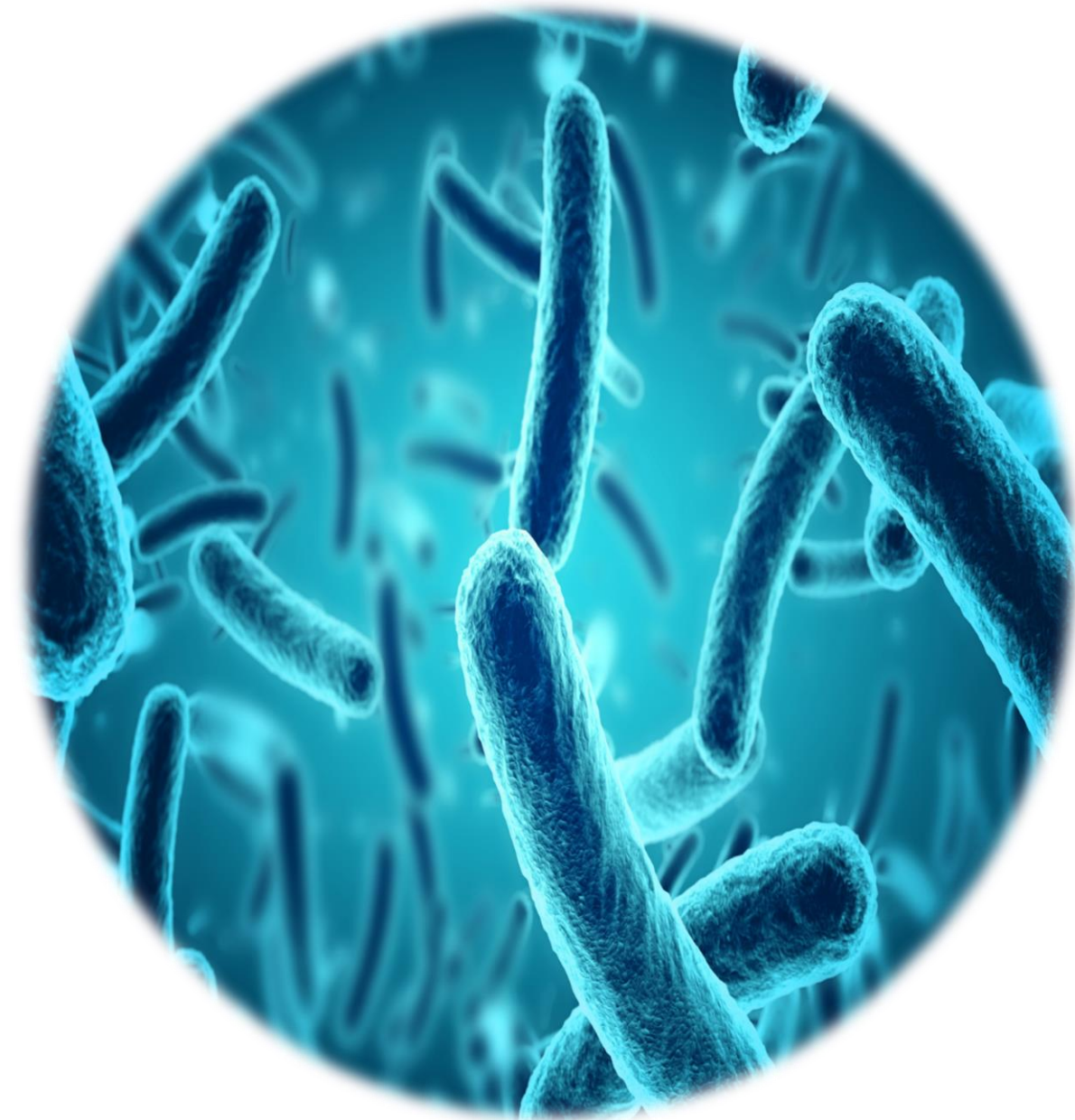




Global Perspectives on AMR
Antimicrobial Resistance
Dr. Marc Sprenger, Director AMR



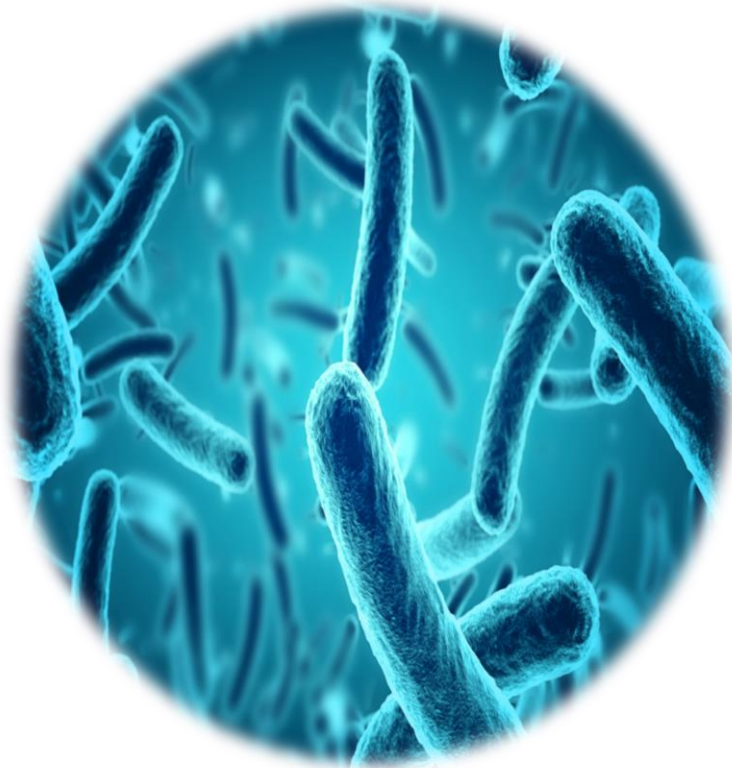
“Antibiotic resistance is a global health crisis that should be addressed with the utmost urgency.”

Dr. Tedros Adhanom Ghebreyesus,
Director General
World Health Organization

New AMR Division (ADG: Hanan Balkhy)

New departments:

1. Global Coordination & Partnership
2. Surveillance, Prevention & Control



Antimicrobial Resistance

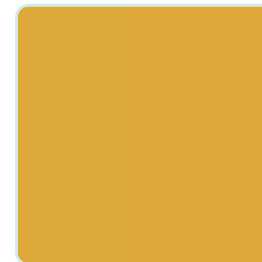
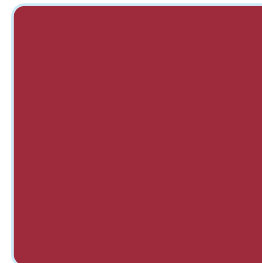
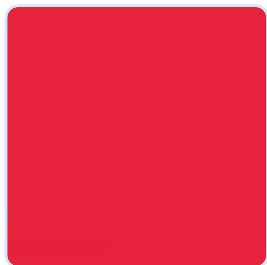
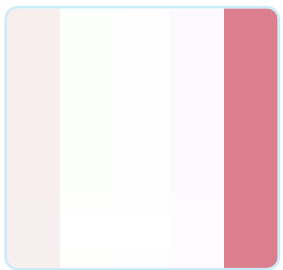
Occurs when bacteria, viruses, fungi and parasites become resistant to the antimicrobial drugs used to treat them

Threatens achievement of the **Sustainable Development Goals**

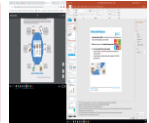
One of the greatest threats to modern medicine

- In some G20 countries, more than **40%** of infections are due to bacteria that are resistant to antibiotics*
- Economic damage of uncontrolled resistance will be comparable to the 2008-2009 global financial crisis

DRIVERS OF ANTIMICROBIAL RESISTANCE:



World Health Organization



Carbapenem-resistant *K.pneumoniae*



3 GOOD HEALTH
AND WELL-BEING



2010 EARS-net

6 CLEAN WATER
AND SANITATION



2016 CAESAR

Extensive drug-resistant *K.pneumoniae*



Round Table Report 8 October 2019

For restricted use

This report summarizes the ECDC daily roundtable discussion and provides update on threats detected and monitored by Epidemic Intelligence.

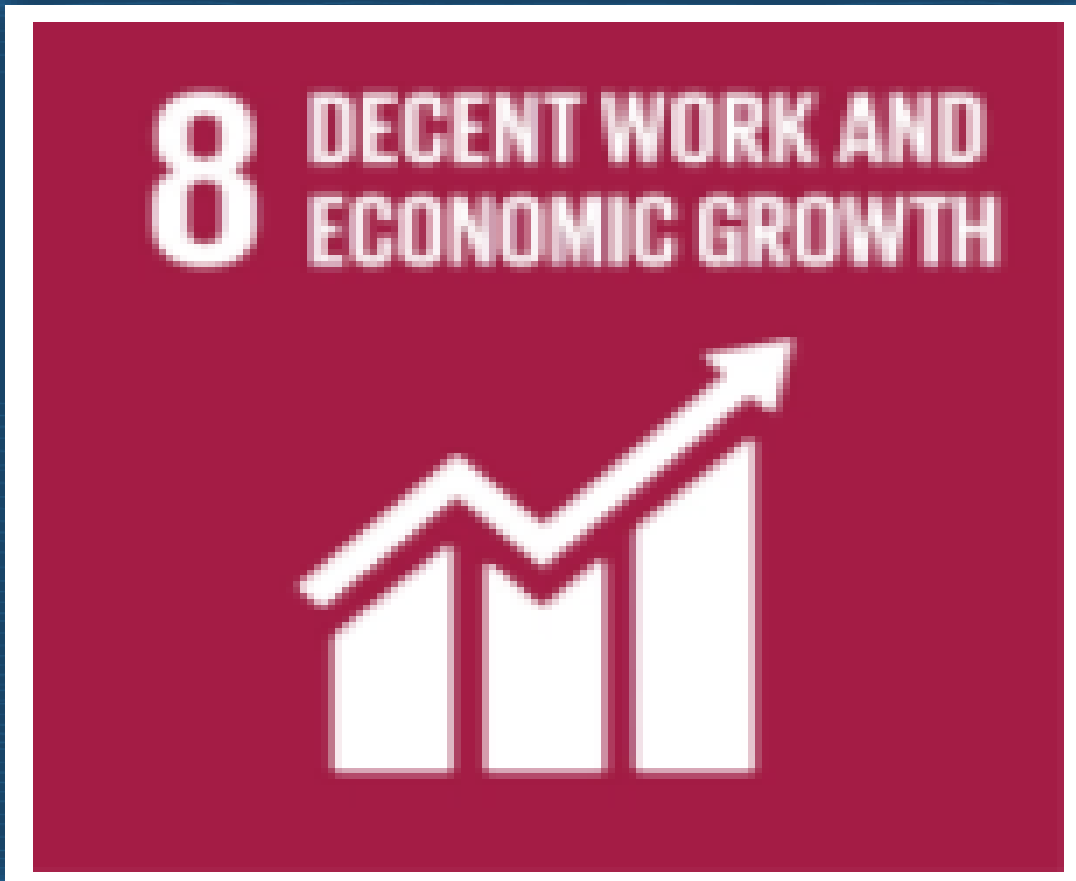
Open Threats

Extensively drug-resistant (XDR) *Klebsiella pneumoniae* – Germany – 2019

Source: EWRS, [RKI](#), [Regional health authority](#), National reference laboratory, University Hospital

Update: Teleconference on 7 October 2019 with the Robert Koch Institute, National reference laboratory, local health authorities and University hospital. Germany has posted information on the outbreak to EWRS on 7 October. Summary, assessment and action were updated accordingly.

Klebsiella pneumoniae ReLAVRA (N=209,972)



Resistance to Imipenem (2000-2014)



Resistance to Meropenem (2000-2014)

Antimicrobial Resistance

- Antimicrobial resistance (AMR) occurs when bacteria, viruses, fungi and parasites become resistant to the antimicrobial drugs used to treat them
- AMR threatens achievement of the Sustainable Development Goals
- AMR is one of the greatest threats to modern medicine
 - In some 50 countries, more than 40% of infections are due to bacteria that are resistant to antibiotics
 - Economic damage of antimicrobial resistance will be comparable to the 2008-2009 global financial crisis

UNIVERSITY OF ANTIMICROBIAL RESISTANCE

Key points:

- 1. The health response to address the threat and impact of antimicrobial resistance
- 2. AMR is a global health threat
- 3. AMR is a threat to the Sustainable Development Goals
- 4. AMR is a threat to the health of the world's population
- 5. AMR is a threat to the health of the world's population
- 6. AMR is a threat to the health of the world's population

OPS/OMS

Salmonella ReLAVRA



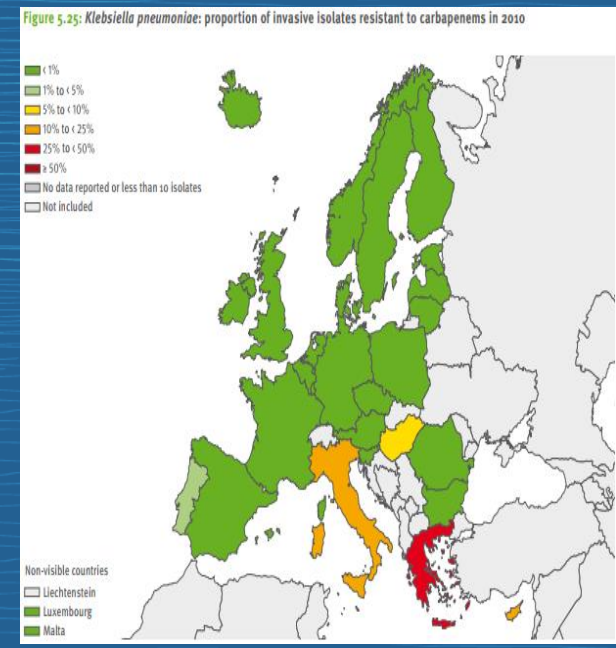
N=127679

Antimicrobial Resistance

- Antimicrobial resistance (AMR) occurs when bacteria, viruses, fungi and parasites become resistant to the antimicrobial drugs used to treat them
- AMR threatens achievement of the Sustainable Development Goals
- AMR is one of the greatest threats to modern medicine
 - In some 50 countries, more than 40% of infections are due to bacteria that are resistant to antibiotics
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UNIVERSITY OF ANTIMICROBIAL RESISTANCE

NS a CIP 2005



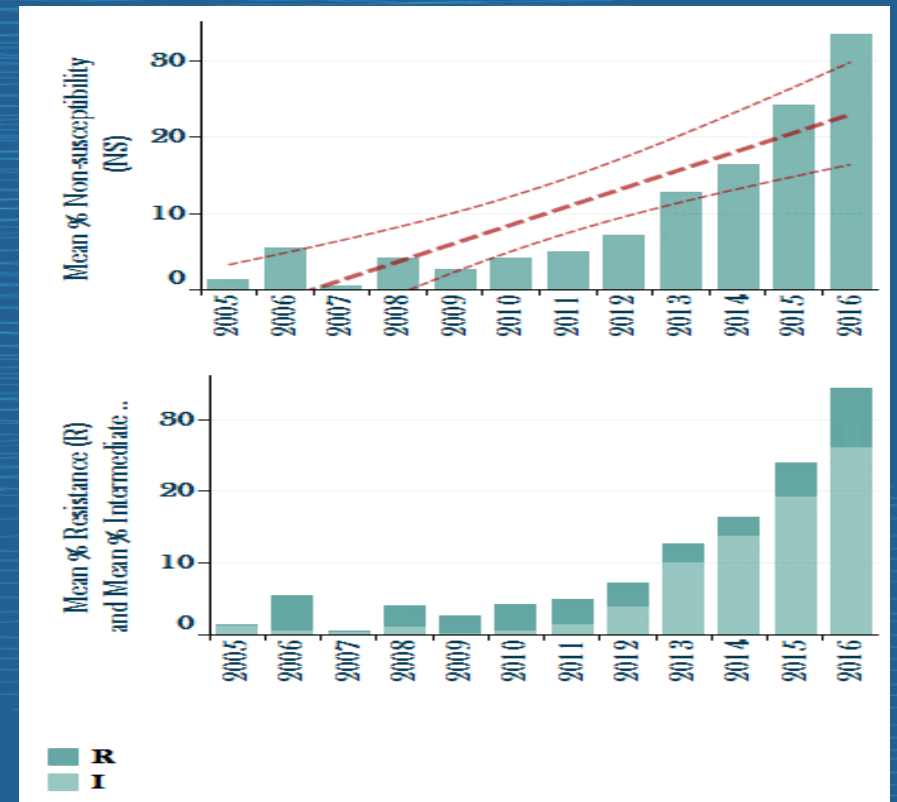
NS a CIP 2016

Resistencia a ciprofloxacina (2005-2016)

Neisseria gonorrhoeae ReLAVRA

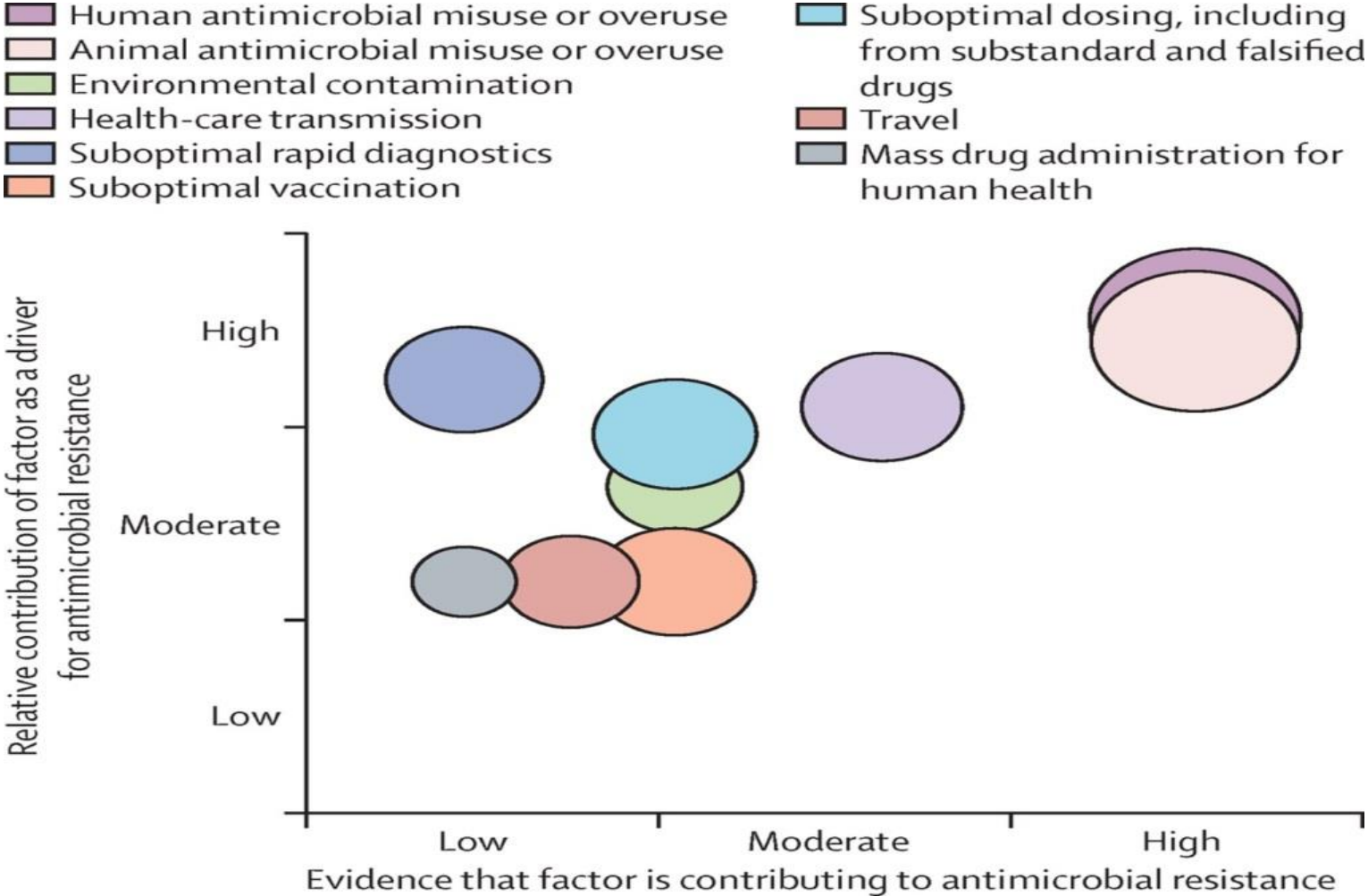


Resistance to ciprofloxacin
(2005-2015)



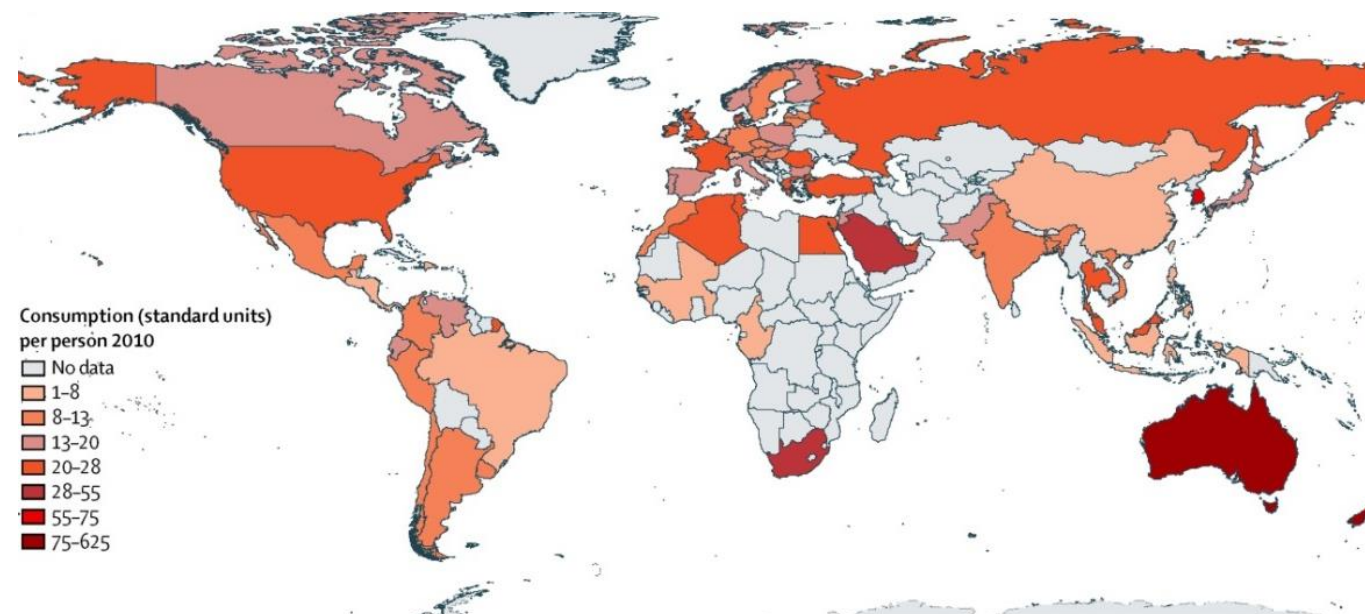
Resistance to penicillin
(2005-2015)

Factors contributing to AMR



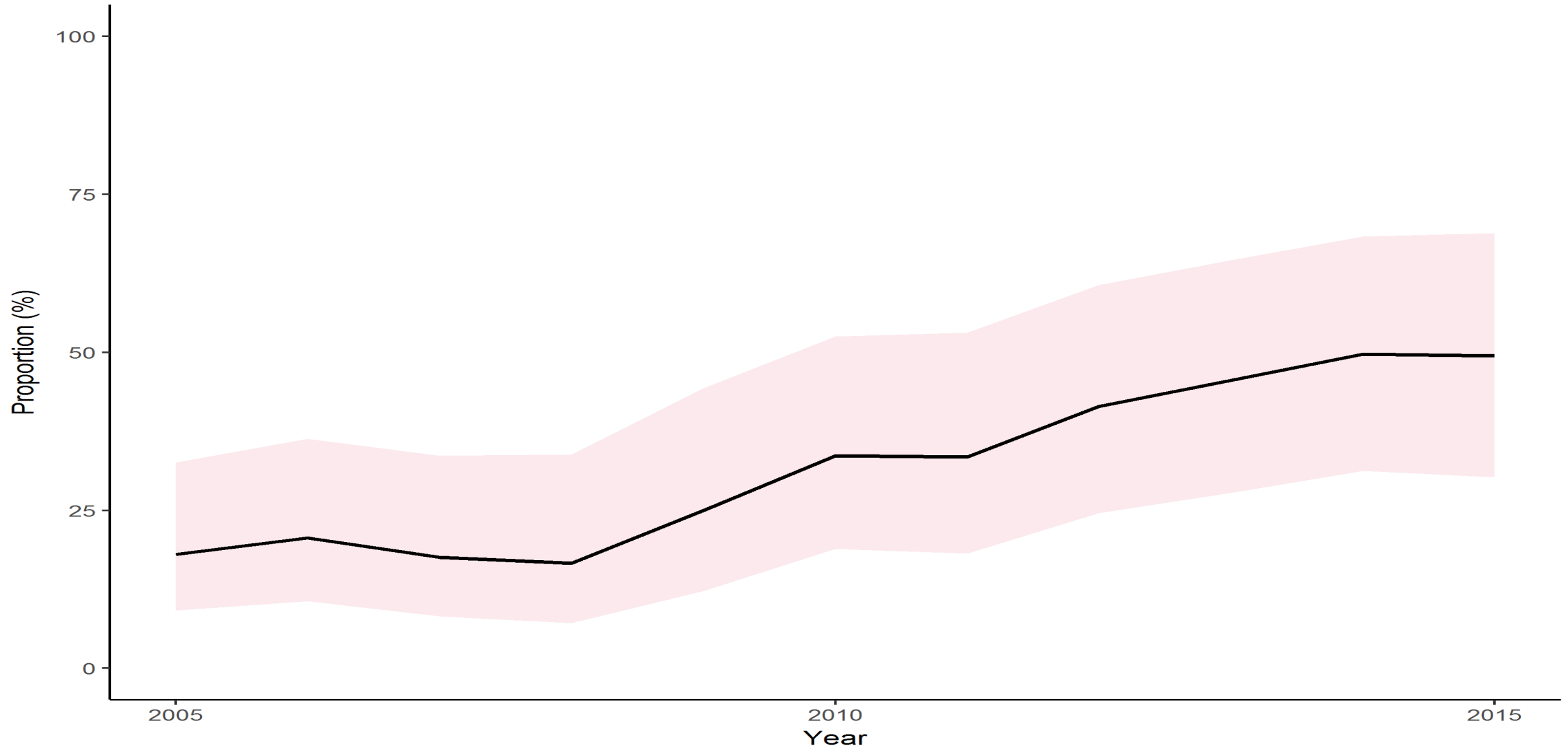
Use of Antibiotics Is On The Rise

Total global antibiotics consumption **increased 30%**



Van Boeckel et al. The Lancet Infectious Diseases 2014 14, 742-750 DOI: (10.1016/S1473-3099(14)70780-7)

AMR Threatens Global Progress

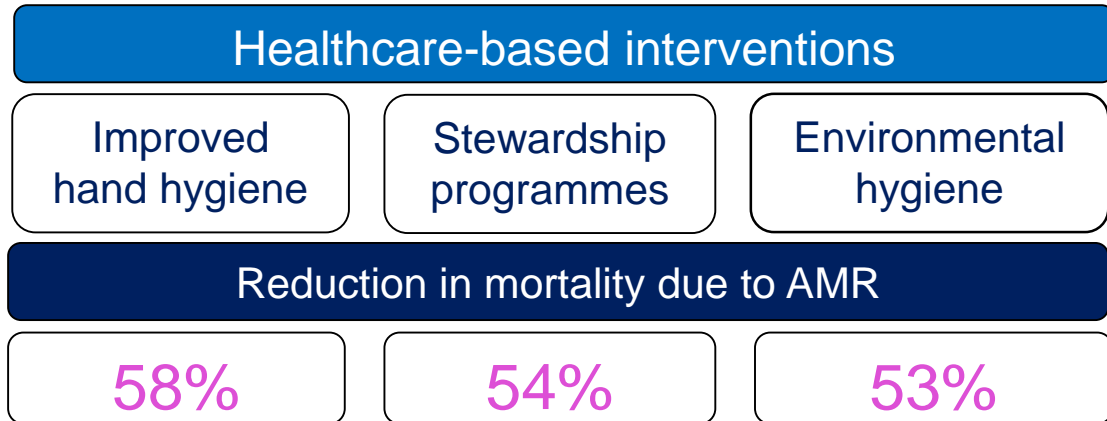


OECD Analysis: Key Findings

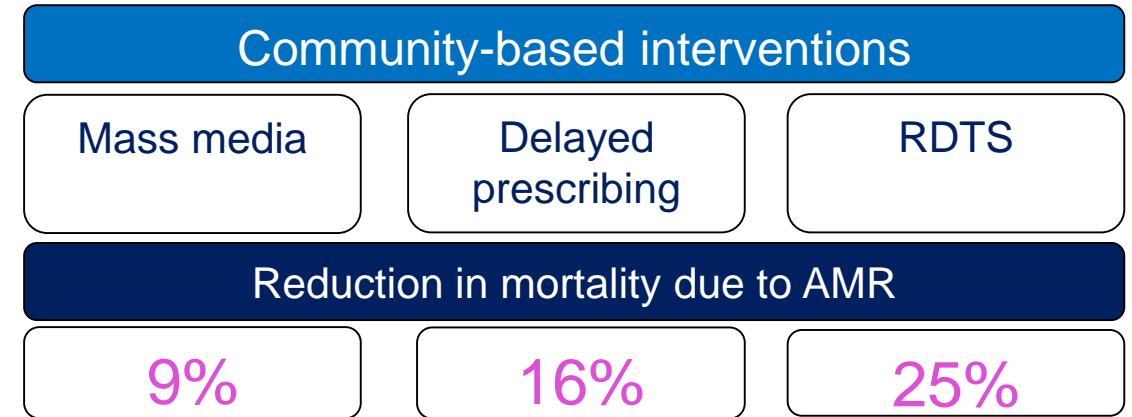


- Between 2015-2050, 2.4 million die in Europe, North America and Australia due to superbug infections
- 75% can be averted by spending USD 2 per person/year
- Most important: hospital hygiene & over-prescription of antibiotics (stewardship)
- Investment in these policies would pay for themselves within one year's time!

OECD Modelling: Cost Effectiveness



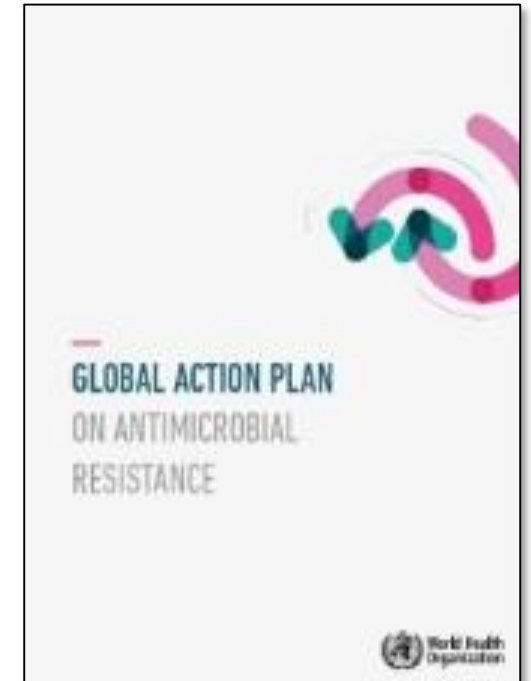
A policy package including all 3 hospital-based policies would save on average **USD PPP 1.2 million** per 100,000 persons per year



A community-based policy package would result in in average reductions in health care expenditure of approximately **USD PPP 275,000**

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



Develop National Action Plans

National Action Plans for AMR



WHA AMR Resolution May 2019:

WHO is scaling up support to countries and regions to develop their NAP

Result: 131 finalized NAP (85 LMIC), 51 are developing NAPs¹.

TWO KEY CHALLENGES ²	WHAT WHO IS DOING
<ul style="list-style-type: none">• Only about 50% have a functioning Multisectoral Coordination Group• Only about 25% have specific budgets to implement their plans.	<ul style="list-style-type: none">• Developing specific guidance for countries to establish multisectoral coordination mechanisms• Developing appropriate costing tools• Expanding the Communities of Practice to support peer learning and exchange of information

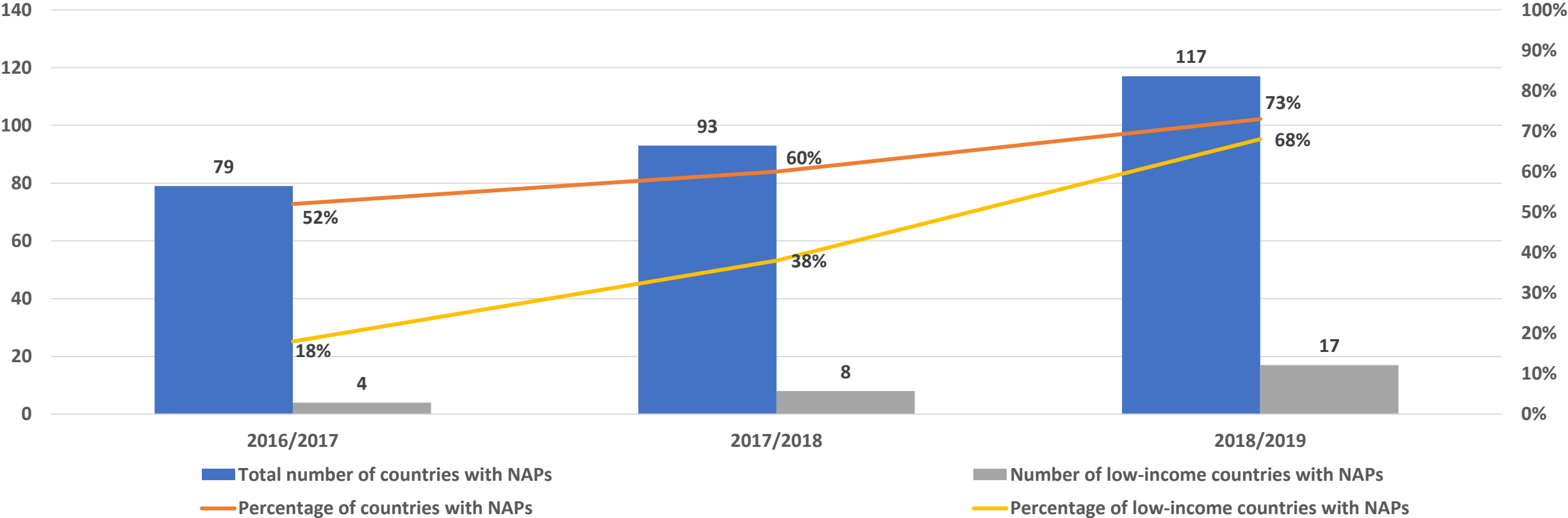
Source: ¹Country Submissions to HQ AMR NAP Team; ²Tripartite Country Self-Assessment Survey Results

National Action Plans for AMR



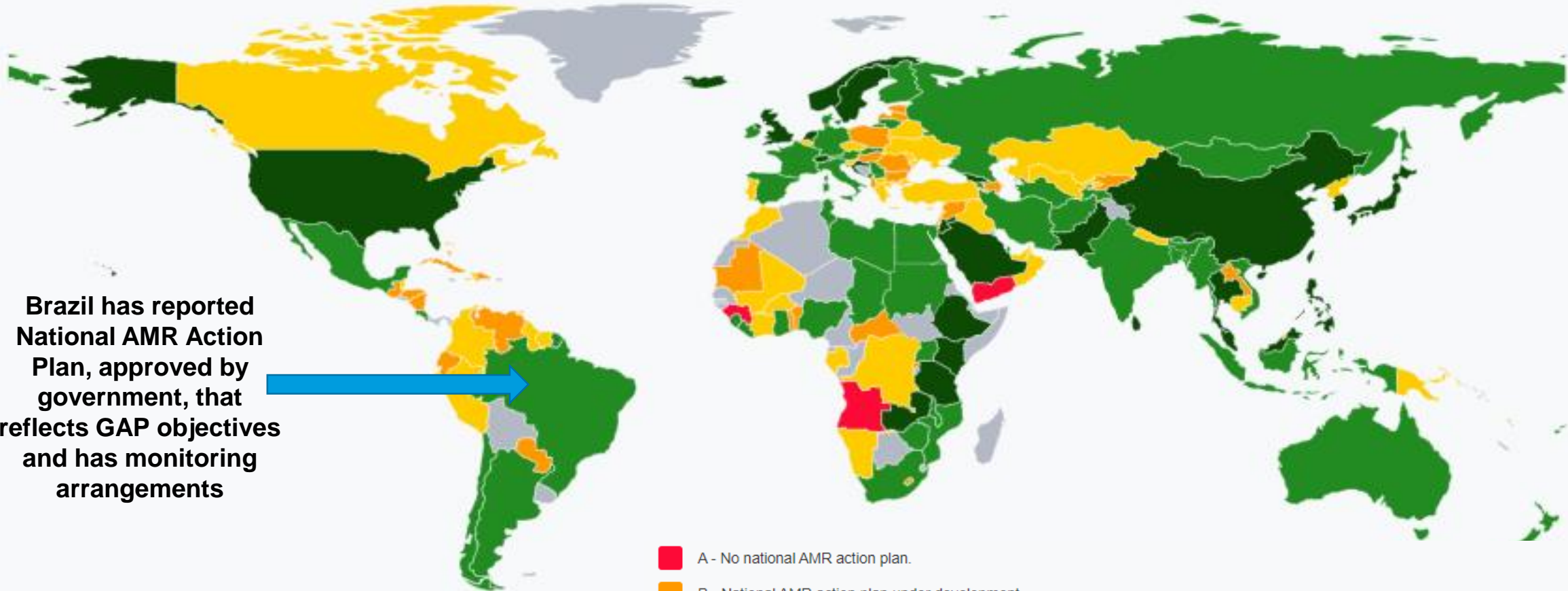
According to the Tripartite Country Self-Assessment Survey, the number of countries that have finalized their NAPs has increased by **21% over the last 3 years**

The number of low-income countries with NAPs has increased by **50%**



Source: Tripartite Country Self-Assessment Survey Results

Global Status on National Action Plans for AMR 2018/2019 Survey Results

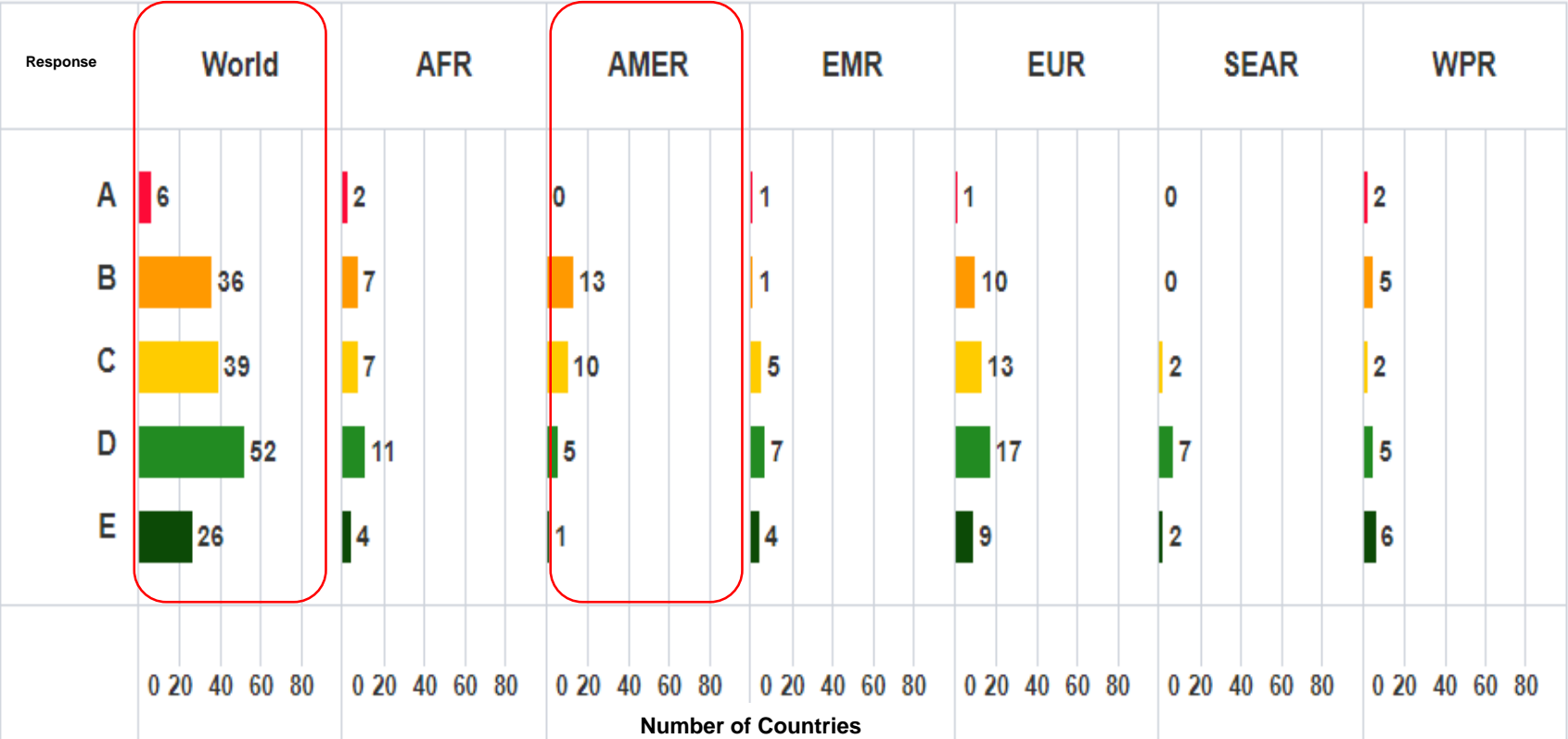


Brazil has reported National AMR Action Plan, approved by government, that reflects GAP objectives and has monitoring arrangements

- A** - No national AMR action plan.
- B** - National AMR action plan under development.
- C** - National AMR action plan developed.
- D** - National AMR action plan approved by government that reflects Global Action Plan objectives, with an operational plan and monitoring arrangements.
- E** - National AMR action plan has funding sources identified, is being implemented and has relevant sectors involved with a defined monitoring and evaluation process in place.

Source: Tripartite Country Self-Assessment Survey Results 2018/2019

Global Status on National Action Plans for AMR 2018/2019 Survey Results



- A - No national AMR action plan.
- B - National AMR action plan under development.
- C - National AMR action plan developed.
- D - National AMR action plan approved by government that reflects Global Action Plan objectives, with an operational plan and monitoring arrangements.
- E - National AMR action plan has funding sources identified, is being implemented and has relevant sectors involved with a defined monitoring and evaluation process in place.

Globally, **73%** of Member States have **finalized** their NAP.

In the **AMER** region, **55%** have **finalized** their NAP, with the remaining **45%** currently **developing** their NAP.

Source: Tripartite Country Self-Assessment Survey Results 2018/2019

AMR and Sustainable Development Goals (SDGs)

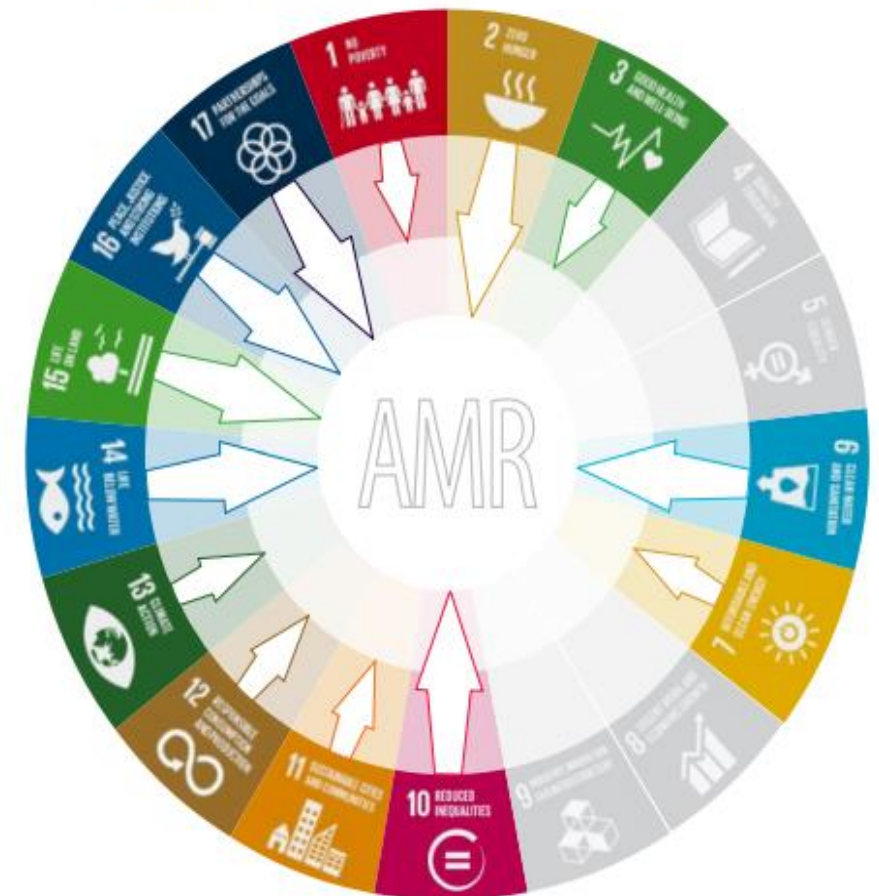
The emergence and spread of AMR will impede progress toward the 2030 agenda

SDGs 1, 2, 3, 8, 11, and 17 are particularly at risk



Progress made on some SDGs will contribute to containing AMR

SDGs 2, 6, 10, 14, 15, 16, and 17 are particularly relevant to AMR



Source: World Bank Group. (2019). Pulling together to beat superbugs: Knowledge and implementation gaps in addressing antimicrobial resistance. Available at: <https://openknowledge.worldbank.org/bitstream/handle/10986/32552/Pulling-Together-to-Beat-Superbugs-Knowledge-and-Implementation-Gaps-in-Addressing-Antimicrobial-Resistance.pdf?sequence=1&isAllowed=y>

AMR and Sustainable Development Goals (SDGs)

SDG 3: ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES



Achieved by

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



Measurement proxy

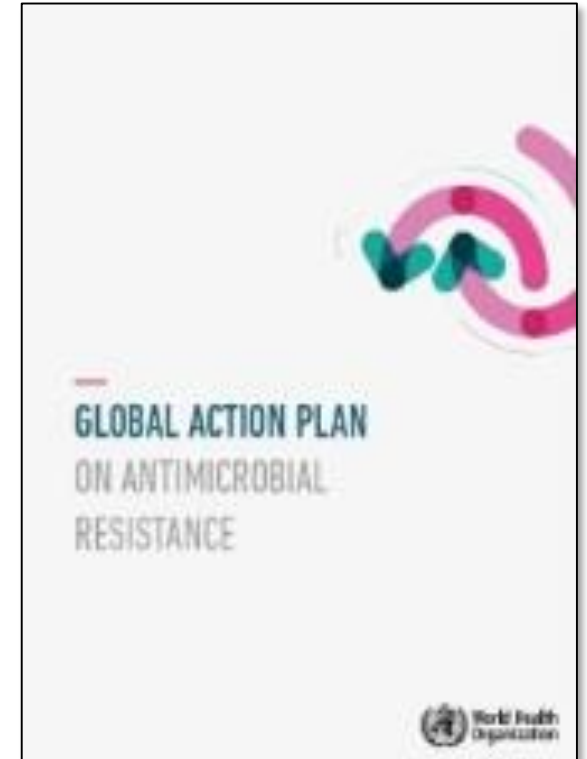


PROPOSED SDG INDICATOR 3.d.2 Proportion of patients with bloodstream infections due to selected antimicrobial resistant organisms

RATIONALE: The new proposed indicator is based on establishing a functional national AMR surveillance system, which is considered a basic building block for AMR monitoring and response

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 Antibiotic Awareness Week 2019 (Nov 18-24)

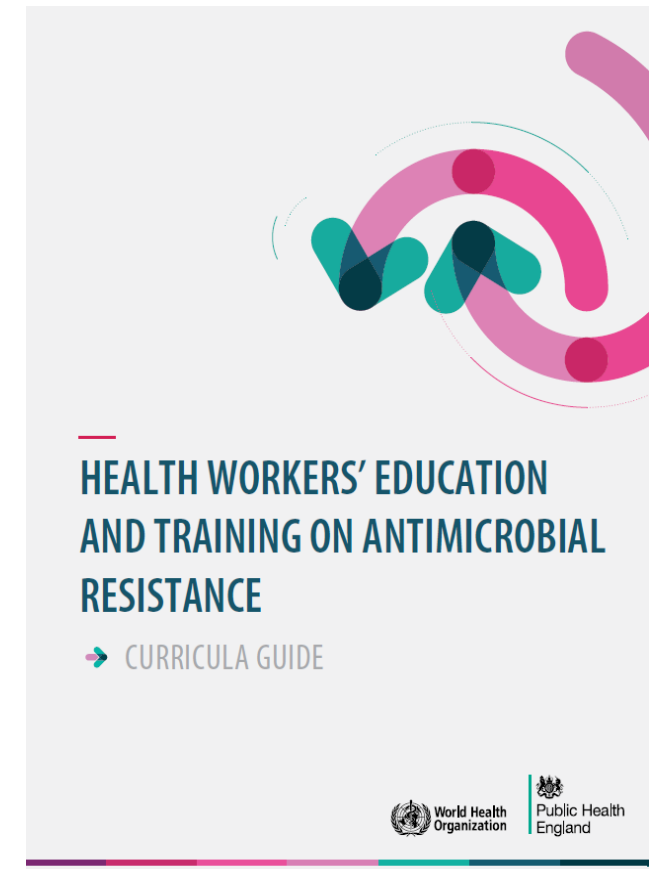
1. WHO's first **augmented reality app** for personal devices
2. A new set of 4 WAAW **posters**, same look and feel from 2018 artwork
3. A new set of **social media** stills and GIFs
4. A starter set of downloadable materials for primary school-aged children
5. The annual Innovate4AMR global student competition

AMR Curricula Guide for Health Workers

WHO and PHE (2019) AMR Curricula Guide: “The objective of the curricula guide is to ensure that health workers receive adequate education and training to become good stewards of antimicrobials in whatever roles they perform”

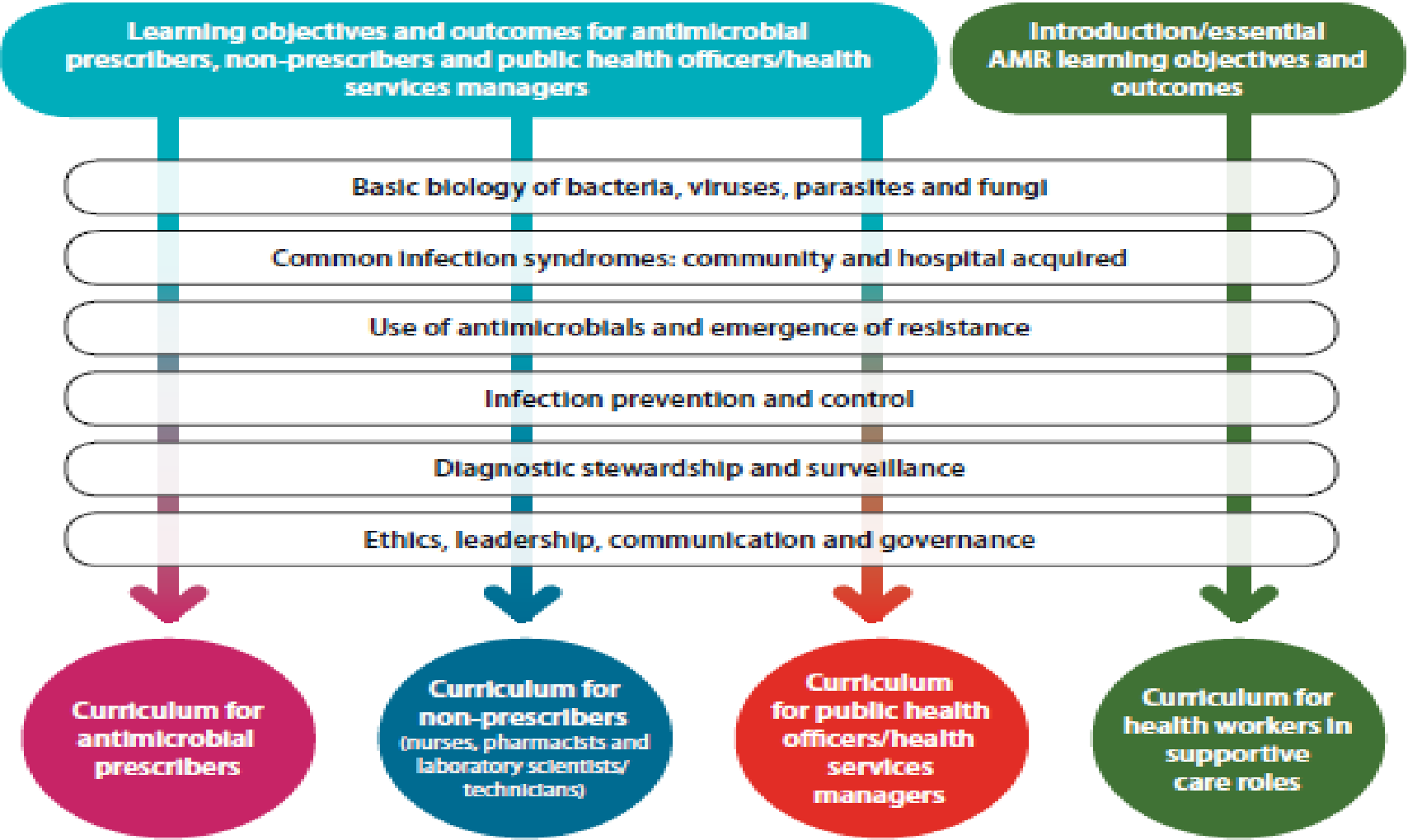
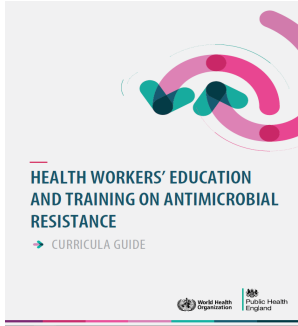
Box 1. Association between pre-service and in-service learning outcomes as conceptualized in this curricula guide

	Pre-service	In-service
Knowledge	To gain the basic concepts that underpin knowledge and awareness of AMR.	To gain enhanced concepts that lead to a greater depth of knowledge and awareness of AMR.
Skills	To facilitate skills-based learning through observership and performance under supervision where relevant.	To facilitate skills acquisition, achieving a degree of competency to be able to carry out tasks independently.
Attitudes	To promote the development of appropriate attitudes for the responsible stewardship of antimicrobials through training and observership.	To actively demonstrate appropriate attitudes and lead by example to ensure responsible stewardship of antimicrobials.



Source: World Health Organization & Public Health England (2019). Health workers' education and training on antimicrobial resistance: Curricula guide. Available at: <https://apps.who.int/iris/bitstream/handle/10665/329380/9789241516358-eng.pdf?sequence=1&isAllowed=y>

AMR Curricula Guide for Health Workers



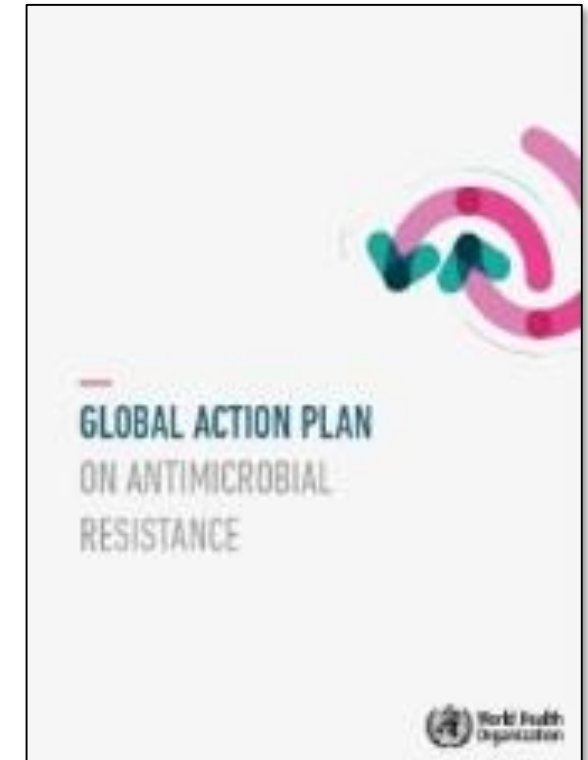
Modular Learning Topics

Categories of health workers

Source: World Health Organization & Public Health England (2019). Health workers' education and training on antimicrobial resistance: Curricula guide. Available at: <https://apps.who.int/iris/bitstream/handle/10665/329380/9789241516358-eng.pdf?sequence=1&isAllowed=y>

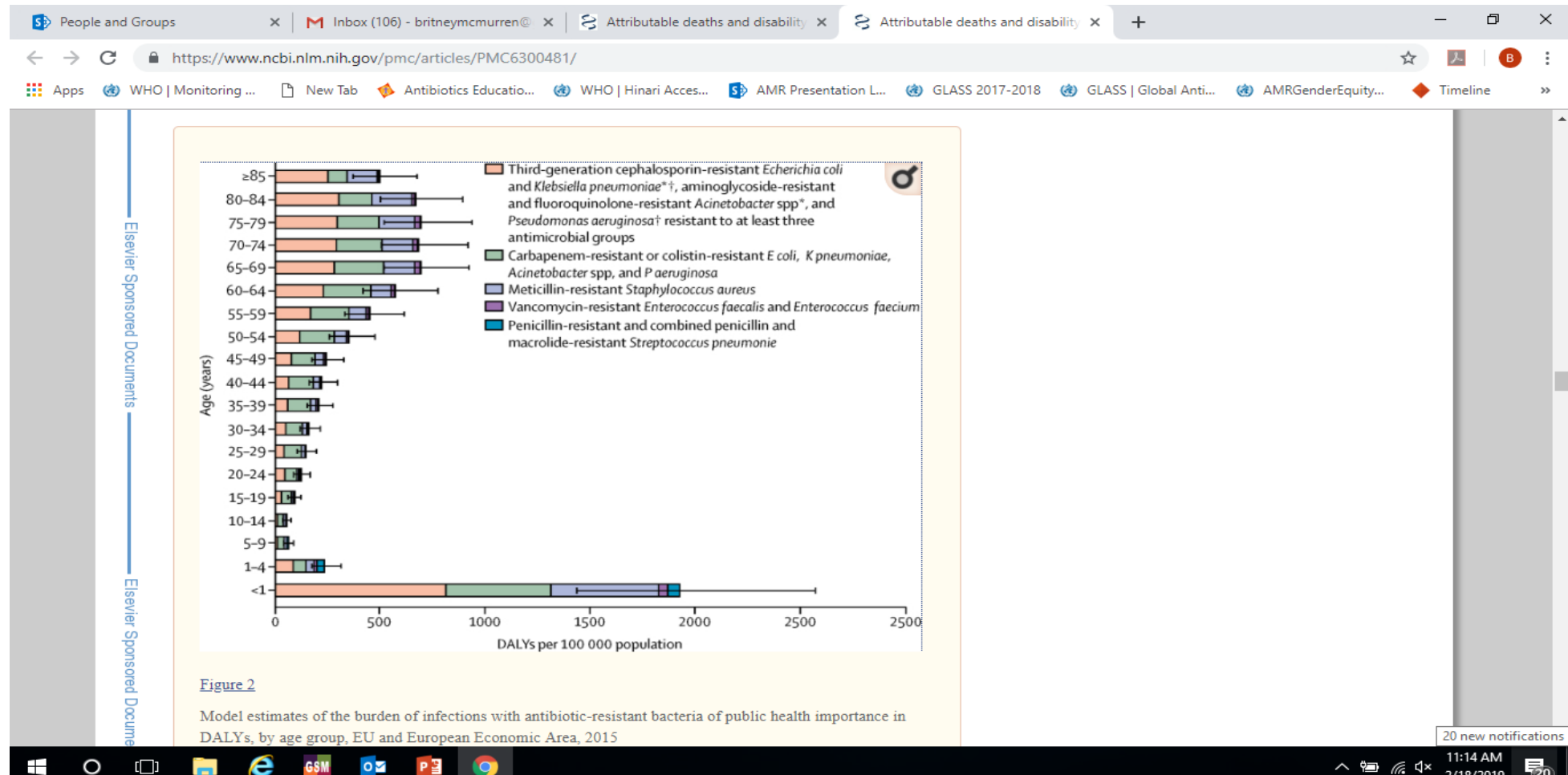
Global Action Plan on AMR

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Global Antimicrobial Resistance Surveillance System (GLASS)

85 countries enrolled, 68 submitted data



1. Second AMC expected spring 2020, combined with GLASS
2. 3rd High Level Technical Meeting on Surveillance of AMR
21–22 October 2020, Stockholm
3. One Health “Tricycle” ESBL E.coli surveillance project:
implemented in 8 countries, 11 more to come
4. Protocol for inclusion Candida spp. published, IT platform
being developed. Collaboration with PAHO and US CDC.

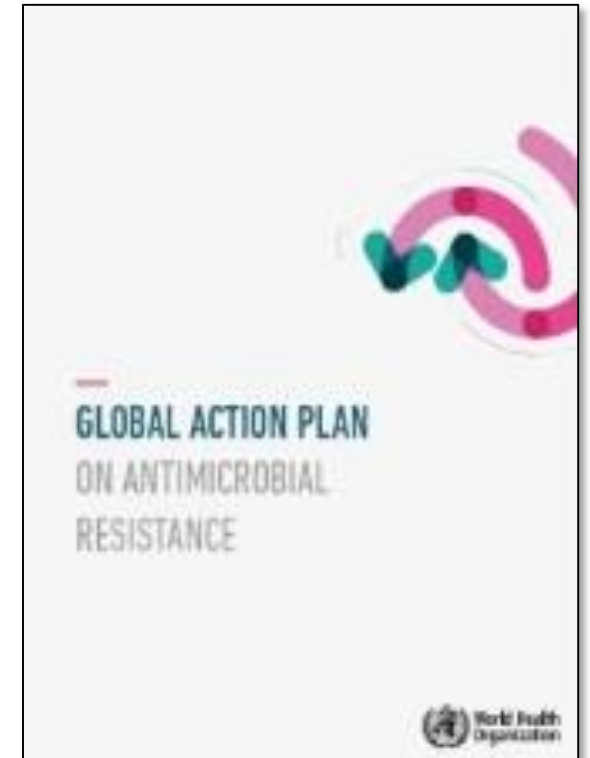
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Challenges

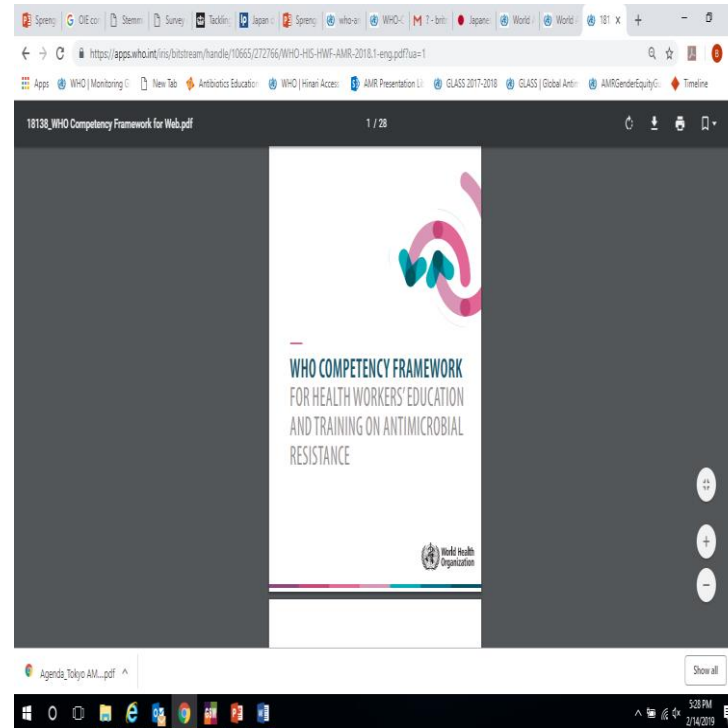
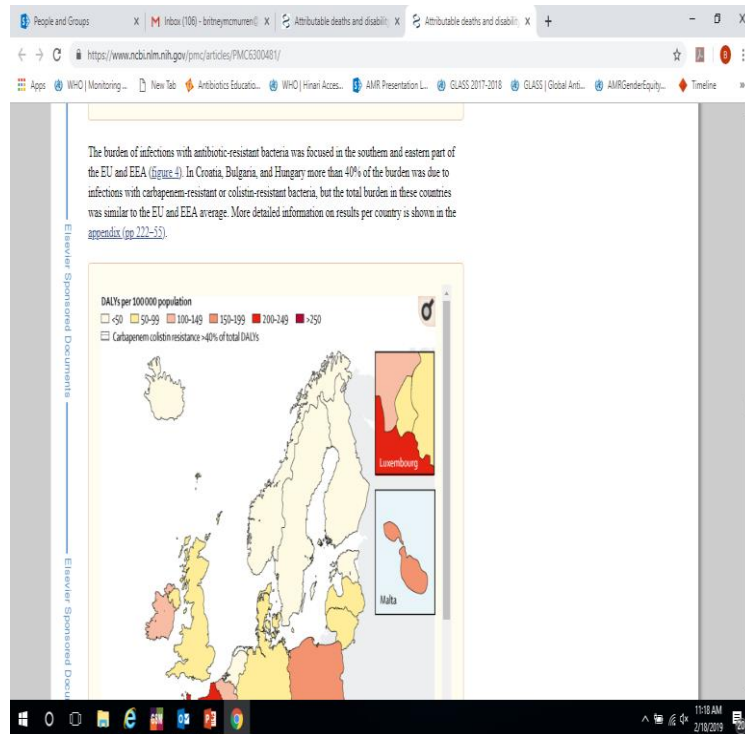
1. Lack of capacity, particularly in low resource settings
2. Coordination with partners
3. Integration with existing surveillance initiatives
4. **Translation of data > information > policies**

Global Action Plan on AMR

1. Improve awareness and understanding
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Reduce Spread of Infections and AMR



Hand Hygiene Campaign Australia



Global Action Plan
on Antimicrobial Resistance

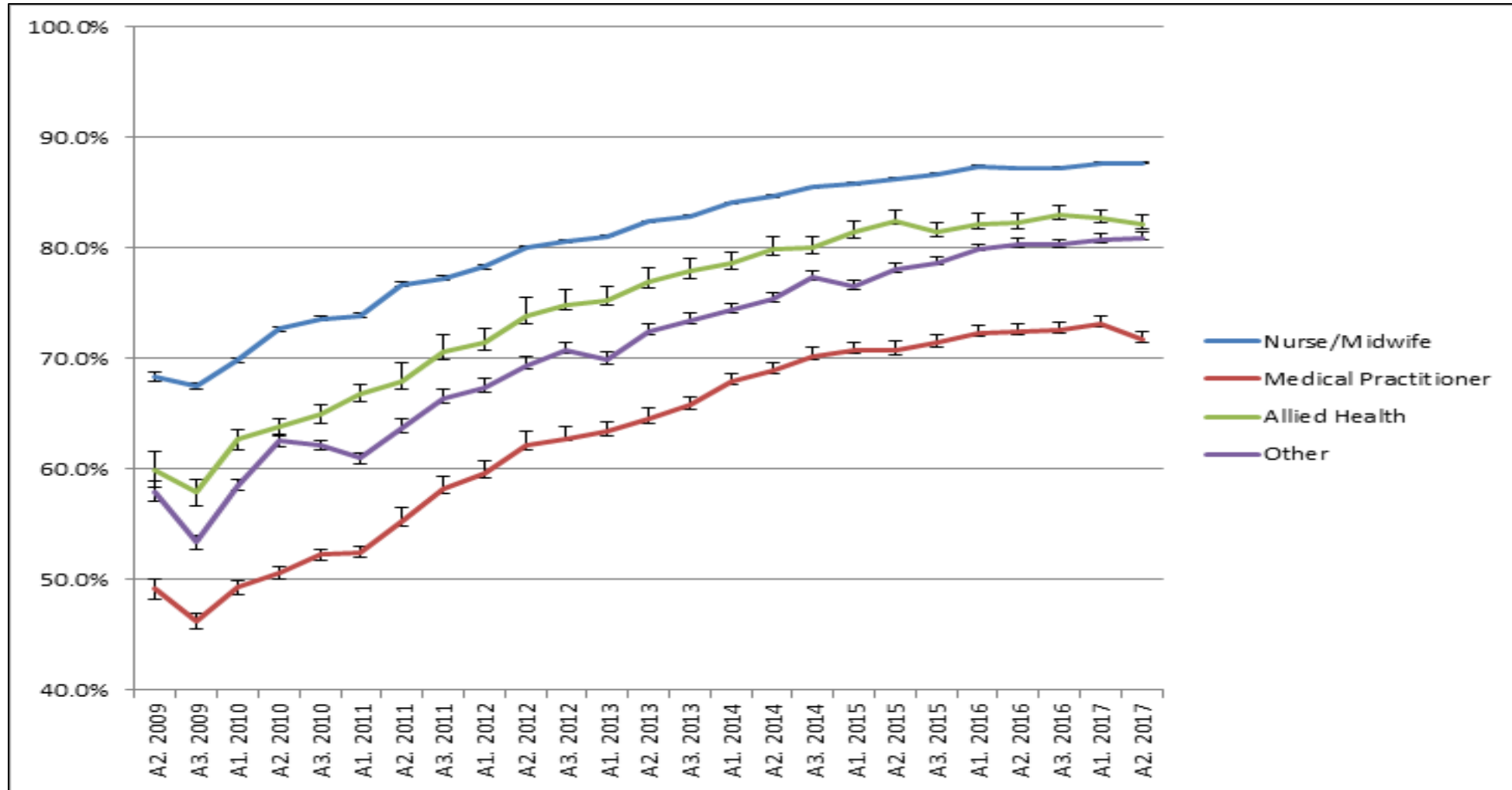
- GET INFORMED
- GATHER DATA
- PREVENT INFECTIONS
- REGULATE MEDICINES
- INVEST NOW

Our time with antibiotics is running out.
CHANGE CAN'T WAIT



Changes in HHC per HCW group

All healthcare facilities



‘For every 10% increase in hand hygiene compliance, the incidence of HA-SAB decreased by 15%’



Critical success factors:

Leadership

Standardized national approach

Adoption of WHO methodology,

Participation as **mandatory** for hospital accreditation,

Public reporting of hospital compliance data

Efforts from frontline infection control practitioners.

Central coordinating

IPC Resources



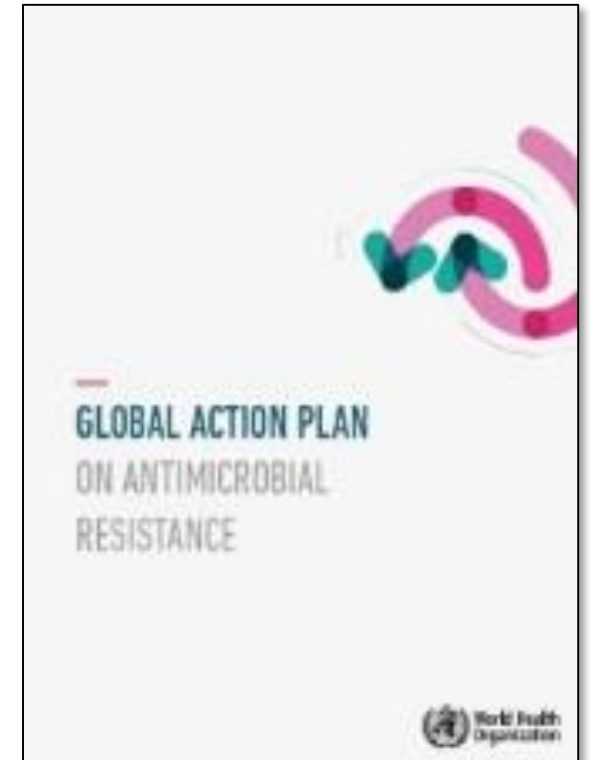
2019 WHO Global Survey on Infection Prevention and Control (IPC) and Hand Hygiene

Objectives:

- 1) To encourage and support local assessments of IPC and hand hygiene activities and the development of local improvement plans.
- 2) To gather a situational analysis on the level of progress of current IPC and hand hygiene activities around the world

Global Action Plan on AMR

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Optimizing Use of Antimicrobials



**WHO Essential Medicines List revised in 2017
to include AWaRe categorization of antibiotics:**

ACCESS GROUP

- first or second choice antibiotics
- offer the best therapeutic value, while minimizing the potential for resistance

WATCH GROUP

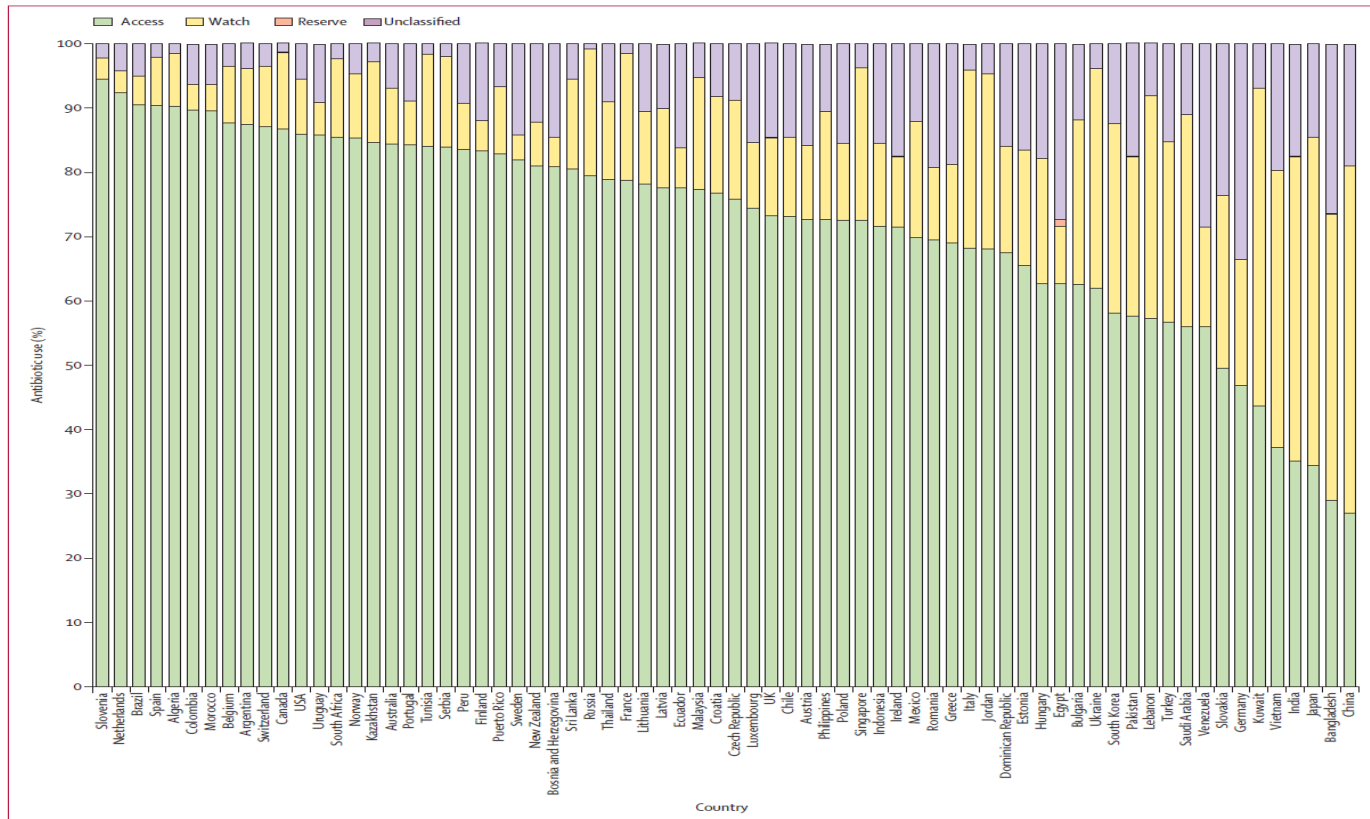
- first or second choice antibiotics
- only indicated for specific, limited number of infective syndromes
- more prone to be a target of antibiotic resistance and thus prioritized as targets of stewardship programs and monitoring

RESERVE GROUP

- “last resort”
- highly selected patients (life-threatening infections due to multi-drug resistant bacteria)
- closely monitored and prioritized as targets of stewardship programs to ensure their continued effectiveness

Optimize the Use of Antimicrobial Medicines

AWaRe Categorization of Antibiotics



ACCESS Antibiotics that should be available at all times



WATCH Antibiotics recommended as first- or second-choice treatment for a small number of infections



RESERVE Antibiotics that are reserved as last resort options



UNCLASSIFIED

Figure 1: Percentage antibiotic use of child-appropriate oral formulations according to WHO AWaRe grouping. Only core Access antibiotics have been included in the Access group. AWaRe=Access, Watch, Reserve.

Optimizing Use of Antimicrobials



29 Countries, or 45% of those reporting indicate consumption of **over 60% of Access** group antibiotics

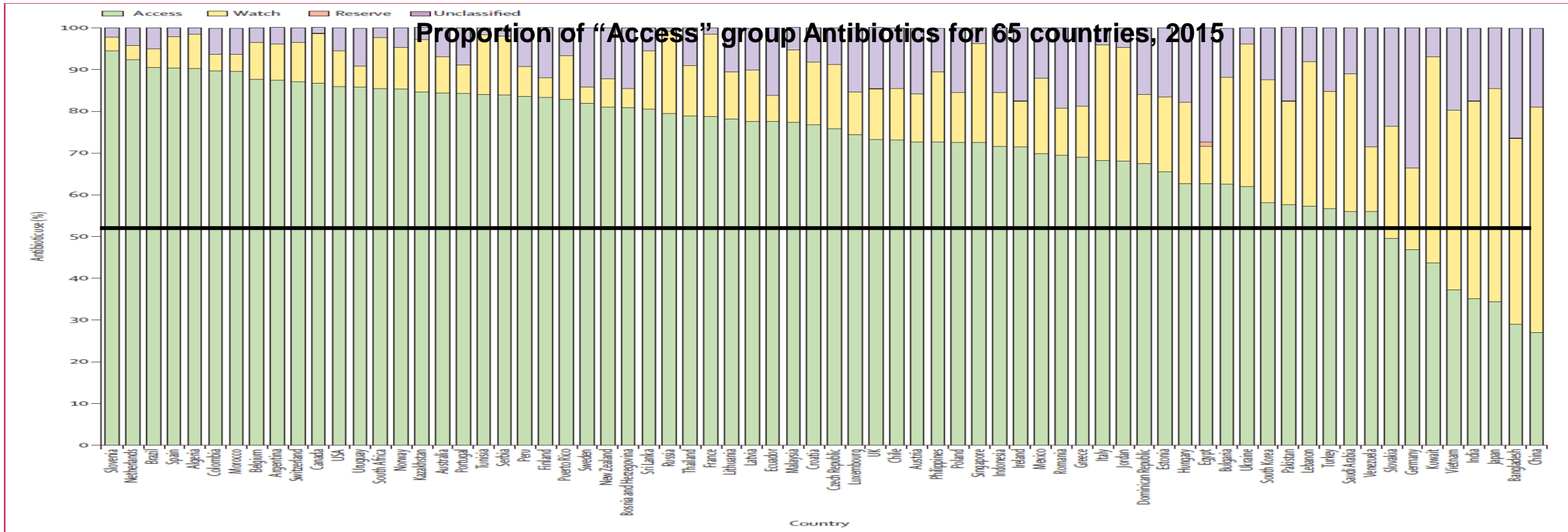


Figure 1: Percentage antibiotic use of child-appropriate oral formulations according to WHO AWaRe grouping. Only core Access antibiotics have been included in the Access group. AWaRe=Access, Watch, Reserve.


■ Latin American countries

Country

Antibiotic Use in Dentistry

In the UK, dentists accounted for 7% of all community prescriptions of antimicrobials

Antibiotic Guardian has created a pledge specifically for dentists



ANTIBIOTIC GUARDIAN

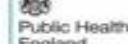
NHS

antibiotics DON'T cure toothache!

- Toothache is **usually** caused by decay, which may lead to dental infection
- The best way to treat a toothache is to remove the cause of infection
- Contact your dentist for the most appropriate advice and treatment
- If you don't have a dentist and require urgent care call **NHS 111**

Find out more and become an Antibiotic Guardian at www.antibioticguardian.com

Supported by:



SELECT A PLEDGE MESSAGE*

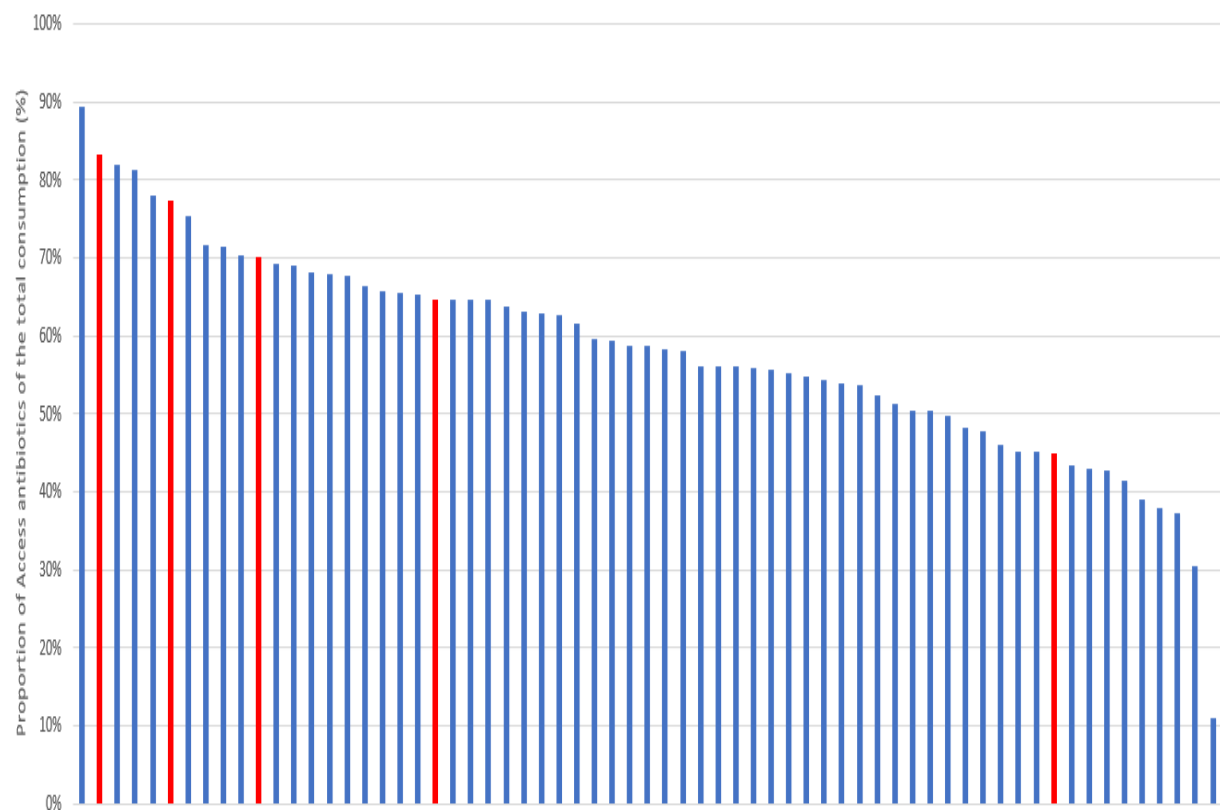
Messages will display below

- **I will consider drainage for dental infections before issuing antibiotics**
- **I will discuss with patients/clients the importance of antimicrobial resistance and encourage them to take the Antibiotic Guardian quiz and make a pledge to become Antibiotic Guardians**
- **When I see a patient with dental pain, I will discuss methods of controlling symptoms rather than prescribing antibiotics as a first course of action**

Antimicrobial Stewardship (AMS)



Example: USA




National antibiotic prescribing rates have decreased 5% from 2011-2016

Difference in prescribing rates between states shows opportunities for targeted stewardship efforts

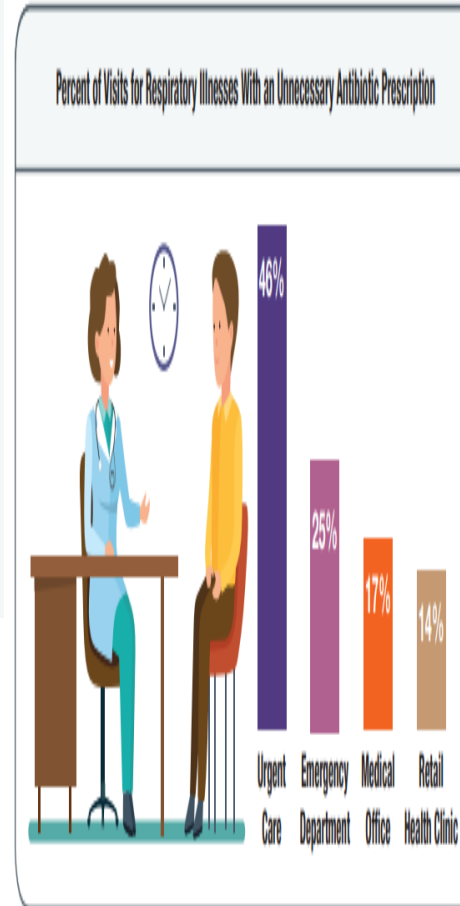
CDC: 7 Core elements AB-Stewardship




Leadership Commitment
Dedicating necessary human, financial, and information technology resources.

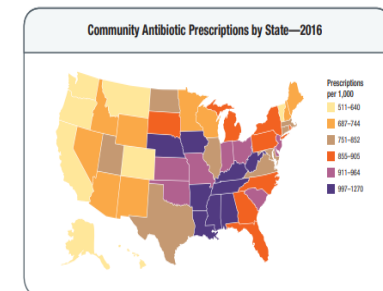

Accountability
Appointing a single leader responsible for program outcomes.


Drug Expertise
Appointing a single pharmacist leader responsible for working to improve antibiotic use.

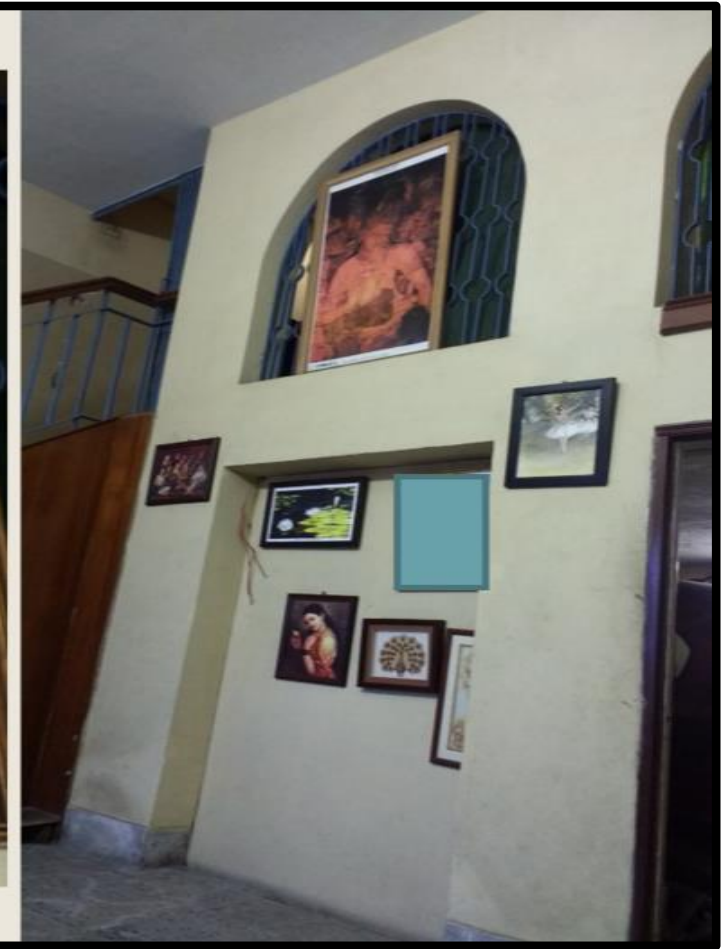


Guidelines recommend **five to seven days** of antibiotic treatment for most sinus infections in adults.

However, **almost 70%** of antibiotic prescriptions for sinus infections are for **10 days**.



Reality of medical practice (Rachel Glogowski)



AMR Stewardship



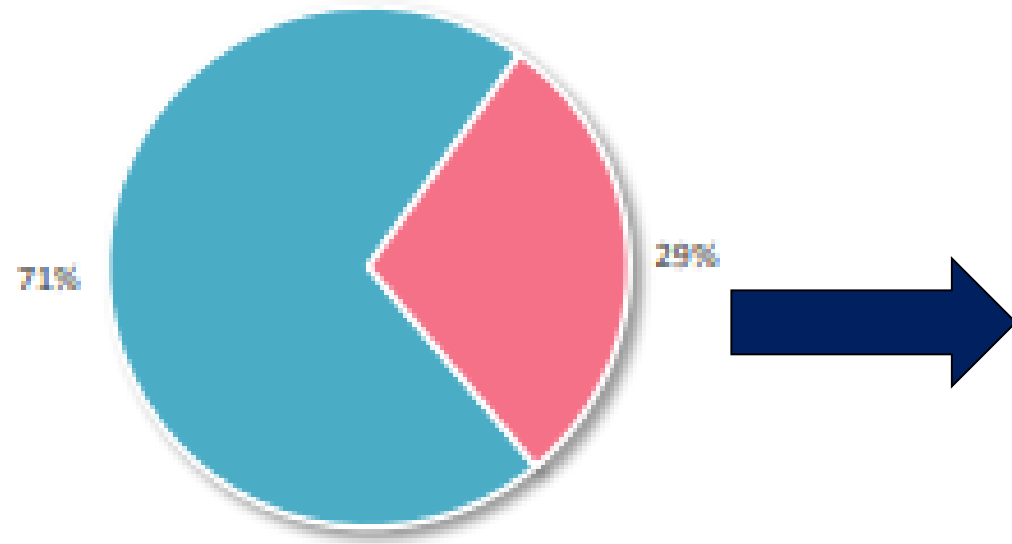
1. WHO is finalizing a **toolkit** on antimicrobial stewardship (AMS) in health-care facilities and relevant training material.
2. To kick off the roll out in countries, the AMR Division is organizing WHO's first Global Partners Meeting on Antimicrobial Stewardship (AMS) in Bangkok at the end of February next year.

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OIE 3rd Annual Report on Antimicrobial Agents in Animals



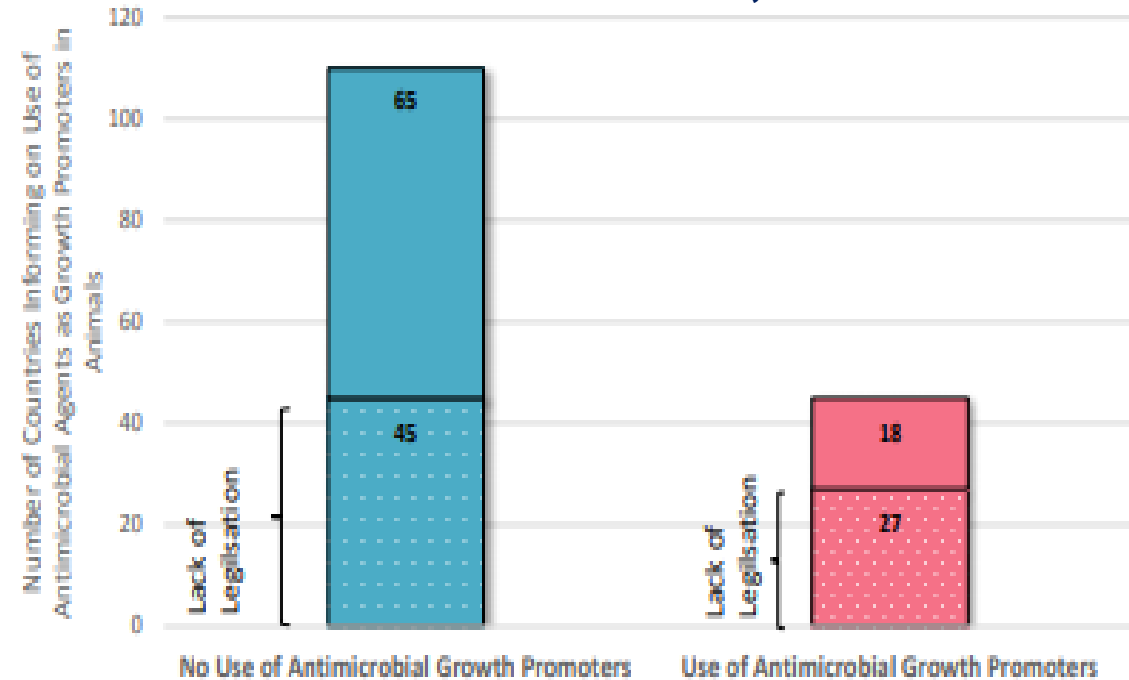
Use of Antimicrobials for Growth Promotion
155 countries, 2017



■ No Use of Antimicrobial Growth Promoters

■ Use of Antimicrobial Growth Promoters

Use of Antimicrobial Growth Promoters by Legislation
155 countries, 2017



Most countries reporting the use of antimicrobials as growth promoters do not have a regulatory framework

'Magical' antibiotic brings fresh hope to battle against drug resistance

It has taken 60 years for bacteria to become resistant to vancomycin; modified drug now works in three ways, making it harder for bugs to develop resistance.



 The WHO has warned that antibiotic resistance is one of the biggest threats to global health, food security and development. Photograph: David Goldman/AP

Priority pathogens for R&D

TUBERCULOSIS: A GLOBAL PRIORITY FOR RESEARCH AND DEVELOPMENT

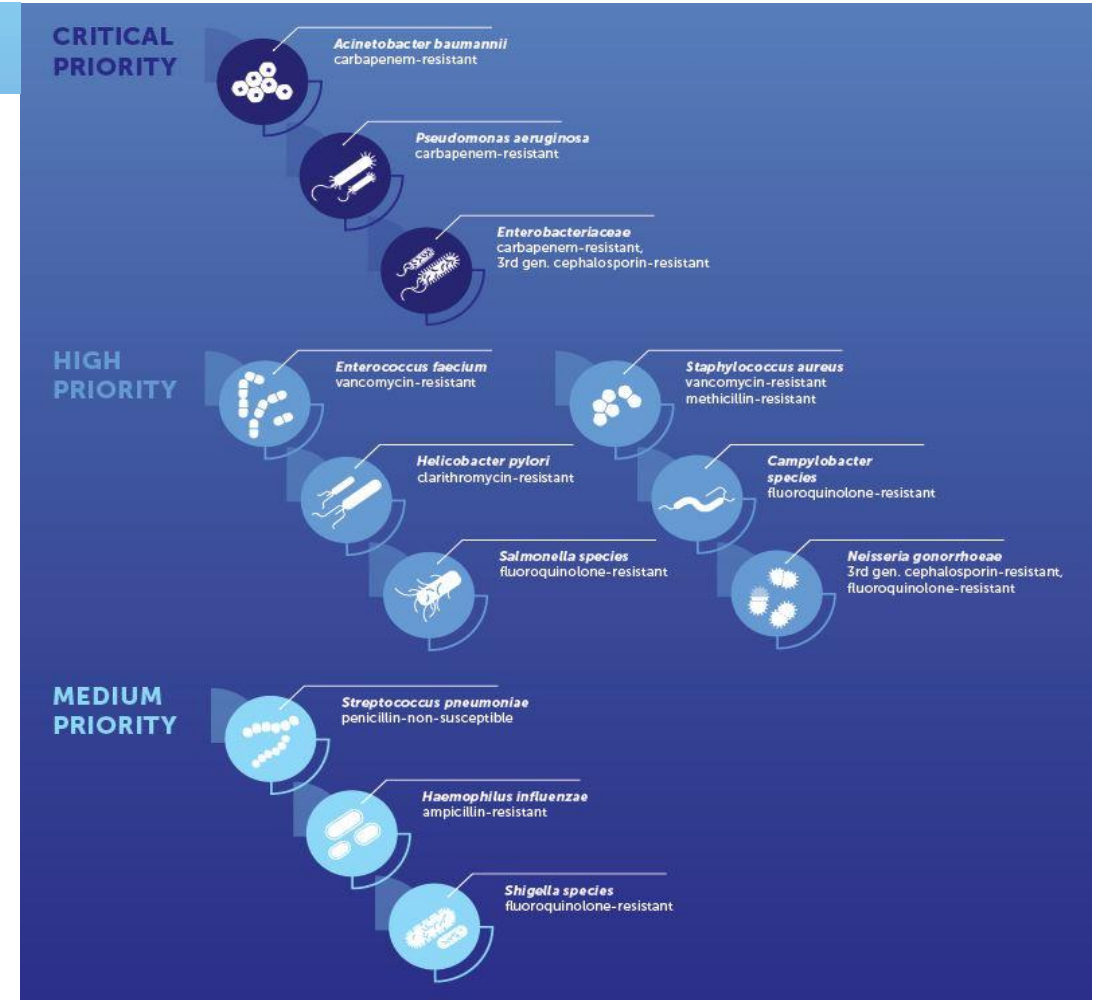
Critical needs:

Drug-resistant TB

Gram-negative bacteria:

- Carbapenem-resistant *A. baumannii*
- Carbapenem-resistant *P. aeruginosa*
- Carbapenem-resistant and 3rd generation cephalosporin resistant *Enterobacteriaceae*

Source:http://www.who.int/entity/medicines/areas/rational_use/PPLreport_2017_09_19.pdf?ua=1



British Poultry Council

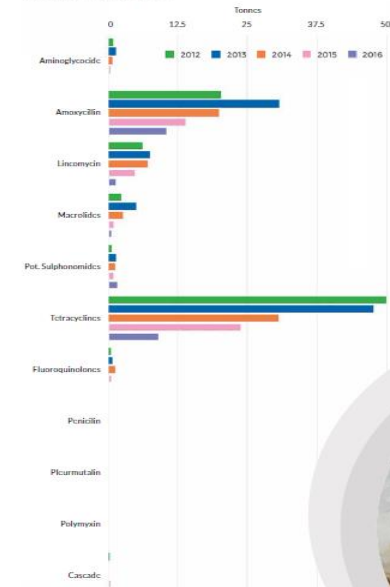
BPC reduced antibiotic use by weight by 71%

Poultry meat production increased by 11%

USE OF ANTIBIOTIC CLASSES 2012-2016

Out of the ten classes of antibiotics used by the sector, over half of the classes show significant reduction in usage between 2012-2016.

This is a result of the high level of commitment and professionalism displayed by poultry meat farmers and veterinarians in implementing the stewardship principles.



2012-2016

72% REDUCTION in the use of (CIA) Fluoroquinolones

77% REDUCTION in the use of (CIA) Macrolides

48% REDUCTION in the use of Amoxicillin

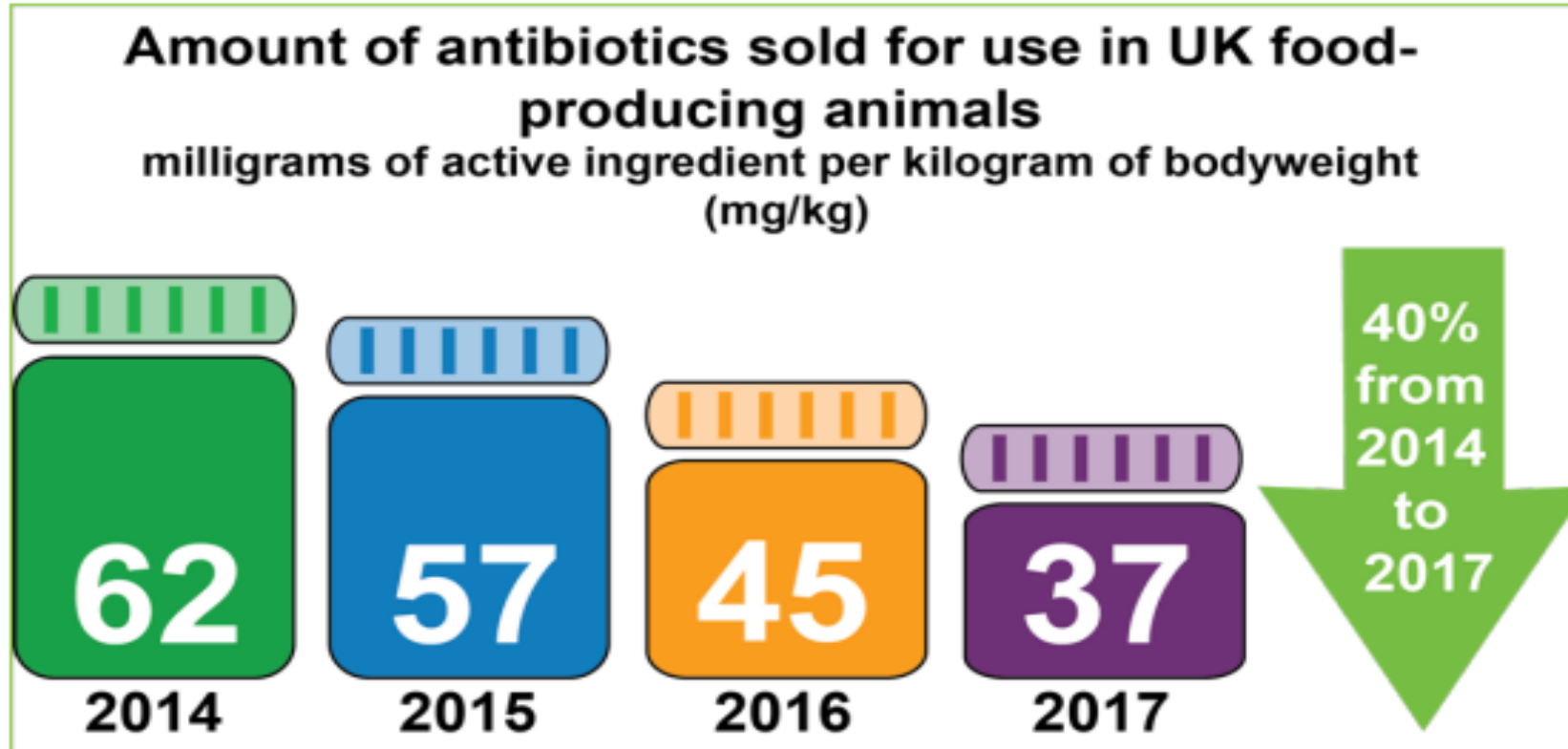
82% REDUCTION in the use of Tetracyclines



JUNE 2017 7

UK One Health Report, 2013-2017

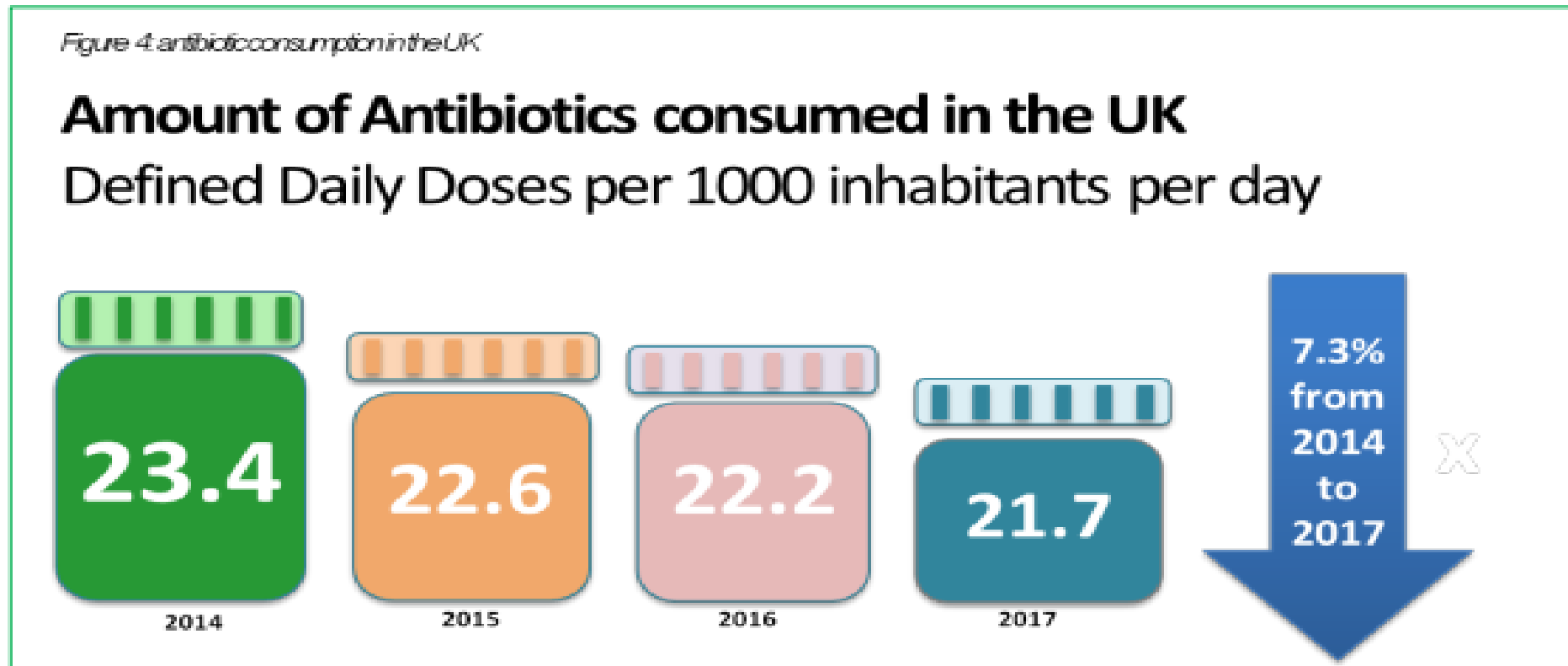
- Decrease of **40%** in antibiotics sold for food-producing animals



Source: Global and Public Health Group, Emergency Preparedness and Health Protection Policy Directorate. (2019). Tackling antimicrobial resistance 2019-2024

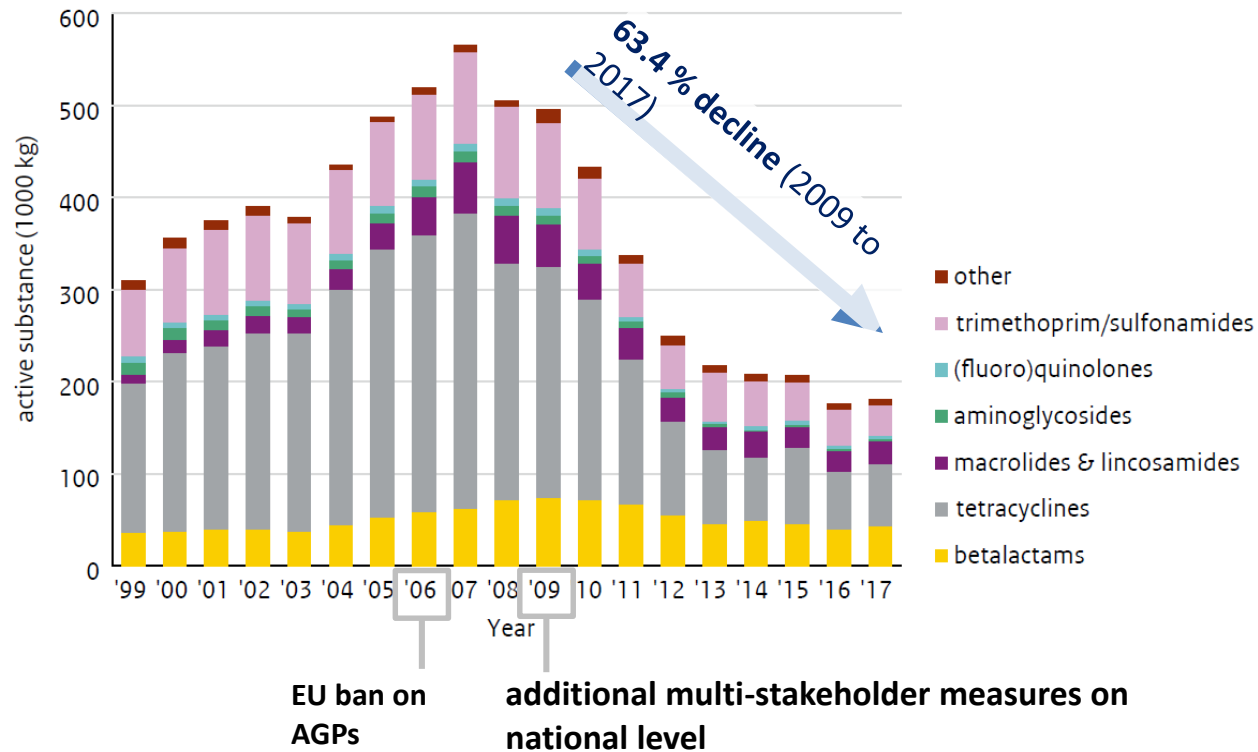
UK One Health Report, 2013-2017

Decrease of **7.3%** in antibiotics dispensed for human consumption



Source: Global and Public Health Group, Emergency Preparedness and Health Protection Policy Directorate. (2019). Tackling antimicrobial resistance 2019-2024

Netherlands: results so far



- 67.9% reduction (2007-2017)
- 63.4% reduction (2017 to reference year 2009)
- Fluoroquinolones and 3rd/4th-gen cephalosporines usage strongly reduced
- 80.7% reduction in use of colistin (2011-2017)

Source: Maran, 2018



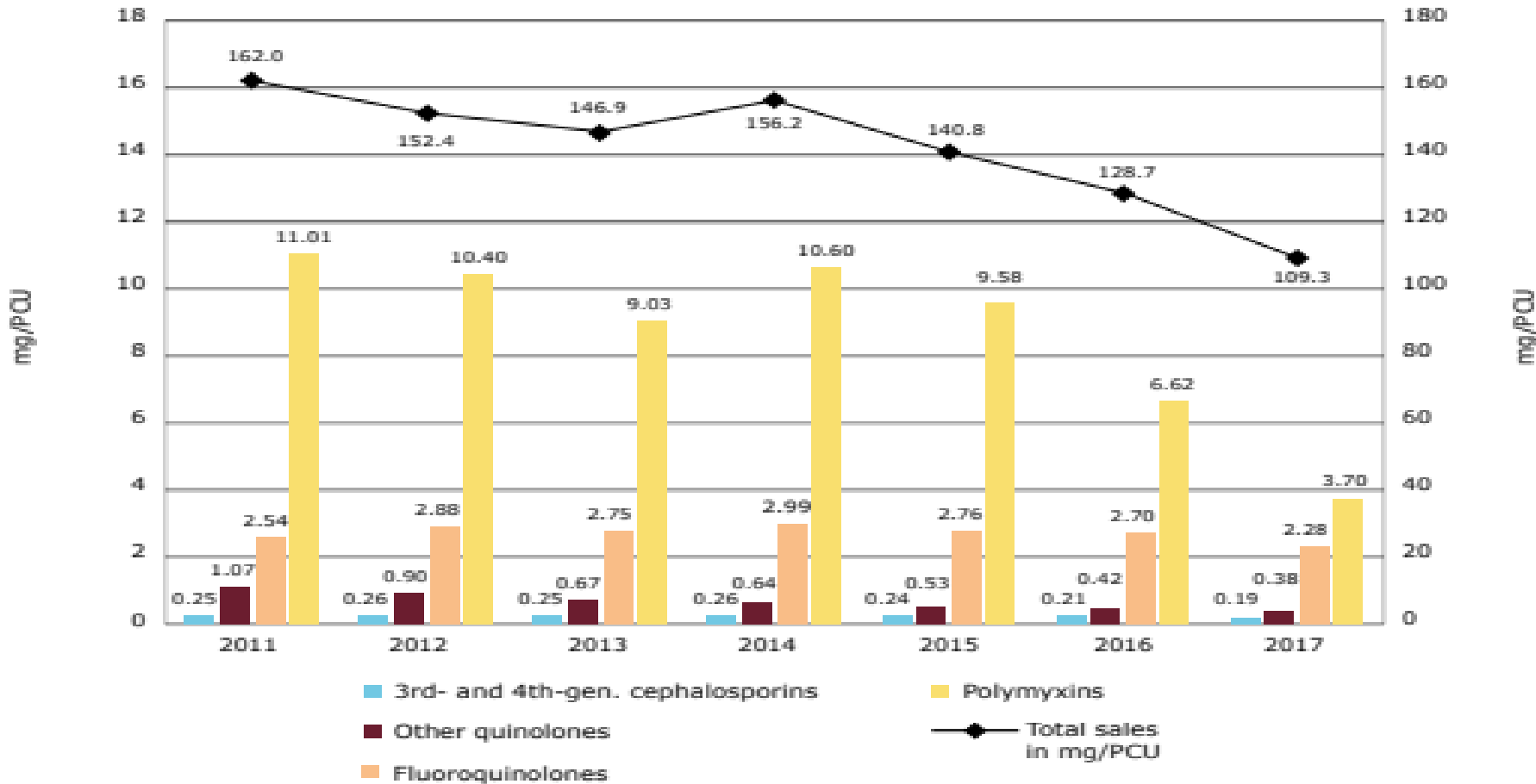
Universiteit Utrecht



One Health: Veterinary Antimicrobials in the EU

EMA (2019) reported an overall decrease of **32.5%** in sales (mg/PCU) from 2011-2017.

Changes by 25 EU/EEA countries, 2011-2017



Reduction in sales reportedly due to:

- Use campaigns
- Restrictions on use
- Increased awareness
- Setting targets

Source: European Medicines Agency, European Surveillance of Veterinary Antimicrobial Consumption. (2019). Sales of veterinary antimicrobial agents in 31 European countries in 2017: Trends from 2010 to 2017. Available at: https://www.ema.europa.eu/en/documents/report/sales-veterinary-antimicrobial-agents-31-european-countries-2017_en.pdf

Water and Sanitation

40% of health facilities in LMICs have no source of water

- Impossible to prevent infection



Hospital water sources

Use of stored water due to intermittent access

Source: Emory University

Antibiotics as a substitute for decent infrastructure



Antibiotics as a substitute for decent hygiene



Antibiotics as a substitute for decent care

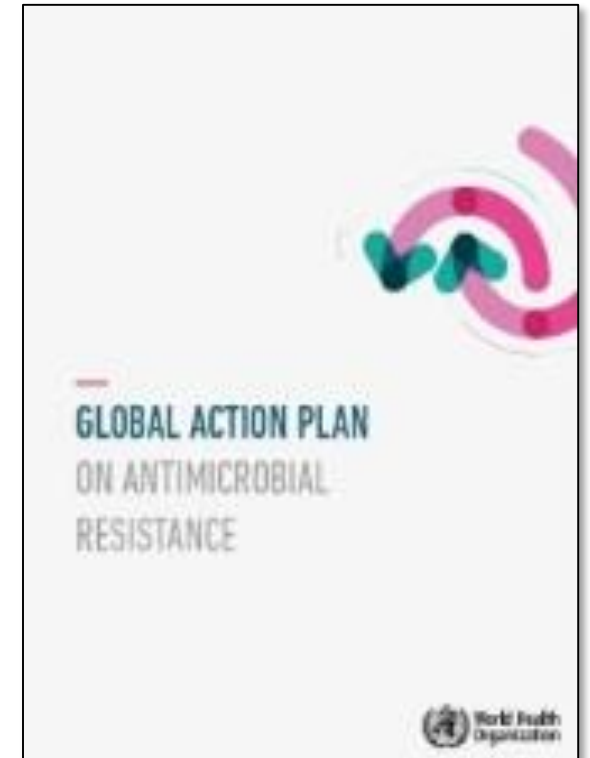


For animals as well as humans



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



“Taking a New Look at an Old Challenge”

- World Bank Group (2019) examined key knowledge and implementation gaps related to AMR (the “know-do” gap), emphasizing the importance of implementation research



Percentage of Funding and Publications for AMR Priority Areas

Priority areas	Definition	Funding	Publications
Therapeutics	Improvement of current antibiotics and treatment regimens, development of new antibiotics and therapeutic alternatives to antibiotics.	57.6	16.4
Diagnostic	Improvement of diagnostics and the development of novel rapid diagnostics to stimulate better use of current antibiotics and support the development and use of new antibiotics and alternatives to antibiotics.	13.1	52.5
Interventions	Study of preventive and control interventions that focus on improved antibiotic stewardship, compliance and prevention of transmission of AMR and to determine and improve their efficacy.	11.3	38.7
Transmission	Comprehensive, multi-disciplinary understanding of the transmission mechanisms by which AMR can spread between bacterial populations and between different animal and human reservoirs and to translate this knowledge into the development of evidence-based strategies to minimize the spread of resistance.	7.5	5.4
Surveillance	Establishment of an international, standardized surveillance program for AMR and antibiotic use in human, and agricultural settings.	6.7	25.8
Environment	Assessment of the contribution of pollution of the environment with antibiotics, antibiotic residues and resistant bacteria on the spread of AMR and the development of strategies to minimize environmental contamination by antibiotics and resistant bacteria.	3.8	10.5



Reflects traditional approach of fighting resistance with development of new antimicrobials; However, can't rely on this approach alone.



Area that requires critical attention, particularly with focus on pollution of the environment with antimicrobials

Table sources: Kelly et al. 2015; JPIAMR 2017; PubMed (accessed on April 28, 2019).

NOTE: Percentage funding from 2017; Publication percentage from 2014-2019

Source: World Bank Group. (2019). Pulling together to beat superbugs: Knowledge and implementation gaps in addressing antimicrobial resistance. Available at: <https://openknowledge.worldbank.org/bitstream/handle/10986/32552/Pulling-Together-to-Beat-Superbugs-Knowledge-and-Implementation-Gaps-in-Addressing-Antimicrobial-Resistance.pdf?sequence=1&isAllowed=y>

Can you make a difference?...Yes!

1. Participate in GLASS and use data for policy
2. Mainstream AMR in UHC & Health Security agenda
3. Support multi-sectoral AMR coordination team
4. Reach out to Civil society and non-state-actors

Conclusion

1. No silver bullet, multiple actions required
2. No time to lose: implement WASH, IPC, Stewardship
3. Political attention is pivotal (WHA)
4. Resources needed, all levels

Its is all about implementation in health/animal system!