Enhancing Antimicrobial Resistance Surveillance in Hospitals in Developing Countries: Overcoming Challenges and Bridging Data Gaps

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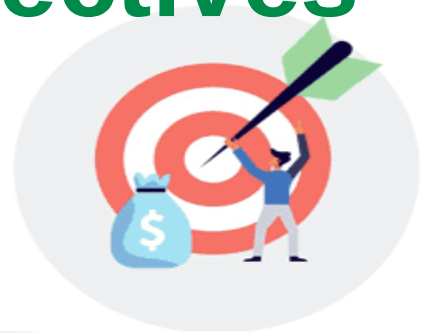
Conflict of Interest

I have no conflict of interest.

Objectives



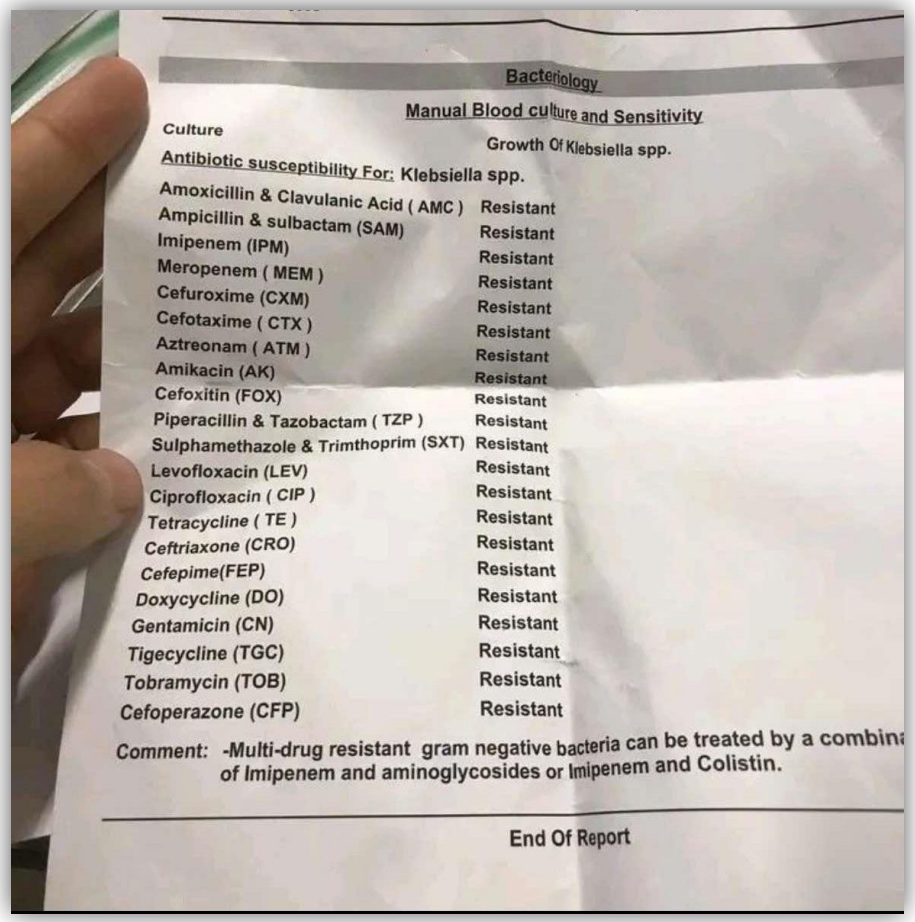
Identify	Explore	Emphasise	Examine	Provide
The primary challenges in antimicrobial resistance (AMR) surveillance within developing countries.	Strategies for improving AMR data collection, management, and reporting.	The importance of regional and global collaboration in AMR initiatives.	The role of digital tools in enhancing AMR surveillance accuracy.	Resources to support effective antimicrobial stewardship practices and improve healthcare outcomes in resource-limited settings.

Key Concept

“If you cannot measure it, you cannot improve it”

Lord Kelvin

Lord Kelvin (1824–1907), a British scientist, stated that when we can measure something and express it in numbers, we truly understand it. Measuring antimicrobial resistance allows us to better understand, discuss, and effectively fight AMR.



Bacteriology

Manual Blood culture and Sensitivity

Culture — Growth Of Klebsiella spp.

Antibiotic susceptibility For: Klebsiella spp.

Amoxicillin & Clavulanic Acid (AMC)	Resistant
Ampicillin & sulbactam (SAM)	Resistant
Imipenem (IPM)	Resistant
Meropenem (MEM)	Resistant
Cefuroxime (CXM)	Resistant
Cefotaxime (CTX)	Resistant
Aztreonam (ATM)	Resistant
Amikacin (AK)	Resistant
Cefoxitin (FOX)	Resistant
Piperacillin & Tazobactam (TZP)	Resistant
Sulphamethazole & Trimthoprim (SXT)	Resistant
Levofloxacin (LEV)	Resistant
Ciprofloxacin (CIP)	Resistant
Tetracycline (TE)	Resistant
Ceftriaxone (CRO)	Resistant
Cefepime(FEP)	Resistant
Doxycycline (DO)	Resistant
Gentamicin (CN)	Resistant
Tigecycline (TGC)	Resistant
Tobramycin (TOB)	Resistant
Cefoperazone (CFP)	Resistant

Comment: -Multi-drug resistant gram negative bacteria can be treated by a combina
of Imipenem and aminoglycosides or Imipenem and Colistin.

End Of Report

Maryana Favour, 2024

Introduction

Antimicrobial resistance (AMR) is a rapidly escalating global health challenge that will cause 39 million deaths between 2025 and 2050.

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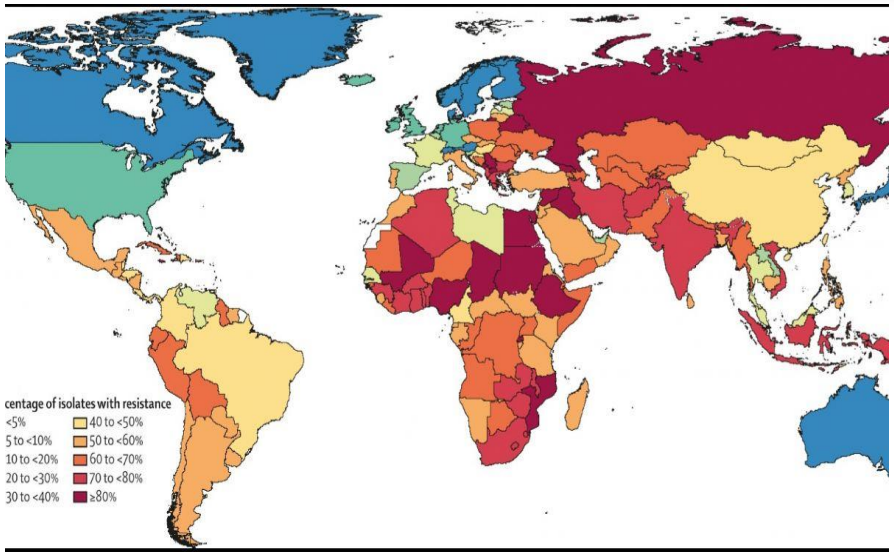
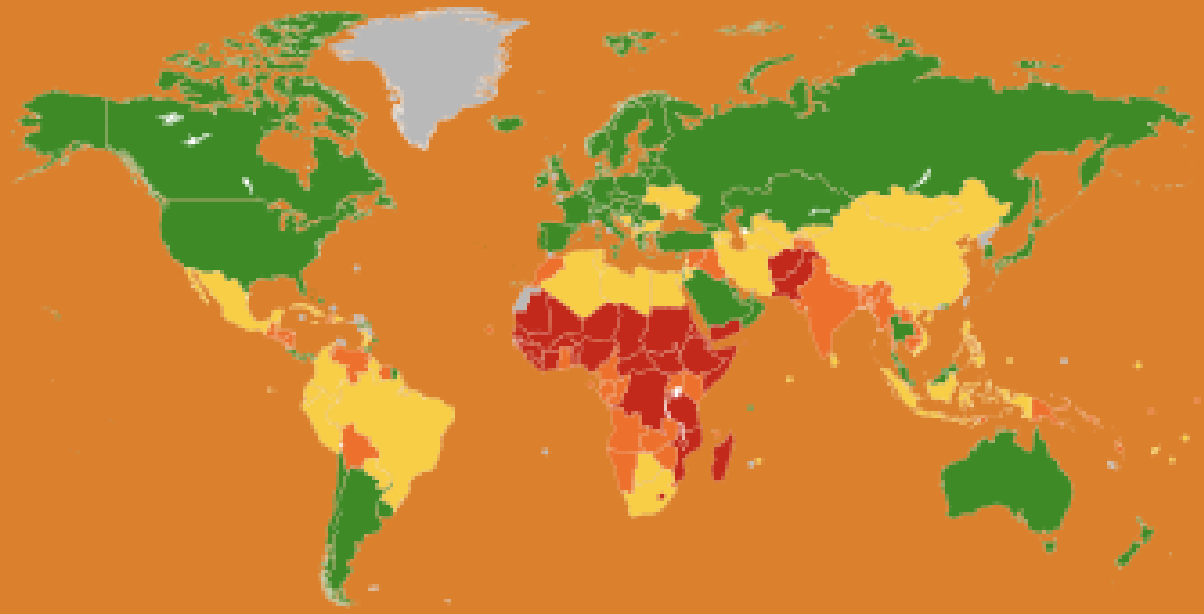
The World Health Organization promotes an urgent need for antimicrobial stewardship (AMS) and robust AMR surveillance.



Tracking AMR in Developing Countries

1. Comprehensive AMR surveillance data is lacking.
2. Developing countries have a high health and economic burden from AMR.
3. Data is fragmented and lacks representativenes s, limiting policy guidance.
4. Step-by-step improvements and strategies can help strengthen AMR surveillance where resources are limited.
5. absence of reliable data, makes it hard to monitor / control antimicrobial utilization.
6. Poor data quality hinders resistance tracking, outbreak detection, and policy-making.

Key Challenges in AMR Surveillance in the Developing Countries



4 Key Challenges in AMR Surveillance

1 Technical Challenges:

- Limited laboratory infrastructure
- Inconsistent methods across facilities
- Shortages of trained personnel

2 Financial Constraints:

- Insufficient funding for programs
- High costs of equipment and technology
- Dependence on inconsistent international aid and support

4 Key Challenges in AMR Surveillance

3 Infrastructural Limitations:

- Lack of digital systems for data handling
- Poor internet connectivity in rural areas

4 Data Quality Issues:

- Non-standardised data collection methods
- Fragmented data systems affecting reporting

4 Effective Strategies for AMR Surveillance

1. Building Capacity in Clinical Practice:

- Investment in training programs and practices for laboratories and healthcare workers on AMR surveillance protocols and antimicrobial stewardship.
- Promote the antimicrobial stewardship team and resources that facilitate AMR surveillance.

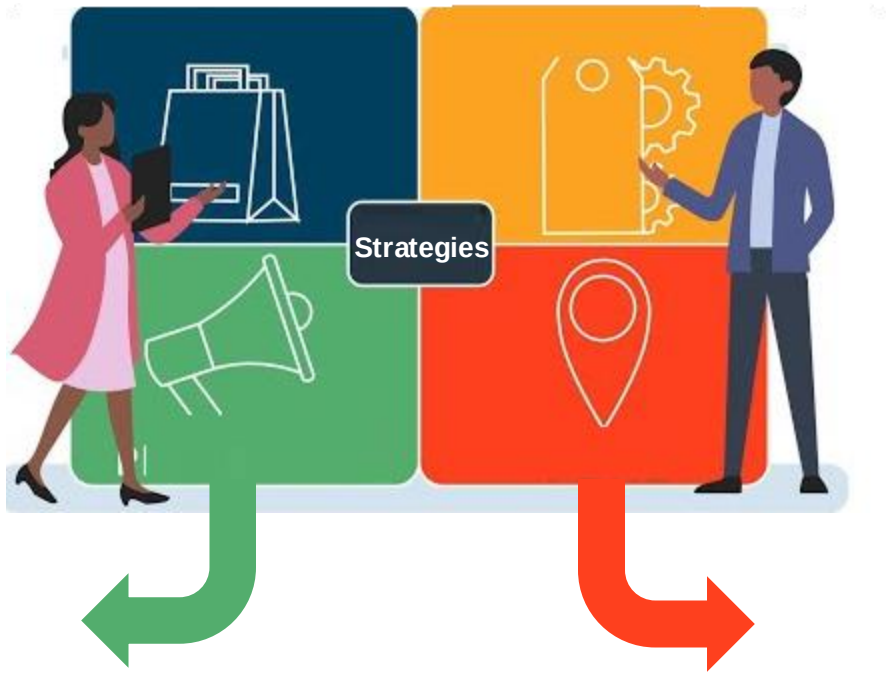
2. Optimizing Resource Allocation:

- Prioritize high-burden hospitals for initial surveillance efforts to maximize the impact of limited resources.
- Prioritize the high-risk areas with high AMR to maximize impact of stewardship and role model.

4 Effective Strategies for AMR Surveillance

3. Implementing Standardized Protocols:

- Adopting WHO-recommended guidelines and protocols across all participating facilities.
- Creating a standardized stewardship toolkit to ensure consistency in data submission.



4. Focus on Sustainable AMS & Funding Models:

- Advocate for government investment in AMR surveillance as a public health priority.
- Explore regional funding initiatives or collaborations.
- Promote audit protocol to maintain sustainability in stewardship and surveillance.

Role of Digital and Technological Tools in AMR Surveillance

Advantages of Digital Tools:

- Improved accuracy in data collection and aggregation.
- Streamlined processes, reducing reliance on manual, error-prone data entry.
- Real-time data sharing capabilities, which are crucial in monitoring AMR trends and responses.

Role of Digital and Technological Tools in AMR Surveillance

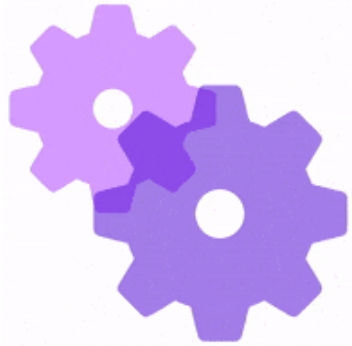
Digital Approaches Over Traditional Methods:

- Mobile applications for healthcare workers in remote areas to collect and transmit data.
- Cloud-based databases that allow secure storage and analysis accessible from anywhere.
- Integration of machine learning algorithms for predictive analysis to identify potential AMR outbreaks.

Importance of National AMR Surveillance and Diagnostic Capabilities

What National AMR Surveillance Data Should Contain

- Infection trends and resistance patterns, Specific pathogens and antimicrobial susceptibility.
- Monitoring of healthcare-associated and community-acquired infections.



Why Strengthening Diagnostic Capabilities is Crucial

- Enables precise treatment decisions and effective antimicrobial stewardship.
- Tracks emerging resistance to public health response and surveillance reliability.

Importance of Regional and Global Collaborations

Such as the South Centre, WHO, and other UN agencies, play a critical role in:

- Facilitating global data sharing for a comprehensive view of AMR trends.
- Establishing best practices and shared resources to standardize AMR surveillance.
- **Examples**: Highlighting the enrolment of South Centre member countries in alignment with GLASS AMR Surveillance, serving as role models to inspire and foster broader regional participation.

WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS)

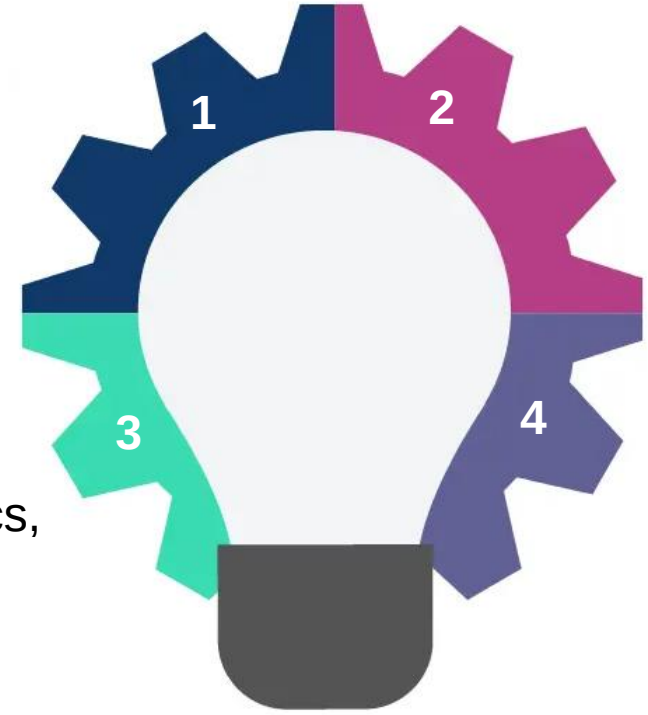
Currently, 109 countries participate in **GLASS**, though many developing nations face challenges in joining. Participation offers significant insights:

Pathogen-Specific Data:

Tracks resistance rates for pathogens like *E. coli* and *S. aureus*.

Antimicrobial Consumption

Provides resistance data for key antibiotics, such as ciprofloxacin, meropenem, ceftriaxone, and co-trimoxazole.

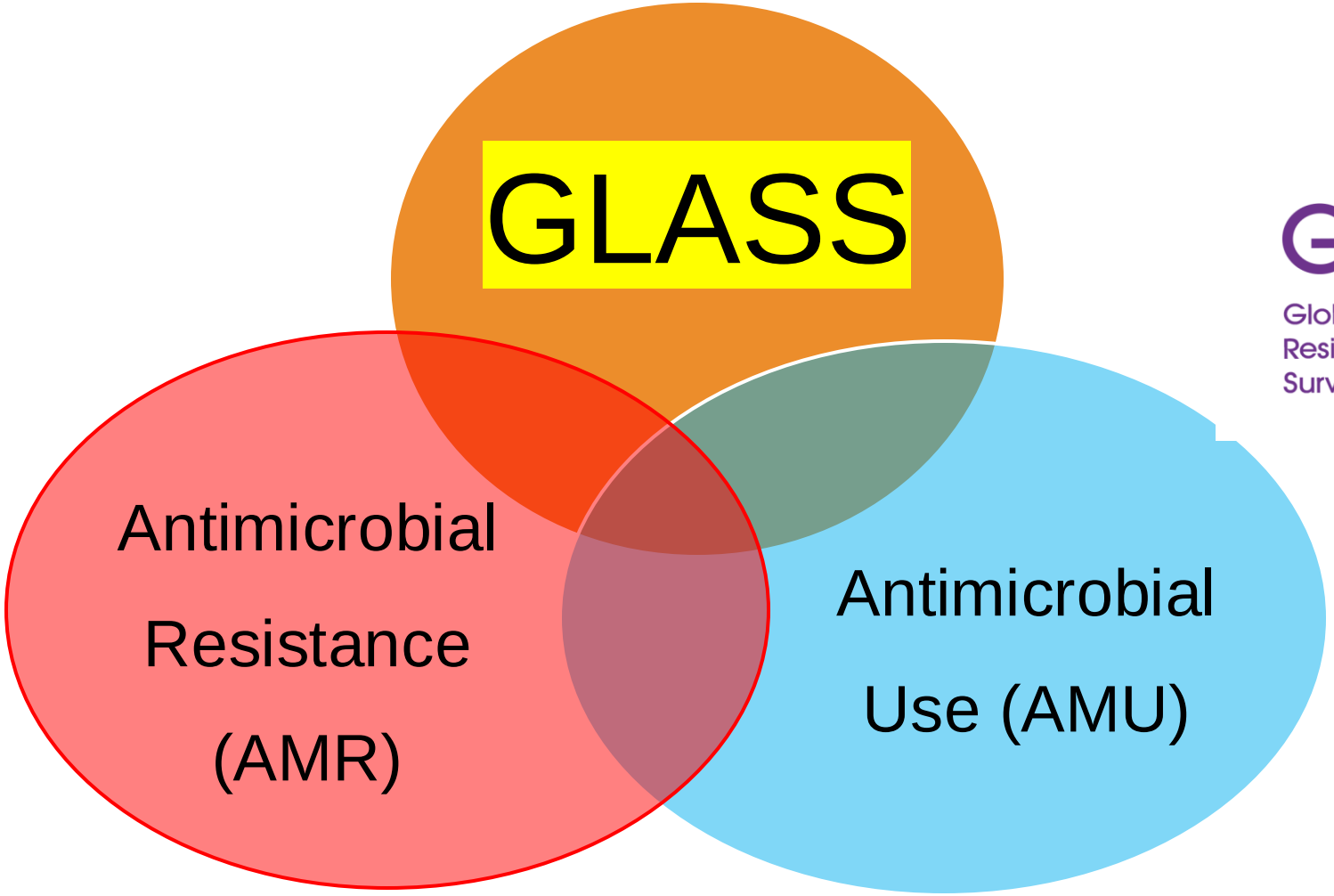


Global and Regional Benchmarks:

Enables comparisons with similar countries and alignment with global AMR standards.

Countries in GLASS: Highlights South Search per country in the interactive WHO dashboard for AMR surveillance.

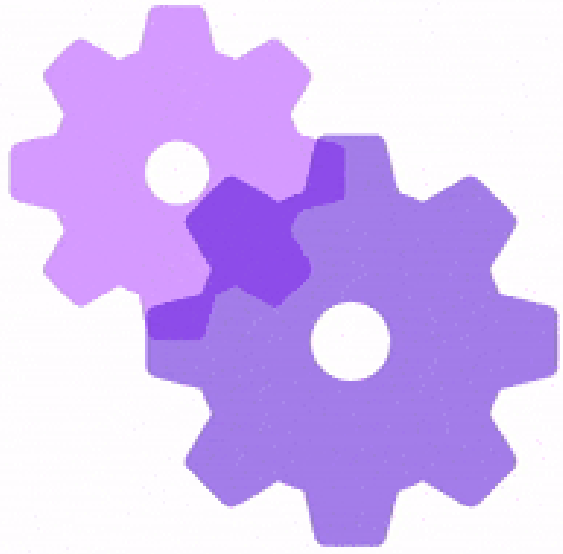
WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS) - **Participation:** 127 countries, territories, and areas.



GLASS
Global Antimicrobial Resistance and Use Surveillance System

WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS): 2022 Report

- **Launch & Scope Expansion:** Initiated in 2015, now includes:
  - Antimicrobial Consumption (AMC), Now called Antimicrobial Use (AMU)
  - One Health Surveillance
- **Trend Data:** AMR rates in common bacteria, AMU trends
- **Significance**
  - **Progress:** Insights from five years of national surveillance data.
  - **Actionable:** Strengthen data quality and global AMR strategies.
- 📊 **Explore More:** WHO's Interactive Dashboards & SDG Indicators



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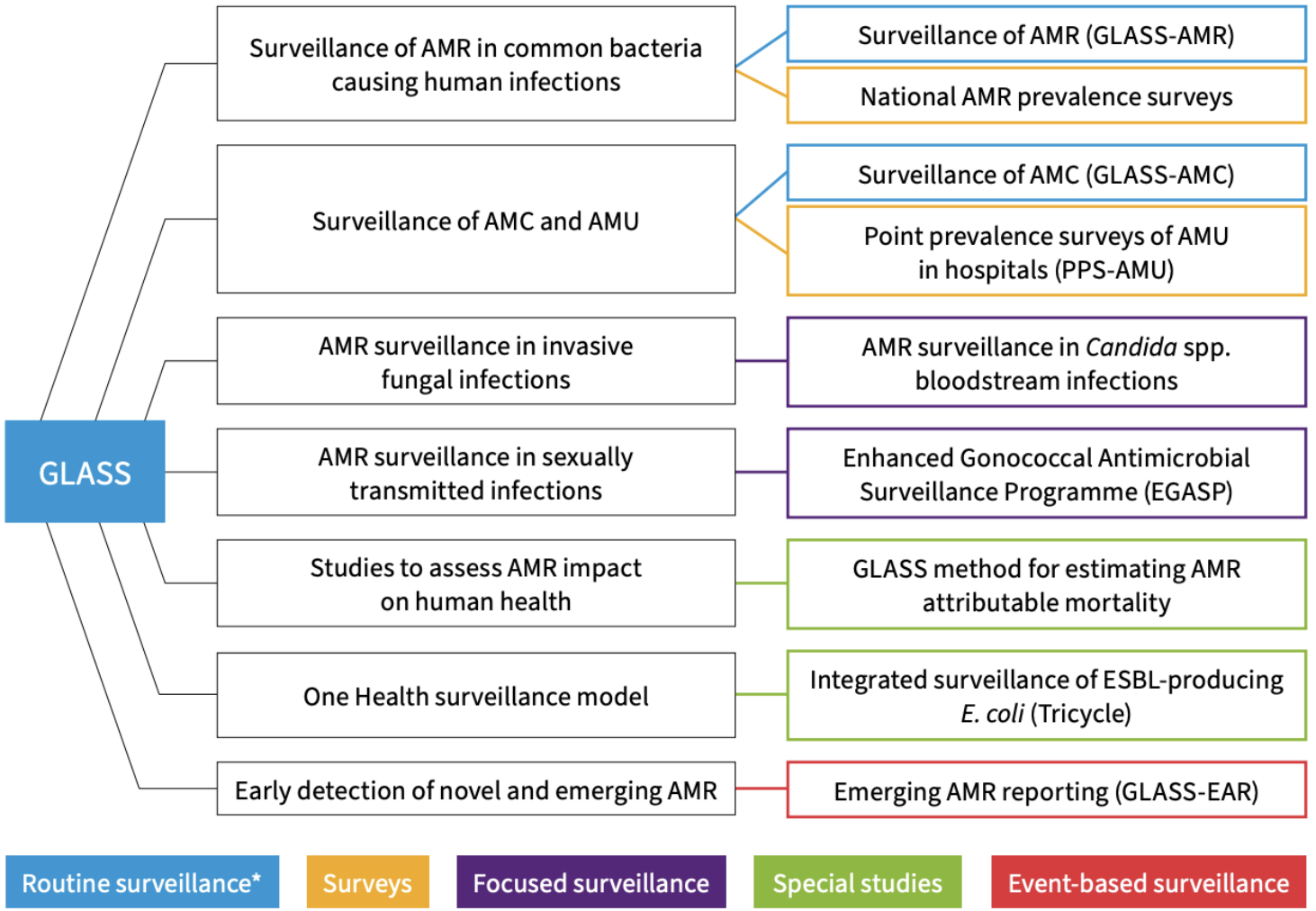
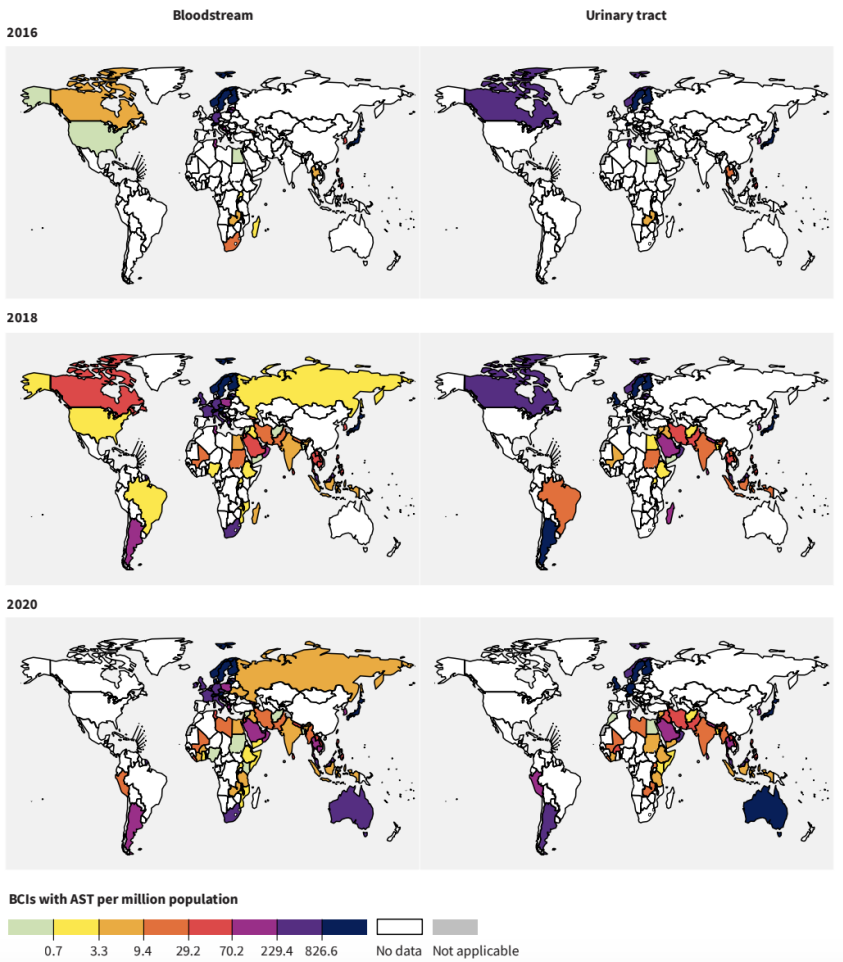
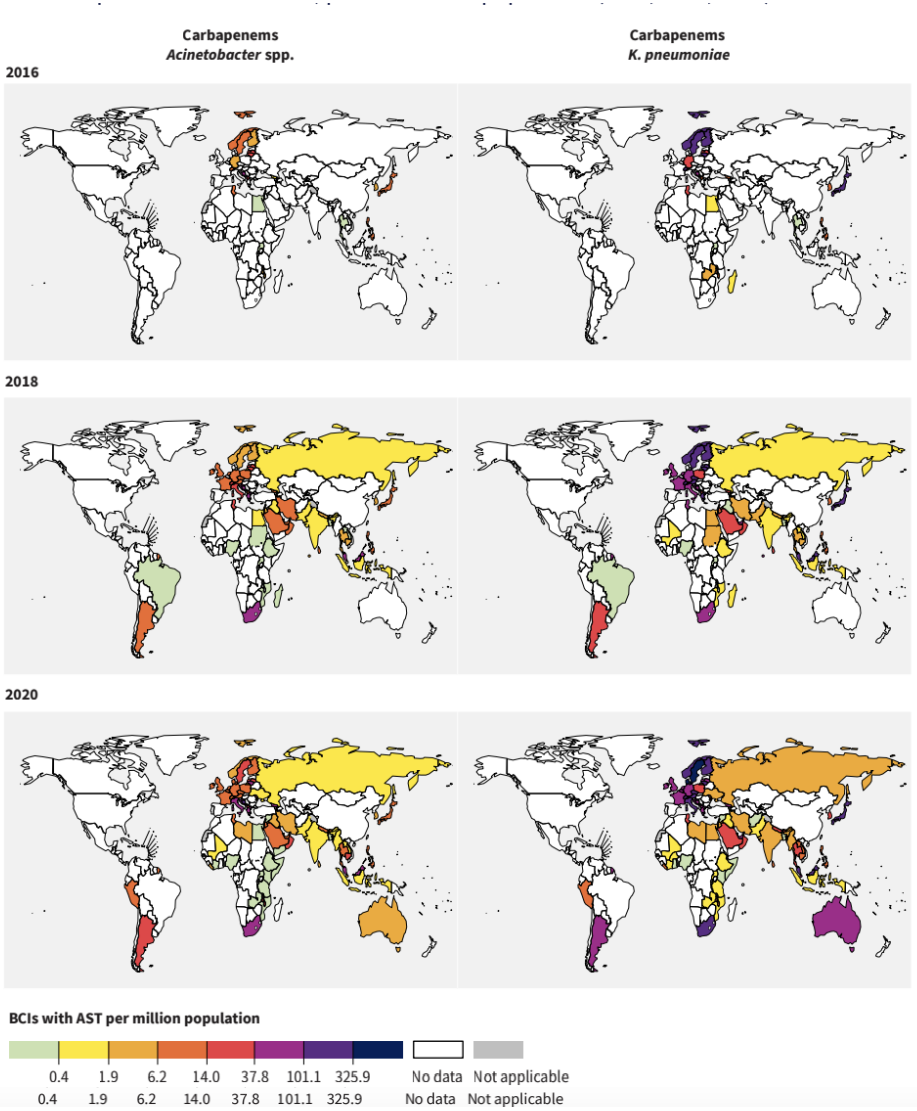




WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS): 2022 Report



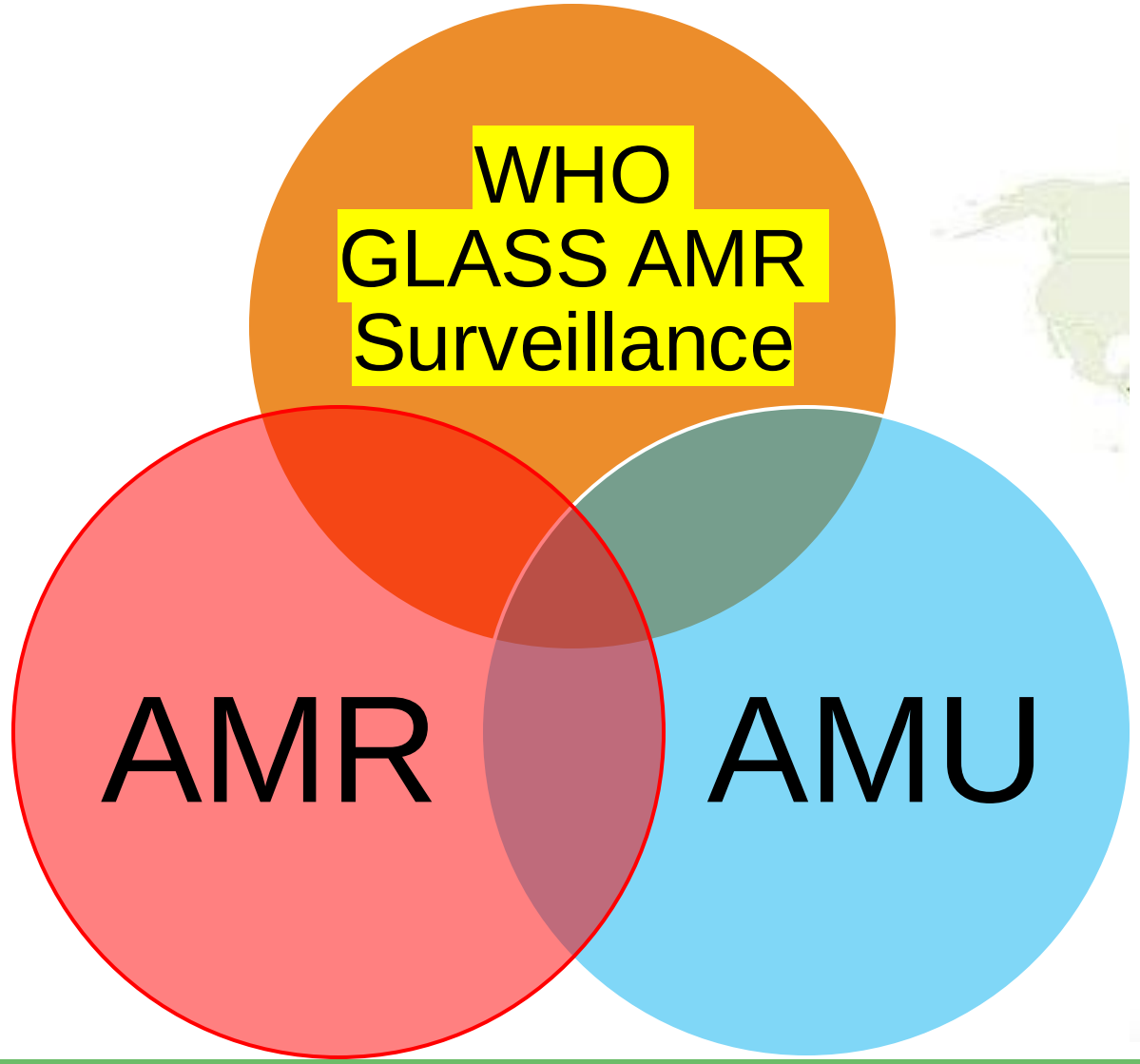
Infectious syndrome	Bacterial pathogen	Number of CTAs reporting BCIs	Total BCIs	BCIs with AST for any antibacterial
Bloodstream				
	Acinetobacter spp.	82	25 913	24 574
	E. coli	85	283 030	280 010
	K. pneumoniae	83	100 716	98 354
	Salmonella spp.	62	6 738	6 176
	S. aureus	82	135 631	120 802
	S. pneumoniae	64	12 826	12 276
	Total	**86**	**564 854**	**542 192**
Gastrointestinal				
	Salmonella spp.	57	17 420	15 904
	Shigella spp.	34	3 273	3 109
	Total	**57**	**20 693**	**19 013**
Gonorrhoea				
	N. gonorrhoeae	43	10 130	10 036
Urinary tract				
	E. coli	57	2 396 191	2 327 636
	K. pneumoniae	55	344 525	332 414
	Total	**57**	**2 750 846**	**2 670 086**
	Grand Total	**87**	**3 346 523**	**3 241 327**

Countries and GLASS

- **New Features:** Interactive dashboard for global AMR and AMU insights

https://worldhealthorg.shinyapps.io/glass-dashboard/_w_8f0b4601/#!/cta-profiles

South Centre 55 Countries and GLASS



MEMBER COUNTRIES

The South Centre currently has **55 developing country Members** coming from the three developing country regions of Africa, Asia, and Latin America and the Caribbean. They include many of the biggest developing countries, middle-income developing countries, least-developed countries and small island developing states.

The Member Countries of the South Centre are:

Algeria	Ghana	Nicaragua
Angola	Guyana	Nigeria
Argentina	Honduras	Pakistan
Barbados	India	Panama
Benin	Indonesia	Philippines
Bolivia (Plurinational State of)	Iran (Islamic Republic of)	Seychelles
Brazil	Iraq	Sierra Leone
Burundi	Jamaica	South Africa
Cabo Verde	Jordan	Sri Lanka
Cambodia	Liberia	State of Libya
China	Malawi	State of Palestine
Colombia	Malaysia	Sudan
Côte d'Ivoire	Mali	Suriname
Cuba	Mauritius	Uganda
Democratic People's Republic of Korea	Micronesia (Federated States of)	United Republic of Tanzania
Dominican Republic	Morocco	Venezuela (Bolivarian Republic of)
Ecuador	Mozambique	Viet Nam
Egypt	Namibia	Zimbabwe
Gabon		

South Centre and GLASS

South Centre Countries	2016	2017	2018	2019	2020	2021
Benin					Yes	
Brazil		Yes				
Burundi					Yes	
Cambodia	Yes					
Colombia						Yes
Côte d'Ivoire				Yes		
Democratic People's Republic of Korea			Yes			
Egypt	Yes					
Gabon				Yes		
Ghana				Yes		
India		Yes				
Indonesia				Yes		
Iran (Islamic Republic of)	Yes					
Iraq		Yes				
Jordan		Yes				
Liberia			Yes			
Malawi		Yes				
Malaysia			Yes			
Mali			Yes			
Mauritius			Yes			
Morocco						
Mozambique		Yes				
Namibia					Yes	
Nigeria		Yes				
Pakistan		Yes				
Philippines	Yes					
Sierra Leone						Yes
South Africa	Yes					
Sri Lanka			Yes			
Sudan			Yes			
Uganda	Yes					
United Republic of Tanzania				Yes		
Viet Nam						Yes
Zimbabwe	Yes					

AMR

55 developing country Members coming from the three developing country regions of Africa, Asia, and Latin America and the Caribbean.

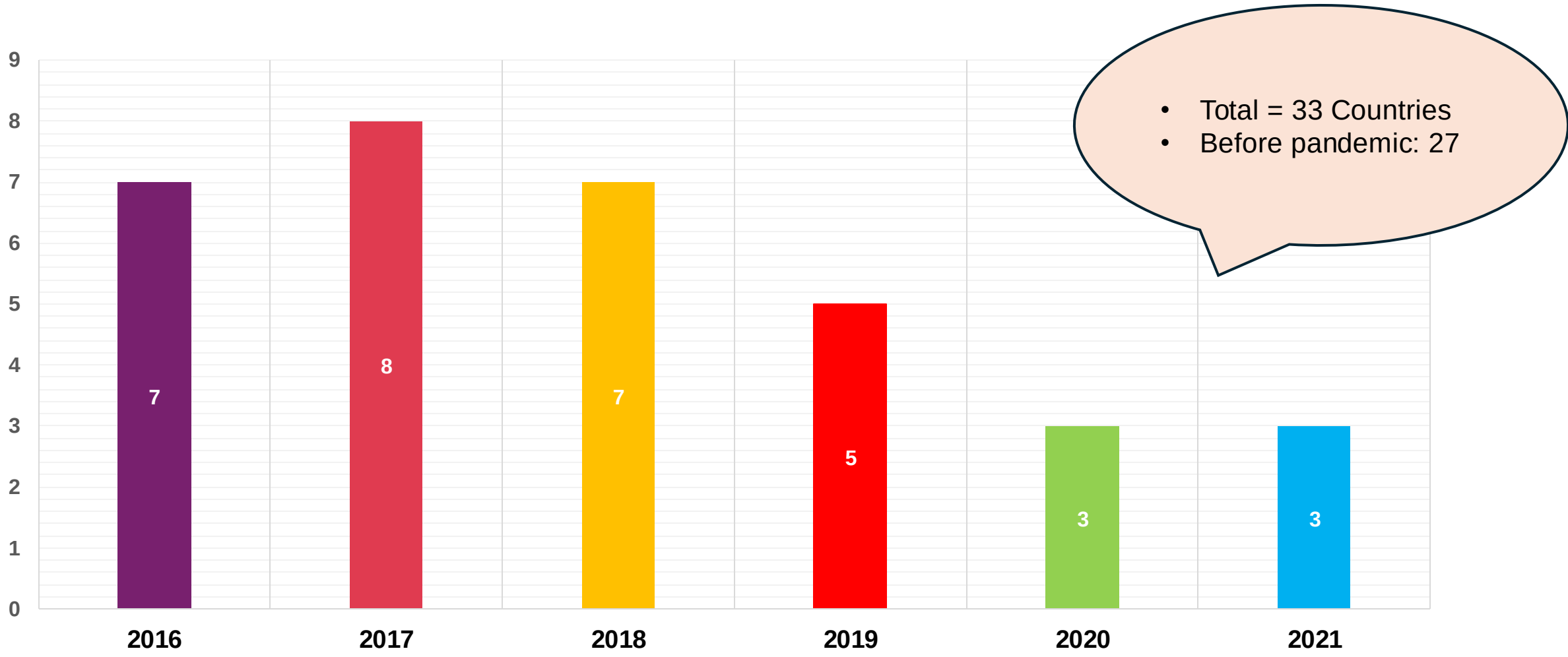
South Centre and GLASS

South Centre Countries	2016	2017	2018	2019	2020	2021	å2022	2023
Benin						Yes		
Brazil		Yes						
Burundi							Yes	
Cambodia								
Colombia						Yes		
Côte d'Ivoire				Yes				
Democratic People's Republic of Korea								
Egypt					Yes			
Gabon			Yes					
Ghana								
India								
Indonesia					Yes			
Iran (Islamic Republic of)					Yes			
Jordan					Yes			
Liberia								
Malawi								
Malaysia								Yes
Mali				Yes				
Mauritius								
Morocco					Yes			
Mozambique								
Namibia								
Nigeria								
Pakistan							Yes	
Philippines								
Sierra Leone						Yes		
South Africa							Yes	
Sri Lanka								
Sudan							Yes	
Uganda						Yes		
United Republic of Tanzania					Yes			
Viet Nam							Yes	
Zimbabwe								

AMU

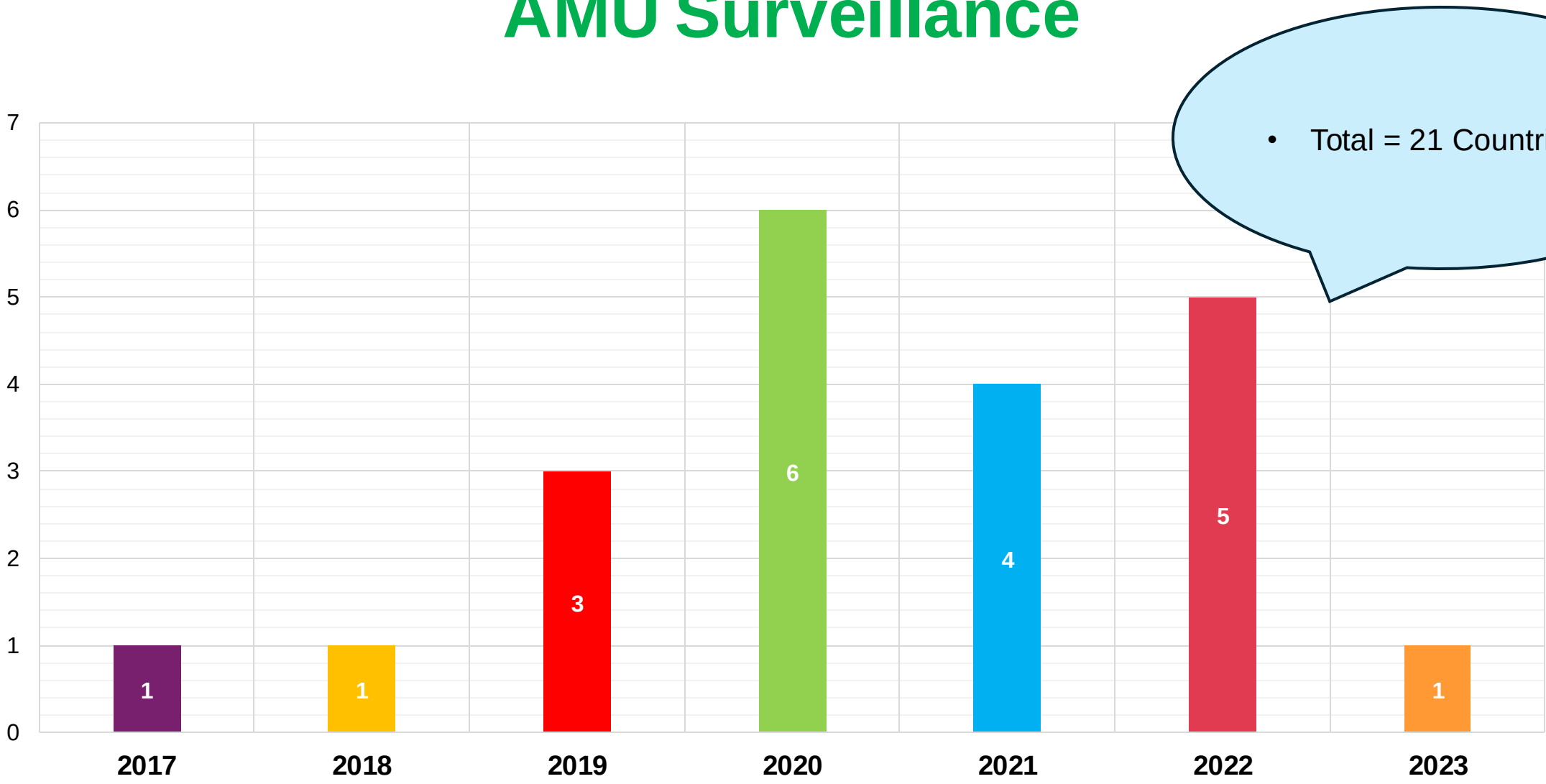
Number of South Centre Countries Enrolled in the WHO GLASS

AMR Surveillance

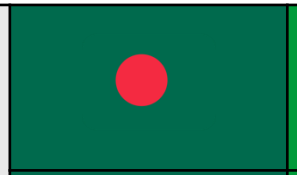
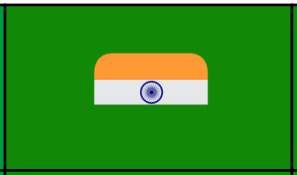
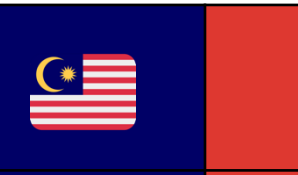


Number of South Centre Countries Enrolled in the WHO GLASS

AMU Surveillance

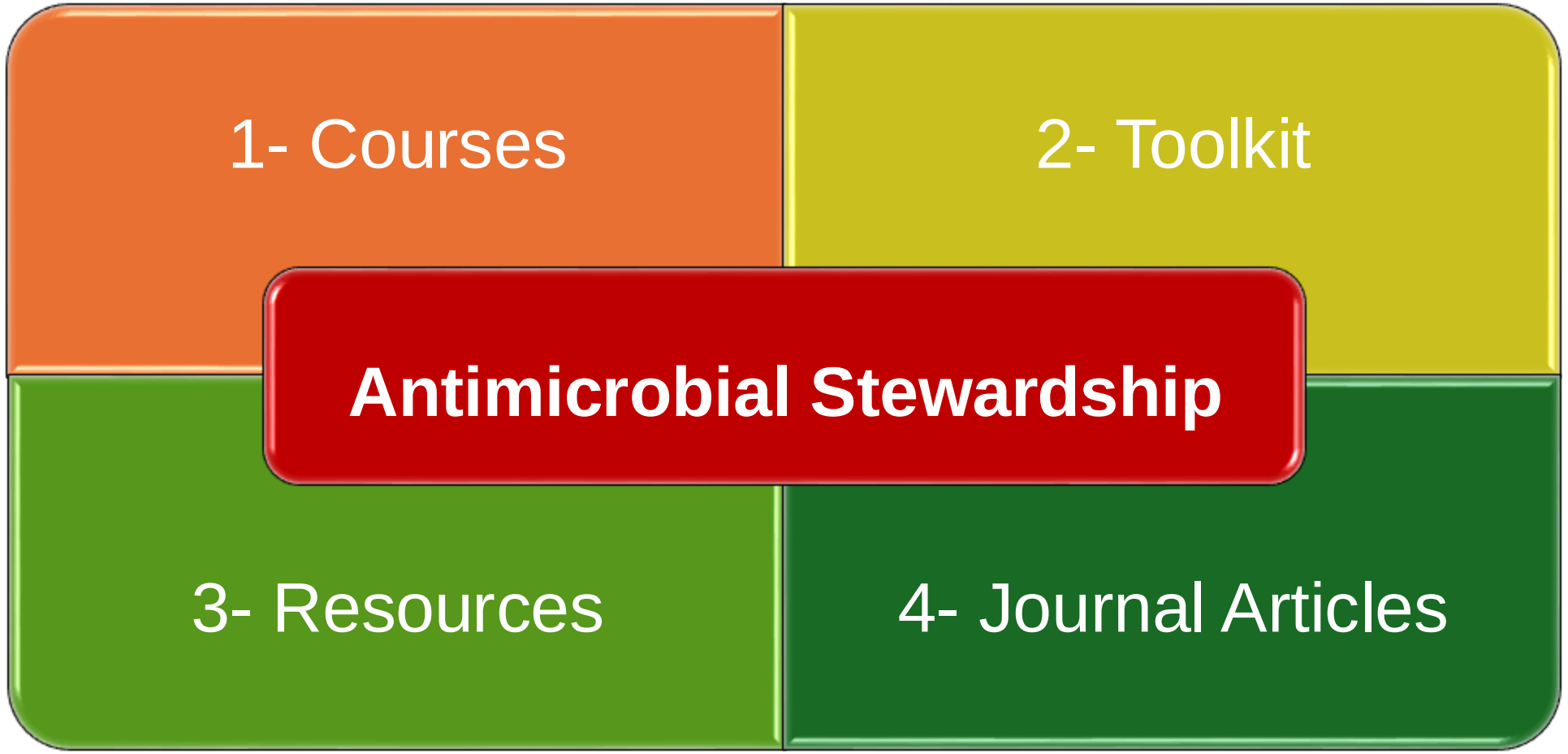


Case Studies and Success Stories

Countries						
	Bangladesh	Brazil	India	Lebanon	Malaysia	South Africa
Population	163.05 million	211.05 million	1.37 billion	6.86 million	31.95 million	58.56 million
Income world bank classification	LMIC	UMIC	LMIC	UMIC	UMIC	UMIC
GLASS-AMR	Yes	Yes	Yes	Yes	Yes	Yes
National action plan	In place	In place	In place	In place	In place	In place
Number of enrolled national surveillance centers	8	18	130	30	110	353
Number of enrolled hospitals	0	11	65	30	42	350
Laboratories performing antimicrobial susceptibility testing (AST)	8	11	41	30	43	50
AST provided for GLASS pathogens	Some		Some	Some	All	All pathogens

AMR Surveillance in LMICs: A Scattered Picture in 2021

Global Resources of Antimicrobial Stewardship



1. Antimicrobial Stewardship Courses

WHO Open Courses

BSAC Open Courses

Future Learn & Coursera

ESCMID

ECDC & CDC

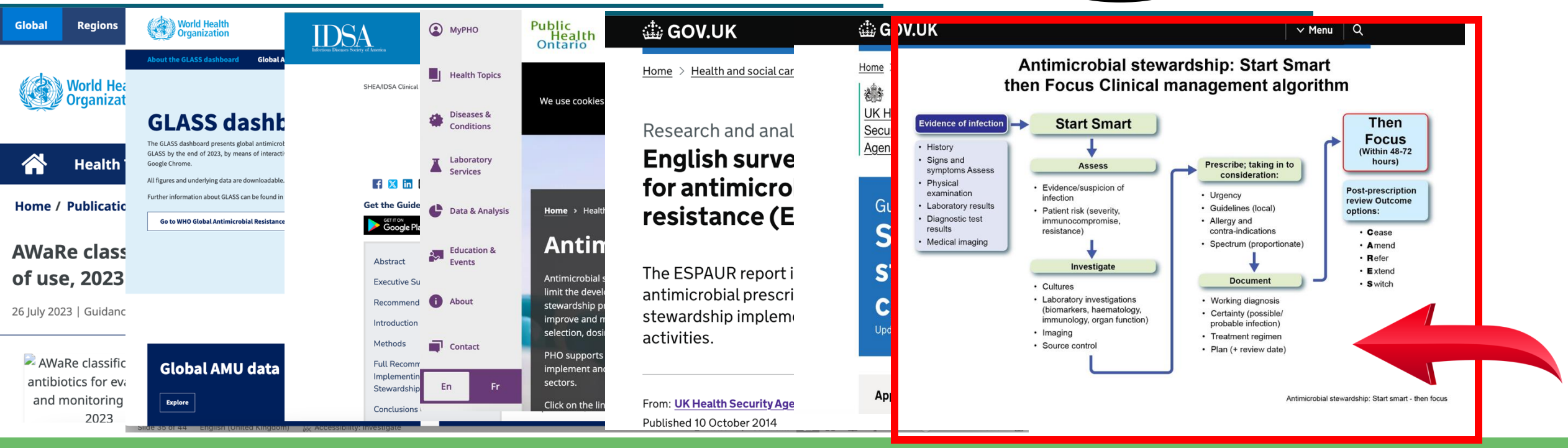
2. Antimicrobial Stewardship Toolkit

WHO

IDSA

Public Health Ontario

UKHSA



3. Antimicrobial Stewardship Resources

WHO | African CDC | UKHSA | CDC & ECDC | United Nation

4. Antimicrobial Stewardship Journal Articles

Frontiers

PMC

MDPI

JAC-AMR

JGAR

Key barriers include

Weak Laboratory Infrastructure

Communication and Collaboration Challenges

Insufficient Workforce

Supply Chain and Quality Issues

Reliance on Inconsistent Funding

Data Gaps and Poor Standardisation

Healthcare accessibility: Limited access to health services in many regions impacts population coverage.

Workforce limitations: Shortages in skilled healthcare professionals hinder effective AMR surveillance.

Moving Forward – Key Takeaways and Recommendations

To enhance AMR surveillance in hospitals across developing countries, we recommend:

Healthcare challenges: Inadequate infection prevention and control (IPC) measures and limited access to clean water and sanitation (WASH).

Urban-local areas: Differences in monitoring hospital-acquired infections (e.g., ICU) vs community-acquired infections.

Systemic barriers: Addressing these challenges is crucial to ensure robust and effective AMR surveillance in developing countries.

CONCLUSION

Strengthening Global AMR Surveillance

- **Comprehensive Strategy:** Tackling AMR demands a global approach with robust, comprehensive surveillance systems tailored to diverse healthcare contexts.
- **Addressing Challenges in Developing Countries:** Overcome key barriers like IPC/WASH infrastructure, workforce shortages, and healthcare access, especially in urban and rural settings.
- **Collaboration and Digital Solutions:** Foster regional and global partnerships while leveraging digital tools for efficient AMR tracking and response.
- **Empowering Surveillance Through Resources:** Use frameworks like WHO's AWaRe classification, AMS toolkits, and surveillance guidelines to streamline efforts.
- **Enhancing Health Systems:** Build resilient systems to ensure effective surveillance, equitable healthcare, effective antimicrobial stewardship and improved global health outcomes.

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THANK YOU!

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