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Antimicrobial Resistance in the Eastern Mediterranean Region

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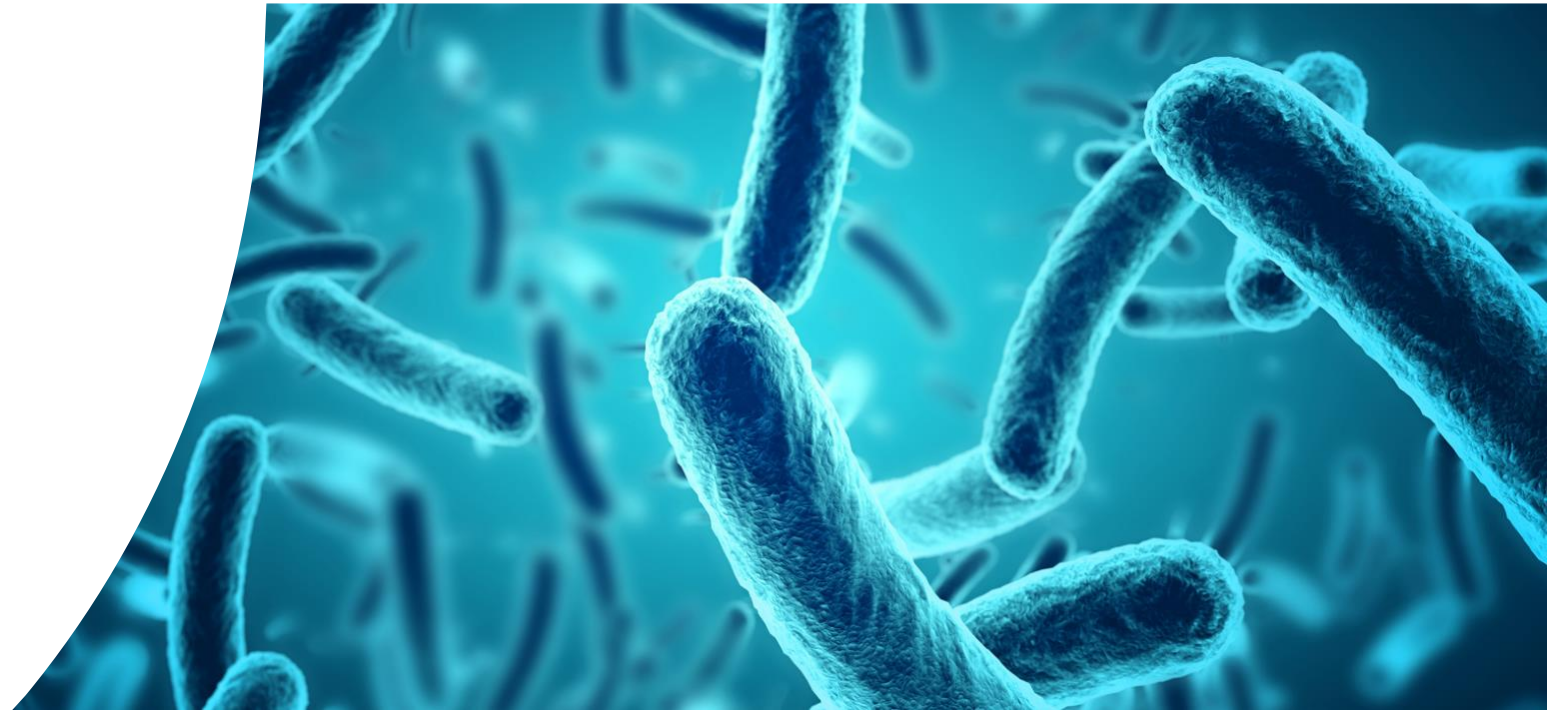
“Left unchecked, antimicrobial resistance will roll back a century of medical progress, damage the environment, interrupt food production, cause more people to fall into extreme poverty and risk global health security.”

Dr Tedros

Director General

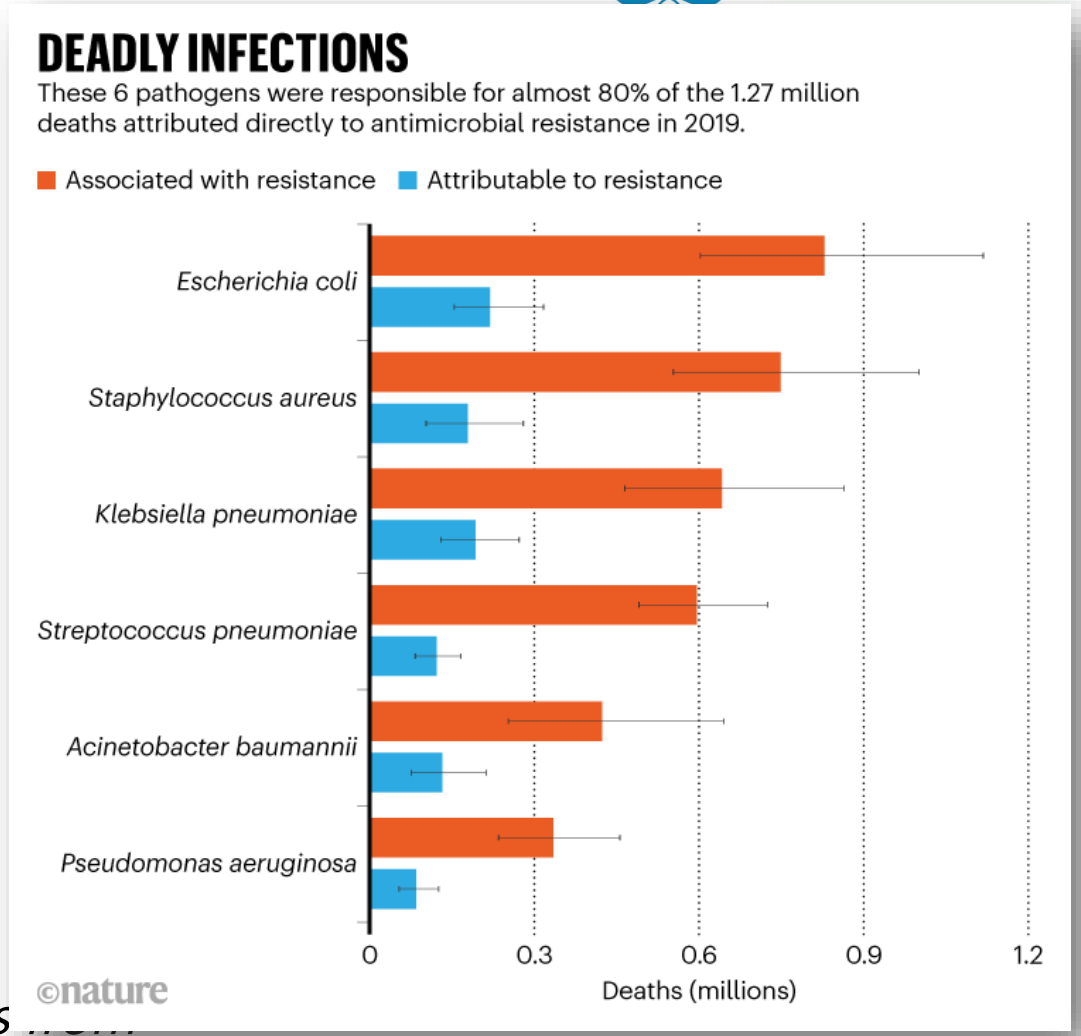
World Health Organization



A major threat to global health

A first comprehensive assessment of the global burden of AMR reveals that in 2019:

- Nearly **1.3 million deaths are directly caused** by bacterial AMR.
- Nearly 5 million deaths are associated with bacterial AMR.
- **1 in 5 deaths** caused by AMR occurred in **children under the age of five** – often from previously treatable infections
- **Sub Saharan Africa faces the highest burden of AMR**, with 255,000 deaths attributable to AMR, and a particularly high number from vaccine-preventable bacterial disease (Streptococcus pneumoniae).



Previous estimates had predicted 10 million annual deaths from AMR by 2050. In 2022, we now know for certain that we are already far closer to this figure than expected!

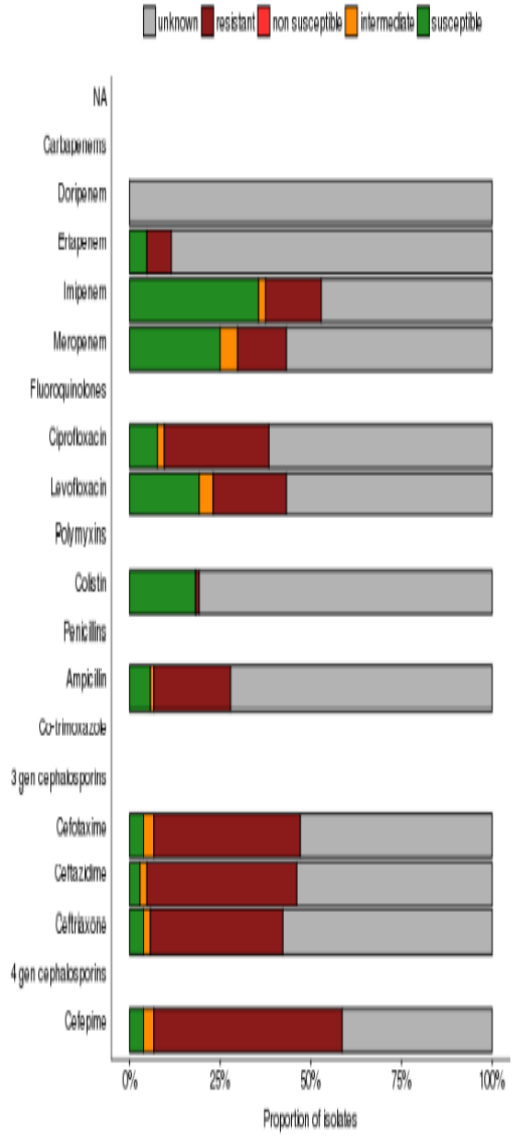
Blood Stream infections in Egypt

2020 WHO GLASS REPORT

World Health Organization Egypt

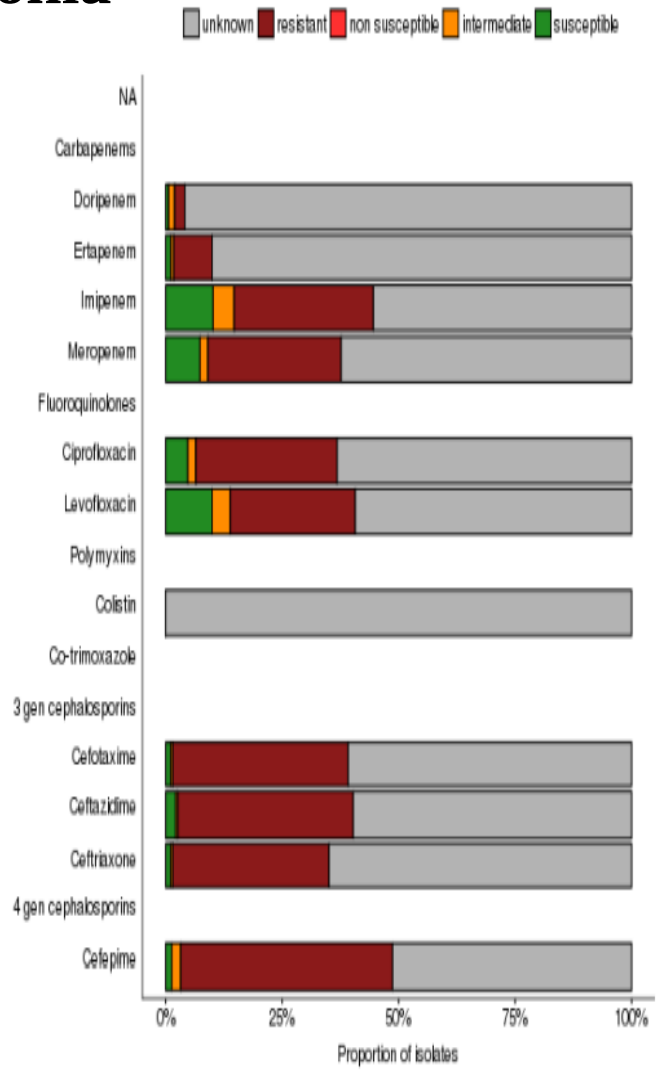
E Coli

Antibiotic	isolates	S %	I %	NS %	R %	UNK %
Carbapenems	ND	ND	ND	ND	ND	ND
Doripenem	104	0%	0%	0%	0%	100%
Ertapenem	104	4.8%	0%	0%	6.7%	88.5%
Imipenem	104	35.6%	1.9%	0%	15.4%	47.1%
Meropenem	104	25%	4.8%	0%	13.5%	56.7%
Fluoroquinolones	ND	ND	ND	ND	ND	ND
Ciprofloxacin	104	7.7%	1.9%	0%	28.8%	61.5%
Levofloxacin	104	19.2%	3.8%	0%	20.2%	56.7%
Polymyxins	ND	ND	ND	ND	ND	ND
Colistin	104	18.3%	0%	0%	1%	80.8%
Penicillins	ND	ND	ND	ND	ND	ND
Ampicillin	104	5.8%	1%	0%	21.2%	72.1%
Sulfonamides-TMP	ND	ND	ND	ND	ND	ND
Co-trimoxazole	ND	ND	ND	ND	ND	ND
3 gen cephalosporins	ND	ND	ND	ND	ND	ND
Cefotaxime	104	3.8%	2.9%	0%	40.4%	52.9%
Ceftazidime	104	2.9%	1.9%	0%	41.3%	53.8%
Ceftriaxone	104	3.8%	1.9%	0%	36.5%	57.7%
4 gen cephalosporins	ND	ND	ND	ND	ND	ND
Cefepime	104	3.8%	2.9%	0%	51.9%	41.3%



Klebsiella Pneumonia

Antibiotic	isolates	S %	I %	NS %	R %	UNK %
Carbapenems	ND	ND	ND	ND	ND	ND
Doripenem	462	0.6%	1.3%	0%	2.2%	95.9%
Ertapenem	462	1.1%	0.6%	0%	8.2%	90%
Imipenem	462	10.2%	4.5%	0%	29.9%	55.4%
Meropenem	462	7.4%	1.7%	0%	28.6%	62.3%
Fluoroquinolones	ND	ND	ND	ND	ND	ND
Ciprofloxacin	462	4.8%	1.7%	0%	30.3%	63.2%
Levofloxacin	462	10%	3.9%	0%	26.8%	59.3%
Polymyxins	ND	ND	ND	ND	ND	ND
Colistin	462	0%	0%	0%	0%	100%
Sulfonamides-TMP	ND	ND	ND	ND	ND	ND
Co-trimoxazole	ND	ND	ND	ND	ND	ND
3 gen cephalosporins	ND	ND	ND	ND	ND	ND
Cefotaxime	462	1.1%	0.4%	0%	37.7%	60.8%
Ceftazidime	462	2.2%	0.4%	0%	37.7%	59.7%
Ceftriaxone	462	1.1%	0.4%	0%	33.5%	64.9%
4 gen cephalosporins	ND	ND	ND	ND	ND	ND
Cefepime	462	1.3%	1.9%	0%	45.5%	51.3%



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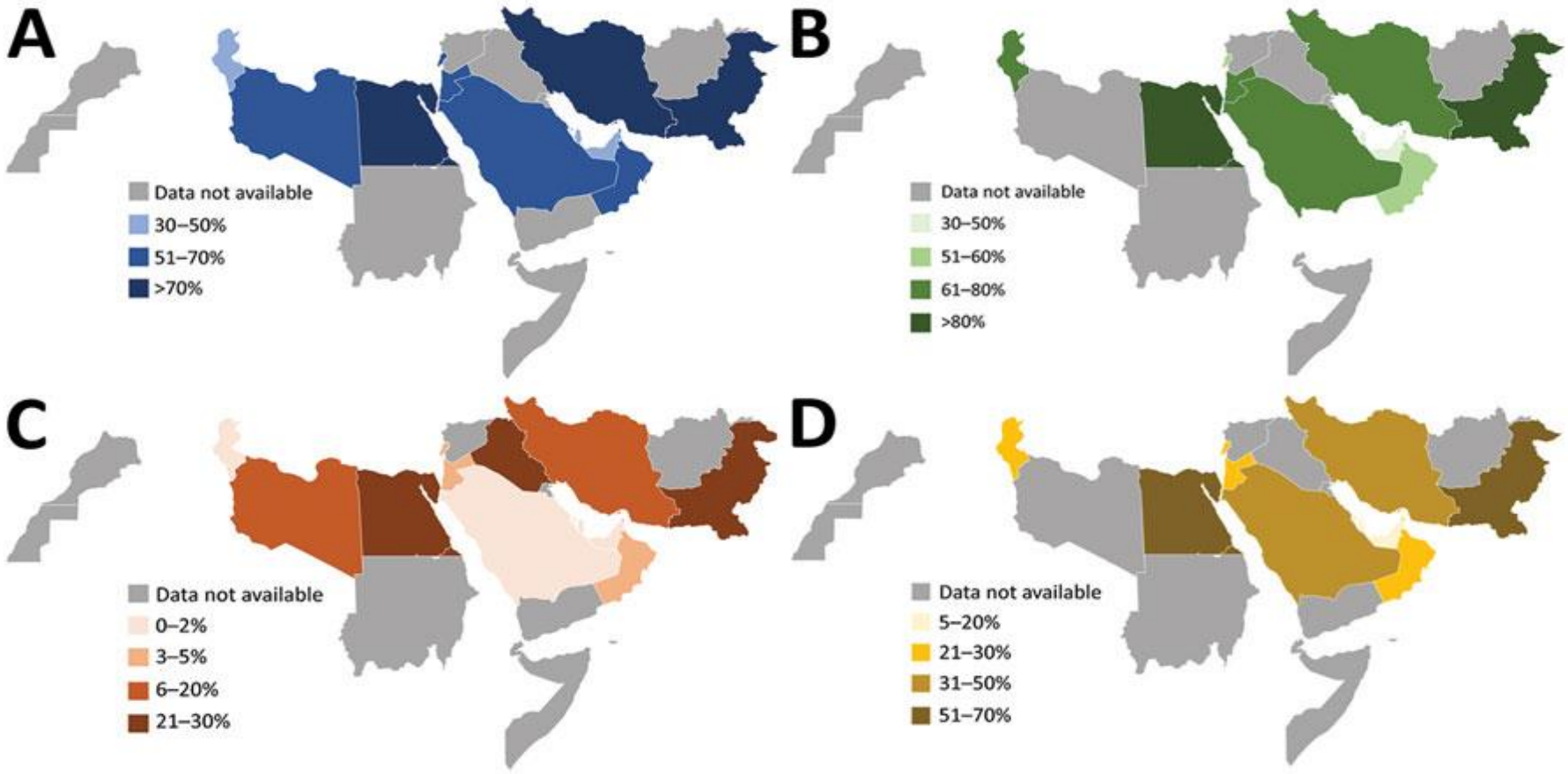
Resistance A) Caused by 3GC-resistant *Escherichia coli,* B) Caused by *K. pneumoniae* resistant to 3GC,. C) Caused by carbapenem-resistant *E. coli*,. D) Caused by carbapenem-resistant Klebsiella *pneumoniae*, D



High burden of carbapenem-resistant infections in the MENA region

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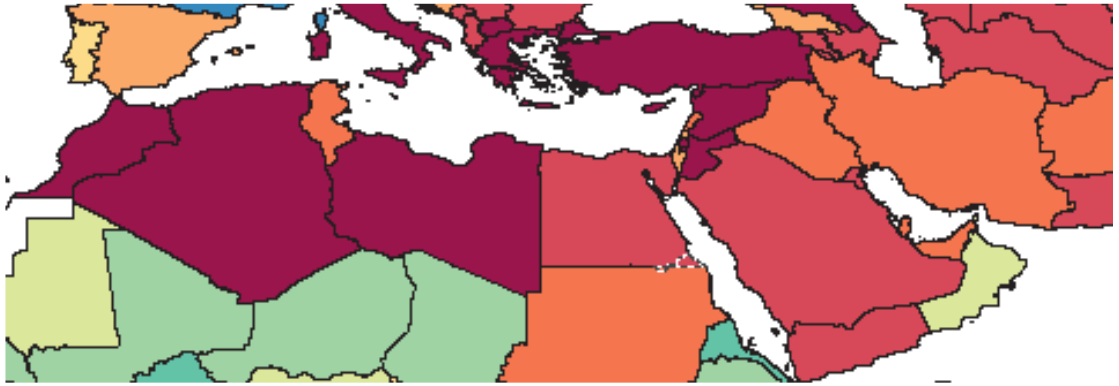
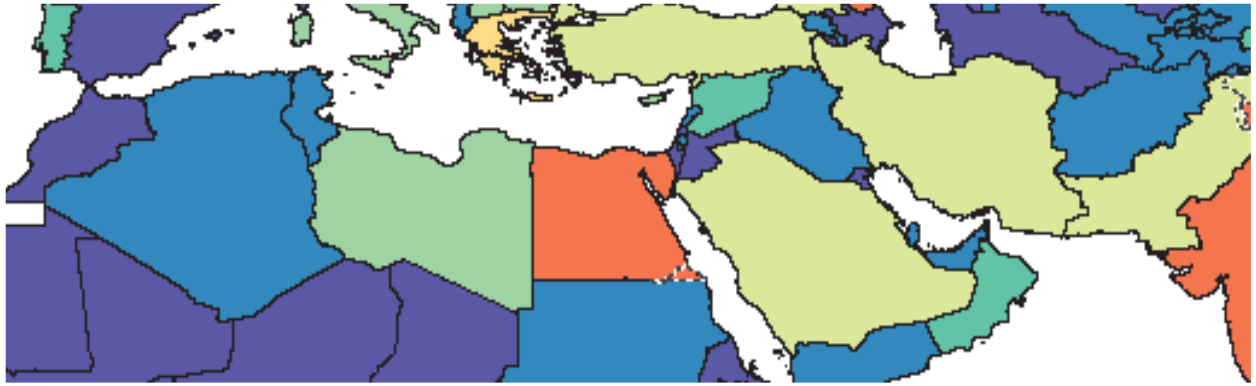
Carbapenem-resistant *Acinetobacter baumannii*



Percentage of isolates with resistance

- <5%
- 5 to <10%
- 10 to <20%
- 20 to <30%
- 30 to <40%
- 40 to <50%
- 50 to <60%
- 60 to <70%
- 70 to <80%
- ≥80%

Carbapenem-resistant *Klebsiella pneumoniae*



Percentage of isolates with resistance

- <5%
- 5 to <10%
- 10 to <20%
- 20 to <30%
- 30 to <40%
- 40 to <50%
- 50 to <60%
- 60 to <70%
- 70 to <80%
- ≥80%

High levels of resistance are a problem globally and regionally.

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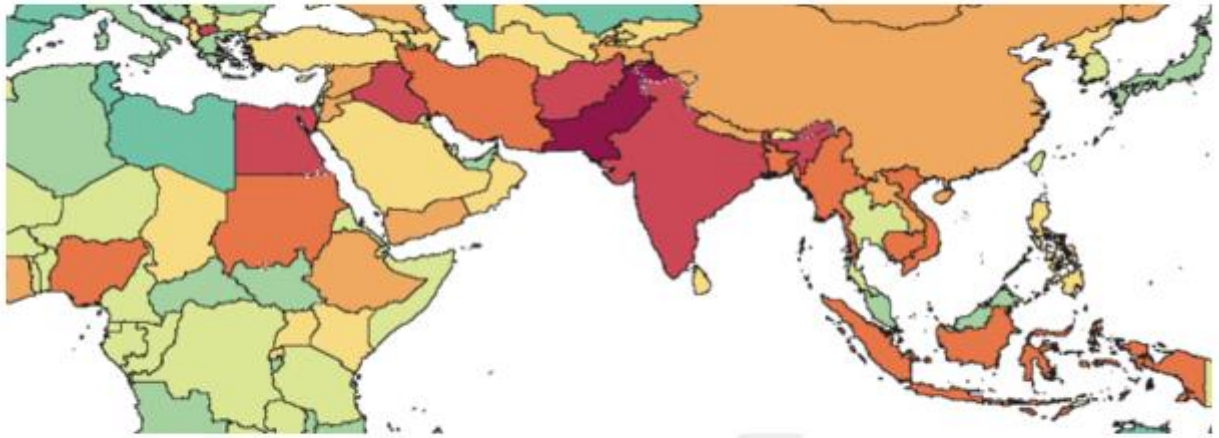
3. Third-generation cephalosporin-resistant Escherichia coli



Antimicrobial Resistance Collaborators, Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis (Lancet 2021)

Two trends in antibiotic access

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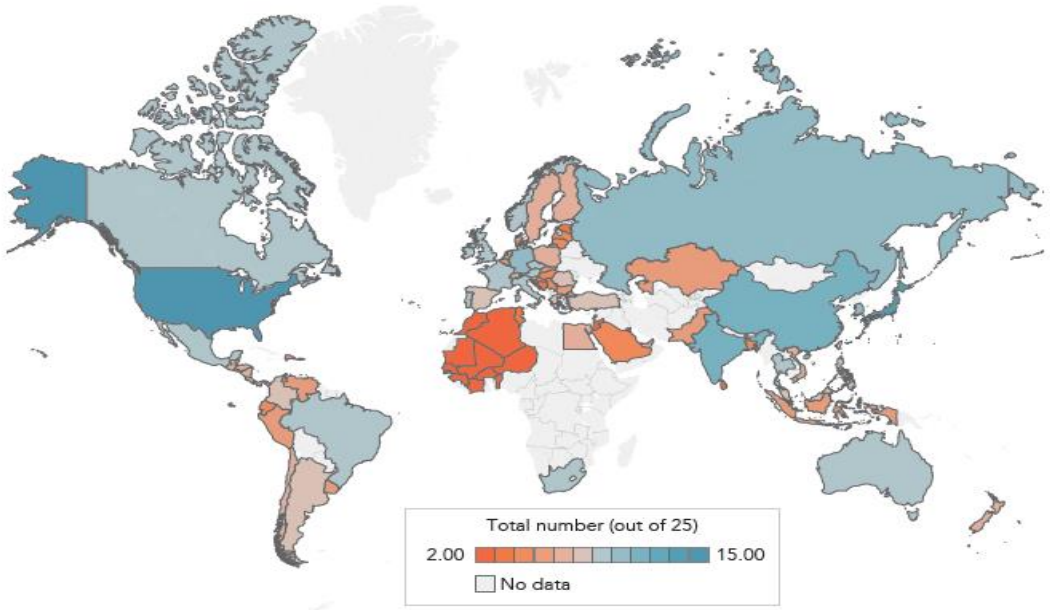
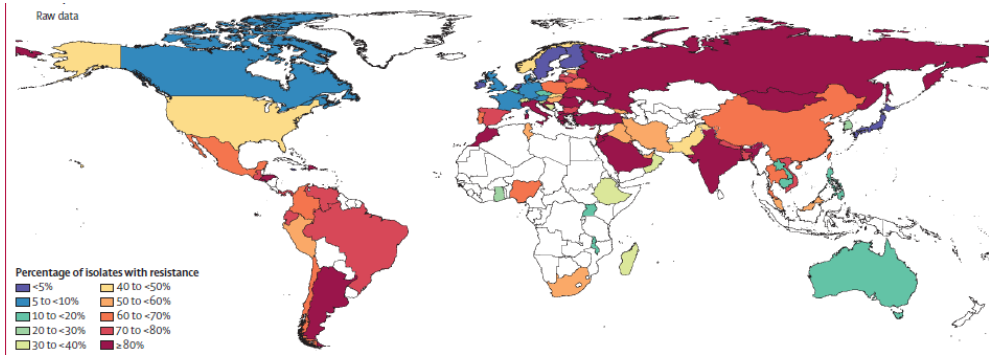
1. Not widely registered

Number of antibiotics registered 1999-2014

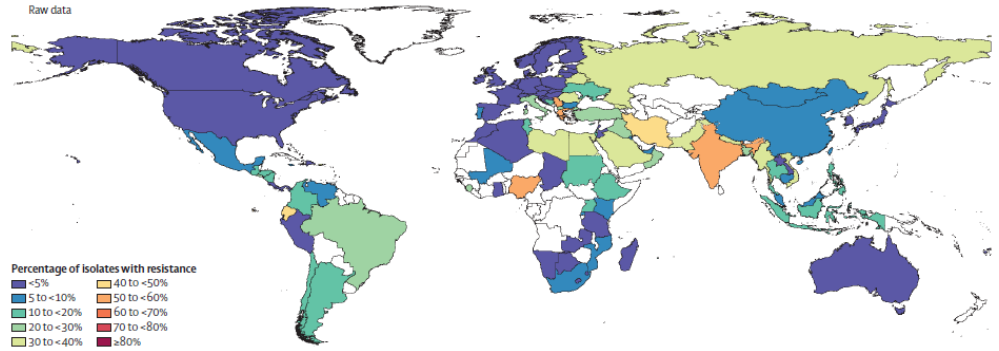


2. Growing antibiotic resistance

Carbapenem-resistant *Acinetobacter baumannii*



Carbapenem-resistant *Klebsiella pneumoniae*



How does resistance develop?

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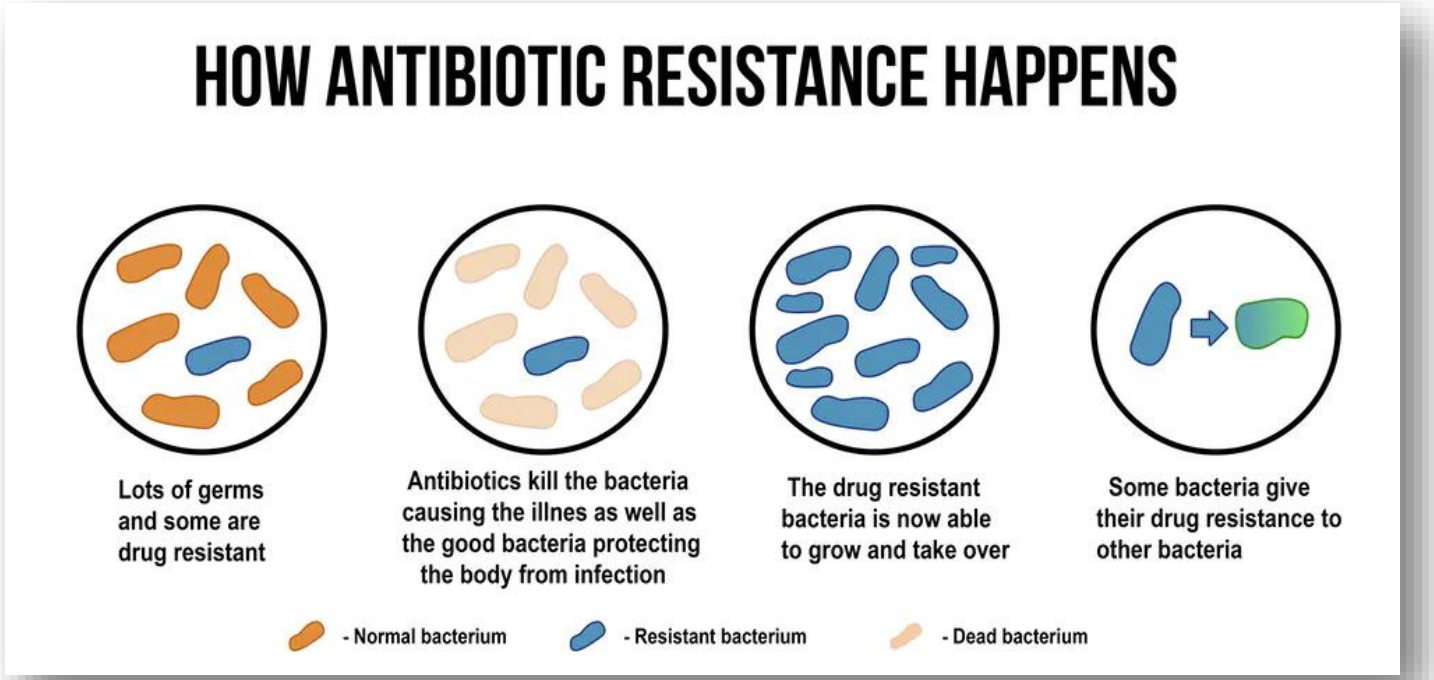
- Excess use results in selection pressures on naturally resistant strains through natural selection.
- Plasmids transfer resistant genes between strains.
- Unlike TB, most resistance develops in bacteria that are not being specifically targeted (usually in the gut microbiome).



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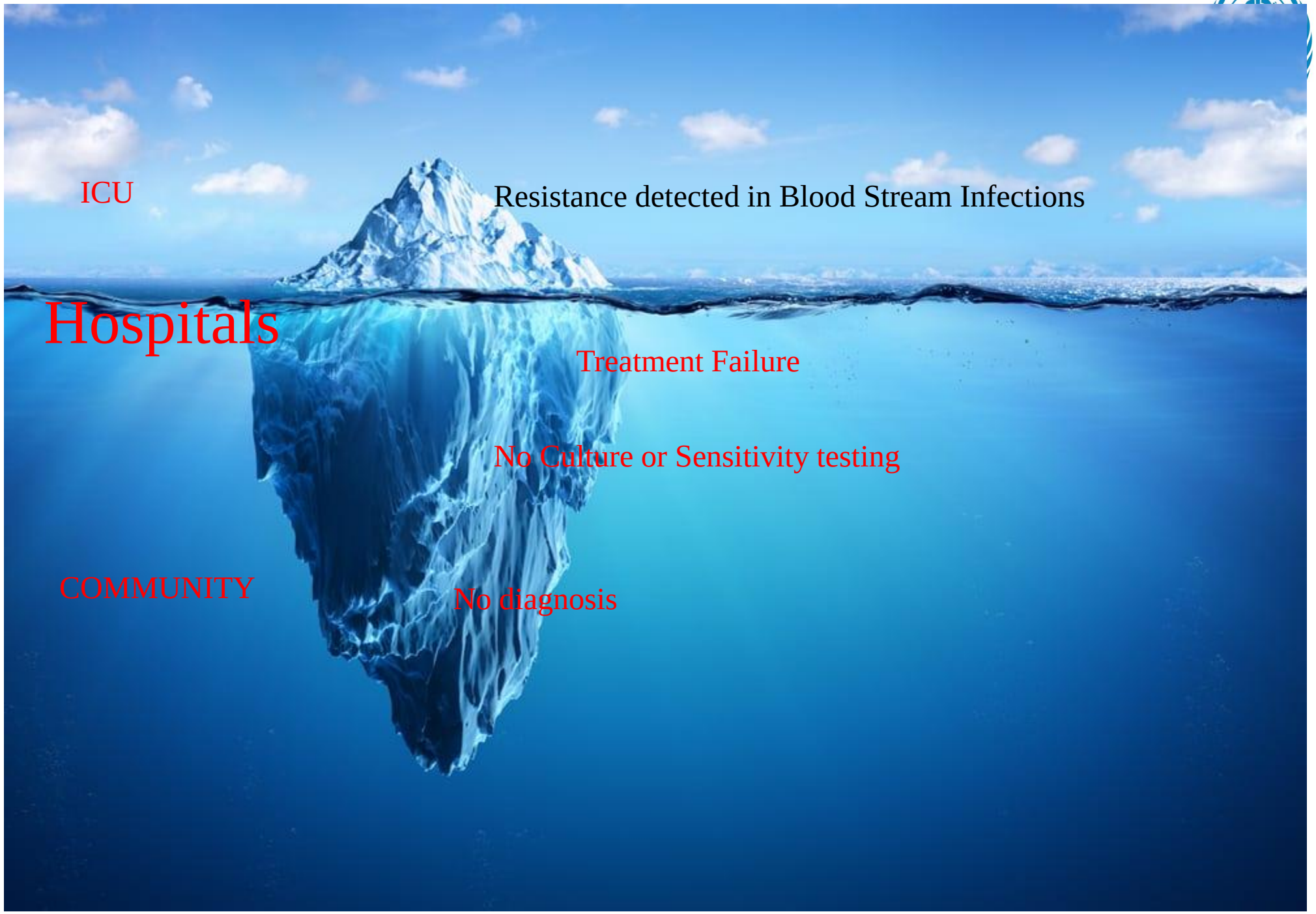

Antibiotics in human health

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… are often used as a substitute for missing infrastructure, poor care, and insufficient hygiene and sanitation.

One Health approach with multi-sectoral engagement

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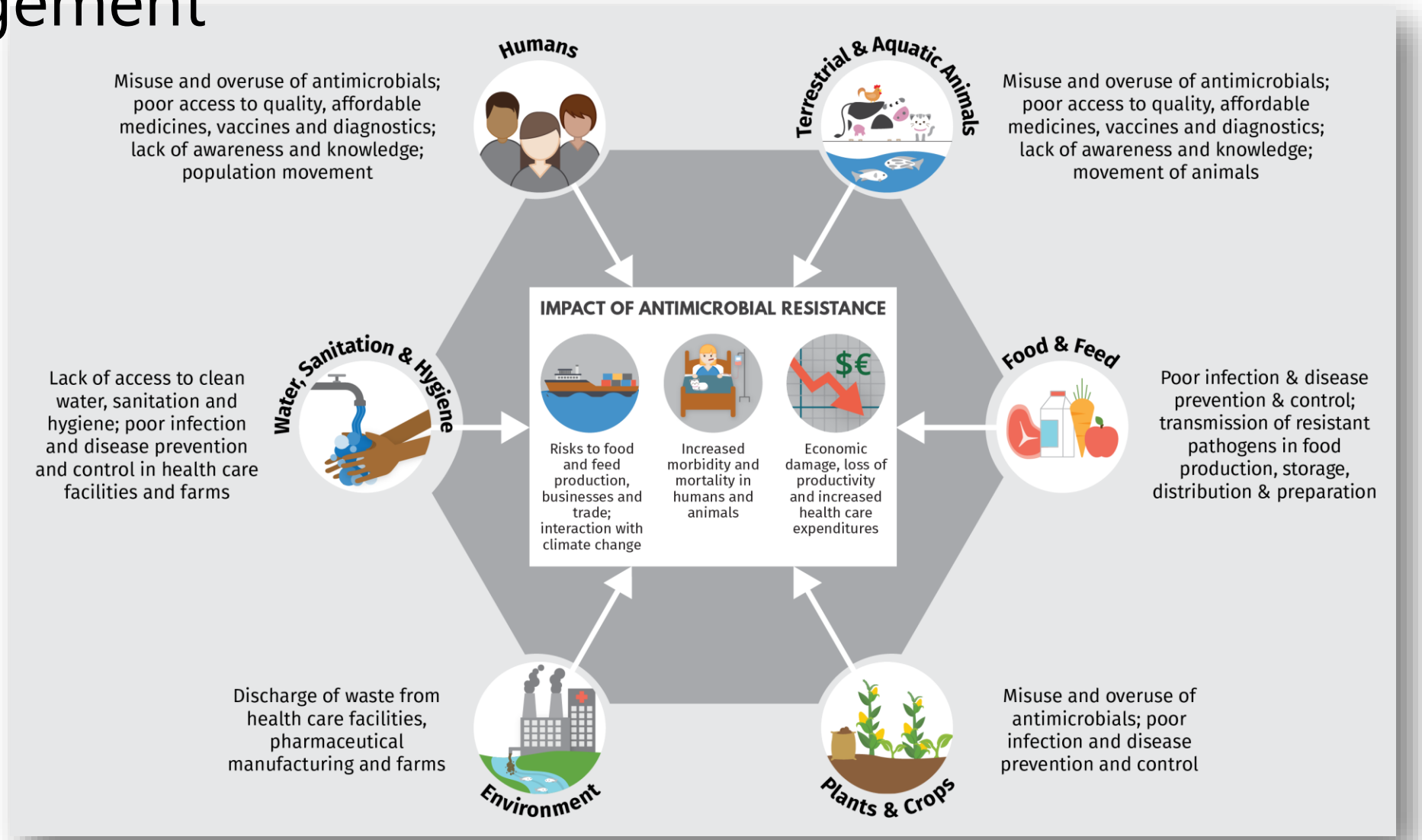
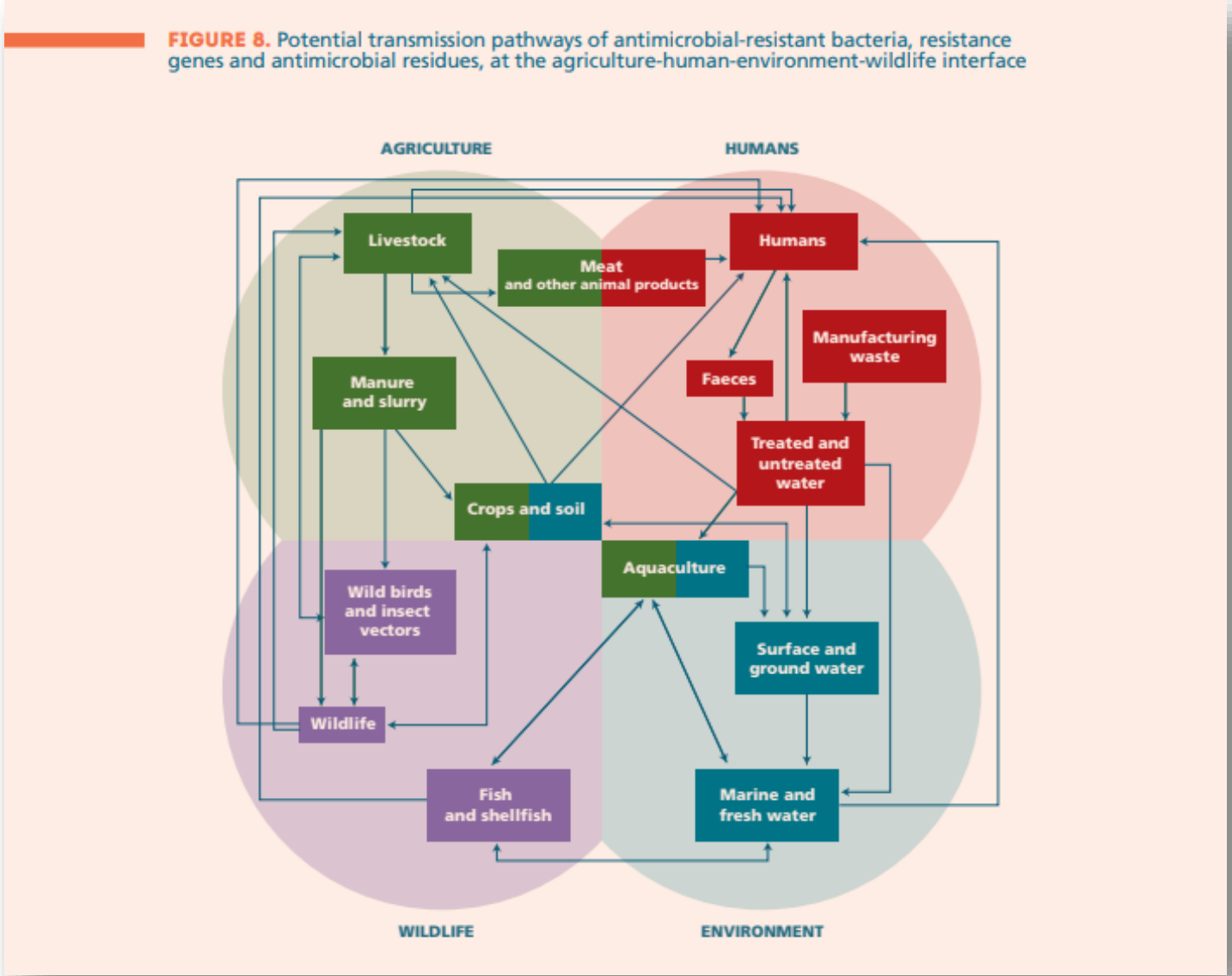


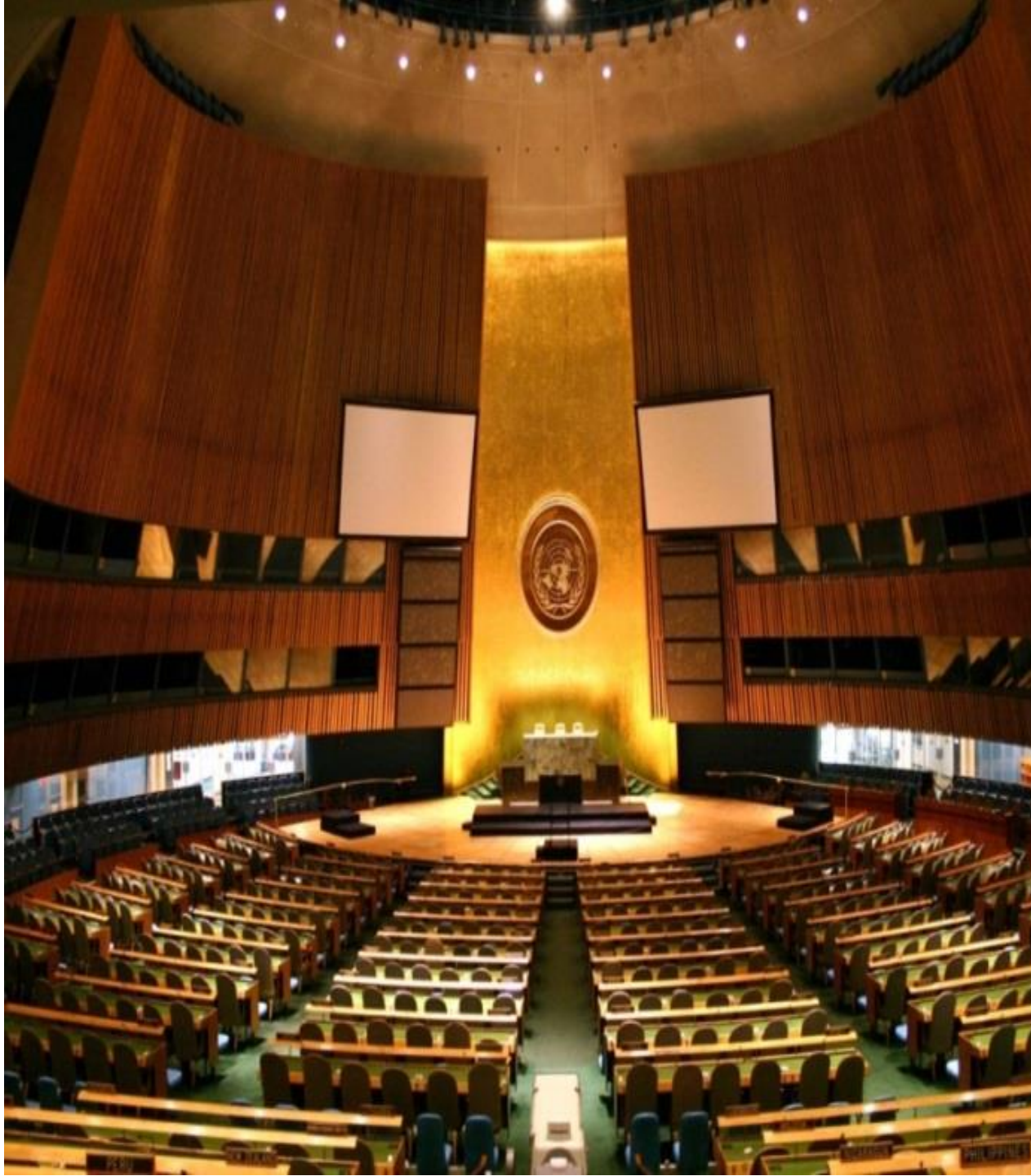
How does resistance spread?



- Pathways of environmental and food-borne spread of AMR are complex and varied.
- Figure 8 illustrates the **diversity of interactions at the interface between agriculture, humans, the environment and wildlife** through which the spread of AMR bacteria, resistance genes, or antimicrobial residues can potentially occur.

Sustained high-level political interest and commitment

- Global Action Plan on AMR adopted in 2015 by WHO
- UN General Assembly Political Declaration September in 2016
- Interagency AMR coordinaton group 2016-2019
- Tripartite secretariat and global leaders group established
- G20 and G7 discussions
  - Global commitment on AMR at 2019 G20 from leaders, Ministers of Agriculture and Minsters of Health.
  - CALL TO ACTION 2021
  - UNEA report AMR and environment UNEP Join 2022



AMR in the SDG indicator framework

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Patterns of antibiotic consumption at national level

% of bloodstream infections due to selected AMR organisms

SDG indicator 3.b.3
Proportion of health facilities that have a core set of relevant essential medicines *(including antibiotics)* available and affordable on a sustainable basis

3 GOOD HEALTH AND WELL-BEING

NEW SDG indicator 3.d.2
Percentage of bloodstream infections due to selected AMR organisms

Egypt Plan for AMR

The Global Action Plan on AMR (GAP) was endorsed by Member States at the 68th World Health Assembly in May 2015

Over 150 countries have now developed a plan aligned with the GAP

- **Improving awareness and education of AMR**
- **Optimizing the use of antimicrobial medicines**
- **Strengthening knowledge through surveillance & research**
- **Reducing the incidence of infection**

Egypts plan shares four objectives with the GAP and offers a comprehensive approach to addressing the problem. Implementation has been patchy.

Awareness, Behavior Change and Health Workforce Education

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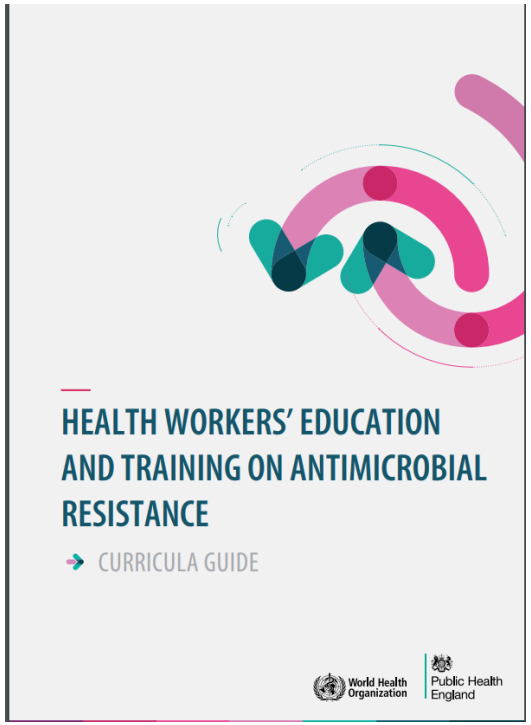
World Antimicrobial Awareness Week

AMR curricula guide Comprehensive guidance on how to develop or include AMR learning content in curricula or syllabi.



Surveillance & evidence-generating

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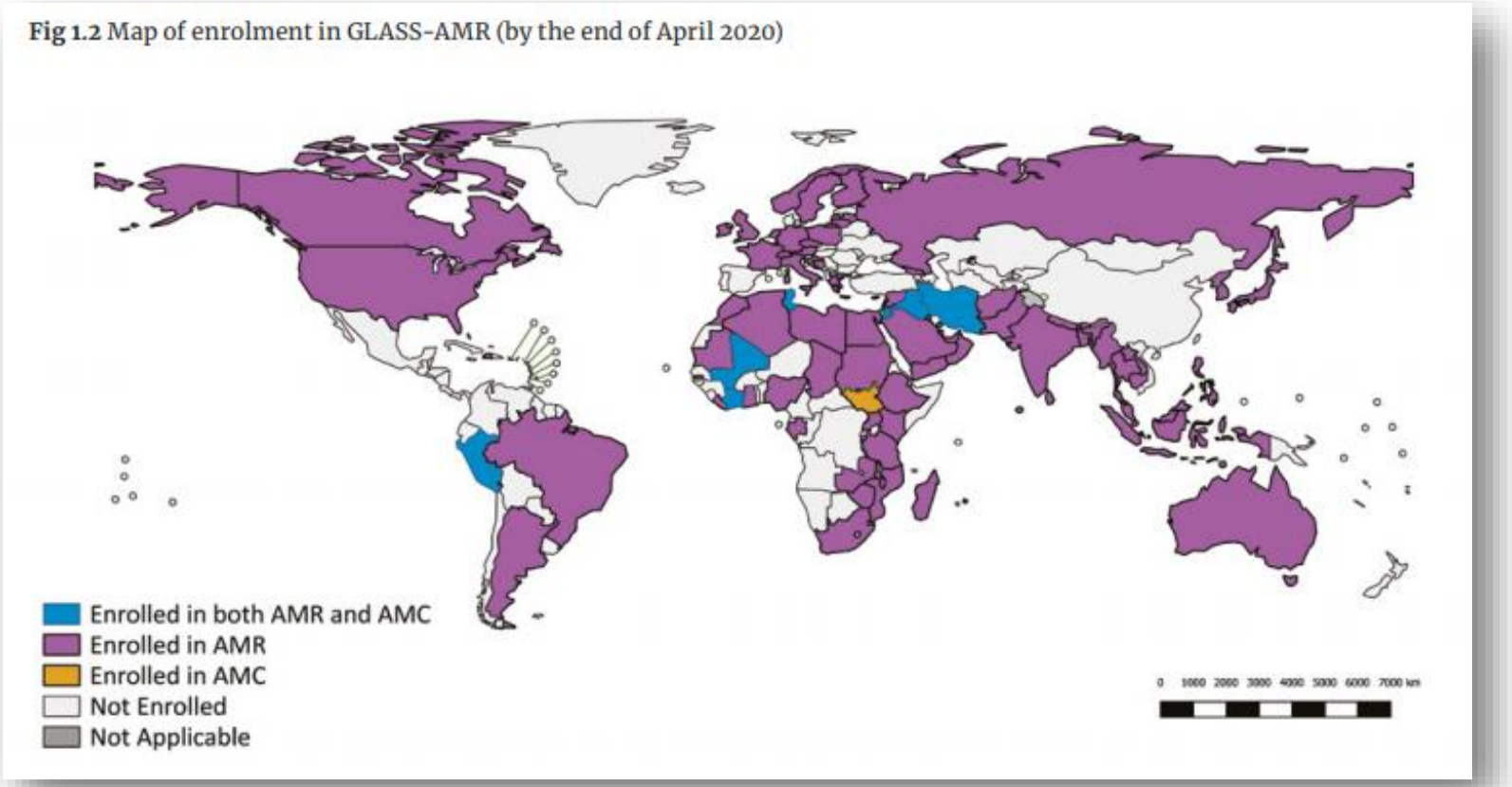
The **Global Antimicrobial Resistance Surveillance System (GLASS)** supports global surveillance and research in order to strengthen the evidence base on AMR and help inform decision-making and drive national, regional, and global actions.

Surveillance is key:

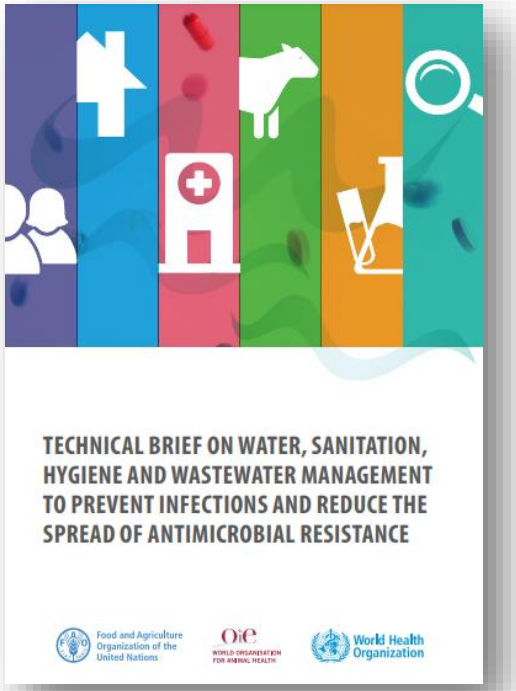
- to assess the **spread and magnitude of AMR**
- to inform the burden of disease estimates
- to **drive action** on local, national and global level

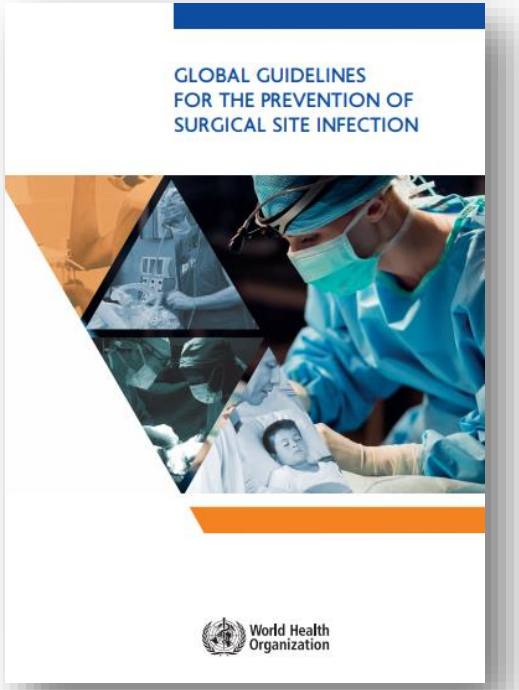
GLASS now aggregates data from more than 64 000 surveillance sites with more than 2 million patients enrolled from 66 countries across the world.

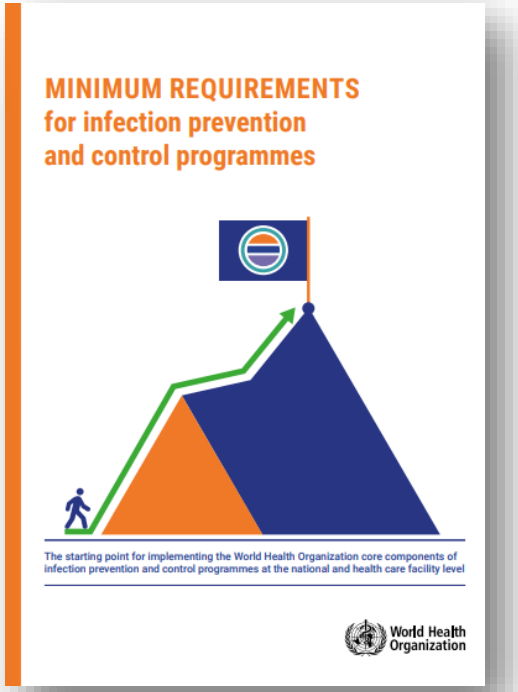


Objective 3: Reduce the incidence of infection

Stronger hygiene and infection prevention measures, including vaccination, strong hand hygiene, appropriate aseptic technique, consistent maintenance of clean, hygienic medical facilities, equipment and practices along with thoughtful and thorough surveillance, monitoring and evaluation measures **can limit the spread of resistant microorganisms and reduce antimicrobial misuse and overuse**.







Vaccination

Hand hygiene

Prevention and Control of CRE CRAB CRPsA in health care facilities

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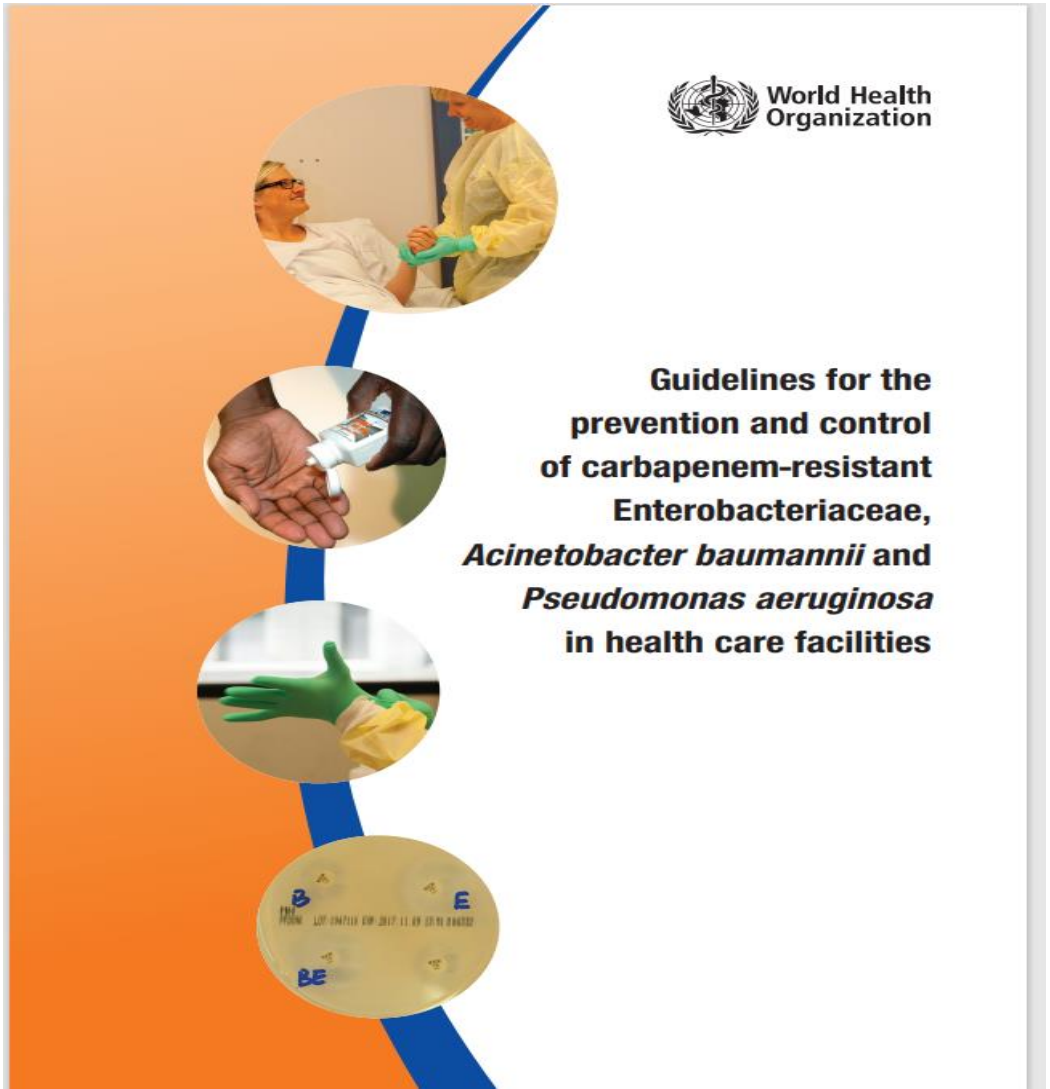
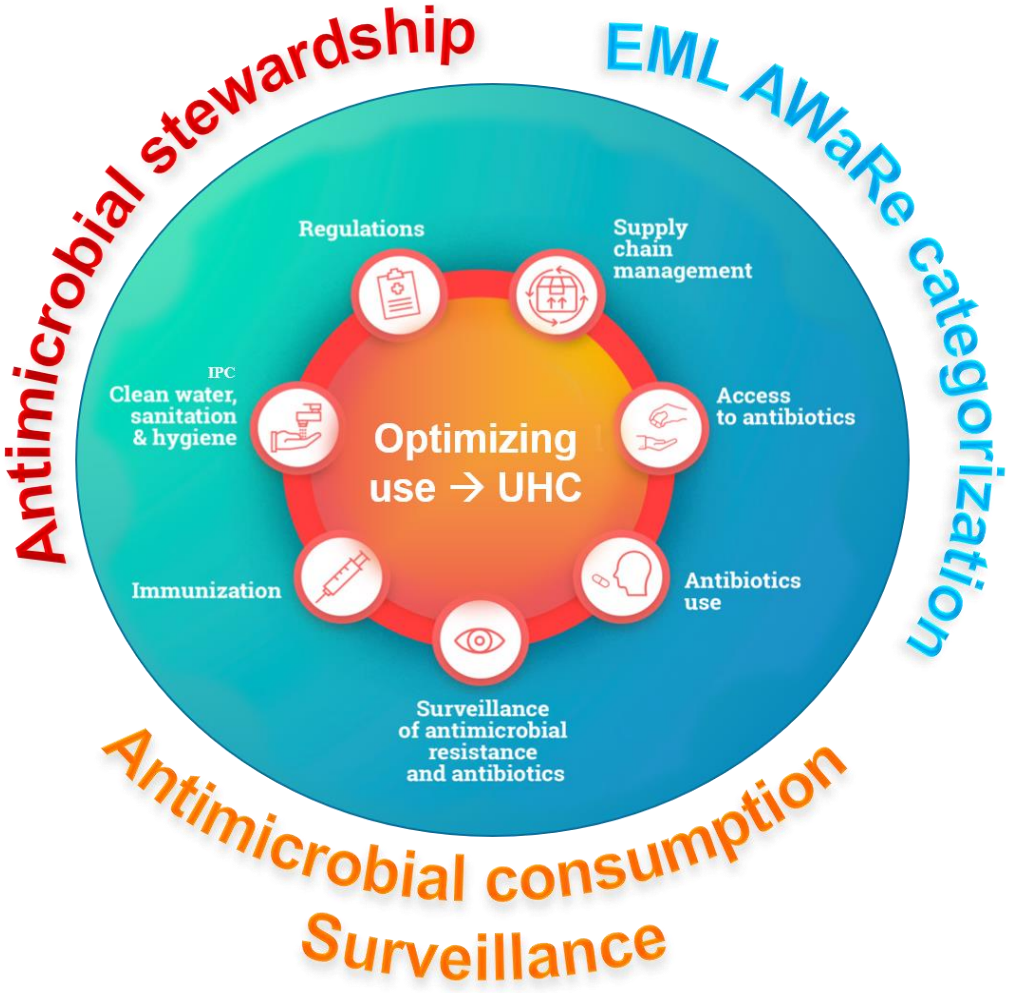


- Multimodal strategy
- Hand Hygiene
- Surveillance
- Contact Precautions
- Isolation / cohorting
- Environmental cleaning
- Monitoring Audit and Feedback

Optimizing Use of Antimicrobials



WHO Antimicrobial Stewardship (AMS) Toolkit

Antimicrobial Stewardship Programmes in healthcare facilities in LMIC

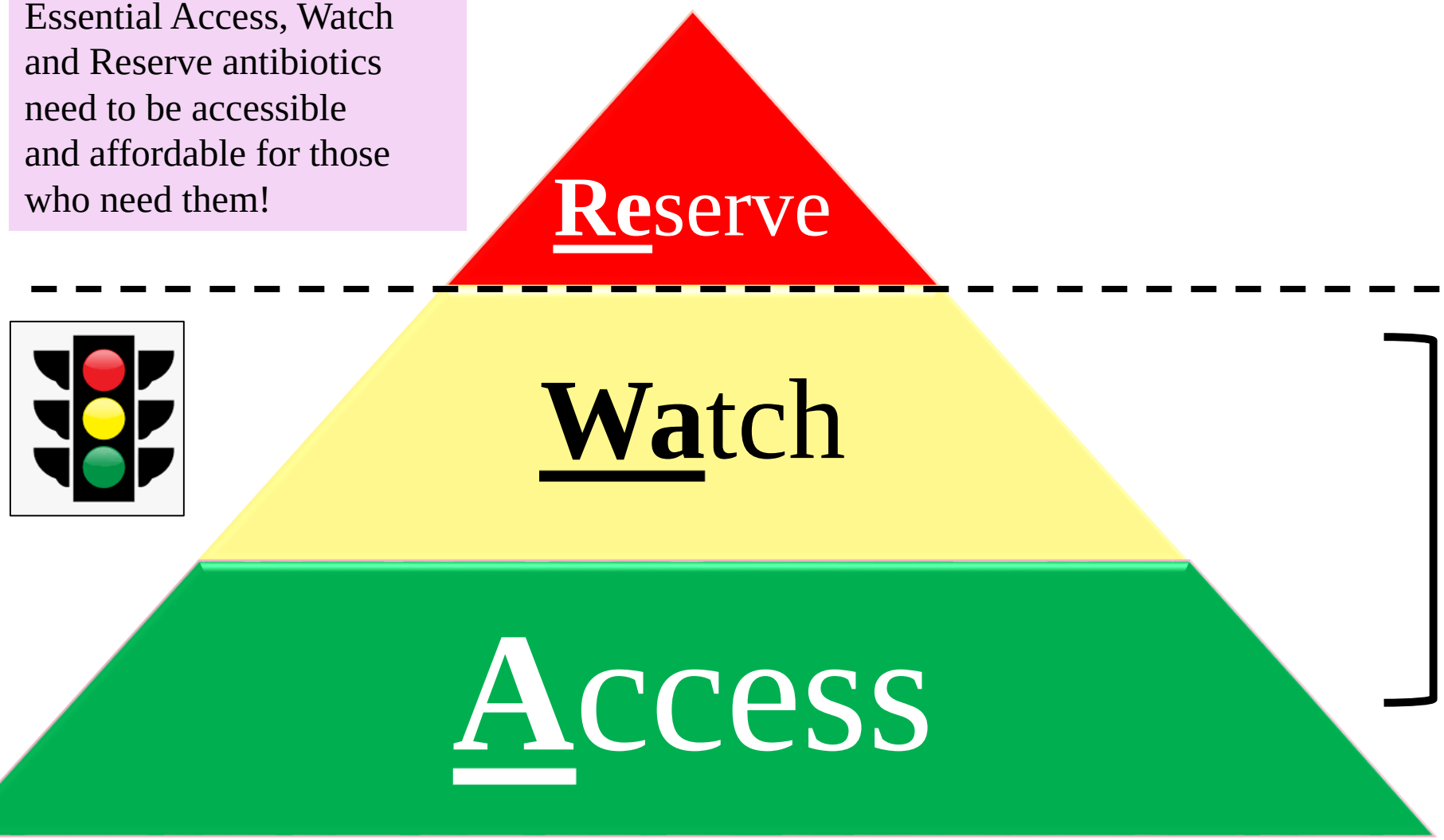
A practical toolkit with guidance on how to plan, implement, monitor and evaluate stewardship interventions in LMIC hospital settings.

- Contains additional resources to support educational workshops and stewardship training programs for HCP
- AMR stewardship is integral to achieving universal health coverage – together with EML AWaRe categorization and surveillance of antimicrobial consumption.

Source: WHO Practical Toolkit: Antimicrobial Stewardship Programmes in Health-Care Facilities in Low- and Middle-Income Countries. 2019. https://apps.who.int/iris/bitstream/handle/10665/329404/9789241515481-eng.pdf

Antibiotics are categorized into three groups

Essential Access, Watch and Reserve antibiotics need to be accessible and affordable for those who need them!



«Last-resort» options against MDRO

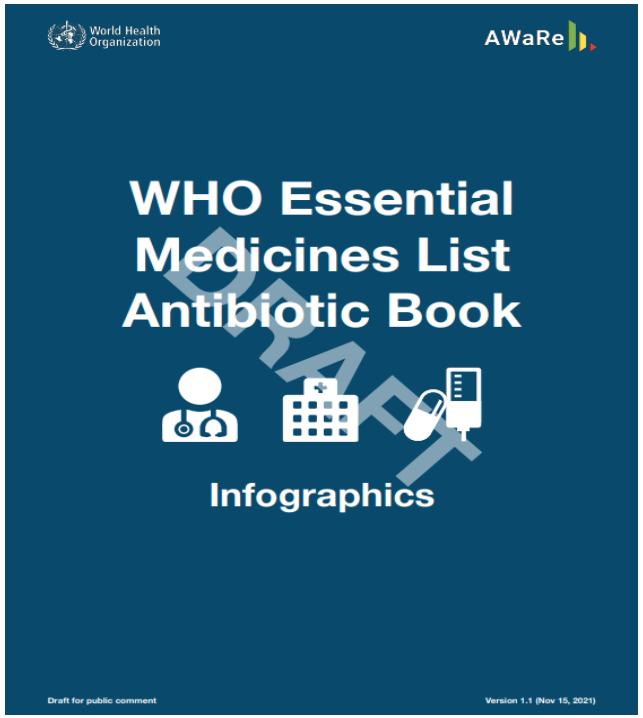
Higher "resistance potential"

Often 1st or 2nd choice for common infectious syndromes

Lower "resistance potential"

WHO Antibiotic book

To be launched Autumn 2022
Empirical treatment of common syndromes
Arabic translation possible
Accompanying App under development



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ADULTS

Exacerbation of Chronic Obstructive Pulmonary Disease

Definition

Acute worsening of patient's respiratory symptoms beyond normal day-to-day variations that results in additional therapy in patients with underlying chronic obstructive pulmonary disease (COPD). COPD refers to a group of diseases that block airflow and impair breathing and includes emphysema and chronic bronchitis

Diagnosis

Clinical Presentation

- Recent and sustained worsening of dyspnea and cough with increased sputum production compared to the baseline in a patient with COPD

Important: symptoms can overlap with pneumonia (pneumonia more likely if tachycardia, tachypnea at rest and crepitations that persist after coughing are present)

Microbiology Tests

Usually not needed but to be considered in severe cases; the respiratory tract of people with COPD may be colonized with bacteria (e.g. *S. pneumoniae*, *H. influenzae*, *M. catarrhalis*, *P. aeruginosa*, *S. maltophilia*) and a positive culture may indicate colonization rather than acute infection

Other Laboratory Tests

Consider C-reactive protein and/or procalcitonin, complete blood count, and blood pH and gases

Imaging

Consider a chest radiograph in patients requiring hospitalization to exclude other diagnoses and in outpatients if pneumonia suspected

Most Likely Pathogens

Respiratory viruses (most cases):
- Influenza virus (A and B)
- Respiratory syncytial virus
- Parainfluenza virus
- Rhinovirus
- Coronavirus (including SARS-CoV-2)

Bacteria (more rarely):
- *Haemophilus influenzae*
- *Moraxella catarrhalis*
- *Streptococcus pneumoniae*
- Gram-negative bacteria including *Pseudomonas aeruginosa* (including multidrug-resistant strains)

Prevention

Recommend smoking cessation, reduced indoor air pollution, use of long-acting inhaled β_2-agonists (± anticholinergics) and vaccination (e.g. against influenza, *S. pneumoniae* and SARS-CoV-2)

Treatment

No Antibiotic Care

- Details of COPD exacerbations management are not discussed here, refer to specific guidelines
- Supplementary oxygen and short-acting inhaled β_2-agonists (± anticholinergics)
- Systemic steroids are usually recommended (improve lung function and favour faster recovery)

Clinical Considerations

Antibiotics are not needed for most cases
- Their use could be considered in patients with dyspnea and an increased volume of purulent sputum
- In case of frequent exacerbations consider risk of infections caused by multidrug-resistant pathogens and previous colonization of the respiratory tract

Mild to Moderate Cases

Antibiotic treatment is not required in the great majority of cases (see "Clinical Considerations" when antibiotics may be indicated)
All dosages are for normal renal function

First Choice

Amoxicillin 500 mg q8h **ORAL**

Second Choice

Cefalexin 500 mg q12h **ORAL**

OR

Doxycycline 100 mg q12h **ORAL**

Severe Cases

Amoxicillin+clavulanic acid 500 mg+125 mg q8h **ORAL**

Antibiotic Treatment Duration

5 days

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Collaborate and become champions
Engage leadership and work through systems
Think about the whole iceberg
Use and share data
Changing Everyones behaviour!
Taylere@who.int