



GLASS approach to the assessment of Impact of AMR on Human Health

GLASS method for estimating attributable mortality of antimicrobial resistant bloodstream infections

June 2020

Global Action Plan on AMR

1. Improve awareness and understanding
2. Strengthen knowledge through surveillance & research
3. Reduce the incidence of infection
4. Optimize the use of antimicrobial medicines
5. Ensure sustainable investment



World Health Assembly, 2015, Resolution WHA68.7

What is GLASS?

Global Antimicrobial Resistance and Use Surveillance System

- The first global system to incorporate official national data from surveillance of AMR
 - standardized approach to the collection, analysis, and sharing of AMR, AMC and AMU data
 - One Health model for AMR surveillance
 - generate data to inform AMR burden estimates



GLASS activities



ROUTINE DATA SURVEILLANCE

Antimicrobial Resistance surveillance
(**GLASS-AMR**)

Antimicrobial Consumption surveillance (**GLASS-AMC**)

FOCUSED SURVEILLANCE

Emerging Antimicrobial Resistance Reporting
(**GLASS-EAR**)

INITIAL PHASE

Enhanced Gonorrhoeae surveillance
(**GLASS-EGASP**)

INITIAL PHASE

Candida spp.
AMR surveillance
(**GLASS-Fungi**)

SURVEYS AND STUDIES

INITIAL PHASE

One Health AMR surveillance
(**GLASS-One Health**)

INITIAL PHASE

Point Prevalence Surveys on antimicrobial use

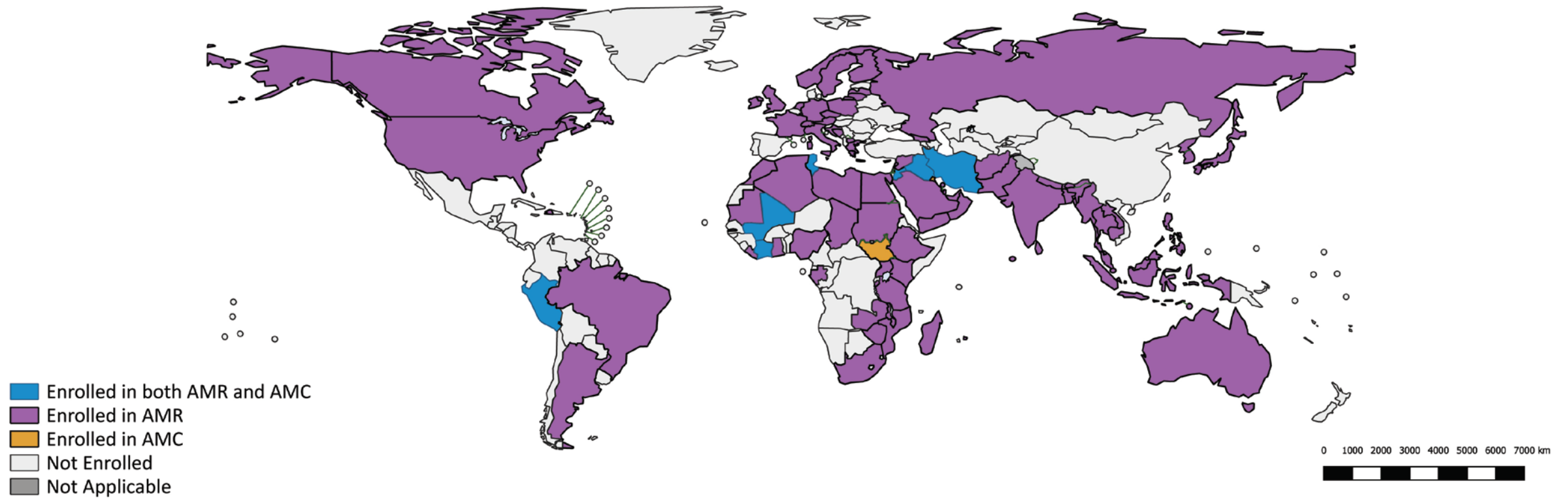
INITIAL PHASE

Assessment of AMR attributable mortality

Countries enrolled in GLASS

As of 20 May 2020

92 countries, territories and areas



Steps towards a global system



Stockholm, April 2021:

- 3rd High Level Technical Consultation and Meeting on Surveillance of Antimicrobial Resistance and Use for Concerted Actions
- Supported by Republic of Korea and Sweden



GLASS method for estimating attributable mortality of AMR bloodstream infection

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“Measuring how many people die each year and why they died are crucial for improving health and reducing preventable deaths ”

~ WHO Global burden of disease report 2017

Challenges

Mortality?

- Determining the cause of death can be complicated
- Patients often die from a combination of:
 1. Severity of disease
 2. Co-morbidities
 3. Other underlying risk factors

THE AMR mortality question

?!

1. Did the patient die **because** of a drug-resistant infection or did the patient die **while having** a drug-resistant infection?
2. If the patient died because of the infection, did the patient die because the pathogen was **resistant**, or because of having an **infection**?

Assessment of literature

GLASS commissioned a literature review in 2017:

Methodological challenges in evaluating the health burden of infections due to antibiotic resistant bacteria

	Case-control studies (%)	Cohort (%)
<i>S. aureus</i>	4 (12.9)	27 (87.1)
<i>S. pneumoniae</i>	4 (7.7)	48 (92.3)
<i>E. coli</i> and <i>K. pneumoniae</i>	24 (27)	65 (73)
<i>A. baumannii</i>	4 (14.3)	24 (85.7)
<i>Salmonella</i> spp. and <i>Shigella</i> spp.	-	9 (100)
Total	36 (17.2)	173 (82.7)

Bloodstream
infection: 157 (75%)

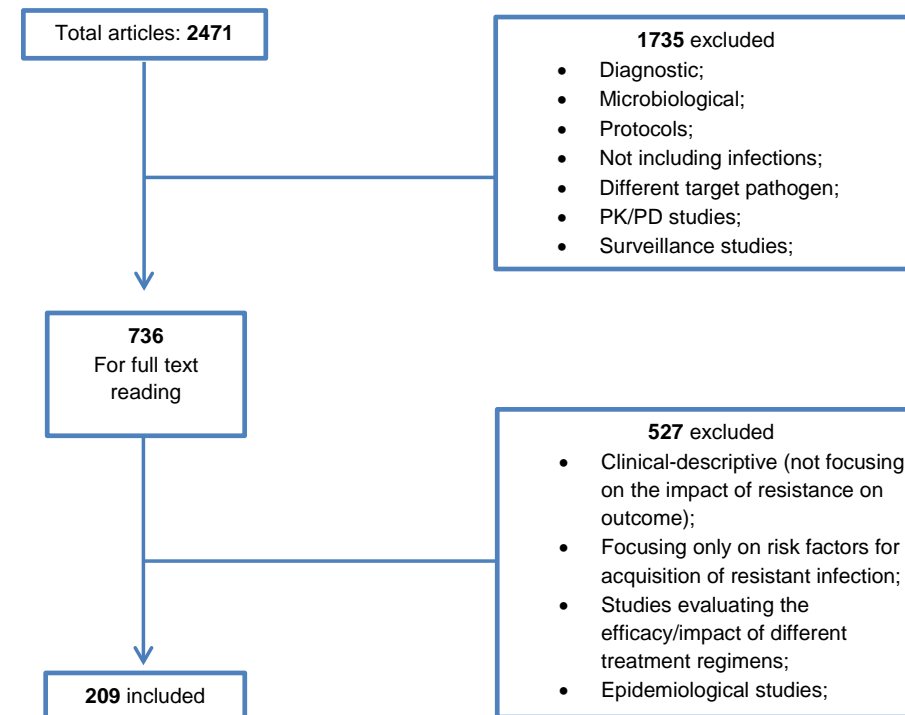


Figure 1. Flow chart of the review process

Target population

Adult, paediatric and neonatal patients seeking care in healthcare facilities

- Acute care healthcare facilities → lowers ascertainment bias
- In-patients → facilitates follow-up

NOTE: Could lead to underestimates of the burden of AMR, BUT:

- long-term goal is to enhance the GLASS system based on the tested methodologies
- collect more diverse, reliable and comprehensive estimates in the future

Target infection

Hospital and community origin bloodstream infections (BSIs)

- syndrome with high lethality
 - minimize sampling bias and reduce misinterpretation of data;
 - identified pathogens are very rarely contaminants, and
 - most patients with BSI will be seeking care as an inpatient.
- The choice of 1 syndrome (BSI) can lead to underestimates of the burden of AMR, **BUT**:
- ✓ long-term goal is to enhance the GLASS system based on the tested methodologies; and
 - ✓ collect more diverse, reliable and comprehensive estimates in the future

Target pathogens

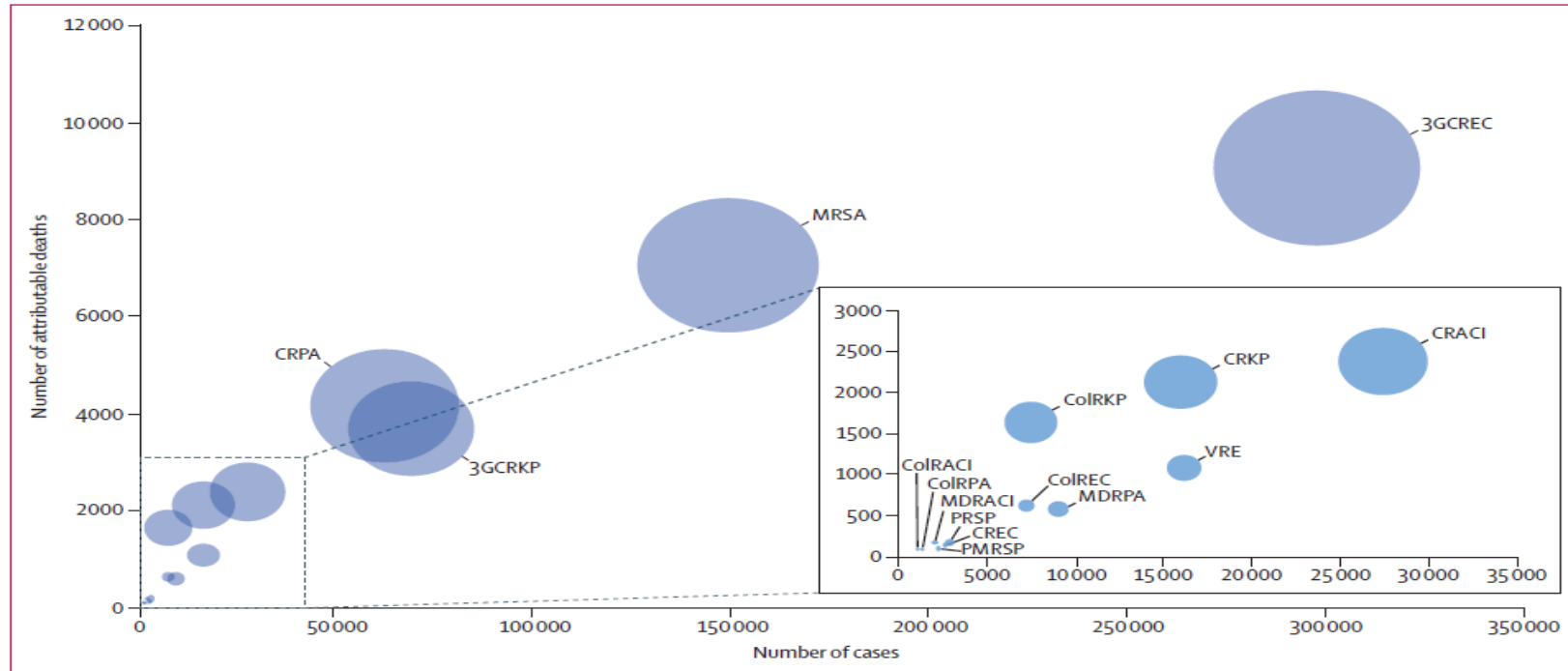


Figure 1: Infections with antibiotic-resistant bacteria, EU and European Economic Area, 2015

Gram-negative: ESBL *E. coli* & Gram-positive: MRSA

Any pathogen relevant for country-specific context (optional)

Target infection-pathogen

Sustainable Development Goal AMR Indicator



Goal 3: Ensure healthy lives and promote well-being for all at all ages

TARGET 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks

Reduce the proportion of bloodstream infections among patients due to

- methicillin-resistant *Staphylococcus aureus* (**MRSA**)
- *Escherichia coli* resistant to 3rd generation cephalosporins

Target outcome

Attributable mortality: Determines how many extra patients died because they acquired a drug-resistant BSI

- **In-hospital mortality** chosen as primary outcome
- Mortality 30 days after BSI with follow-up beyond hospital discharge (optional)
- Excess length of hospitalization (optional)

➤ **Flexible protocol that can be adapted to local needs!**

Design

- Prospective cohort study to estimate AMR BSI attributable mortality
- Patient selection
 1. Through collection of blood samples done for routine diagnostic purposes
 2. Active case finding
- Comparison of case-fatality rates between patients groups (cohorts):
 1. Patients with AMR BSI
 2. Similar patients with BSIs by the same pathogen, but not AMR
 3. Uninfected patients (optional)
- Duration of the study will depend on the required **sample size**

Conclusions

Conclusions

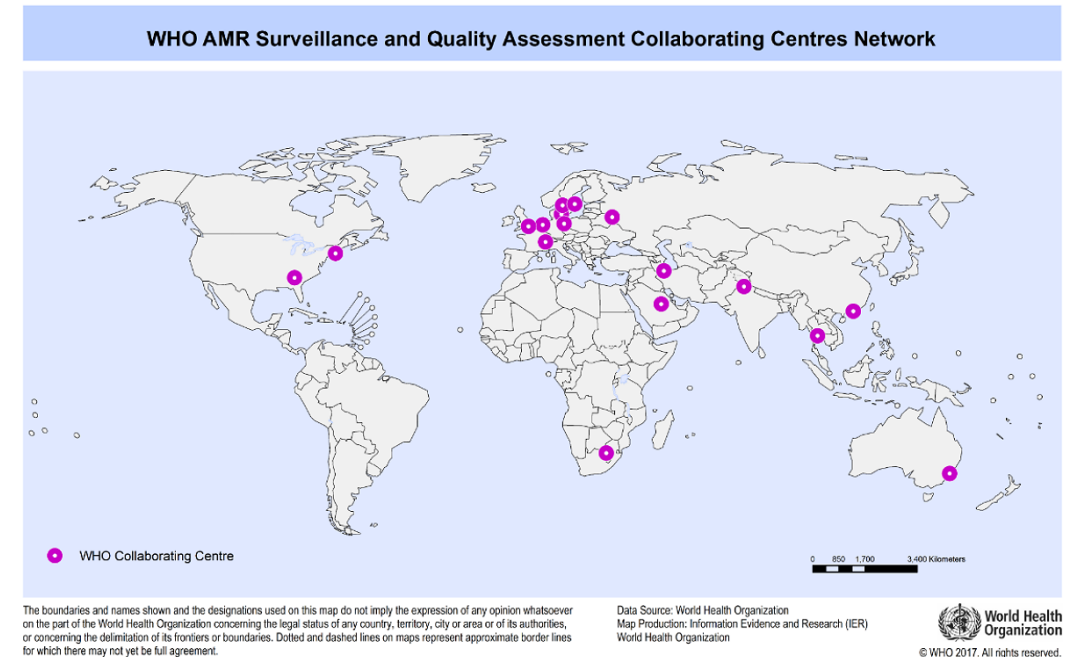
- Most estimates of the impact of AMR on human health are based on fragmented, very limited data, which makes consolidation for regional or global estimates impossible.
- The GLASS method will generate robust estimates of the impact of AMR on human health through a systematic, harmonized approach in all countries.
- Like the SDG AMR indicator, the method addresses AMR BSI, which are considered to be among the most serious life-threatening infectious diseases.
- GLASS relies on continued data sharing as well as global collaboration, harmonisation, and coordination between all partners involved in the implementation of AMR surveillance.

Partners



Work through WHO network with partners' support

- GLASS AMR Collaborative Platform with partner technical institutions
- WHO AMR Surveillance and Quality Assessment Collaborating Centres Network
- Key support
 - country capacity building to conduct AMR surveillance
 - foster the participation of countries in GLASS
 - GLASS development and dissemination



For more information on GLASS

- More information on GLASS and synergies, enrolment procedures, links to the GLASS manuals, the yearly report, and data visualization can be found on the GLASS website <http://www.who.int/glass/en/>
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- Other WHO AMR surveillance initiatives
 - HIV Drug Resistance <http://www.who.int/hiv/pub/drugresistance/hivdr-action-plan-2017-2021/en/>
 - MDR-TB Surveillance <http://www.who.int/tb/areas-of-work/monitoring-evaluation/mdr-tb-surveillance/en/>
 - Malaria drug resistance and response http://www.who.int/malaria/areas/drug_resistance/en/
 - Influenza virus resistance http://www.who.int/influenza/patient_care/antivirals/oseltamivir_summary/en/



Thank you!

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