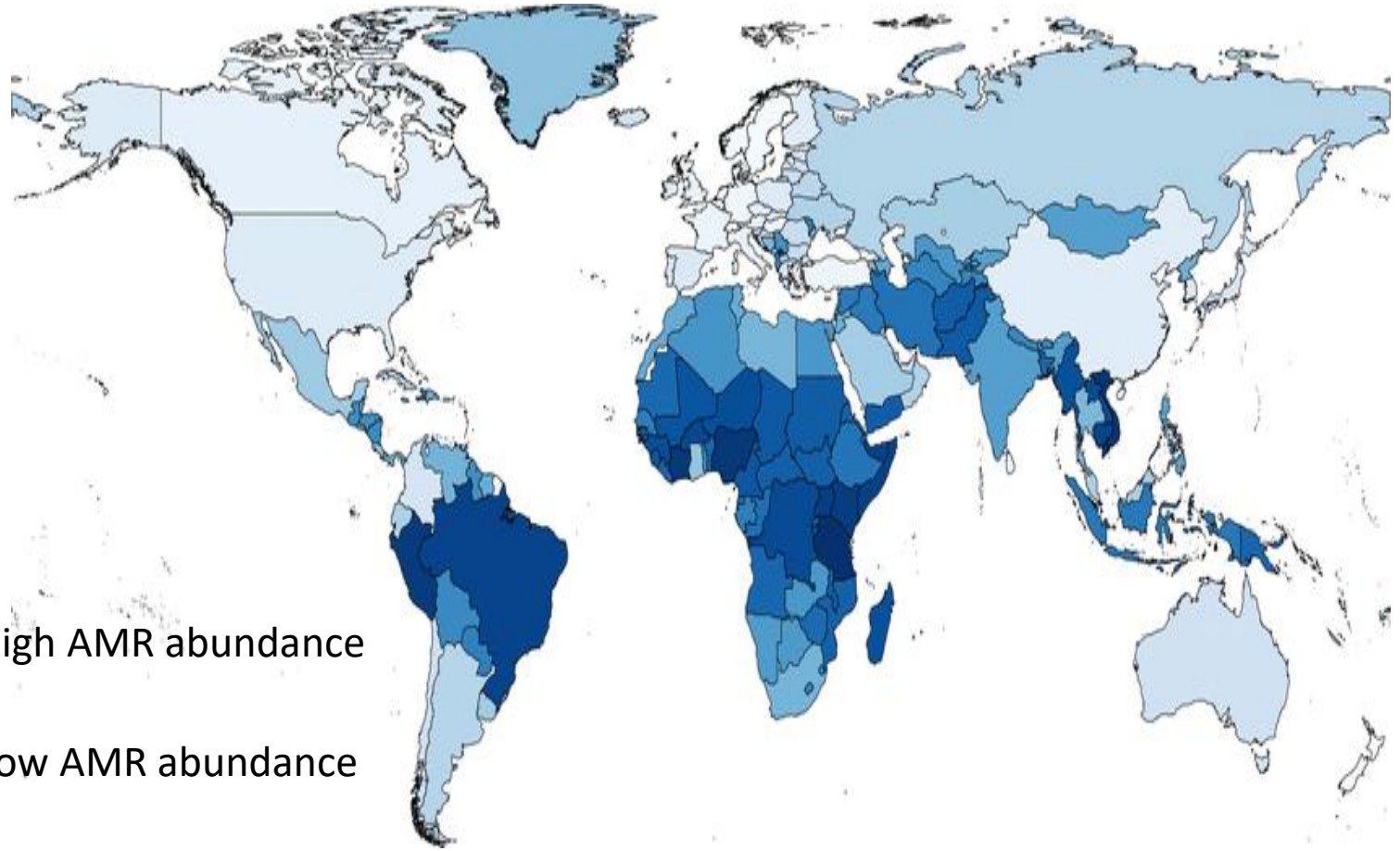


https://www.healthdata.org/research-analysis/health-topics/antimicrobial-resistance-amr

Global predictions of antimicrobial resistance (AMR)

Data indicates that AMR is a primary driver of global mortality, with a significant shift in the burden of disease expected over the coming decades.

- **Geographical Distribution**
  High AMR abundance particularly in parts of
- **Africa**
- **South America**
- **Southeast Asia**



https://www.researchgate.net/figure/Global-predictions-of-antimicrobial-resistance-AMR-abundance-in-all-countries-and_fig4_331616816

WHO GLASS report: Primary global platform

- standardized collection
- report formal, reporting of official national AMR data
- incorporate various types of surveillance, it relies on structured, officially recognized channels from member states

https://www.who.int/initiatives/glass

AMR SURVEILLANCE DATA SOURCE: WHY WE NEED AMR SURVEILLANCE?

AMR Surveillance Geographical Regions

Tracking Antimicrobial Resistance & Use (AMR/AMU) patterns across different scales

Early Warning System for Outbreaks

Rapidly detecting unusual resistance trends and potential disease outbreaks

Detect Resistant Pathogens

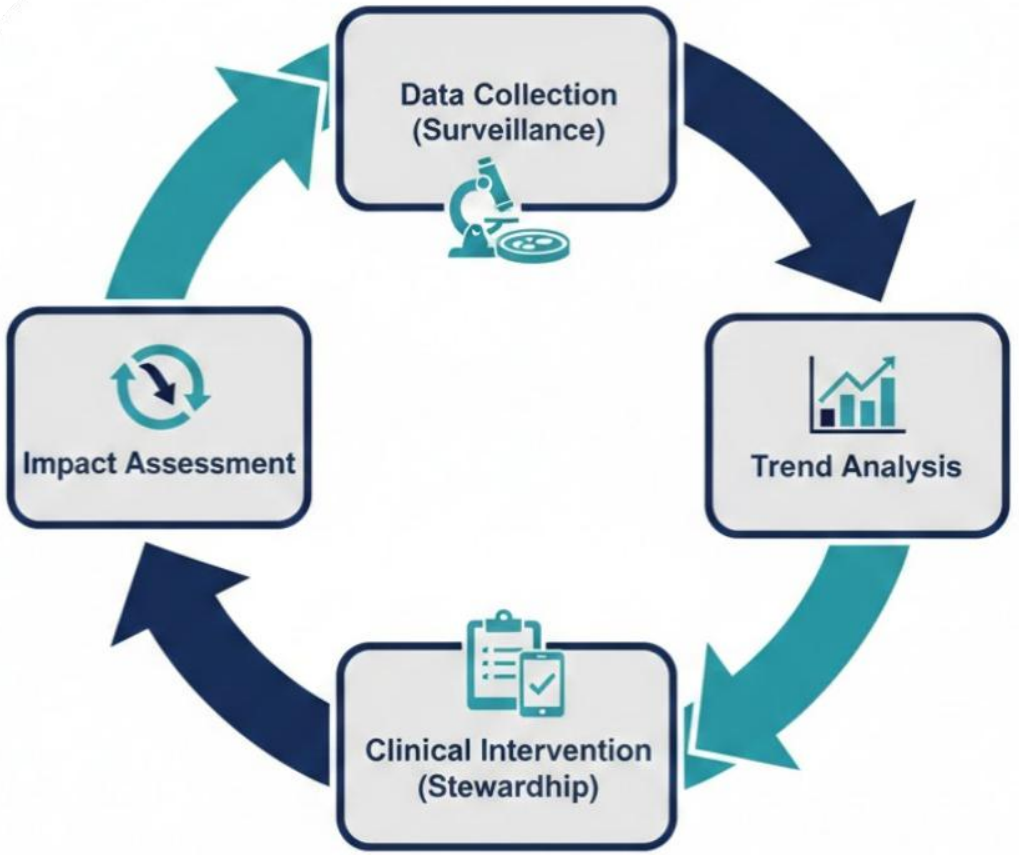
Pinpointing emerging Pinpointing emerging and specific drug-resistant bacterial, viral, or fungal strains

Guiding Public Health Actions

Informing resource allocation, developing treatment guidelines, and crafting effective interventions.

The symbiotic relationship
AMR data (surveillance) & Stewardship

- **Data Collection (Surveillance**) *Gathering baseline data from hospitals and the field*
- **Trend Analysis** *Interpreting the data to identify patterns*
- **Clinical Intervention (Stewardship)** *Implementing effective stewardship programs to improve patient outcomes*
- **Impact Assessment** *Evaluating the effectiveness of interventions.*



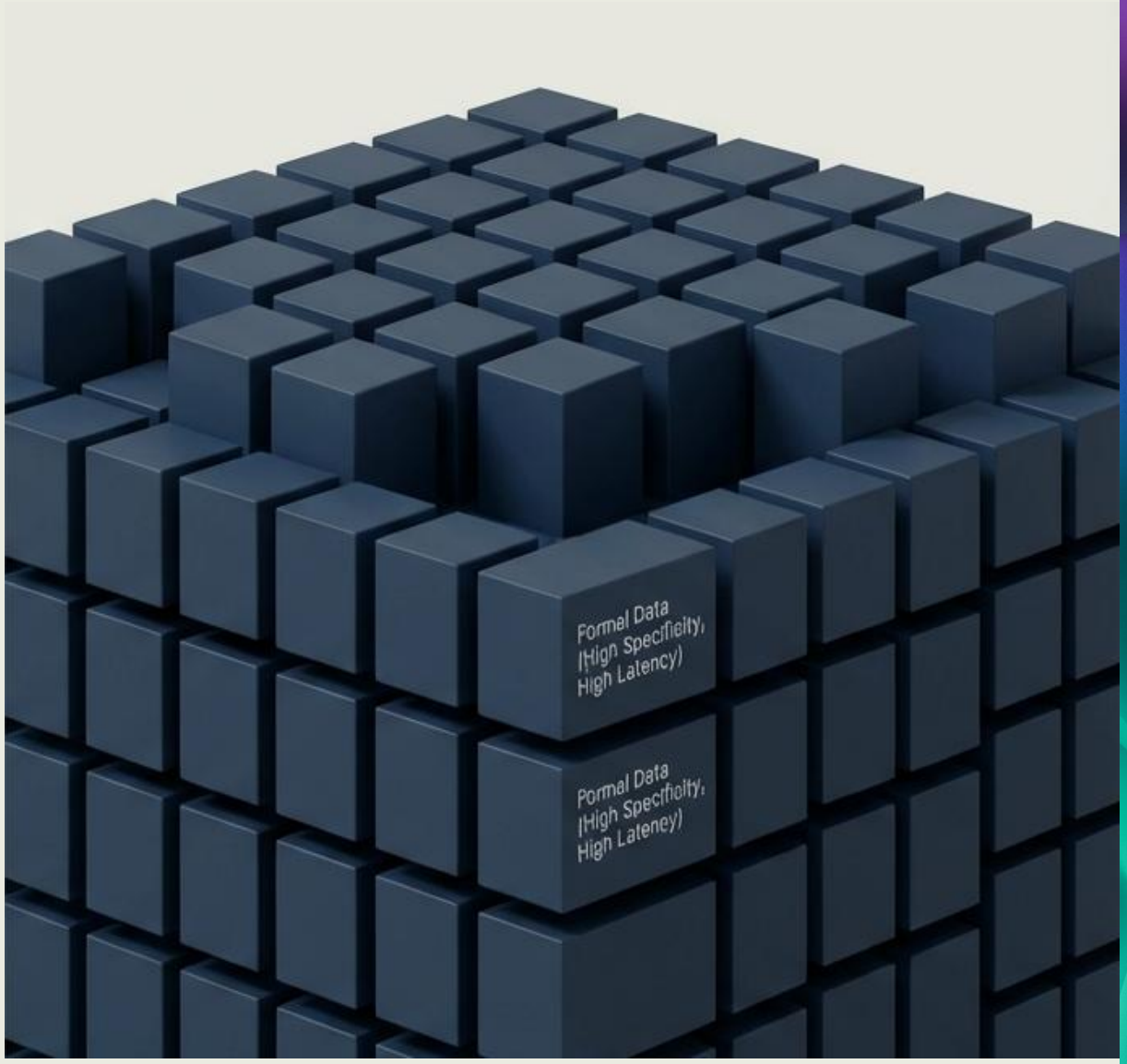
Source: Adapted from World Wealth Organization & CDC Guidelines, 2025.

Formal AMR data source

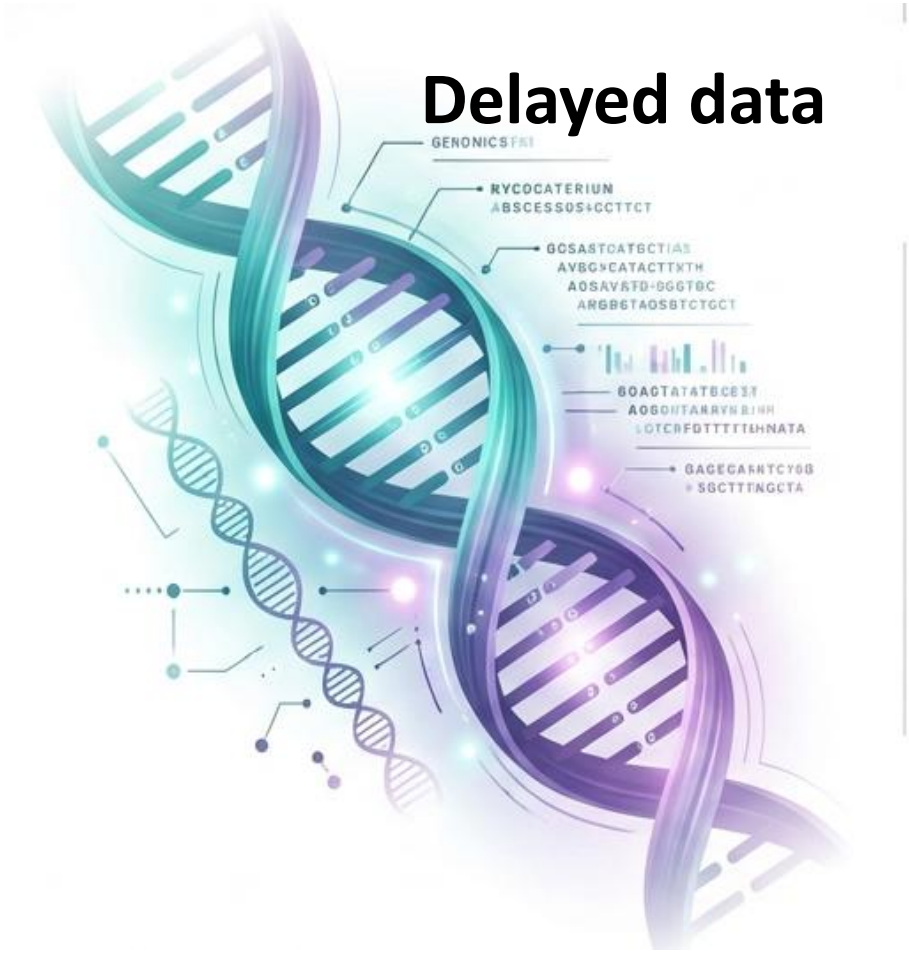
- Ground truth of AMR data
- Clinical lab reports
- Reference laboratories
- Standardized methodology
- Confirmed microbiological samples
- Official reporting system
- Specific data metrics

Data Lag problem

Traditional clinical data often has a 1–2year reporting lag. By the time a national report is published, a resistant strain may have already crossed borders



Formal- AMR surveillance data source



Delayed data

Subject:

Mycobacterium abscessus complex

NTM-Hospital environment, Medical University

Context:

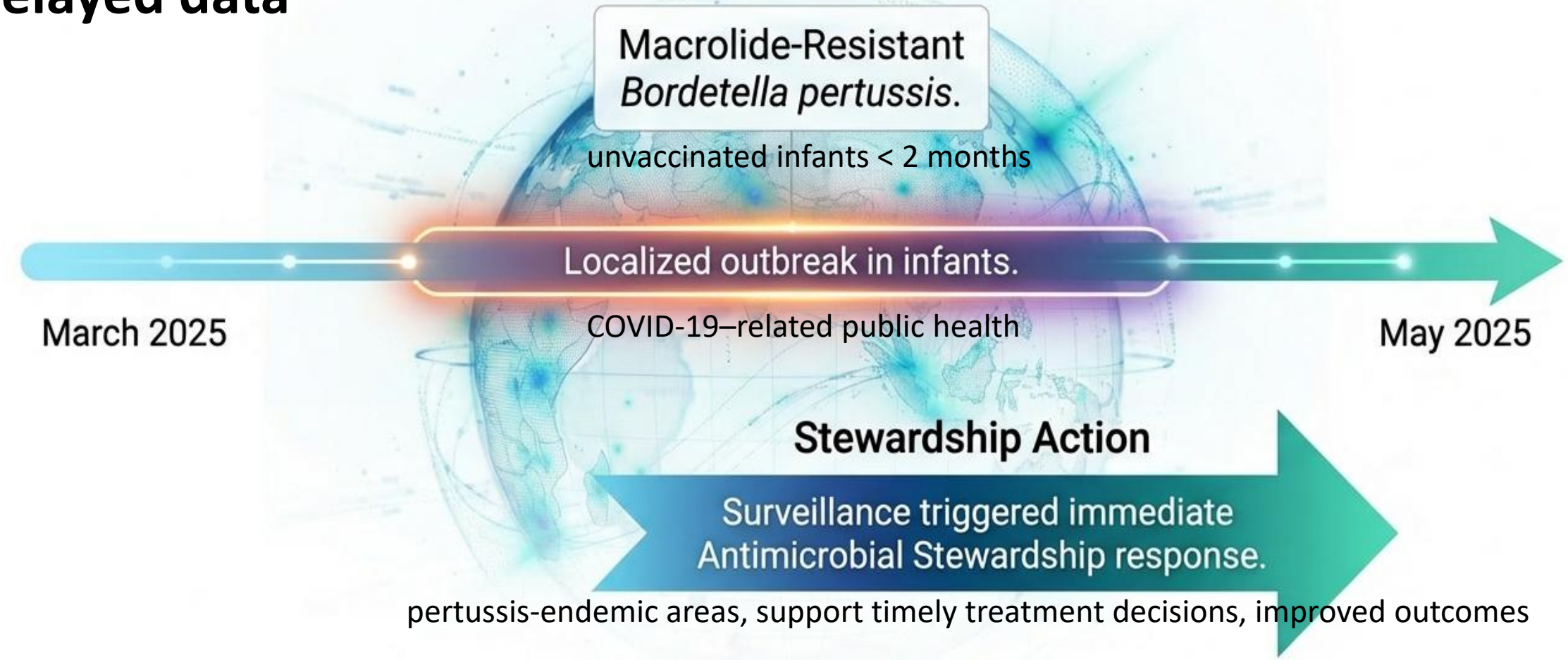
Surveillance review of genome and drug resistance on tropical islands in China (2014-2023)

Takeaway:

Long-term surveillance data successfully identified specific resistance patterns in a localized geography.

Wang J, et al. Genome and drug resistance analysis of Mycobacterium abscessus complex on tropical islands in China. Front. Microbiol., 4 Feb 2026. Sec. Antimicrobials, Resistance and Chemotherapy.17: 2026. https://doi.org/10.3389/fmicb.2026.1702466

Delayed data



Obara T, et al. Localized outbreak of macrolide-resistant pertussis in infants, Japan, March-May 2025. Emerg Infect Dis. January 2026. doi.10.3201/eid3201.250824

Speed Over Formality: prolonged delays in publishing, outbreaks reports

The Radar in Action: Recent Case Studies

JAPAN (2025)

Localized outbreak of macrolide-resistant *Bordetella pertussis* in infants.

March-May 2025

Source: Emerging Infectious Diseases, Jan 2026

Obara T, et al. Localized outbreak of macrolide-resistant pertussis in infants, Japan, March-May 2025. Emerg Infect Dis. January 2026

CHINA (2014-2023)

Surveillance review of *Mycobacterium abscessus* complex.

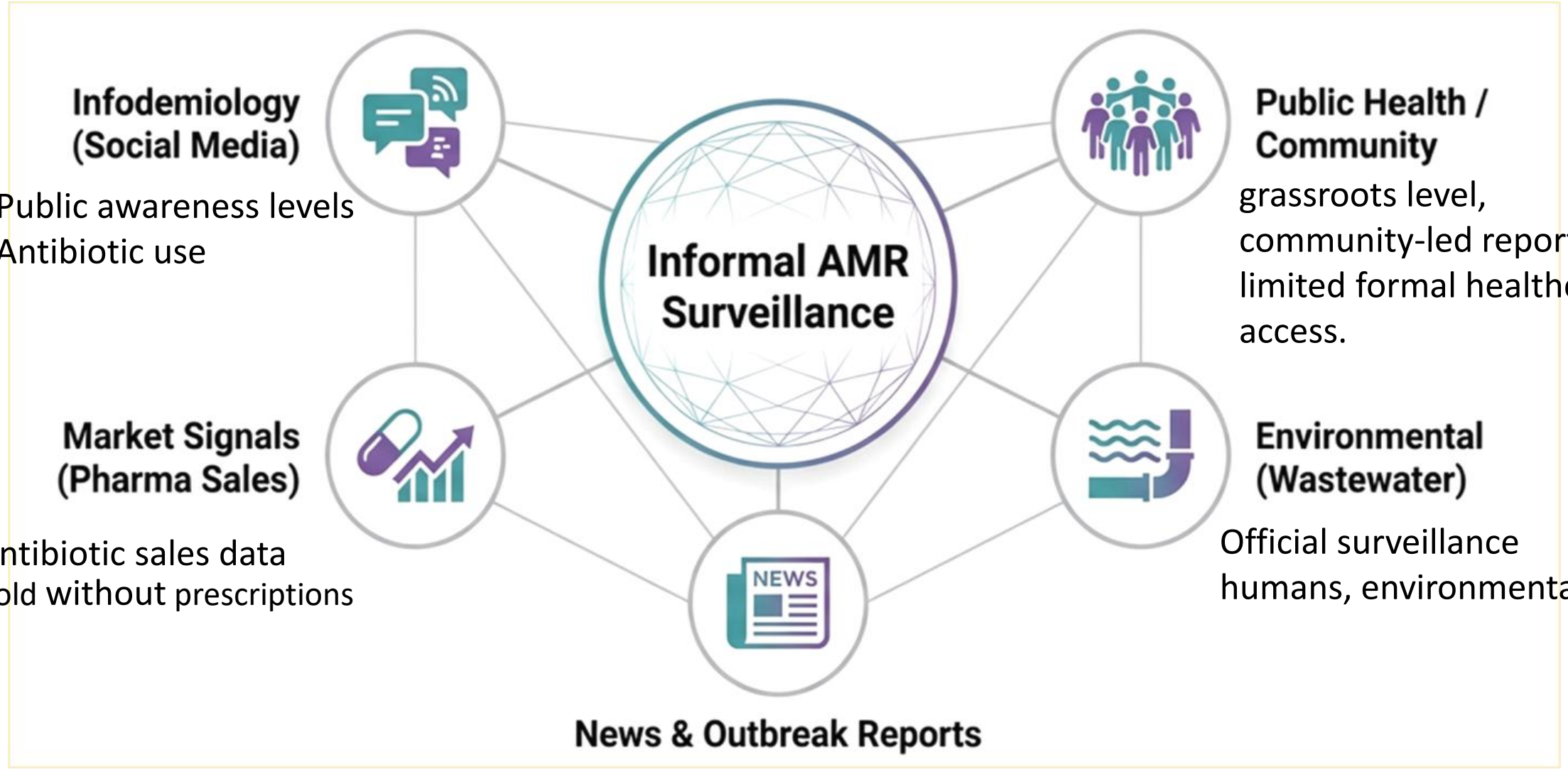
Genome and drug resistance analysis on tropical islands

Source: Front. Microbiol., Feb 2026.

Wang J, et al. Genome and drug resistance analysis of M.abscessus complex on tropical islands in China. Front. Microbiol., 4 Feb 2026. Sec. Antimicrobials, Resistance & Chemotherapy.17:2026.

Informal AMR data source

Event-based" rather than "routine

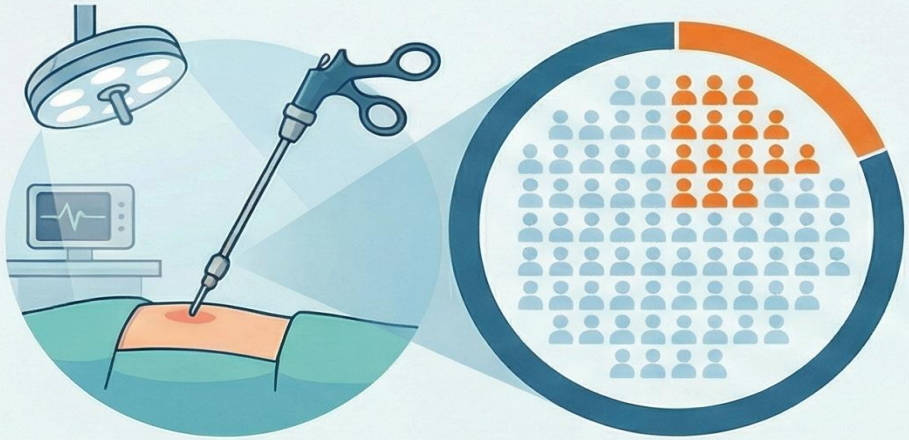


Crowdsourced Information

Informal AMR data source

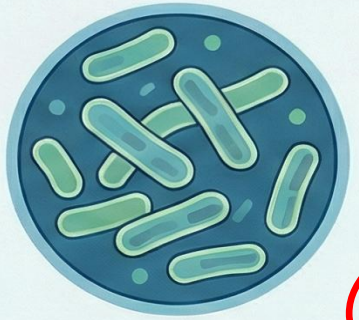
How dangerous is the bacterial infection that caused 70 patients' surgical wounds to not heal? (Vietnam)

Medical Alert: Managing the NTM Bacterial Outbreak at Quang Tri General Hospital



70 Cases Out of 500 Surgeries

Approximately **14%** of laparoscopic patients developed symptoms like fluid discharge and slow-healing wounds.



Rare "NTM" Bacteria Identified

The cause is **Non-tuberculous Mycobacteria**, a slow-growing, acid-fast bacillus similar to tuberculosis.

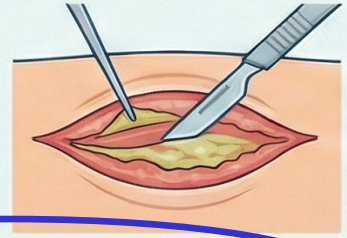
Atypical Bacterial Traits

NTM is rare, non-contagious via respiratory routes, and resistant to standard antibiotic protocols.

Long-term 3–5 Month Recovery

Due to slow bacterial growth, patients require extended treatment, often continuing as outpatients.

Clarification on "Wound Widening"



Surgical debridement to remove infected tissue is a treatment step, not secondary organ surgery.

Outbreak Successfully Contained

No new infection cases have been recorded since October 15, 2025.

Published: Fri 14 Nov 2025;

Period of Incident:
July to early October 2025

Total Patients Affected:
70 individuals

Primary Surgery Type:
Laparoscopic (Appendicitis, Gynecology)

Source :**VN Express**; https://vnexpress.net/vi-khuan-lay-nhiem-khien-70-benh-nhan-khong-lanh-vet-mo-nguy-hiem-the-nao-4963611.html

Informal AMR surveillance data source: *Salmonella* outbreaks report (18 Feb 2026)

CDC warns of ***Salmonella*** **outbreak** linked to moringa powder capsules

1st-line and alternative antibiotics: ciprofloxacin, Azithromycin, ceftriaxone

Health Alert: Drug-Resistant *Salmonella* in Moringa Supplements

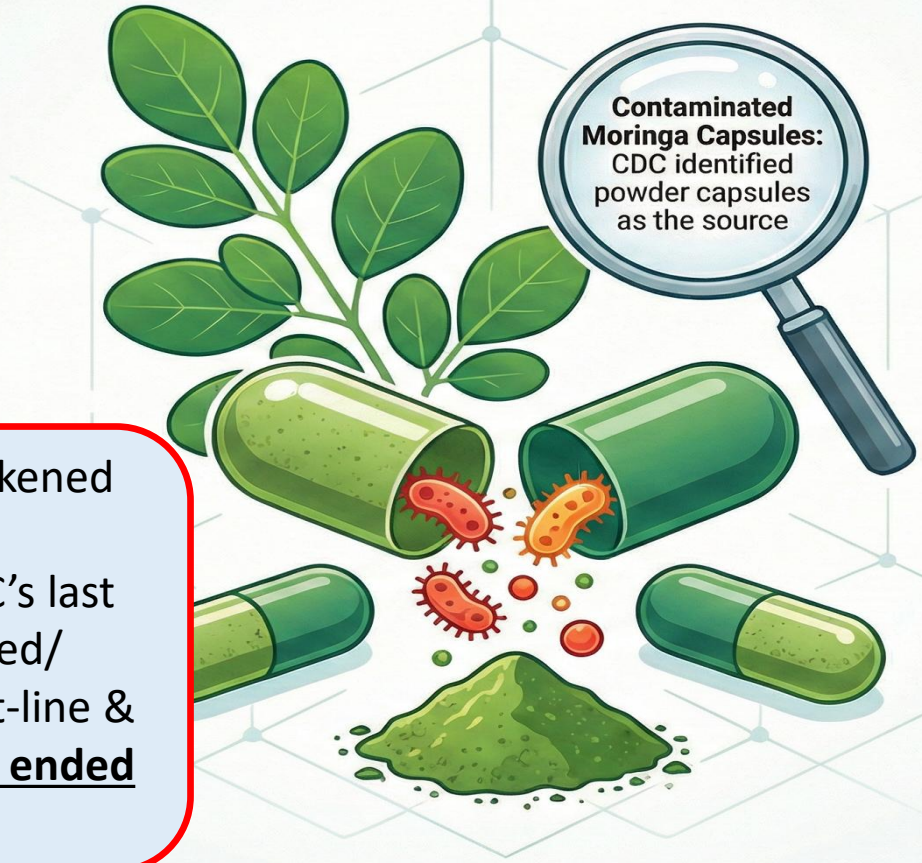
Contaminated Moringa Capsules Linked to Outbreak; Treatment Challenges Due to Extensive Drug Resistance

Outbreak Scope and Impact

7 Cases Across 7 States

Outbreak resulted in 3 hospitalizations,

CIDRAP (2-04-26): outbreak sickened 10 people/8 states/3 new case-patients reported since the CDC's last update in February. 3 hospitalized/ S. Newport/ resistant to all first-line & alternative antibiotics. **The CDC ended its investigation:**



The Challenge of Drug Resistance

Extensively Drug-Resistant Strain

Resistance to Core Antibiotics: Strain resists standard treatments.

Potential Treatment Ineffectiveness: High resistance means standard medical interventions may fall.

Whole-genome sequencing reveals resistance to nearly all first-line and alternative antibiotics.

Source: CIDRAP (Center for Infectious Disease Research and Policy) -https://www.cidrap.umn.edu/salmonella/cdc-warns-salmonella-outbreak-linked-moringa-powder-capsules

The advantages of Informal AMR data sources

Real-Time Capture

Eliminates the prolonged delays associated with formal reporting.

Broader Scope

Captures non-laboratory data from healthy individuals and travelers.

Community Integration

Utilizes universities, research centers, and community reporting networks.

One Health Approach

Integrates environmental data (wastewater, rivers, soils) with human health data.

ProMED
INTERNATIONAL SOCIETY
FOR INFECTIOUS DISEASES

ProMED-AMR
Digital early-warning & event-based surveillance system

- ProMED-AMR - a program of ISID
- Digital early-warning
- Event-based surveillance system
- Non -traditional data sources
- Real-time detection of unusual resistance patterns

media reporting, professional networks, community submissions, field observations to complement formal laboratory-based systems

https://isid.org/amr-surveillance-low-resource-settings-waaw-2025/

ProMED
INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES

Primary goal of ProMED-AMR

Using

- **Digital disease detection methods** and **non-traditional sources**
  inspected, analyzed, comments
- **Informal Data Integration:** non-traditional sources, media reports, articles, online forums (Digital & Event-Based Surveillance), pharmacy sales data, informal community health observations, reports from the field

Update

- AMR research, news, outbreaks information
- Rapidly detect and validate the occurrence of AMR pathogens
- Early Detection of Emerging Resistance
- Emergence of novel "superbugs,"/ unexpected clusters of resistant infections

https://isid.org/promed-antimicrobial-resistance-network-promed-amr

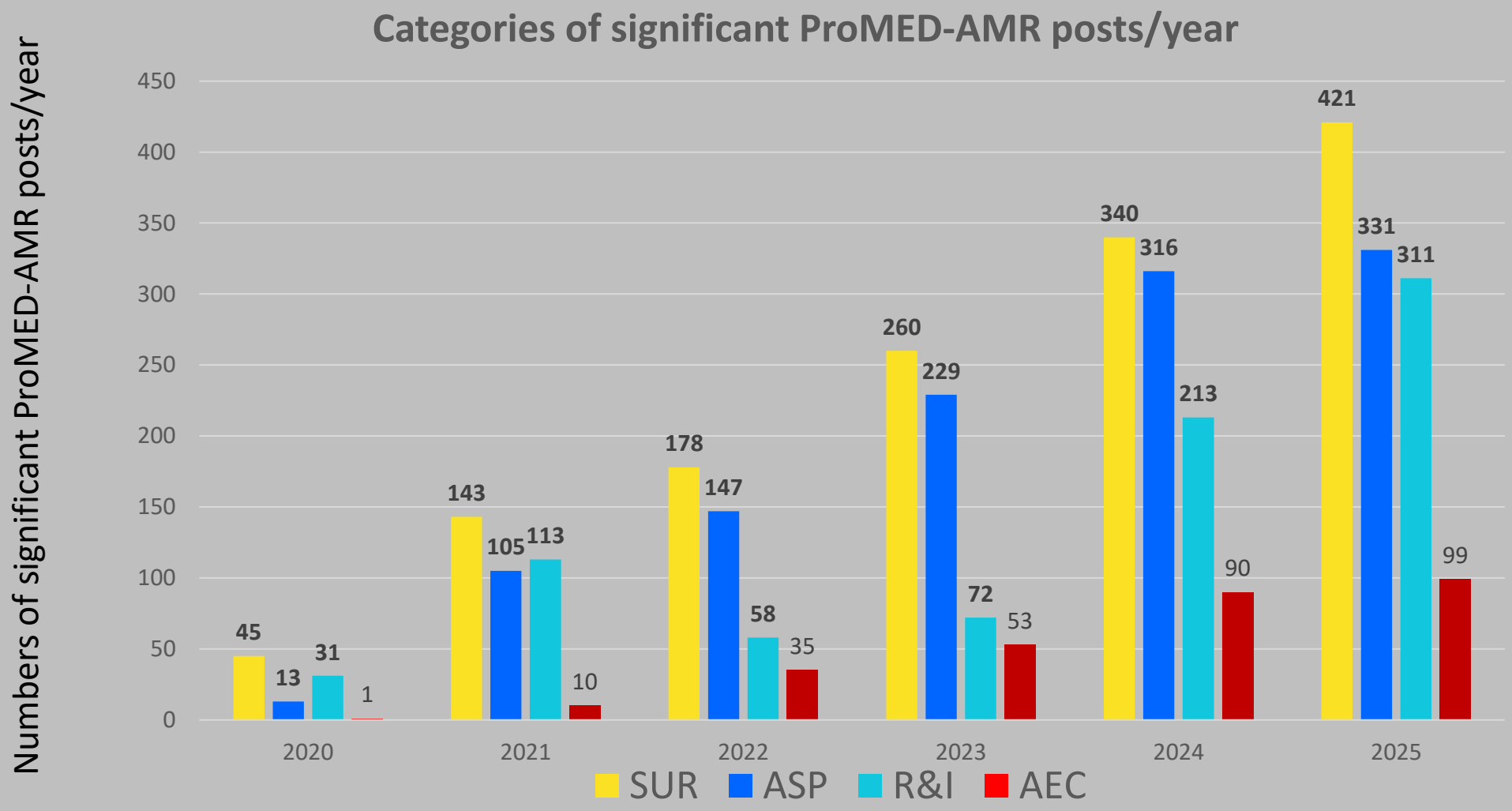
➢ **One Health Integration**

- tracks movement of resistant pathogens across the One Health spectrum
- includes monitoring resistance trends - humans, livestock, pets, wildlife, environment (such as soil & wastewater)

➢ **Improving Global Situational AMR awareness**

- providing real-time information exchange the system empowers practitioners, researchers, public health officials
- timely data to inform rapid risk assessments and interventions

Total number & categories of ProMED-AMR posts (2020-2025)



Surveillance(SUR)= **30.9%**

Antimicrobial stewardship (ASP)=**25.4%**,

Research & Innovation(R&I) =**17.7%**

Antimicrobial environmental contamination (AEC)= **6.4%**

ProMED-AMR published posts: Informal AMR data – referred formal AMR data

ANTIMICROBIAL STEWARDSHIP (28): PAENIBACILLUS DENDRITIFORMIS, DESTRUCTIVE MENINGITIS, INFANTS, TACKLING ANTIMICROBIAL RESISTANCE

Summary

A new public health alert highlights *Paenibacillus dendritiformis* as a cause of severe neurological symptoms in infants. The report, a collaboration between NEJM Evidence

Date: Wed 4 Jan 2026
Source: CIDRAP (Center for Infectious Disease Research and
https://www.cidrap.umn.edu/public-health-alerts/public-healt
dendritiformis-cause-destructive-meningitis

Public Health Alerts: *Paenibacillus dendritiformis* destructive meningitis in infants

A Public Health Alerts report today [4 Feb 2026] details 2 US
neurologic symptoms after infection with *Paenibacillus dendritiformis*, raising

The citation, abstract and full text of the article referenced above follow:

Smith D, Garikipati D, Bastug K, et al. *Paenibacillus dendritiformis* as Cause of Destructive Meningitis in Infants. NEJM Evidence, Publishe 3 Feb 2026.doi: 10.1056/EVIDpha2500297

Abstract

"Invasive infections due to *Paenibacillus* species pose a serious risk to young infants and have a high risk of neurologic sequelae. This report describes2 infants with seve

ANTIMICROBIAL ENVIRONMENTAL CONTAMINATION (07): ENVIRONMENTAL DIMENSION OF ANTIBIOTIC RESISTANCE, SURVEILLANCE AND RISK ASSESSMENT, REVIEW

Summary

Date: Mon 26 Jan 2026
Source: EurekAlert [edited]
https://www.eurekalert.org/news-releases/1114125

Tracking antibiotic resistance in the environment gets a high tech upgrade

Antibiotic resistance is often framed as a hospital problem, but a growing body of evidence shows that the environment plays an equally critical role in the global spread of drug resistant bacteria. Rivers, soils, wastewater, and even the air can act as reservoirs for antibiotic resistance genes that may eventually reach humans and animals. A new review highlights how advances in metagenomic sequencing are

The citation and abstract of the article referenced above follow:

Fang P, Yu Z, Huang J, Li B. 2026. Profile surveillance and risk assessment of the environmental dimension of antibiotic resistance via the metagenomic approach. Biocontaminant 2: e002 doi: 10.48130/biocontam-0025-0027

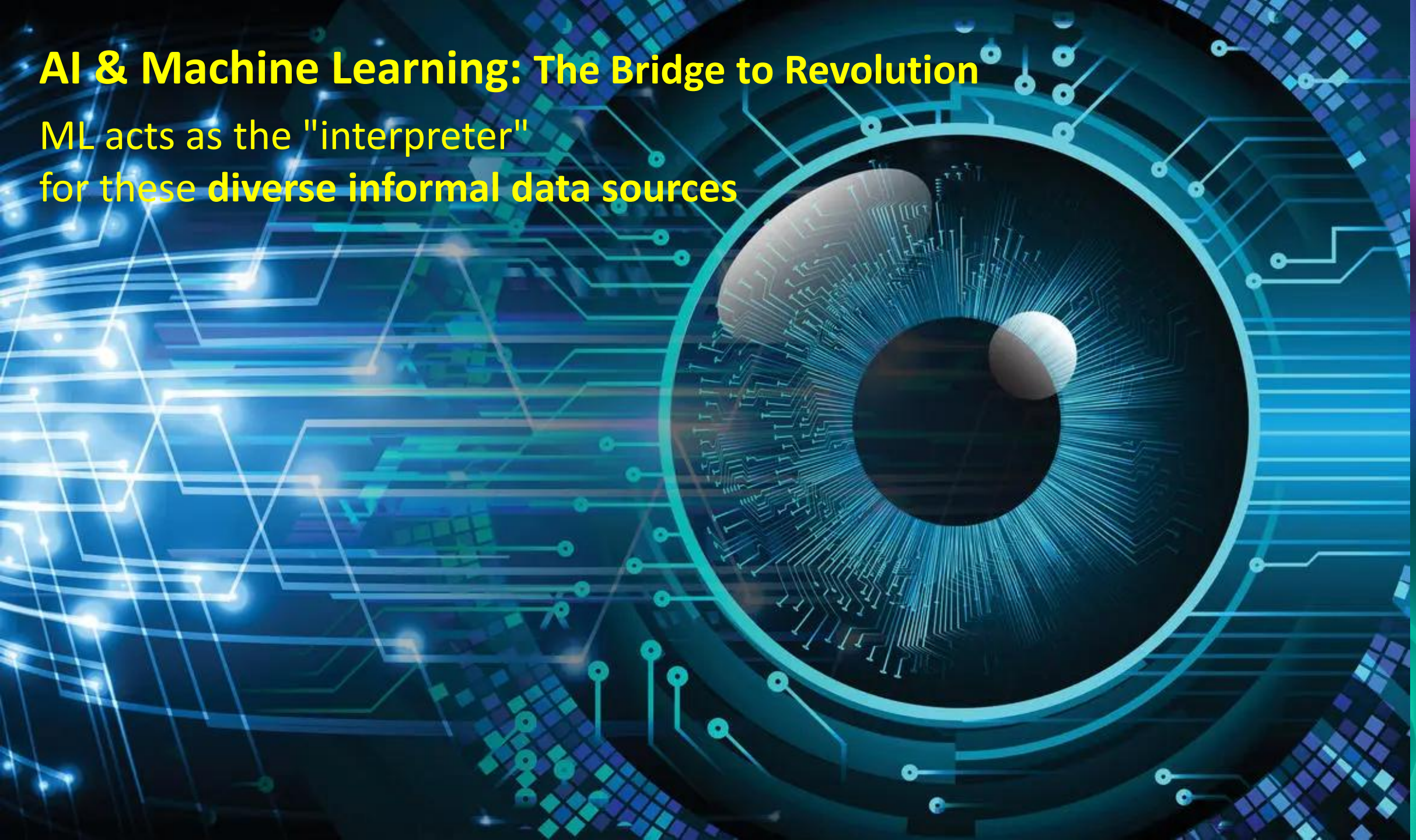
Abstract

"Antibiotic resistance has been recognized as a global environmental and public health challenge. Over the past decades, methods of studying antibiotic resistance genes

https://www.promedmail.org/?lang=amr

AI & Machine Learning: The Bridge to Revolution

ML acts as the "interpreter"
for these **diverse informal data sources**



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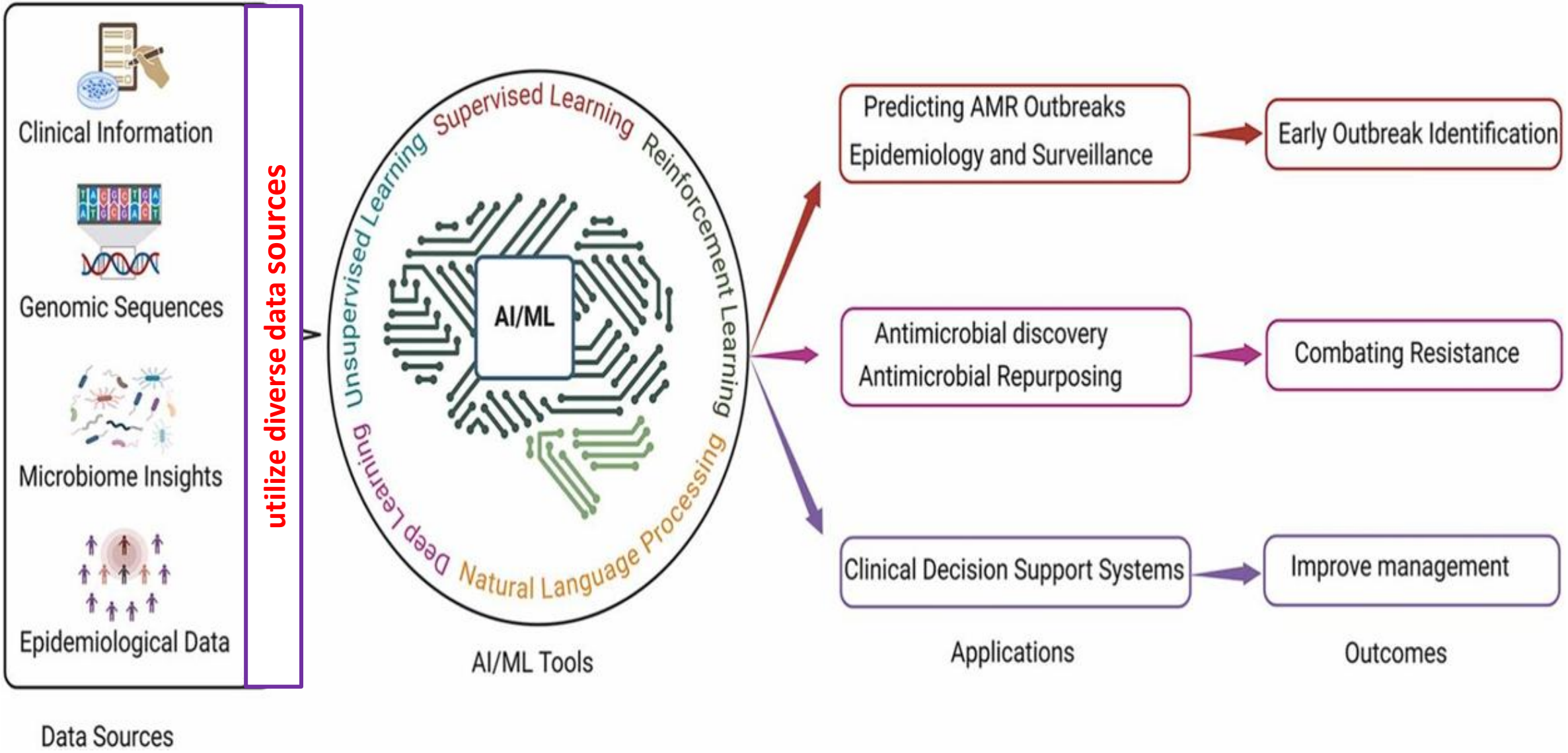
The role of AI and ML: Predicting & Combating AMR



https://www.csbj.org/article/S2001-0370(25)00007-8/fulltext#fig0005

How AI can be applied to informal AMR data sources?

Current evidence

- improve **real-time monitoring** of resistant pathogen transmission
- significantly enhance the efficiency of **resistance diagnosis**
- optimize **personalized treatment** strategies

Natural Language Processing (NLP) for Digital Intelligence

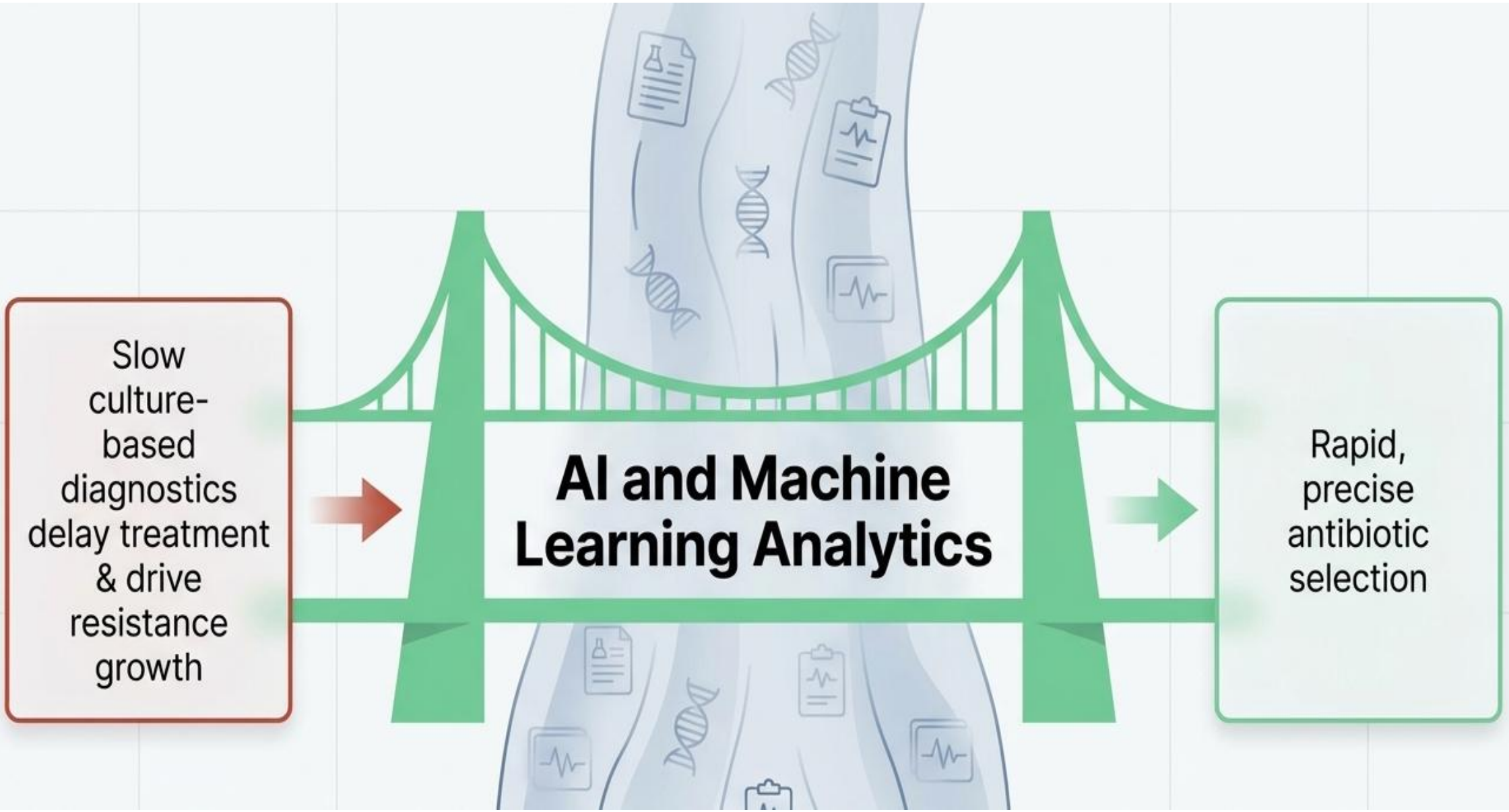
Primary challenge

- **informal data : unstructured**

AI uses NLP to transform

- "**human talk**" into "**epidemiological data**

https://xhyxzz.pumch.cn/article/doi/10.12290/xhyxzz.2025-0655


Slow culture-based diagnostics delay treatment & drive resistance growth
AI and Machine Learning Analytics
Rapid, precise antibiotic selection

Leveraging AI & Machine Learning to Combat Antimicrobial Resistance

PRECISION MEDICINE & DIAGNOSTICS

AI-Powered Predictive Analytics

Machine Learning (ML) Algorithms

Advanced Diagnostic Tools

PUBLIC HEALTH & SURVEILLANCE

AI-Driven Surveillance Systems

- Improve detection of AMR trends
- Enhance global monitoring

Integration of Diverse Data Sources

- Electronic health records
- Laboratory results
- Environmental data for actionable insights

ANTIMICROBIAL STEWARDSHIP & CHALLENGES

Antimicrobial Stewardship Programs (ASPs)

- Promote prescribing guideline adherence
- Evaluate intervention outcomes
- Optimize resource allocation

Critical Implementation Challenges

- Data Quality & Bias
- Algorithm Transparency (e.g., 'Black Box' problem)
- Ethical Considerations

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AI-Challenges

Data Quality & Bias: [high-income countries & LMICs]
https://gh.bmj.com/content/3/4/e000798

The "Black Box" Problem: [result without explaining why].
https://www.who.int/publications/i/item/9789240029200

Privacy Concerns: Using "informal" data, **ethical questions**
https://pubmed.ncbi.nlm.nih.gov/30617331/

High Technical Barrier: specialized hardware, data scientists, lacking, research, academic institutions in higher income countries

https://www.imperial.ac.uk/Stories/harnessing-artificial-intelligence-tackle-antimicrobial-resistance/

The Next Frontier: AI-Driven Hybrid AMR Intelligence

- not to replace Formal data but to Augment Formal Data
- create a One Health AI Ecosystem
- simple "**data" to actionable "intelligence”**

Collaboration Across Disciplines

- clinical expertise, data scientists, environmental scientist, policy makers - working together

https://www.imperial.ac.uk/Stories/harnessing-artificial-intelligence-tackle-antimicrobial-resistance

THANK YOU

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