Global Infrastructure and Surveillance

U.S Role Abroad

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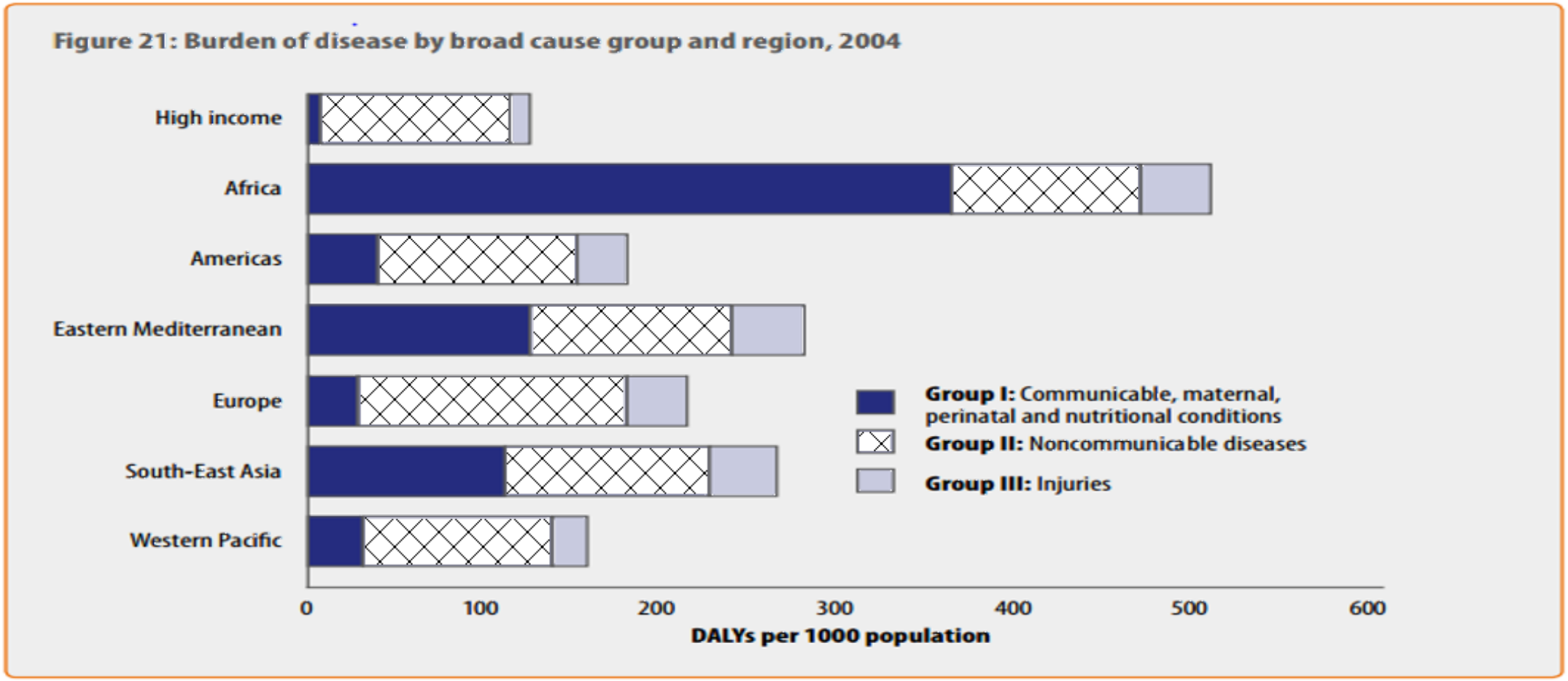
World Health Organization

* Focus on surveillance- U.S role in strengthening surveillance for animal

Magnitude Problem: Communicable Disease Burden



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This figure shows the burden of disease by broad cause group in 2004 for each of the WHO regions. Disease burden is quantified in terms of Disability-Life-Adjusted Years (DALYs) per 1000 population. The 3 groups of diseases are as follows:

Group I: communicable disease, maternal, perinatal and nutritional conditions

Group II: noncommunicable diseases

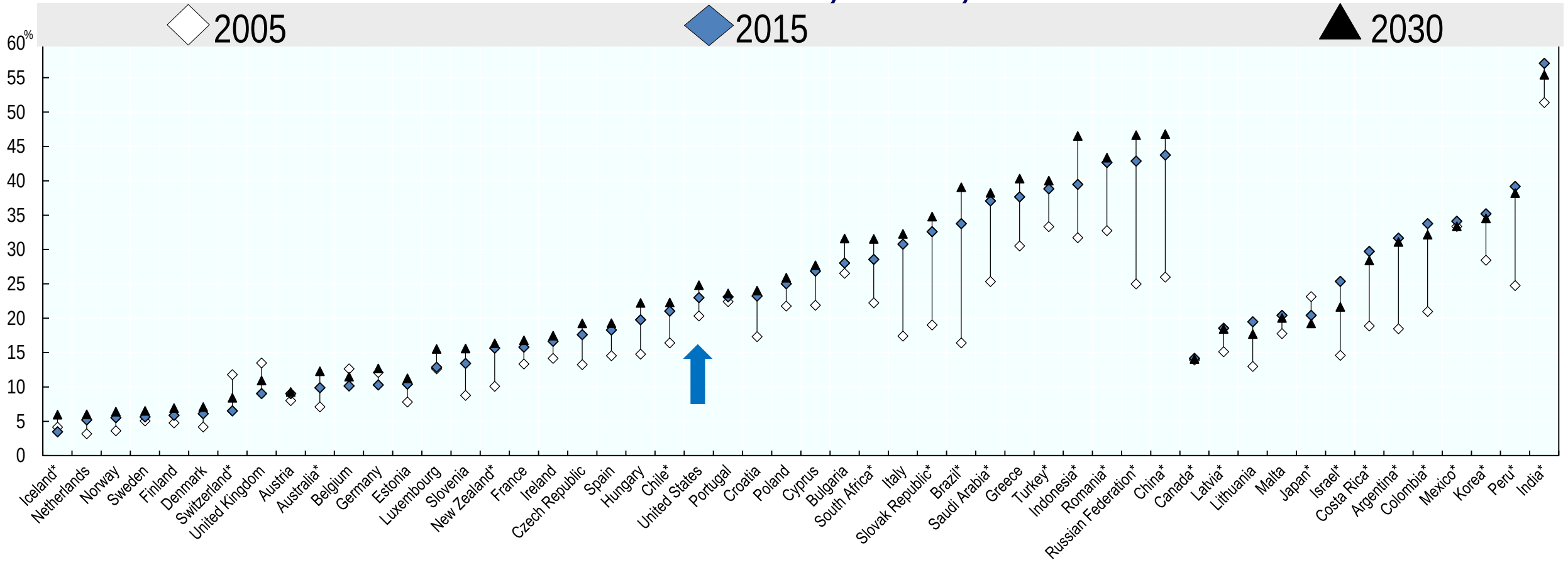
Group III: Injuries

Communicable disease burden (Group I) as a proportion of all disease and injury conditions is highest in the African Region, followed by the South-East Asian and Eastern Mediterranean Regions.

Source: World Health Organization. (2004). Global Burden of Disease: 2004 Update. Available at: https://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_full.pdf

Magnitude of Resistance

OECD: 40%-60% of infections in Indonesia, Brazil, Russian Federation resistant



World Health Organization

This figure shows the average **resistance proportions across eight antibiotic-bacterium combinations** in OECD countries. The eight antibiotic-bacterium combinations included in the analysis are: third-generation cephalosporin-resistant Escherichia coli, fluoroquinolones-resistant Escherichia coli, penicillin resistant Streptococcus pneumoniae, methicillin-resistant Staphylococcus aureus, carbapenem resistant Klebsiella pneumoniae, third-generation cephalosporin-resistant Klebsiella pneumoniae, carbapenem-resistant Pseudomonas aeruginosa, and vancomycin-resistant Enterococcus facealis and Enterococcus faecium. Nearly a quarter of all infections are caused by resistant bacteria in the U.S. at present. Percentage of resistant bacteria is currently much higher in many other countries with a large proportion of the world's population; resistance is expected to grow in 2030 without intervention. If you look in China, it was about at the same level as in the U.S. in 2005, but now it's much higher- about 40%, and it will increase further. If you look at India, resistance proportions are now at 50%, and projected to increase further.

Health security is at stake!

Source: OECD. Stemming the Superbug Tide: Just a Few Dollars More (p. 92). (2018). Available at: https://www.oecd-ilibrary.org/docserver/9789264307599-en.pdf?expires=1546597697&id=id&accname=ocid195767&checksum=3DDA307F378357E85A08C17542ED65F2 (p. 92)

Global Action Plan's 5 Strategic Objectives

1. Improve awareness & understanding (WAAW 130 countries)
2. Strengthen knowledge through surveillance & research
3. Reduce the incidence of infection
4. Optimize the use of antimicrobial medicines
5. Ensure sustainable investment

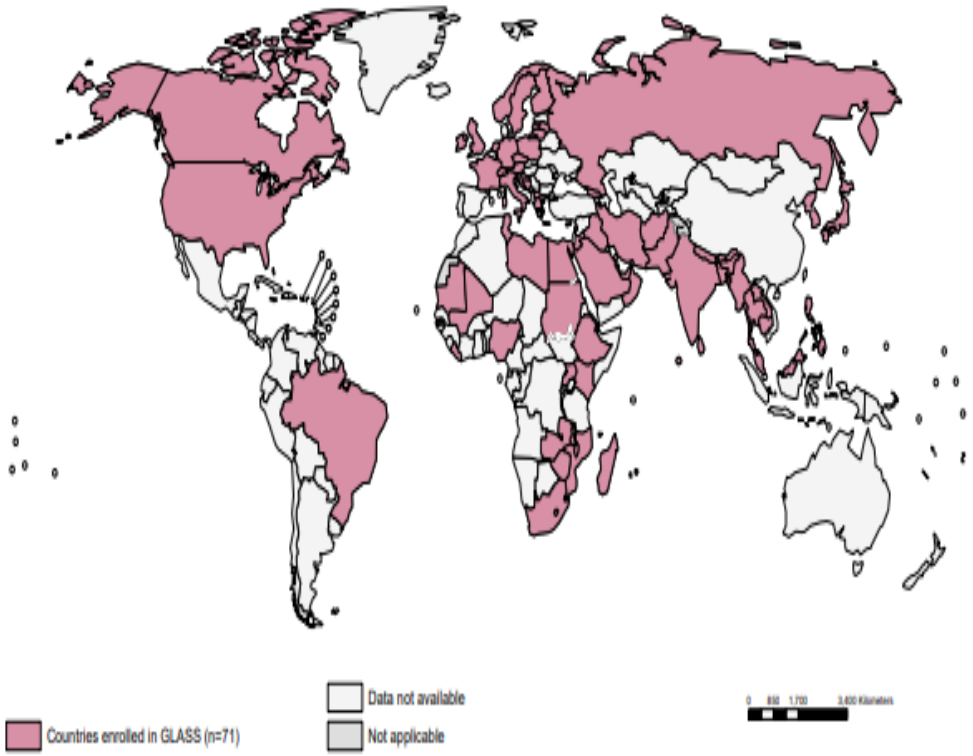
Base: Information for action (long & short term)

World Health Organization

Source: 130 countries from WAAW graphic: http://apps.who.int/world-antibiotic-awareness-week/activities/en#/grid-content

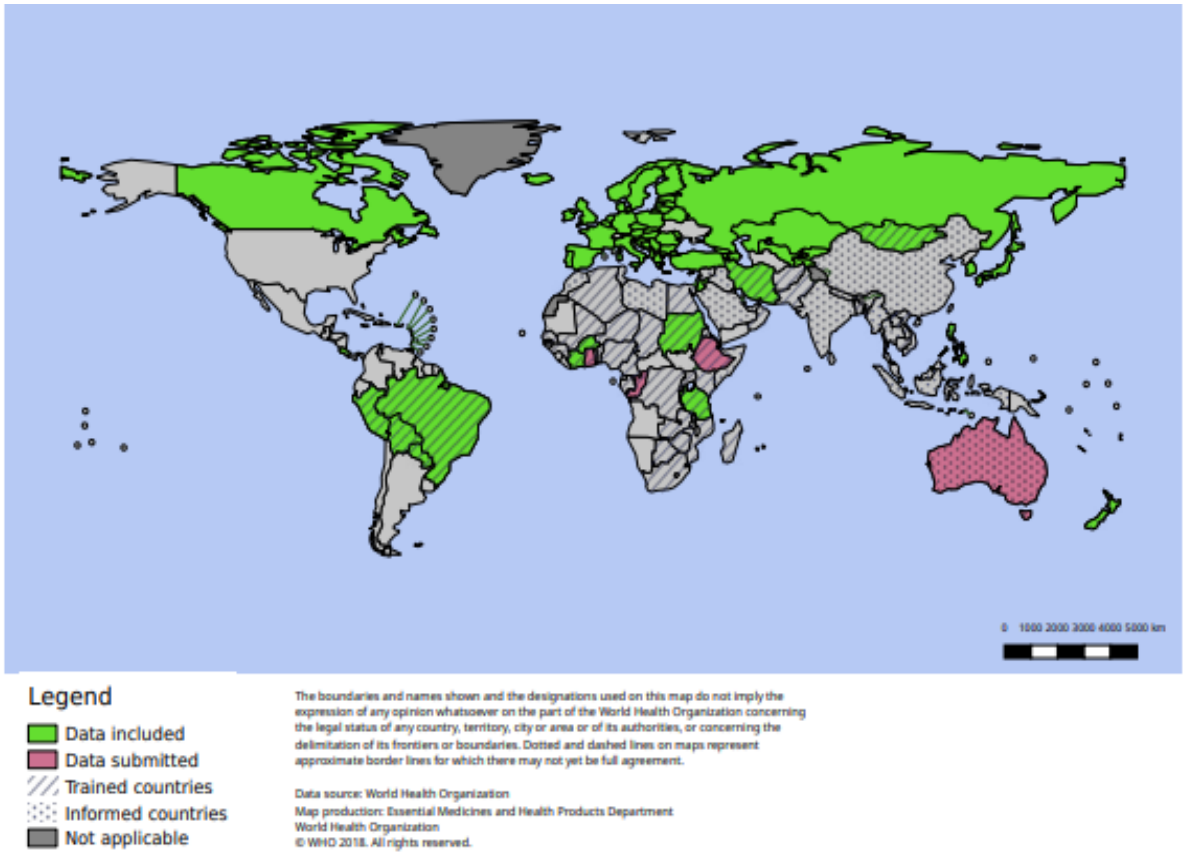
Information for Action: Bacteria & Antibiotics & HAI

GLASS



71 countries enrolled

Consumption Data



World Health Organization

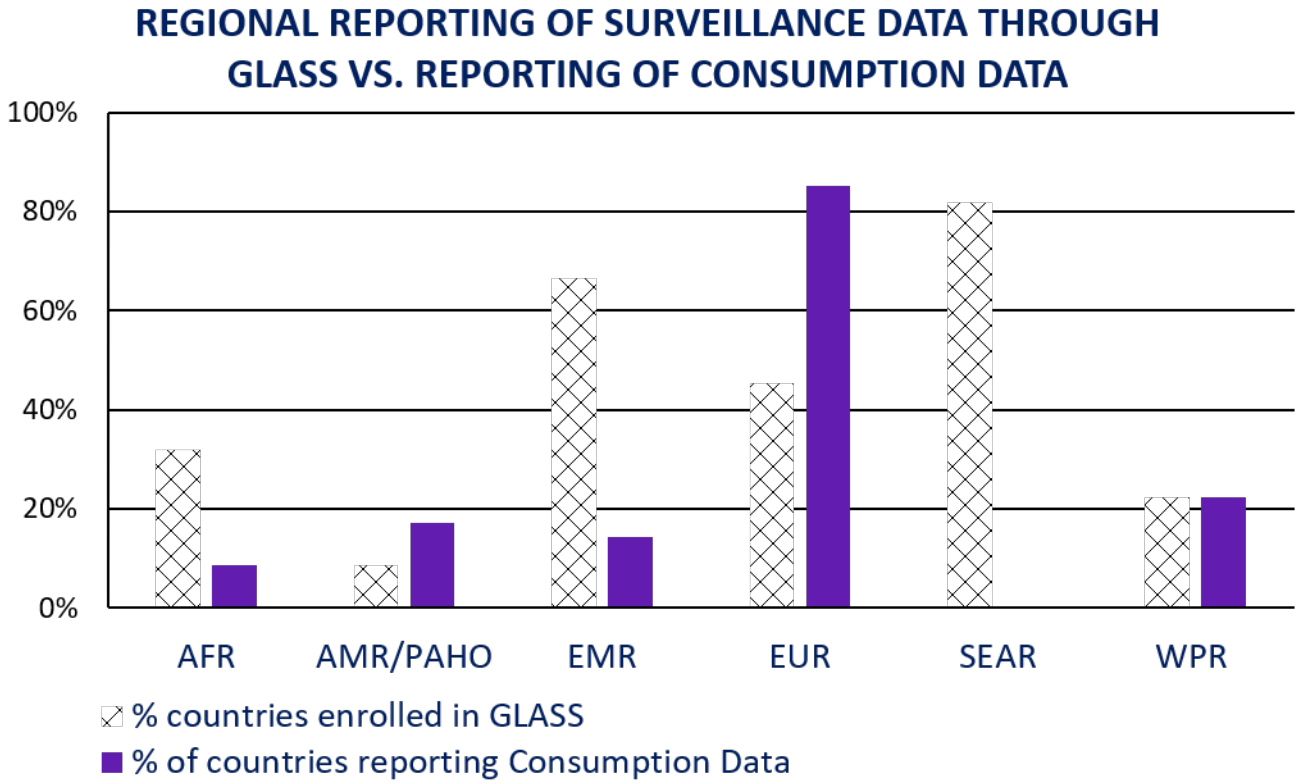
[Figure on the left] According to the recently published WHO Global Antimicrobial Resistance Surveillance System (GLASS) Report, there are 71 countries currently enrolled in GLASS. As per December 2018, this includes 15 countries in the African Region, 3 countries in the Region of the Americas, 14 countries in the Eastern Mediterranean Region, 24 countries in European Region, 9 countries in South-East Asian Region, and 6 countries in the Western Pacific Region.

Source: World Health Organization. (2019). Global Antimicrobial Resistance Surveillance System (GLASS) Report: Early implementation 2017-2018. Available at: https://apps.who.int/iris/bitstream/handle/10665/279656/9789241515061-eng.pdf?ua=1

[Figure on the right] The Consumption Data figure from the 2018 WHO Consumption Data Report shows the distribution of countries that took part in the initial phase of the WHO global programme on surveillance of antimicrobial consumption. The figure identifies countries by 4 groups: countries who have been informed of consumption surveillance, countries who have been trained on consumption surveillance, countries who submitted data on consumption surveillance, and countries that had their consumption data included in this report. Note that not all data submitted was included due to format, coverage or quality issues. There were 65 countries in total who had their data included in the report, including 4 in the African Region, 6 in the Region of the Americas, 46 in European Region, 3 in the Eastern Mediterranean Region and 6 in the Western Pacific Region.

Source: World Health Organization. (2018). WHO Report on Surveillance of Antibiotic Consumption. Available at: https://www.who.int/medicines/areas/rational_use/who-amr-amc-report-20181109.pdf?ua=1

A Long Way To Go



Note: 100% of countries in AMR/PAHO, EMR, and WPR **who are enrolled in GLASS have submitted data**; this figure is 93% in AFR, 92% in EUR, and 89% in SEARO

PROGRESS

REPORTED TO GLASS	2017	2018
Number of sites enrolled	729	6015
Number of patients with suspected infection	507,923	1,706,578

World Health Organization

[Figure on the left] This bar graph compares the percentage of countries enrolled in GLASS per region versus the percentage of countries reporting antimicrobial consumption data per region. Note that consumption data reporting has been independent of GLASS thus far, but a consumption module has been integrated in GLASS this year in an attempt to harmonize data. In the African Region, 32% of countries are enrolled in GLASS, and 9% of countries are reporting consumption data; in the Americas, 9% are enrolled in GLASS, and 17% are reporting consumption data; in the Eastern Mediterranean Region, 67% are enrolled in GLASS, and 14% are reporting consumption data; in the European Region, 45% are enrolled in GLASS, and 85% are reporting consumption data; in the South-East Asia Region, 82% are enrolled in GLASS, and 0% are reporting consumption data; and in the Western Pacific Region, 22% are enrolled in GLASS and 22% are reporting consumption data. The takeaway point is that, while there has been great progress made in surveillance, there is still a long way to go!

Source: WHO. (2019). Global Antimicrobial Surveillance System (GLASS) Report: Early implementation 2017-2018. Available at: https://apps.who.int/iris/bitstream/handle/10665/279656/9789241515061-eng.pdf?ua=1

Source: World Health Organization. (2018). WHO Report on Surveillance of Antibiotic Consumption. Available at: https://www.who.int/medicines/areas/rational_use/who-amr-amc-report-20181109.pdf?ua=1

[Figure on the right] This figure shows progress made in GLASS reporting from 2017 to 2018. In 2017, there were 729 sites participating in GLASS; this number increased to 6015 in 2018. In 2017, 507, 923 patients with suspected infection were reported to GLASS; in 2018, this number increased to 1,706,578 (a near 30% increase).

Source: WHO. (2019). Global Antimicrobial Surveillance System (GLASS) Report: Early implementation 2017-2018. Available at: https://apps.who.int/iris/bitstream/handle/10665/279656/9789241515061-eng.pdf?ua=1

Bacteria Surveillance: Use for Prescription, Guidelines & Policies

Requirements for system that captures AMR trends & emerging AMR

1. Continuous availability of quality clinical lab
   - Major challenge in low- and lower middle-income countries

2. Robust national reference labs with lab and epidemiological capacity

Needed:

Multisectoral AMR surveillance: humans, livestock production, and environment

Agree on and apply data sharing practices: **AMR surveillance data is a GLOBAL GOOD!**

Better understanding role of WGS

Good surveillance data can inform strategies, steer behavior change, improve patient outcome, improve health security with early alerts of emerging AMR, but for all this we need robust surveillance systems at global, national and local levels…

US plays a key role in global AMR surveillance, with technical and political leadership also in this field.

WHO GLASS has been developed with **strong support from US CDC** and targets to foster systems for capturing trends on AMR and AMC and emerging AMR

Sharing information on emerging AMR is critical for timely development of new therapeutic, diagnostic and prevention tools. It is an essential element of health security and tools such as JEE could be used/reinforced for this purpose. Although a global mechanism has been established by WHO (GLASS-EAR), yet the use of these structures for early reporting and discussion of emerging AMR for prompt control actions is very weak both at the national and global levels.

The national body coordinating AMR surveillance needs a robust NRL collecting and analyzing data and laying the foundation for surveillance.

Continuous availability of quality clinical lab

- Other challenges for national, and thereby global surveillance include procurement of quality laboratory consumables for AST and introducing routine internal and external quality assessment. For the latter, we've experienced quite some issues of getting EQA strains through customs and into countries. This will also be a major problem for GLASS globally. Through its channels and expertise, the US can provide valuable technical and financial support to WHO to meet these and other challenges related to global surveillance.

Diagnostic stewardship for better use of diagnostic tests

- Even when good lab infrastructure is in place, yet, the optimal application of these resources will be paramount not only for the individual patient outcome, but also for the quality of the information generated by surveillance.
- Diagnostic stewardship aims at increasing the flow of samples, building technical skills of laboratory personnel, improving feedback time and communication between microbiologists and clinicians (and increasing trust and respect between the two disciplines), supporting treatment decisions (incl de-escalation or switching to narrow-spectrum Abs), collecting and analyzing data and laying the foundation for surveillance. These activities can be linked to other efforts and thereby contribute directly or indirectly to antimicrobial stewardship, healthcare-associated infections monitoring (and IPC), and various types of behavior change.

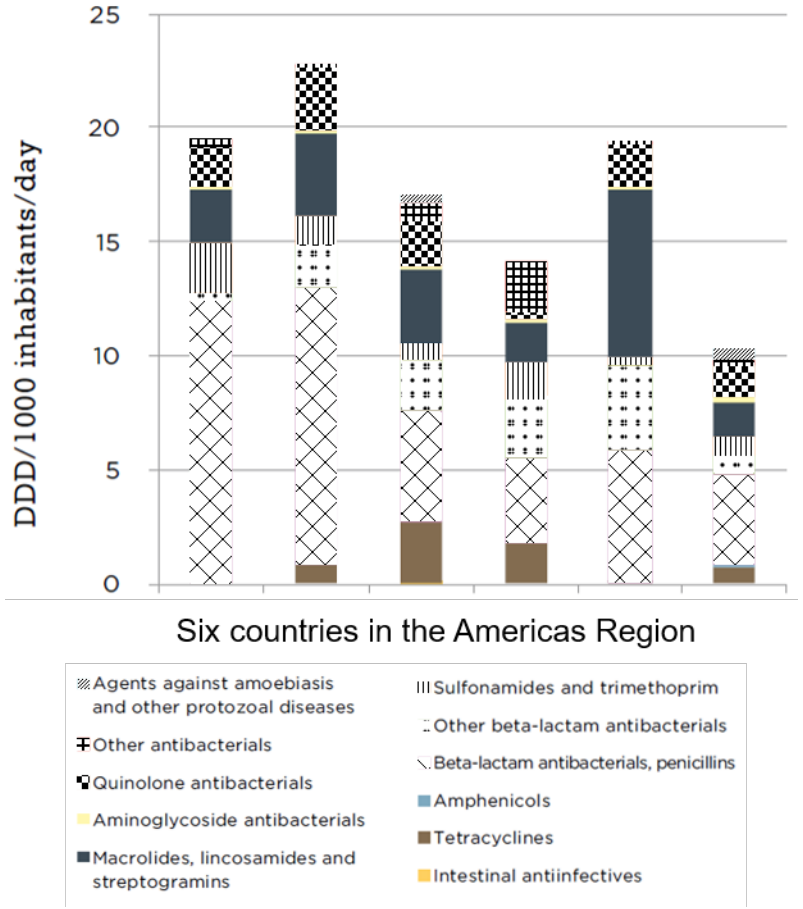
One Health: special emphasis to include the environmental aspects, so not only human, animal and agriculture. The recent CDC/UK report highlight data identifying the potential for the environment (e.g., soil and water) to be a source of antimicrobial-resistant germs that can affect human health.

Last but not least: data sharing is still an important bottleneck. Some countries do have AMR surveillance data but still hesitate in sharing them with international agencies, including governmental

agencies such as WHO. Global AMR surveillance data is needed for global health security. As much as important it is to support countries with limited resources to build capacities to generate and share AMR surveillance data, sharing existing data is also NEEDED.

AMR surveillance data should be seen as a GLOBAL GOOD to be promoted and supported by all!

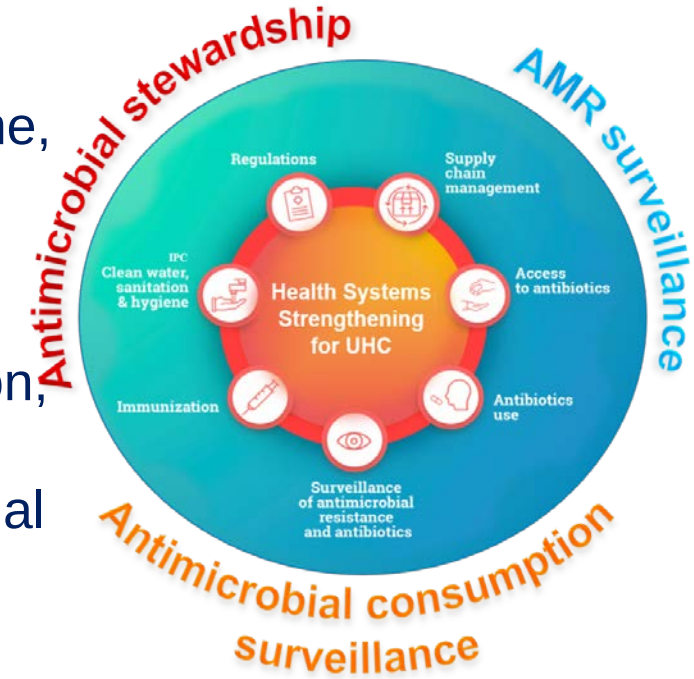
Antibiotic Consumption & AMR: Vital for Stewardship



Antimicrobial stewardship (AMS)

- *Actions to promote responsible use*
- Goal: improve patient care and outcome, and limit development and spread of AMR

- **National**: develop/strengthen legislation, regulation, guidelines
- **Hospital & community**: support optimal use of AB



Principle: start with first line AB

WHO's work on AMS: Training course & Toolkit for LMICs

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[Figure on the left] The bar graph shown here captures antibiotic consumption data for six countries in the Region of the Americas. Antibiotic consumption is classified by antibiotic class, and shown as a proportion of Defined Daily Doses per 1000 inhabits per day. Countries 1, 2, 4, 5 and 6 are showing data from 2016, while country 2 is showing data from 2015. Penicillins were the most frequently consumed antibiotic group across all countries.

Source: World Health Organization. (2018). WHO Report on Surveillance of Antibiotic Consumption. Available at: https://www.who.int/medicines/areas/rational_use/who-amr-amc-report-20181109.pdf?ua=1

[Figure on the right] AMS, AMR and AMC surveillance are integral to health systems strengthening to achieve UCH and ultimately to combat AMR.

Recent OECD report: Investment in a comprehensive public health package encompassing some of these measures (including Stewardship programmes) in OECD countries could pay for themselves within just one year and end up by saving USD 4.8 billion per year.

WHO EURO collaborated with Memorial Sloan Kettering Cancer Center and U Stanford School of Medicine to develop the Antimicrobial Stewardship: A Competency based approach" on OpenWHO, which to date has more than 17'000 learners from 174 countries representing all WHO regions enrolled. The University Stanford School of Medicine has recently been designated as a WHO CC on AMS working with WHO HQ, PAHO and EURO.

The draft toolkit was developed by HQ together with global AMS experts including from the US CDC and builds on various global AMS guidance documents including the 2018 CDC Core elements of antibiotic stewardship programs in resource-limited settings.

Feasibility studies on the draft toolkit are ongoing to inform the finalization of the toolkit to ensure it is practical and effective for LMIC settings.

Optimize the Use of Antimicrobial Medicines

AWaRe Categorization of Antibiotics

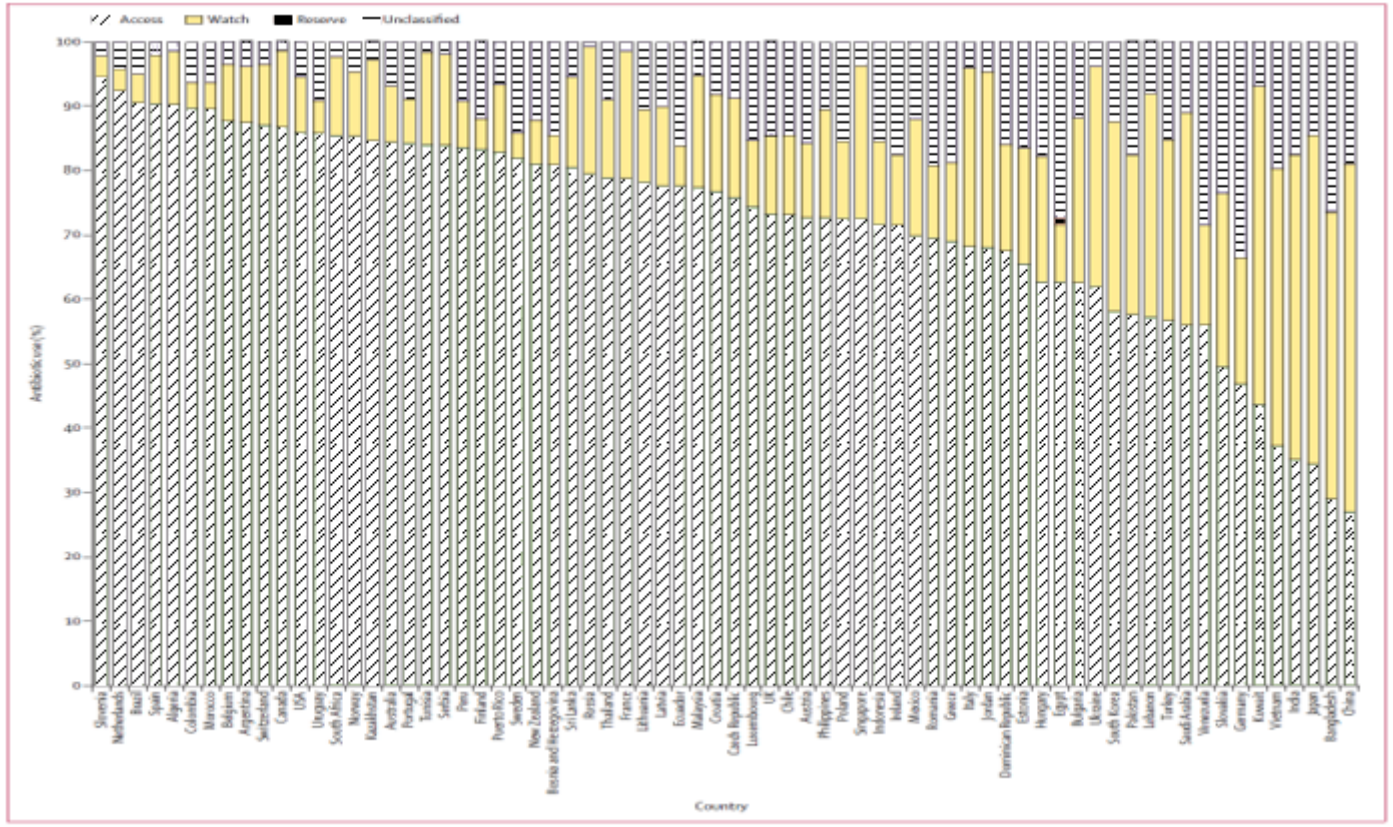

Figure 1: Percentage antibiotic use of child-appropriate oral formulations according to WHO AWaRe grouping
Only core Access antibiotics have been included in the Access group. AWaRe=Access, Watch, Reserve.

ACCESS Antibiotics that should be available at all times

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

RESERVE Antibiotics that are last-resort options

UNCLASSIFIED

World Health Organization

The 2017 WHO Model List of Essential Medicines for Children (EMLc) classifies antibiotics as Access, Watch, or Reserve, based on recommendations of their use as first-choice, second-choice and last resort options for common infections. The AWaRe Categorization of Antibiotics figure shows the proportion of Access, Watch and Reserve antibiotics used in 70 middle-income and high-income countries in 2015. Data was derived from wholesale figures of oral antibiotic formulations appropriate for use in young children.

Source: Hsia, Y., Sharland, M., Jackson, C., Wong, I., Magrini, N., Bielicki, J. (2018). Consumption of oral antibiotic formulations for young children according to the WHO Access, Watch, Reserve (AWaRe) antibiotic groups: an analysis of sales data from 70 middle-income and high-income countries. *The Lancet, 19(1*), p. 67-75. doi: https://doi.org/10.1016/S1473-3099(18)30547-4

Key: Reduce Spread of Infections and AMR

Infection Prevention and Control is important to:

1. **Promptly detect clusters and outbreaks**
2. **Evaluate the impact of IPC measures as an indicator of quality of care**

Health Care Facilities

- 58% of countries have an IPC program and national IPC Guidelines
- Only 15% are able to monitor and report compliance with standards
- The USA national HAI & AMR surveillance system (NHSN) is an exemplar model
- However, 40% of health facilities in LMICs have no source of water

Community

- **WASH in schools**
  - 23% have no sanitation, 19% have no drinking water, 36% have no access to handwashing
- **WASH in households**
  - 61% of the world population does NOT have access to safe sanitation

*Source: World-Health Organization Country Self-Assessment Survey (reporting period: Nov 2017-May 2018)

**Source: World Health Organization and UNICEF. (2015). Water, sanitation and hygiene in healthcare Facilities: Status in low- and middle-income countries and way forward. Retrieved from: http://apps.who.int/iris/bitstream/handle/10665/154588/9789241508476_eng.pdf;jsessionid=EC0DE6C7C6EA6E1D8C6A43DBA8E347E5?sequence=1

Tricycle project, producing data on proportions of ESBL-E. coli among E. coli in water (as marker of fecal-water-orally transmitted AMR) and selected antibiotics. The environment arms are especially important in countries without infrastructure (neither current nor near future) for case-based AMR surveillance, or for antibiotic sales and use data (very rough estimates only), but will most probably also underline the need for increased implementation of WASH as means to combat AMR.

As of now, 6 countries participate in the pilot, and the environment part being reported as the least troublesome to execute. Another 14 countries plan to join.

US Support for GLOBAL AMR fight is Pivotal

Support needed from US for setting up:

1. Surveillance infrastructure (GLASS) & monitoring antimicrobial use in LMICs
2. Appropriate use (stewardship) of antibiotics programmes
3. WASH & IPC training, expertise & capacity
4. Good animal husbandry, veterinary and environmental surveillance systems (One Health / Tripartite)

Strengthen both health security and health system (UHC) agenda!