Global Antimicrobial Resistance Surveillance System

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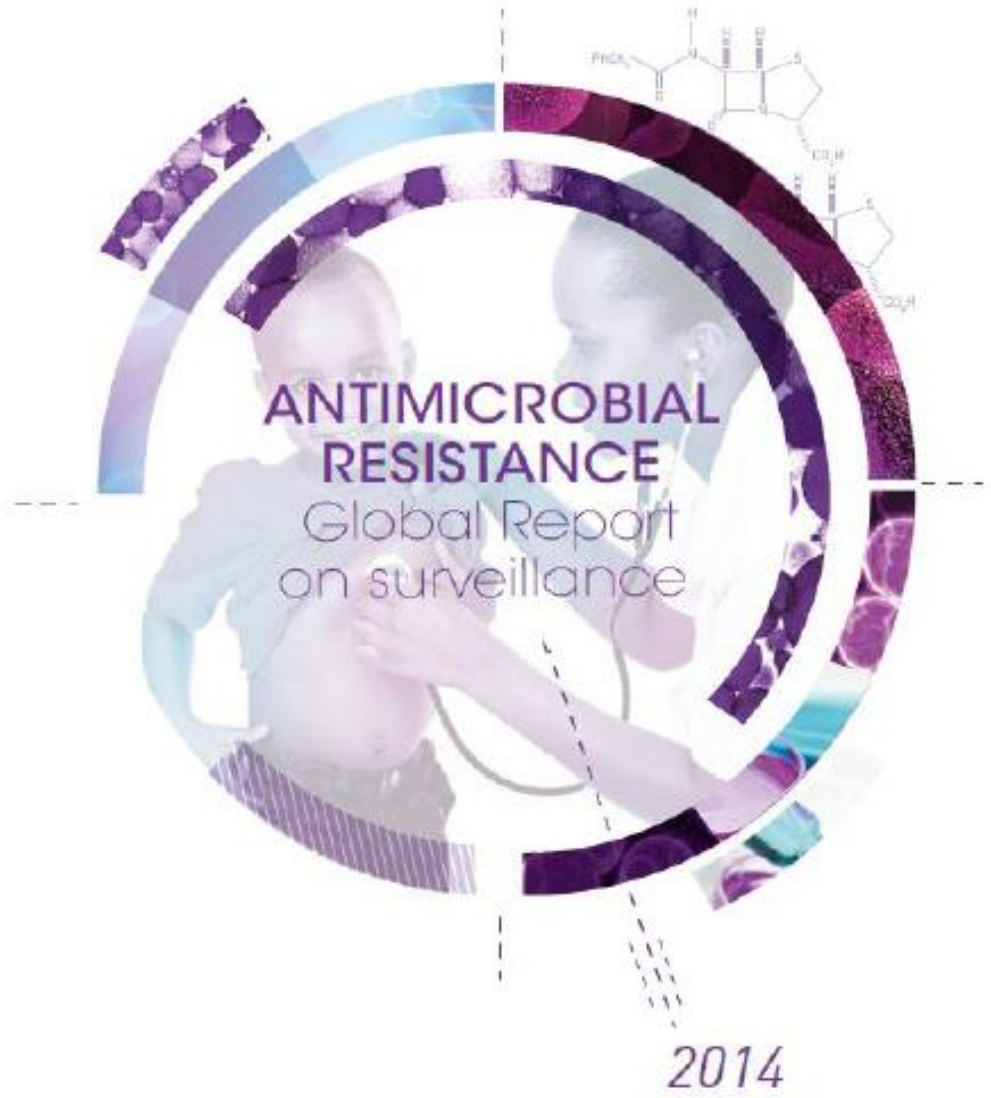
Presentation

1. Antimicrobial resistance: Global surveillance report
2. Moving forward to the fight against AMR

Global surveillance report: WHO



World Health Organization

What is Antimicrobial Resistance (AMR)?

Medicines for treating infections lose effect because the microbes change;

1. mutate
2. acquire genetic information from other microbes to develop resistance

Types of AMR

1. **Antibacterial resistance** (e.g. to antibiotics and other antibacterial drugs)
2. **Antiviral resistance** (e.g. to anti-HIV medicines)
3. **Antiparasitic resistance** (e.g. to anti-malaria medicines)
4. **Antifungal resistance** (e.g. to medicines used to treat *Candidiasis*)

AMR is a natural phenomenon accelerated by use of antimicrobial medicines. Resistant strains survive and aggregate.

Antimicrobial Resistance Global Report on Surveillance 2014 (I)

- Focuses on antibacterial resistance (ABR)
- Information gathered include:

Surveillance of ABR according to WHO regions	National and published data on 7 bacteria	Systematic reviews of evidence of health and economic burden in 5 bacteria/ resistance combinations	Identification of gaps
			

Selected Bacteria/Resistance Combinations

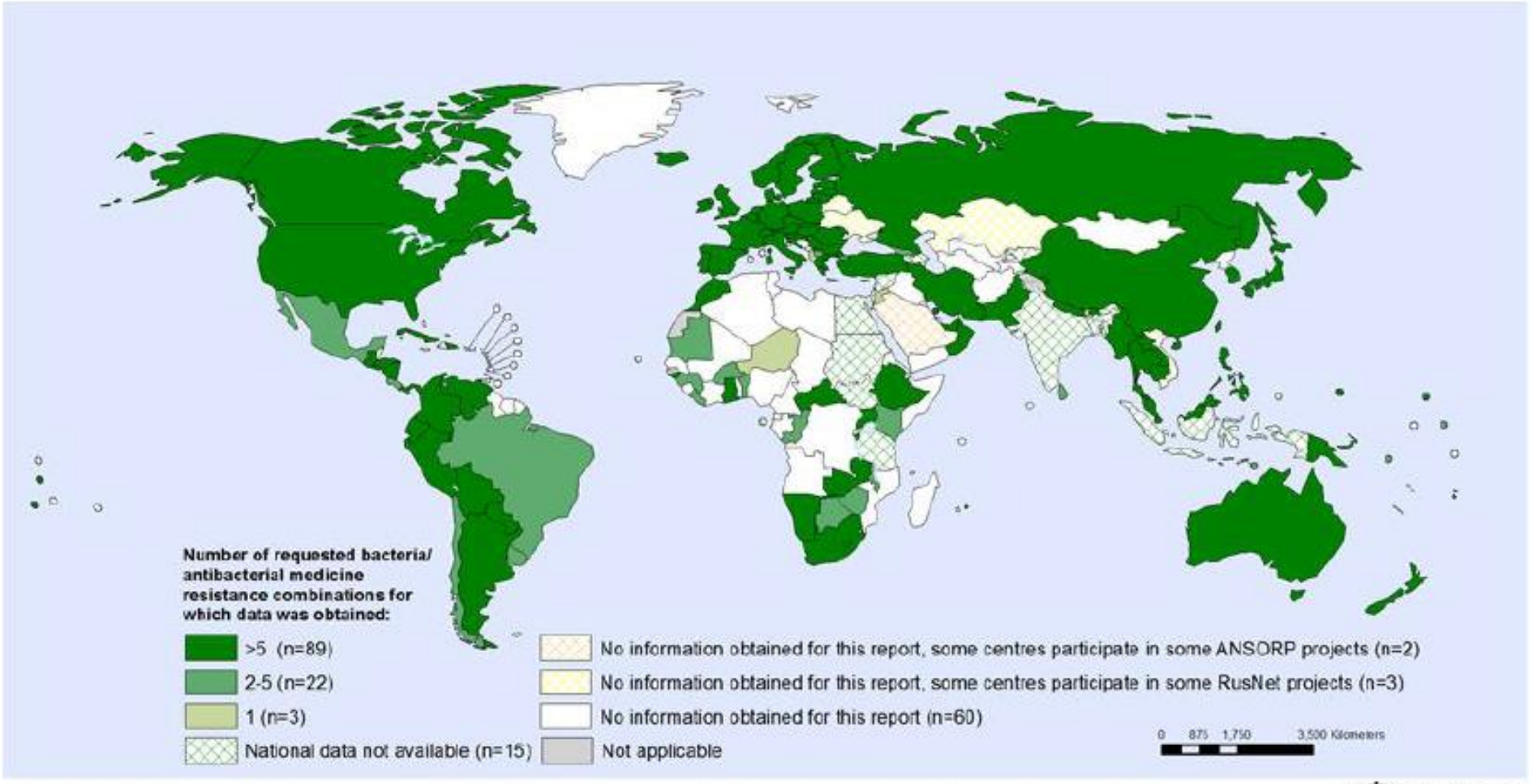
Bacterium	Resistance/ decreased susceptibility to:
Escherichia coli	3rd generation cephalosporins, fluoroquinolones
Klebsiella pneumoniae	3rd generation cephalosporins, carbapenems
Staphylococcus aureus	Methicillin (beta-lactam antibiotics) i.e. MRSA
Streptococcus pneumoniae	Penicillin
Nontyphoidal *Salmonella* (NTS)	Fluoroquinolones
Shigella species	Fluoroquinolones
Neisseria gonorrhoeae	3rd generation cephalosporins

Data Collection
Resistance Proportions and Surveillance

National official sources > National and international networks of ABR surveillance > Scientific literature

Published from 2008 when no data could be obtained

Available National Data* on Resistance for Nine Selected Bacteria/Antibacterial Drug Combinations, 2013



Data Source: World Health Organization
Map Production: Health Statistics and Information Systems (HSI)
World Health Organization

World Health Organization

*National data means data obtained from official sources, but not that data necessarily are representative for the populationor country as a whole

Bacteria Commonly Causing Infections in Hospitals and Communities

Name of bacterium/ resistance	Examples of typical diseases	No. of 194 MS providing national data	No. of WHO regions with national reports of 50 % resistance or more	Range of reported proportion of resistance
Escherichia coli	Urinary tract infections, blood stream infections			
-vs 3rd gen. cephalosporins		84	5/6	0-82
-vs fluoroquinolones		90	5/6	3-96
Klebsiella pneumoniae	Pneumonia, blood stream infections, urinary tract infections			
-vs 3rd gen. cephalosporins		85	6/6	2-82
-vs carbapenems		69	2/6	0-68
Staphylococcus aureus	Wound infections, blood stream infections			
-vs methicillin "MRSA"		83	5/6	0.3-90

Bacteria Mainly Causing Infections in the Community

Name of bacterium/ resistance	Examples of typical diseases	No. of 194 MS providing national data	No. of WHO regions with national reports of 25 % resistance or more	Range of reported proportion of resistance
Streptococcus pneumoniae	Pneumonia, meningitis, otitis			
-non-susceptible to penicillin		66	6/6	0-73
Nontyphoidal *Salmonella*	Foodborne diarrhoea, blood stream infections			
-vs fluoroquinolones		66	3/6	0-96
***Shigella* species**	Diarrhoea ("bacillary dysenteria")			
- vs fluoroquinolones		34	2/6	0-47
Neisseria gonorrhoeae	Gonorrhoea			
-vs 3rd gen. cephalosporins		42	3/6	0-36

Estimates of Burden of Antibacterial Resistance

European Union
population 500m

25,000 deaths per year

2.5m extra hospital days

Overall societal costs
(€ 900 million, hosp. days)
Approx. €1.5 billion per year

Source: ECDC 2007

Thailand
population 70m

>38,000 deaths

>3.2m hospital days

Overall societal costs
US$ 84.6–202.8 mill. direct
>US$1.3 billion indirect

Source: Pumart et al 2012

United States
population 300m

>23,000 deaths

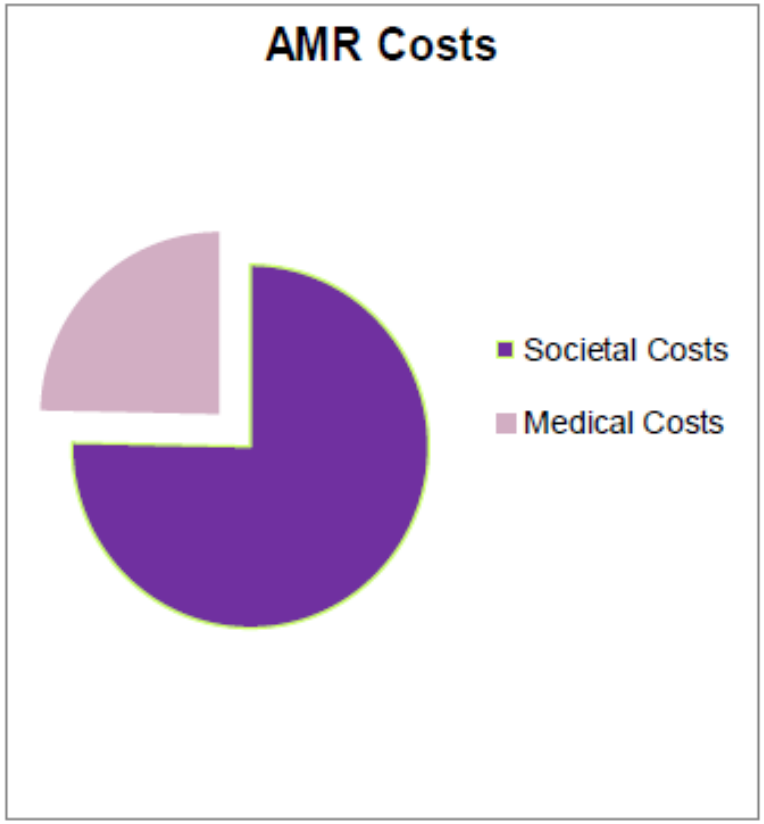
>2.0m illnesses

Overall societal costs
Up to $20 billion direct
Up to $35 billion indirect

Source: US CDC 2013

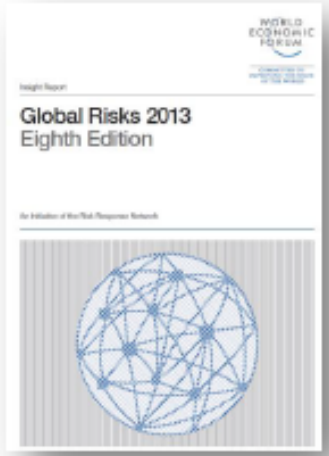
Global information is insufficient to show complete disease burden impact and costs

Overall Economic Impact Much Higher



Source: Roberts et al CID 2009; 49:1147-84.

- Reduced consumer income, employment, savings
- Increased national investment, spending, healthcare delivery
- Reduced gross domestic product (GDP): 1.4% to 1.6%



Summary:
Antibacterial Resistance

1. High proportions of resistance were reported in all regions to common treatments for bacteria causing infections in both healthcare settings and in the community

2. Antibacterial resistance has a negative effect on patient outcomes and health expenditures

3. Treatment options for common infections are running out

4. Despite limitations, the report demonstrates worldwide magnitude of ABR and surveillance gaps

Summary:
Surveillance of Antibacterial Resistance

1. Gaps are largest where health systems are weak

2. There is no agreement on surveillance standards:
   - What samples and information to collect
   - How to analyse samples
   - How to compile and share data

3. Obtained national data was usually based on proportions of resistant bacteria rather than proportions of resistant bacteria causing specific diseases or affecting defined populations

4. The report provides a benchmark for future surveillance progress

AMR in Food-Producing Animals and Food Chain

1. Major gaps exist in surveillance and data sharing
2. Integrated surveillance systems would enable data comparison from food-producing animals, food products and humans
3. Surveillance is hampered by lack of implemented global standards
4. WHO is pursuing a multi-sectoral approach by collaborating with the Food and Agriculture Organization (FAO), the World Organisation for Animal Health (OIE) and other stakeholders

Surveillance of Antimicrobial Resistance: Needs and Next Steps

Vision

"To achieve a monitoring capacity that will capture the global situation of antimicrobial resistance, and inform decision-making."
http://apps.who.int/iris/bitstream/10665/90975/1/WHO_HSE_PED_2013.10358_eng.pdf

Towards integrated surveillance of AMR

In humans and animals
and in disease specific programs

Immediate steps will focus on ABR

Standards for global surveillance
Collaborative platform for surveillance

Global AMR Surveillance System

GLASS

- Supports the Global Action Plan on Antimicrobial Resistance

Goal:

- Enable standardized, comparable, validated data on AMR to be collected, analyzed and compared across countries
- Inform decision making, drive policies and action

Objectives

GLASS will collect, analyse and report harmonized data on infected patients, aggregated at national level, following the standard definitions described in this manual. The objectives of GLASS are to:

- foster national surveillance systems and harmonized global standards;
- estimate the extent and burden of AMR globally by selected indicators;
- analyse and report global data on AMR on a regular basis;
- detect emerging resistance and its international spread;
- inform implementation of targeted prevention and control programmes; and
- assess the impact of interventions.

5-year Roadmap

Table 1. Five-year road map for implementation of GLASS

Year	Targets
2015	Prepare manual, set up IT hub and plan support for implementation of GLASS. Establish a platform for international collaboration with WHO collaborating centres, national and regional networks and other laboratories and institutions to allow WHO to support countries in implementing GLASS. Initiate country enrolment.
2016	Start collection of baseline data on human antibacterial-resistant infections from WHO Member States. Report on progress in implementation. Target the participation of 15% of Member States.
2017	Consolidate baseline data collection on human antibacterial-resistant infections from WHO Member States. Increase the capacity of the platform to build relations with other AMR surveillance systems (e.g. in animal health, agriculture and use and consumption of antibiotics). Extend Member States participation to 20%.
2018	Report on the global and regional AMR data in human health. Explore the feasibility of case-finding by surveillance of clinical syndromes at selected surveillance sites. Extend Member States participation to 30%.
2019	Review lessons learnt from early implementation to inform further development of GLASS. Extend Member States participation to 40%.

Surveillance methods

1. Routine surveillance and case finding based on routine clinical samples of priority specimens
2. Priority pathogen-antibacterial combinations on which GLASS will gather data
3. Priority specimen types to be assessed

Surveillance methods

Priority specimens and pathogens for surveillance of AMR

Table 2. Priority specimens and pathogens for surveillance of AMR

Specimen	Laboratory case definition	Surveillance type and sampling setting	Priority pathogens for surveillance
Blood	Isolation of pathogen from blood[a]	Selected sites or national coverage Continuous Patients in hospital and in the community	*E. coli* *K. pneumoniae* *A. baumannii* *S. aureus* *S. pneumoniae* *Salmonella* spp.
Urine	Significant growth in urine specimen[b]	Selected sites or national coverage Continuous Patients in hospital and in the community	*E. coli* *K. pneumoniae*
Faeces	Isolation of *Salmonella* spp.[c] or *Shigella* spp. from stools	Selected sites or national coverage Continuous Patients in hospital and in the community	*Salmonella* spp. *Shigella* spp.
Urethral and cervical swabs	Isolation of *N. gonorrhoeae*	Selected sites or national coverage Continuous Patients in hospital and in the community	*N. gonorrhoeae*

Surveillance methods

Priority specimens and pathogens-bacterial combination

Table 3. Pathogen–antimicrobial combinations on which GLASS will gather data

Pathogen	Antibacterial class	Antibacterial agents that may be used for AST[a,b]
Escherichia coli	Sulfonamides and trimethoprim	Co-trimoxazole
	Fluoroquinolones	Ciprofloxacin or levofloxacin
	Third-generation cephalosporins	Ceftriaxone or cefotaxime and ceftazidime
	Fourth-generation cephalosporins	Cefepime
	Carbapenems[c]	Imipenem, meropenem, ertapenem or doripenem
	Polymyxins	Colistin
	Penicillins	Ampicillin
Klebsiella pneumoniae	Sulfonamides and trimethoprim	Co-trimoxazole
	Fluoroquinolones	Ciprofloxacin or levofloxacin
	Third-generation cephalosporins	Ceftriaxone or cefotaxime and ceftazidime
	Fourth-generation cephalosporins	Cefepime
	Carbapenems[c]	Imipenem, meropenem, ertapenem or doripenem
	Polymyxins	Colistin
Acinetobacter baumannii	Tetracyclines	Tigecycline or minocycline
	Aminoglycosides	Gentamicin and amikacin
	Carbapenems[c]	Imipenem, meropenem or doripenem
	Polymyxins	Colistin
Staphylococcus aureus	Penicillinase-stable beta-lactams	Cefoxitin[d]
Streptococcus pneumoniae	Penicillins	Oxacillin[e]
		Penicillin G
	Sulfonamides and trimethoprim	Co-trimoxazole
	Third-generation cephalosporins	Ceftriaxone or cefotaxime
Salmonella spp.	Fluoroquinolones	Ciprofloxacin or levofloxacin
	Third-generation cephalosporins	Ceftriaxone or cefotaxime and ceftazidime
	Carbapenems[c]	Imipenem, meropenem, ertapenem or doripenem
Shigella spp.	Fluoroquinolones	Ciprofloxacin or levofloxacin
	Third-generation cephalosporins	Ceftriaxone or cefotaxime and ceftazidime
	Macrolides	Azithromycin
Neisseria gonorrhoeae	Third-generation cephalosporins	Cefixime
		Ceftriaxone
	Macrolides	Azithromycin
	Aminocyclitols	Spectinomycin
	Fluoroquinolones	Ciprofloxacin
	Aminoglycosides	Gentamicin

Priority specimen types to be assessed

- Blood
- Urine
- Faeces
- Urethral and cervical swabs

Countries should cover the sites of infection, pathogens and AST that they consider priority for surveillance

Countries can join GLASS even if they can provide information on only some of the pathogen-antimicrobial combinations

Surveillance methods

Information to be submitted

- Total number of population
- Number of patients seeking care for 12 months at surveillance sites in both outpatient and in-patient facilities
- Number of patients with positive and negative cultures per specimen type and with susceptible and non-susceptible pathogens for each priority pathogen-antibiotic combination per specimen type, stratified by:
  - age
  - gender
  - hospital or other type of facility (with qualifications)
  - community patients (with qualifications)

Participation

Enrolment:

- WHO will invite Member States to participate
- Training and tools will be provided

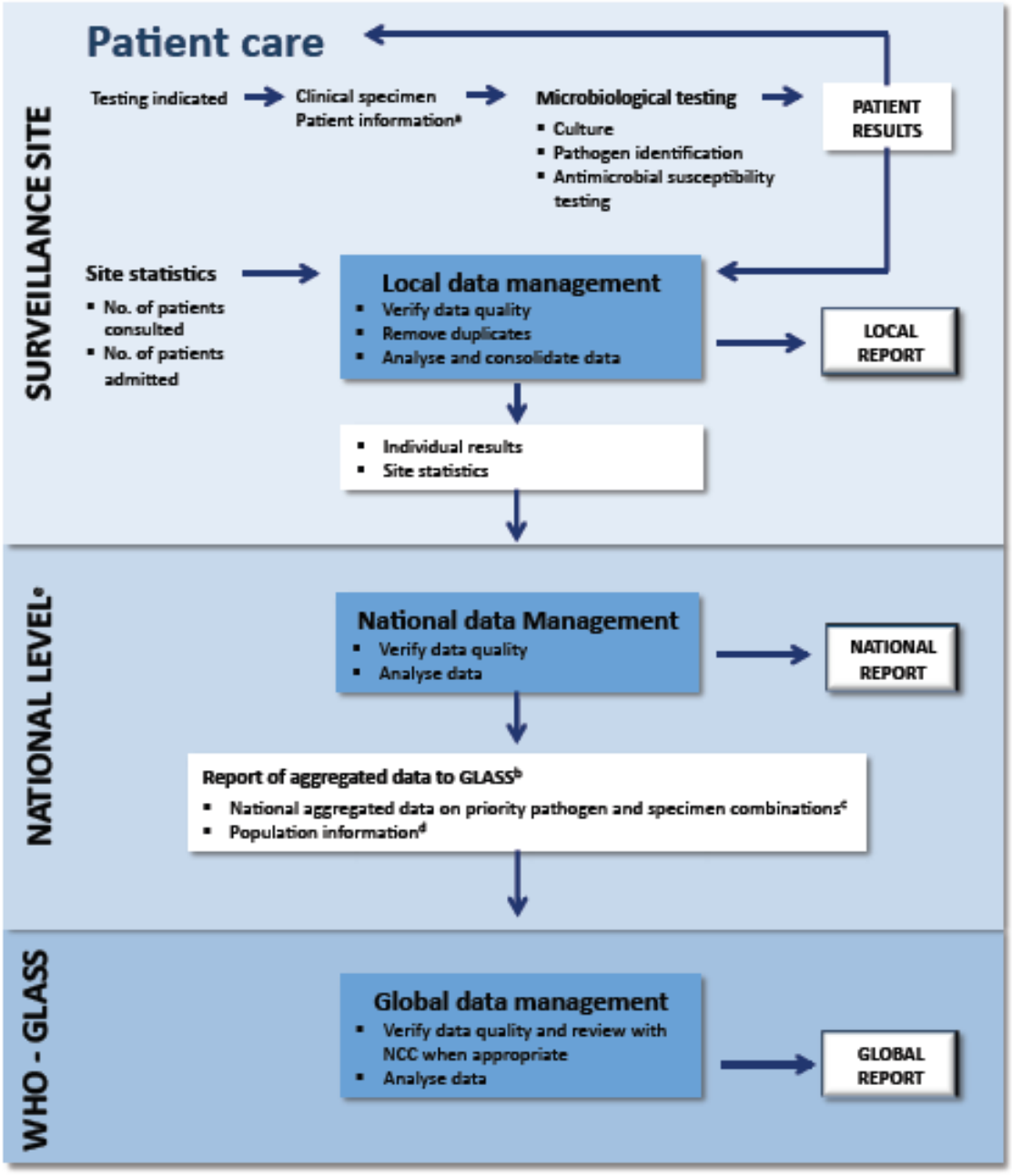
Participation

Requirements for participation:

1. National Coordinating Centre
2. National Reference Laboratory
3. AMR Surveillance sites

Reporting

Figure 1. Schematic view of information flow



THANK YOU