

Harnessing genomics for AMR surveillance

The Surveillance and Epidemiology of Drug-resistant Infections Consortium (SEDRIC) genomics working group

SARS-CoV-2 has brought about a step change in global microbial pathogen surveillance by highlighting the potential and capacity for genomics to deliver actionable information in real time. The time has come to build on and deliver the use cases for combatting antimicrobial resistance. In 2022, SEDRIC convened a genomics working group to evaluate and develop recommendations for the future use of genomics for AMR surveillance.¹ This executive summary outlines key recommendations from the SEDRIC genomics working group.



Health laboratories



Applications: Outbreak detection & control | Diagnostics

Recommended actions: Build capacity, including hub and spoke models
The cost-effectiveness of genomics improves with throughput but differs markedly by geographical region. These barriers can be partly overcome by initiating genomics in regional hub and spoke models to centralise training, infrastructure, and supply chains.

Develop new training competencies
Competencies in genomic epidemiology are required for health scientists conducting genomic AMR surveillance either as a new workforce or developing/delivering training for existing staff categories.

Invest in AMR genomic surveillance innovations
Genomic surveillance innovations (clinical and environmental metagenomics, gene/plasmid tracking, and machine learning) offer advantages, but research to address the common barrier of an uncharacterised association with health outcomes is needed.

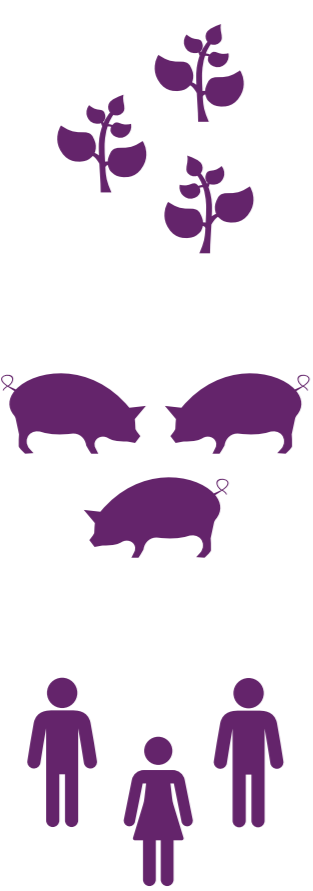
Applications: Detect emerging threats | Assess interventions

Recommended actions: Harmonise and standardise surveillance
Agree on an abbreviated list of bug/drug combinations (shorter than existing² and informed by local needs); develop clinical standards; support pathogen-specific expert review groups for interpretation guidelines; and develop a single access user portal. Agree sampling frameworks for One Health.

Agree equitable data sharing and governance
Benefits are maximised with open, immediate data sharing, but concerns exist around stigmatisation and inequitable data contribution and use. Based on lessons from SARS-CoV2 and in line with the WHO global genomic surveillance strategy,³ the group highlighted a critical role for robust governance.

Improve stakeholder interactions and relationships
Improved trust, communication, and partnerships among stakeholders are particularly important for network and One Health surveillance. Policy makers need to define key questions, researchers and health deliverers should consolidate and advocate clear use cases.

Public health networks



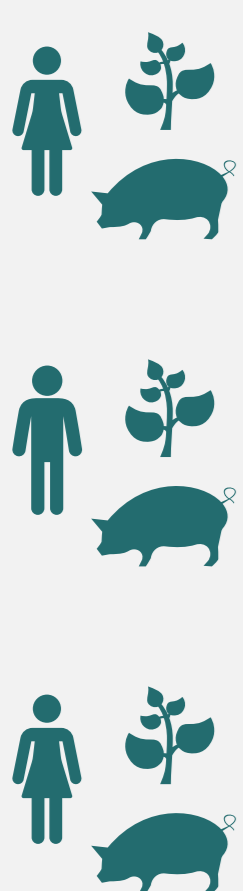
Applications: Risk assessment frameworks | Environmental monitoring

Recommended actions: Define a framework for use at all levels
The aims, actions, and outcomes of genomic AMR surveillance data need to be clearly defined at all levels; for example, clinical applications rely on robust inference of phenotype from genotype, while clearly defined risk mitigations are needed for One Health.

Address funding models and evaluate cost-effectiveness
Funding models are needed for research and capacity-building programmes, surveillance implementation, and continuous improvement, particularly for One Health surveillance with a breadth of stakeholders. Real-time cost-effectiveness studies are needed.

Better integrate environmental surveillance
The environment is an under-surveyed potential source of AMR genes. We need to build on and expand from examples in agriculture where a direct impact of AMR surveillance and interventions are characterised.

Integrated One Health



Benefits of genomics for AMR surveillance

- Monitor resistance against multiple antimicrobials in parallel
- Differentiate AMR evolution vs spread
- Improve data sharing, storage, and quality assessment
- Create adaptable infrastructure for future pandemic response

Recommended actions for stakeholders

Policy makers

- Guide implementation
- Define key outcomes
- Build stakeholder relationships
- Agree goals

Industry

- Agricultural: engage in One Health surveillance
- Biotech: improve supply chains and address cost barriers for LMIC, develop accessible complete sequencing platforms

Health deliverers

- Co-create implementation science
- Advocate use cases
- Evaluate cost-effectiveness

Research community

- Co-create implementation science
- Partner in ongoing improvements
- Improve data interpretation