



# Access to antibiotics

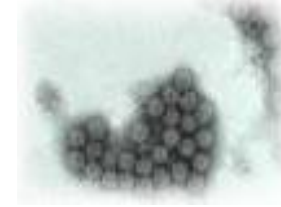
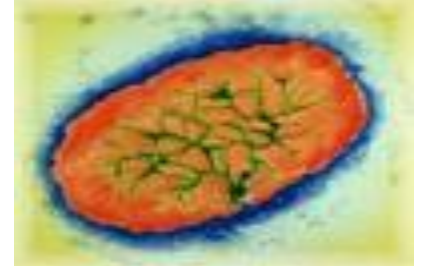
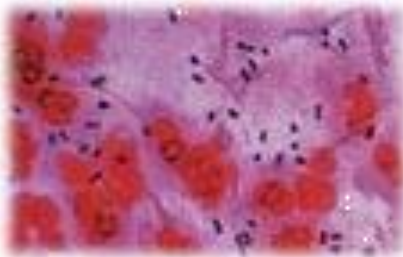
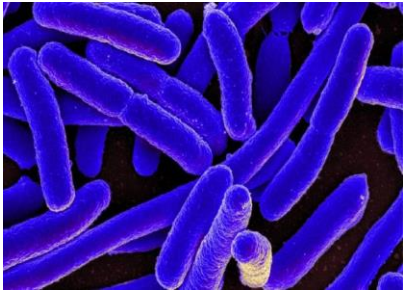
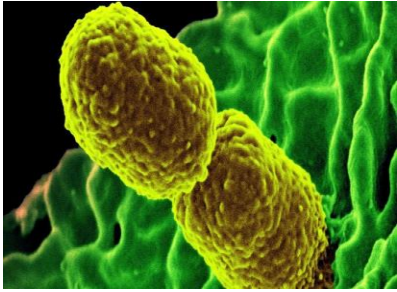
12<sup>th</sup> June 2024

Andrew Farlow

University of Oxford,  
Senior Research Fellow

Centre for  
Tropical Medicine and Global Health  
Nuffield Department of Medicine

(some slides removed before public posting)



# Penicillin developed in Oxford, saved tens of millions of lives...



From the OxSciBlog Archives... [2008-2013]

OXFORD NEWS BLOG

Home > News >

## Penicillin: the Oxford story

SHARE THIS

Jonathan Wood | 16 Jul 2010



When [Howard Florey](#) came to Oxford in 1935 as the newly appointed Professor of Pathology, he arrived to state of the art but largely empty labs in the new [Sir William Dunn School](#).

Antimicrobial drugs have added about 20 years to life expectancy...

# But...

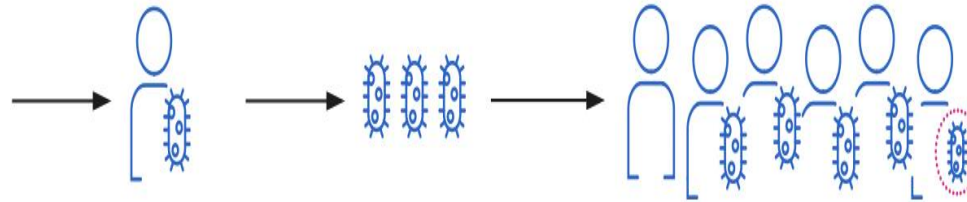
The image shows a screenshot of a Financial Times article. At the top, the Financial Times logo is visible. Below it, a navigation bar includes links for HOME, WORLD, UK, COMPANIES, TECH, MARKETS, CLIMATE, OPINION, WORK & CAREERS, LIFE & ARTS, and HTSI. A red banner below the navigation bar reads "Special Report FT Health: Future of Antibiotics". The article title is "Antibiotic resistance raises prospect of untreatable gonorrhoea". Below the title, there is a sub-headline: "Just one drug remains effective for the sexually transmitted disease but soon the bacteria may be able to evade it". The main image of the article shows a vial of Ceftriaxone in a metal tray, set against a background of purple and blue microscopic images of bacteria. On the left side of the article, there are social media sharing icons for X, Facebook, LinkedIn, and a Save icon.

- Gonorrhoea the second most common bacterial STI in the UK
  - over 82,000 cases reported in 2022
  - 50.3% (54,961) increase on 2021
  - Might become untreatable in the future due to the rapid rise of AMR
- Not just common STIs already resistant to antibiotics.
- 92% of bacteria that cause urinary tract infections (UTIs) are resistant to at least one common antibiotic; 80% are resistant to two

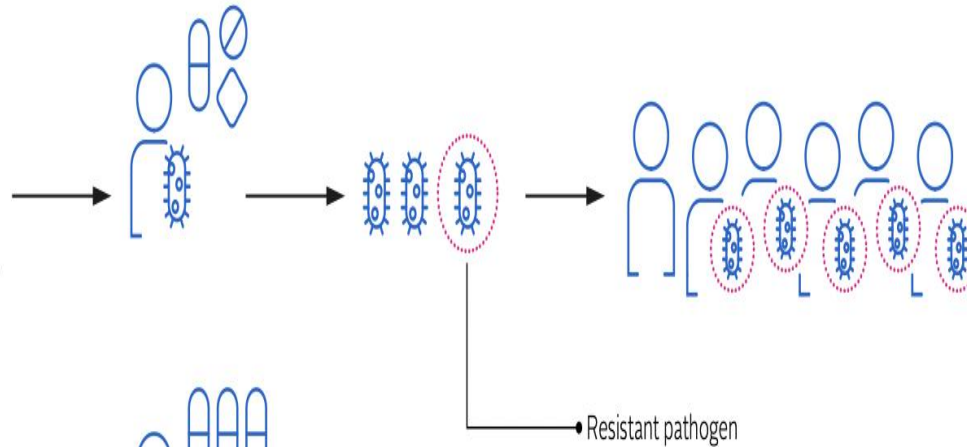
**#NotInOurLifetime**

# No or inappropriate access leads to AMR

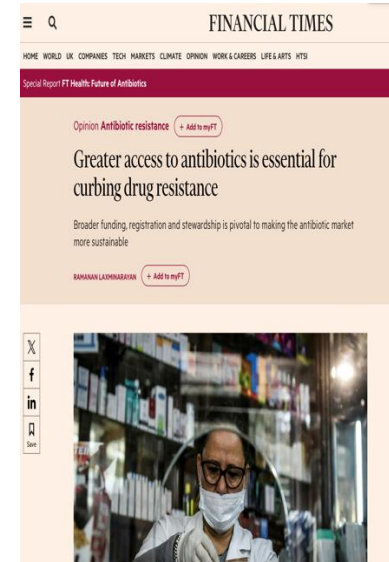
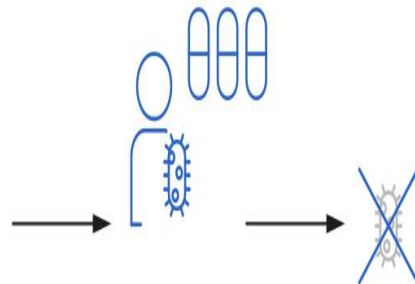
1. **No access to antibiotics:** the infection can spread unchecked among a population and may develop resistance due to natural selection, despite the absence of antibiotics.



2. **Lack of access to the right antibiotic:** the wrong antibiotic kills only some susceptible pathogens and allows for pathogens with resistant genes to survive and spread unchecked. This is the highest driver of resistance.



3. **Access to the right antibiotic:** the right antibiotic is the most likely to cure the infection and stop further spread of AMR.



# WHO AWaRe Strategy for antibiotic stewardship



**Access**

- which indicates the antibiotic of choice for each of the 25 most common infections. These antibiotics should be available at all times, affordable and quality-assured



**Watch**

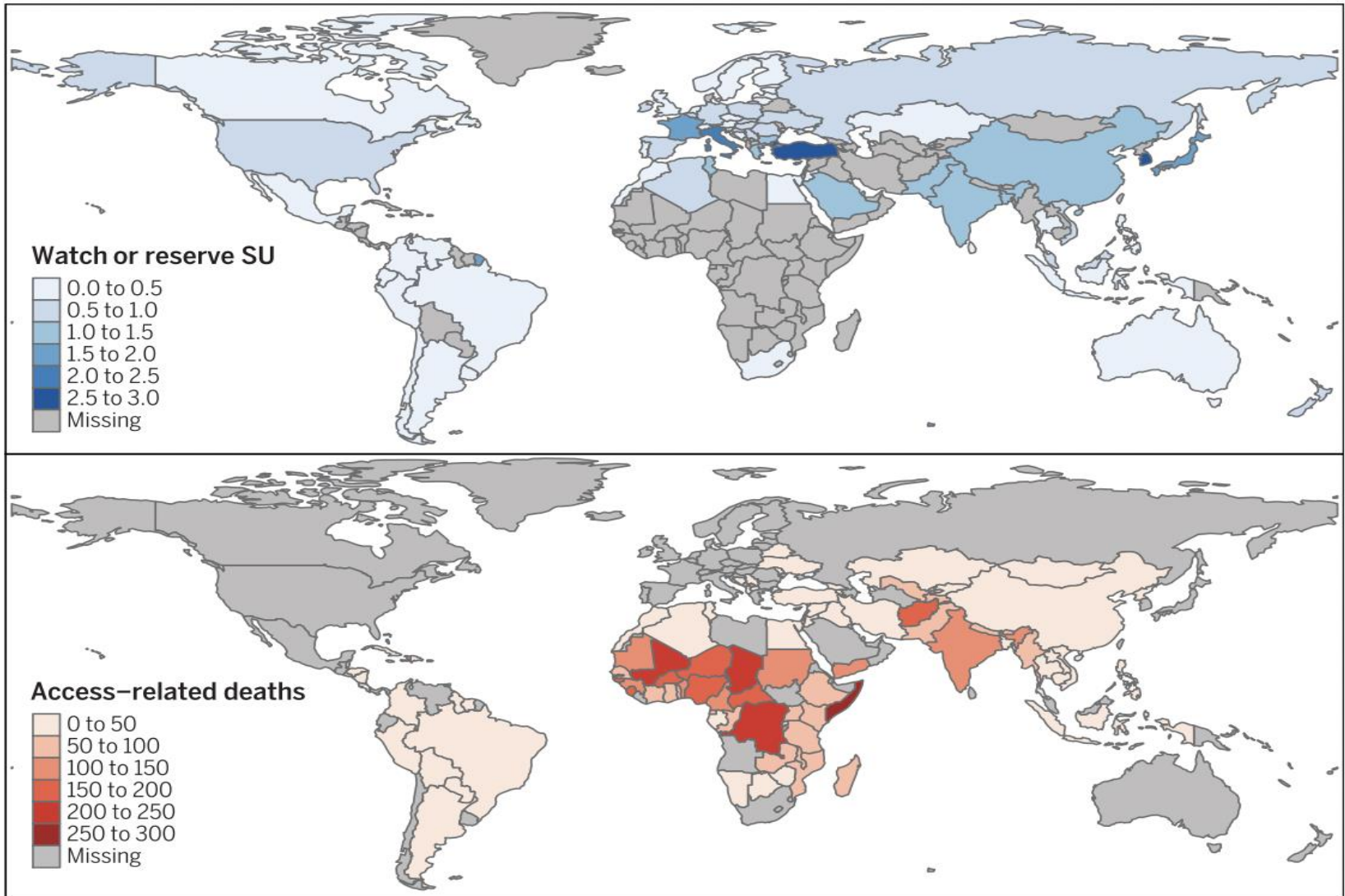
which includes most of the “highest-priority critically important antimicrobials” for human medicine and veterinary use. These antibiotics are recommended only for specific, limited indications



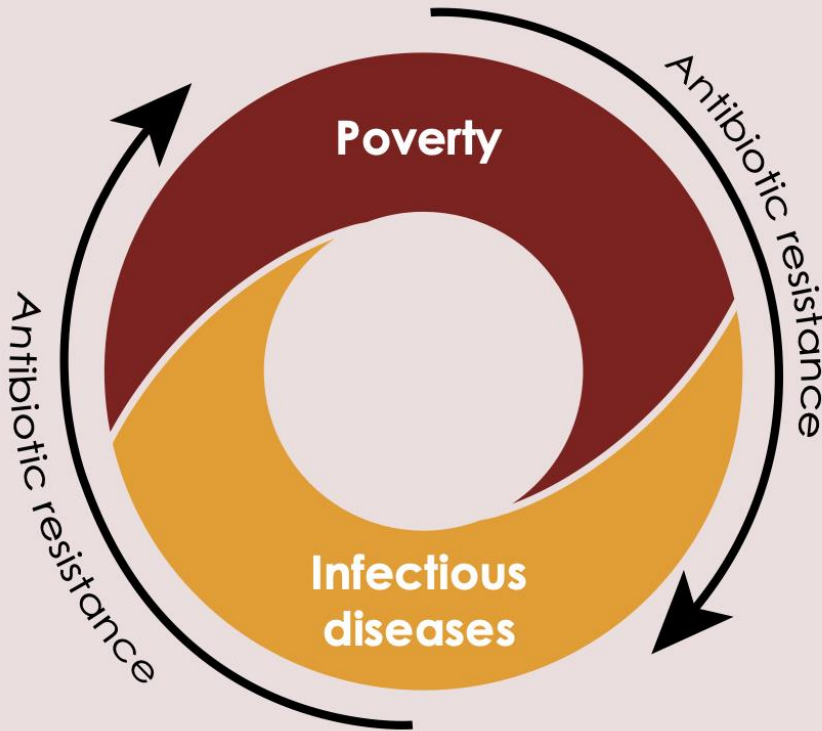
**Reserve**

antibiotics that should only be used as a last resort when all other antibiotics have failed

# Overuse in some places while lack of access in other places



# Vicious circle



People living in poverty are more prone to infectious diseases

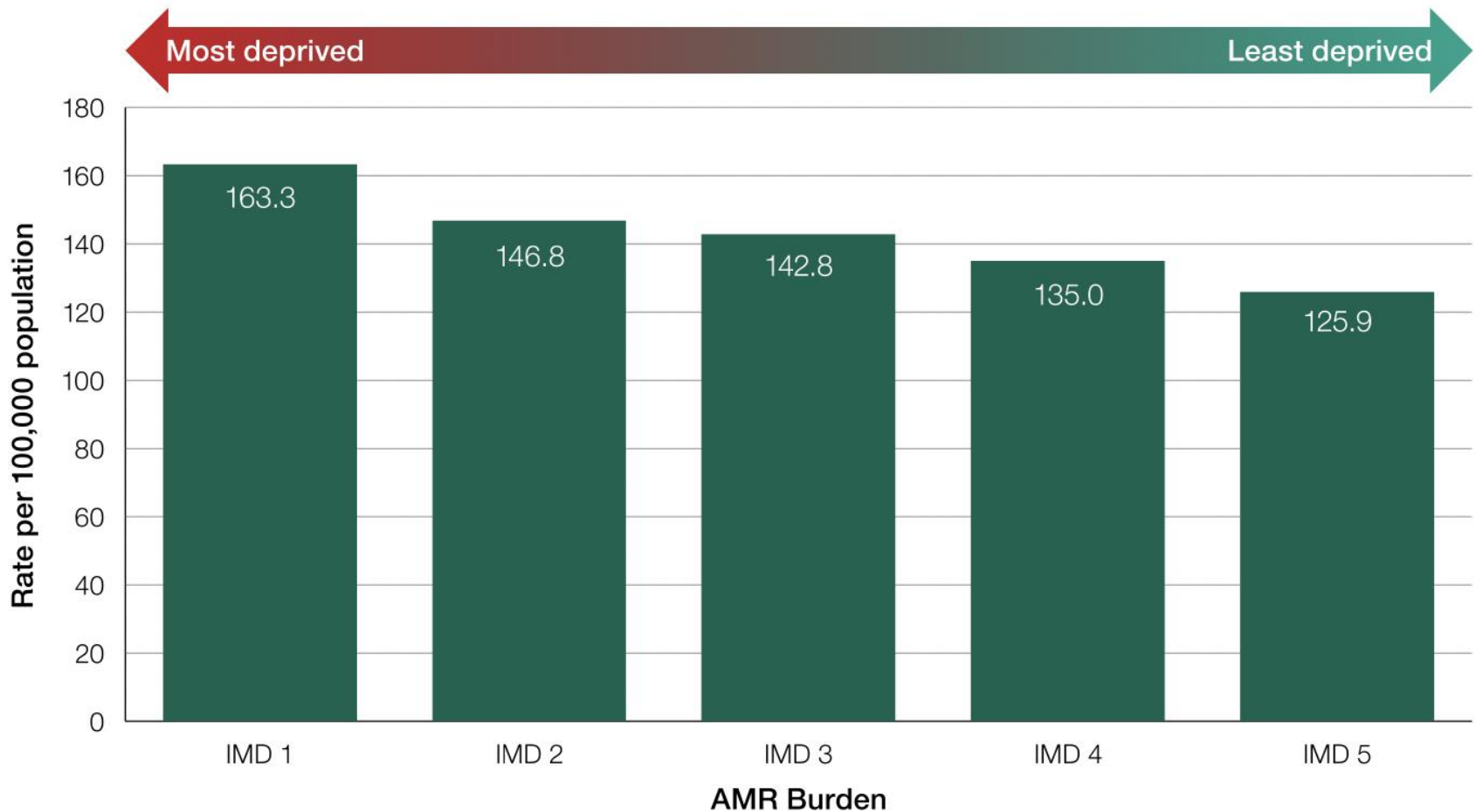
Circumstances of poverty increase the spread of antibiotic resistance

The cost of having an infectious disease drives people into poverty

Antibiotic resistance significantly increases cost of treatment driving people into poverty or making treatment inaccessible



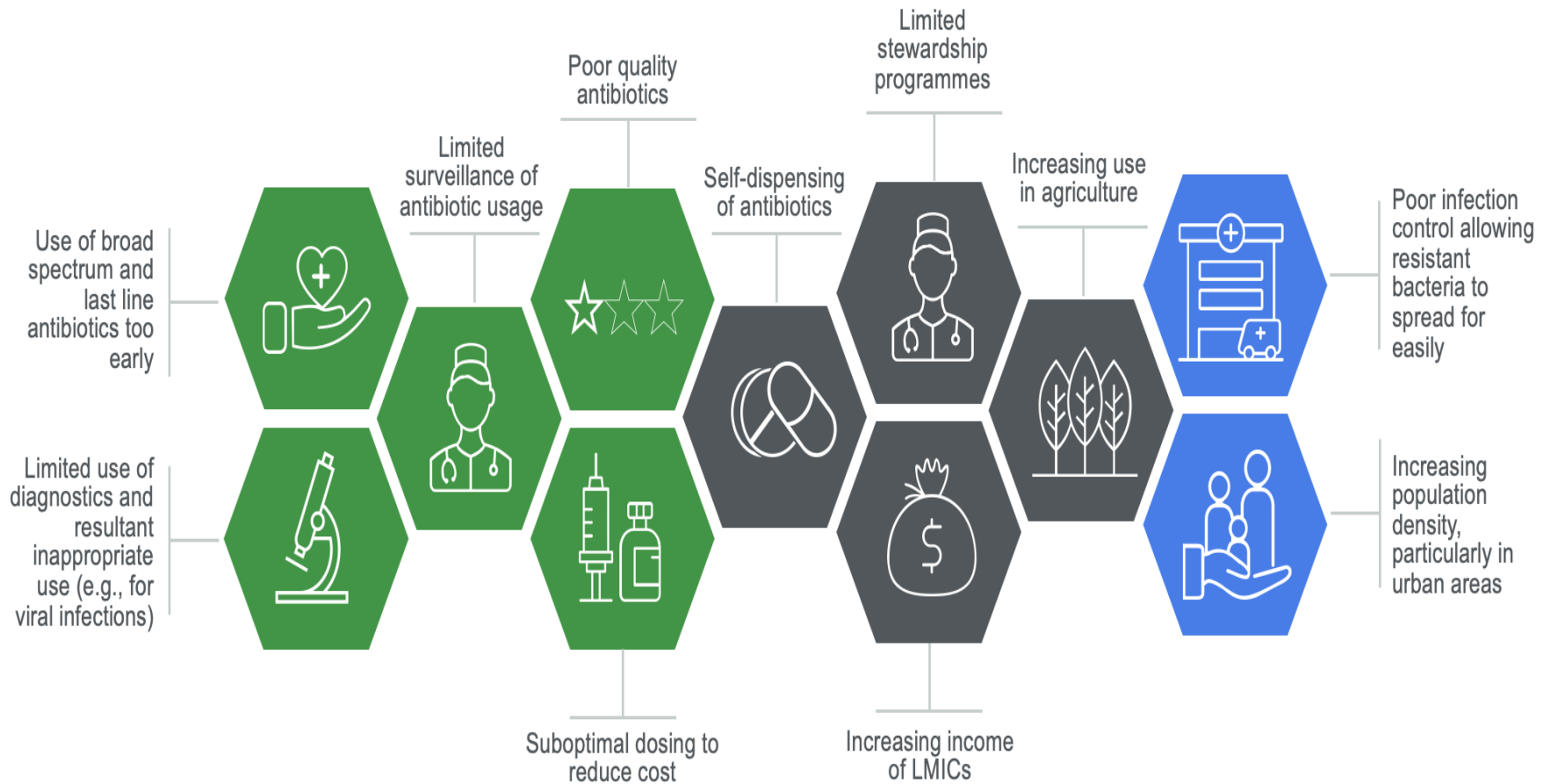
# AMR burden from bloodstream infections by deprivation in UK



IMD = Indices of Multiple Deprivation



# Key drivers of resistance



Antibiotic misuse



Antibiotic overuse



Increased infection spread

# Need to balance access, innovation, stewardship



Hoffman S, Outterson K. JLME (2015)

# Supply-Side Access Solutions

- Product Development Partnerships
- Prize funds
- Longer patent lives of new classes of antimicrobial drugs
- New procurement models (Netflix fee to use, insurance, etc.)
- International agreement (like WHO Framework Convention on Tobacco Control) to control use of antimicrobials, including:
  - technical and financial assistance to poor and low-income countries to balance access to essential drugs with action to curb resistance;
  - Monitoring emergence of drug-resistant microbes;
  - systems to ensure compliance with the agreement

# Demand-Side Access Solutions

- Alternative treatment options (where possible)
- Increase immunity (health and non-health ways)
- Education of health professionals and patients:
  - Most patients think antibacterial drugs are effective against common cold and influenza, and demand them when they have viral infection. Doctors oblige.
- Infection control measures (e.g., hand washing, screening and isolation)
  - 2-10 million bacteria between our fingertips and our elbows
  - Few people wash their hands long enough to kill off all infectious bugs after going to the toilet.



Better  
hygiene



Access to  
clean water  
and sanitation



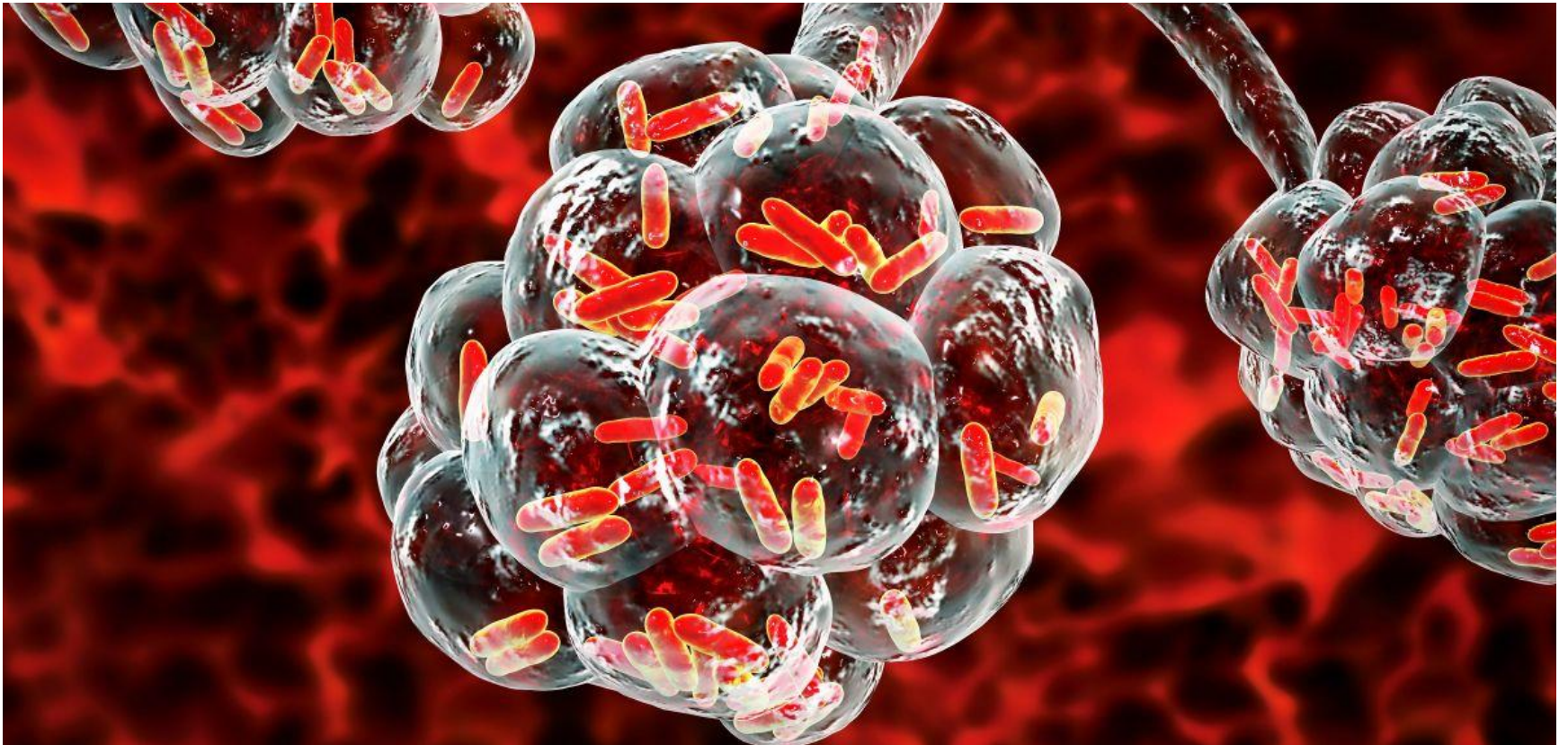
Infection control  
in healthcare  
facilities



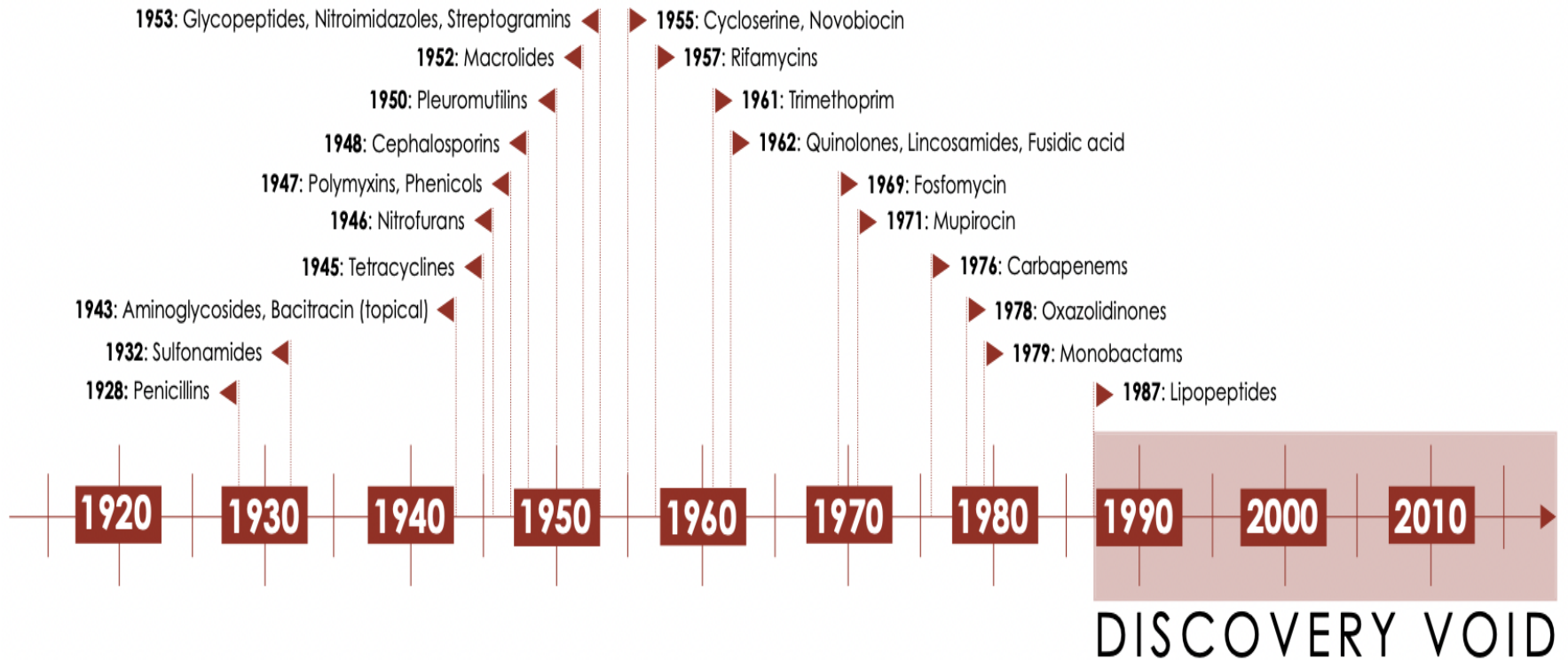
Vaccination

- Policies of stewardship and regulations

# Need to develop new effective vaccines, medicines, and treatments



# Discovery void



- No new class of antibacterial drug developed since 1987
- Any new class of drugs will be restricted to prevent resistance, reducing R&D returns
- Higher returns from chronic diseases, such as diabetes (longer use of drugs)

# New antibiotics do not go to those who need them



## PLOS ONE

OPEN ACCESS PEER-REVIEWED  
RESEARCH ARTICLE

### Introduction and geographic availability of new antibiotics approved between 1999 and 2014

Cecilia Källberg, Christine Årdal, Hege Salvesen Blix, Eili Klein, Elena M. Martinez, Morten Lindbæk, Kevin Outterson, John-Arne Rettingen, Ramanan Laxminarayan

Published: October 16, 2018 • <https://doi.org/10.1371/journal.pone.0205166>

Article	Authors	Metrics	Comments	Media Coverage
---------	---------	---------	----------	----------------

#### Abstract

Introduction  
Material and methods  
Results  
Discussion  
Conclusion

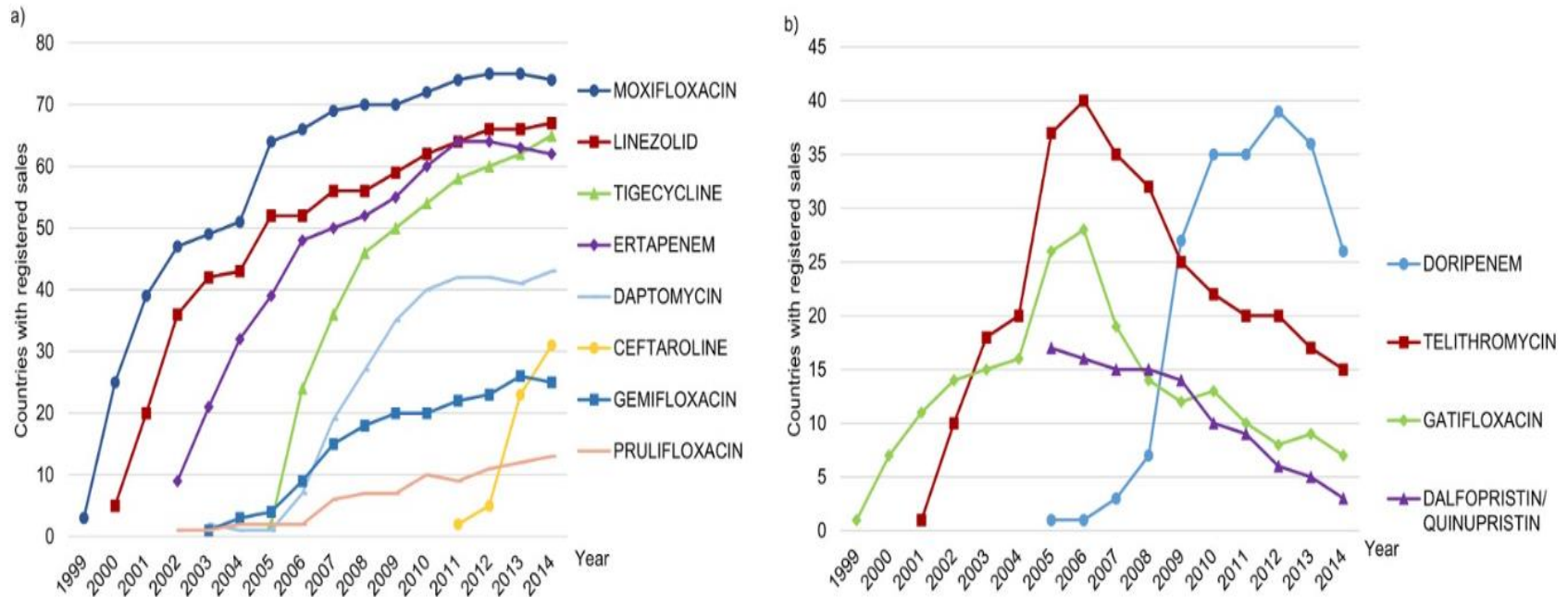
#### Abstract

##### Background

Despite the urgent need for new, effective antibiotics, few antibiotics of value have entered the market during the past decades. Therefore, incentives have been developed to stimulate antibiotic R&D. For these incentives to be effective, geographic availability for recently approved antibiotics needs to be better understood. In this study, we analyze geographic availability and market introduction of antibiotics approved between 1999 and 2014.

- Nearly 40 per cent of new antibiotics launched between 1999 and 2014 were registered for sale in fewer than 10 countries.
- In 185 countries the drugs were not made available.
  - Undermines immediate health needs
  - Harms long-term effort to curb drug-resistant infections

# Of 25 NCEs, only 12 had registered sales in more than 10 countries



**Fig 1. Number of countries with registered sales of the NCEs reaching more than 10 countries.** (a) The 8 NCEs experiencing a continuous increase in number of countries with registered sales per year. (b) The 4 NCEs experiencing an increase followed by a decrease in number of countries with registered sales per year.

<https://doi.org/10.1371/journal.pone.0205166.g001>



# Heavily skewed by income class of country

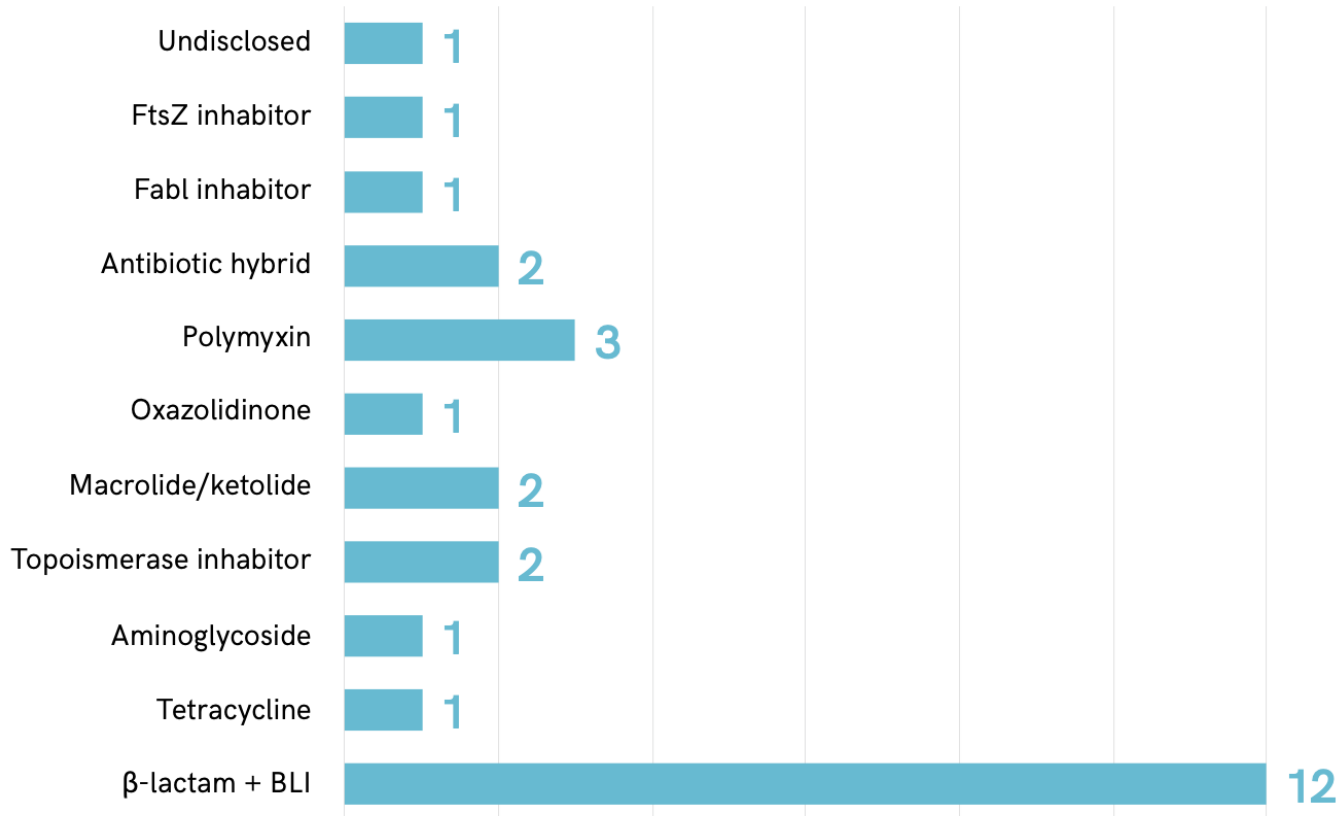
Table 2. Spread of NCEs between country income classes.

NCE	Year of MA	Year after first MA	High Income Countries	Upper Middle Income Countries	Lower Middle Income Countries	Countries with registered sales	Total number of countries with registered sales	Span	Code
MOXIFLOXACIN	1999	3	67%	26%	5%	39	75	0-10	
		5	65%	29%	4%	49		11-20	
		10	59%	27%	13%	70		21-30	
LINEZOLID	2000	3	81%	17%	3%	36	70	31-40	
		5	72%	23%	5%	43		41-50	
		10	58%	27%	14%	59		51-60	
ERTAPENEM	2002	3	63%	31%	3%	32	65	61-70	
		5	65%	29%	4%	48		71-80	
		10	53%	33%	13%	64		81-90	
TIGECYCLINE	2005	3	69%	25%	6%	36	65	91-100	
		5	64%	26%	8%	50			
		10	55%	29%	14%	65			
DAPTOMYCIN	2003	3	100%	0%	0%	1	47		
		5	95%	5%	0%	19			
		10	62%	29%	10%	42			
DORIPENEM	2005	3	100%	0%	0%	3	44		
		5	70%	22%	7%	27			
		10	50%	27%	19%	26			
TELITHROMYCIN	2001	3	72%	28%	0%	18	43		
		5	61%	34%	3%	38			
		10	82%	14%	0%	22			
CEFTAROLINE	2010	3	78%	17%	4%	23	31		
		5	45%	45%	9%	11	30		
		10	47%	40%	13%	15			
GATIFLOXACIN	1999	3	21%	29%	43%	14			
		5	75%	25%	0%	4	28		
		10	40%	40%	20%	15			
GEMIFLOXACIN	2003	3	35%	30%	35%	23			
		5	100%	0%	0%	15	21		
		10	100%	0%	0%	3			
DALFOPRISTIN/ QUINUPRISTIN	1999	3	100%	0%	0%	15	21		
		5	100%	0%	0%	14			
		10	100%	0%	0%	3			
PRULIFLOXACIN	2002	3	100%	0%	0%	2	14		
		5	100%	0%	0%	2			
		10	67%	22%	11%	9			

Table 3. Spread of NCEs between geographic regions.

NCE	Year of MA	Year after first MA	East Asia & Pacific	Europe & Central Asia	MENA	North America	Latin America & Caribbean	South Asia	Sub-Saharan Africa	Countries with registered sales	Total number of countries with registered sales
MOXIFLOXACIN	1999	3	21%	41%	8%	5%	23%	0%	3%	39	75
		5	20%	43%	8%	4%	22%	0%	2%	49	
		10	19%	44%	10%	3%	17%	4%	3%	70	
LINEZOLID	2000	3	22%	50%	0%	6%	17%	3%	3%	36	70
		5	23%	51%	0%	5%	16%	2%	2%	43	
		10	22%	46%	2%	3%	19%	7%	2%	59	
ERTAPENEM	2002	3	25%	38%	0%	6%	28%	0%	3%	32	65
		5	23%	46%	2%	4%	23%	0%	2%	48	
		10	19%	48%	6%	3%	19%	3%	2%	64	
TIGECYCLINE	2005	3	19%	44%	6%	6%	22%	3%	0%	36	65
		5	20%	46%	4%	4%	20%	4%	2%	50	
		10	20%	46%	8%	3%	17%	5%	2%	65	
DAPTOMYCIN	2003	3	0%	0%	0%	100%	0%	0%	0%	1	47
		5	0%	84%	0%	5%	11%	0%	0%	19	
		10	26%	52%	0%	5%	14%	2%	0%	42	
DORIPENEM	2005	3	33%	0%	0%	33%	33%	0%	0%	3	44
		5	26%	59%	0%	4%	7%	4%	0%	27	
		10	35%	38%	0%	4%	15%	4%	4%	26	
TELITHROMYCIN	2001	3	6%	61%	17%	0%	11%	0%	6%	18	43
		5	11%	39%	13%	5%	29%	0%	3%	38	
		10	5%	68%	0%	9%	9%	0%	9%	22	
CEFTAROLINE	2010	3	17%	74%	0%	4%	4%	0%	0%	23	31
GATIFLOXACIN	1999	3	36%	0%	0%	18%	36%	0%	9%	11	30
		5	47%	0%	0%	13%	27%	7%	7%	15	
		10	36%	7%	7%	7%	21%	21%	0%	14	
GEMIFLOXACIN	2003	3	25%	0%	0%	25%	25%	0%	25%	4	28
		5	20%	7%	20%	13%	20%	13%	7%	15	
		10	13%	13%	35%	4%	17%	13%	4%	23	
DALFOPRISTIN/ QUINUPRISTIN	1999	3	20%	60%	0%	13%	7%	0%	0%	15	21
		5	21%	64%	0%	7%	7%	0%	0%	14	
		10	33%	33%	0%	33%	0%	0%	0%	3	
PRULIFLOXACIN	2002	3	50%	50%	0%	0%	0%	0%	0%	2	14
		5	50%	50%	0%	0%	0%	0%	0%	2	
		10	33%	56%	0%	0%	0%	11%	0%	9	

# Antibiotics in the clinical pipeline targeting WHO priority pathogens still insufficient against priority pathogens



BLI:  $\beta$ -lactamase inhibitor; FabI: enoyl-acyl carrier protein reductase; FtsZ: filamenting temperature-sensitive Z; WHO: World Health Organization.

# Diversity of non-traditional approaches

18%

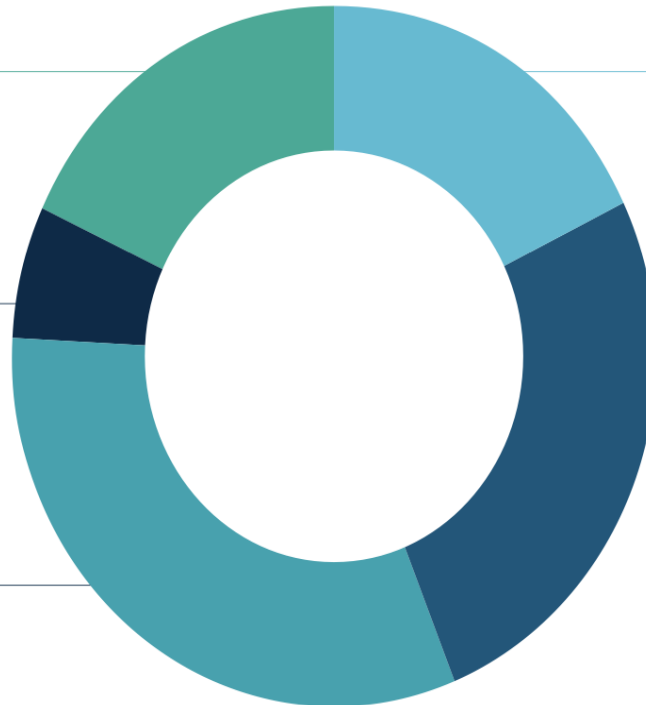
Miscellaneous, 6

6%

Immuno-  
modulating agents, 2

32%

Microbiome-  
modulating agents, 11



18%

Antibodies, 6

26%

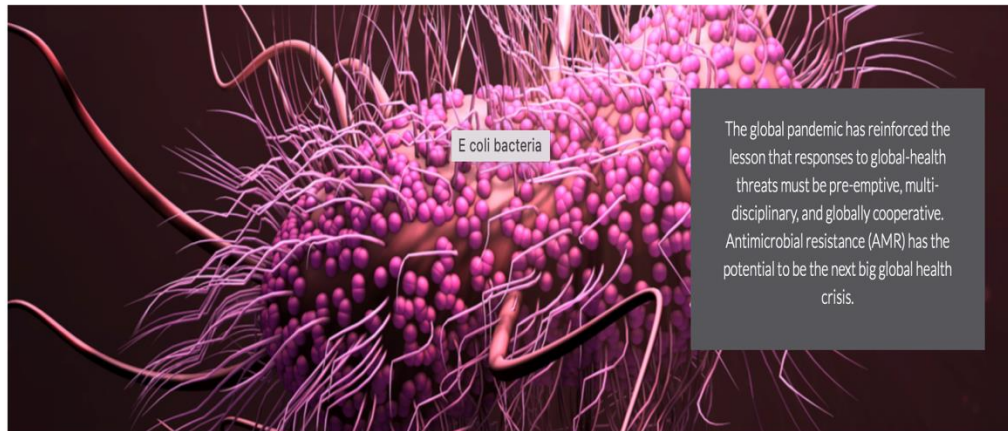
Bacteriophage and  
phage-derived enzymes, 9



**BUT: over 90% ( $n = 30$ ) of the non-traditional agents are pathogen-specific, most of which target *S. aureus* ( $n = 7$ ) and *C. difficile* ( $n = 12$ ). This **selectivity** confirms a trend also observed in the preclinical space and **requires significant diagnostic availability for optimal use, often not available** outside of specialized health-care facilities in **low-resource settings****

# Some recent AMR activities (including access)

Antimicrobial resistance



### FT AMR Tracker

This FT dashboard tracks responses to the growing threat of antimicrobial resistance.



### How can we coordinate efforts to solve global health problems

Antimicrobial resistance (AMR) is a major global health threat and tackling it an extremely high priority. Our interim report explores how this group can work together to create a safe, friendly, space for collaboration, learning and maximising impact.



### The state of AMR data

Despite global efforts to tackle AMR, governments and policymakers must do more to tackle the looming threats of AMR, particularly in translating policy to action.



GLOBAL HEALTH STRATEGY GROUP FOR  
ANTIMICROBIAL RESISTANCE

## AMR IN THE COMMUNITY WORKSHOP



Save The Date

**Wed, 16 March, 2022**

10.00 - 13.00 CET (9.00 - 12.00 GMT) | Online Meet

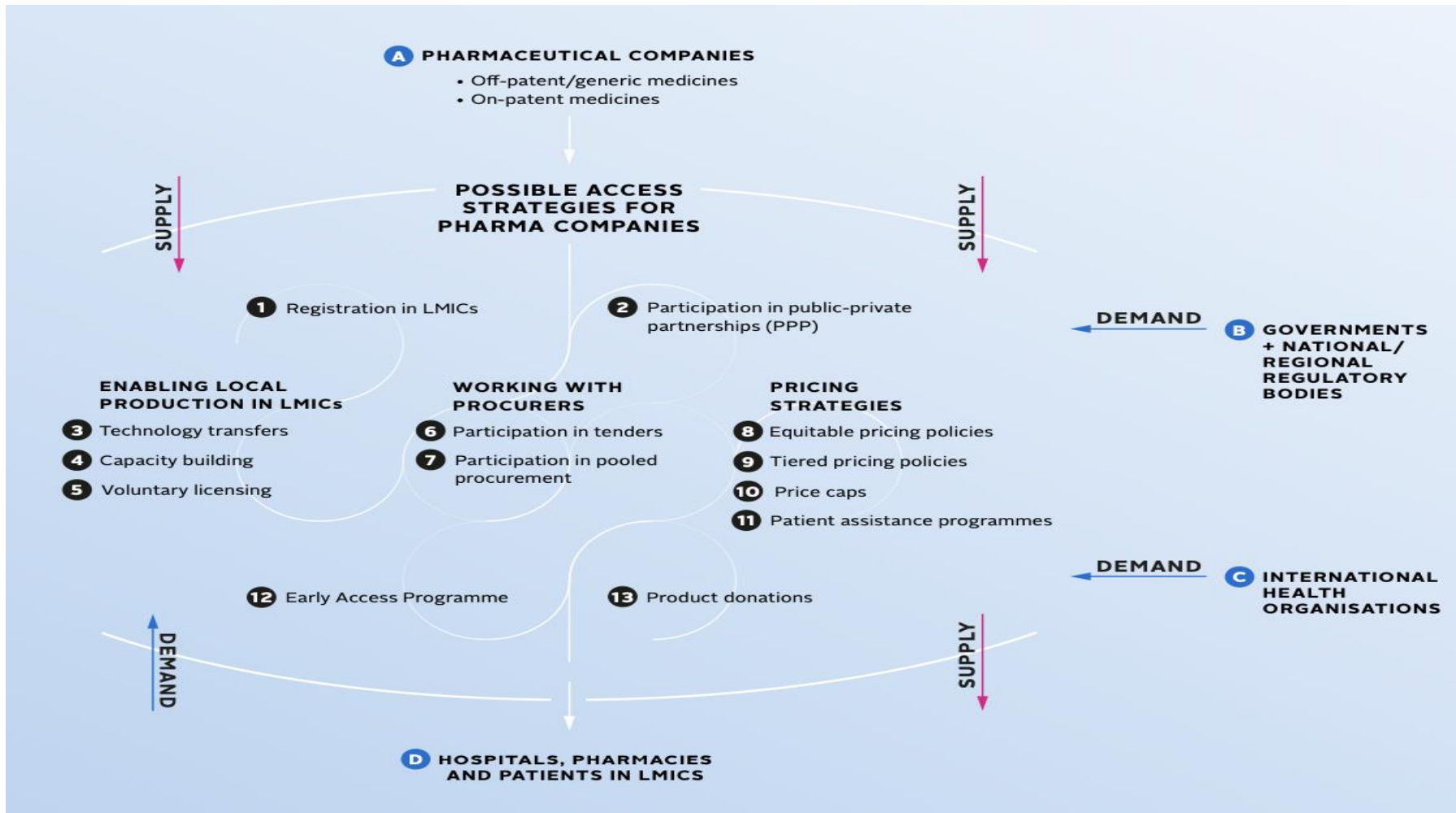
JOIN US

ZOOM LINK: <https://itu.zoom.us/j/92745514230>

Organised jointly by the Global Health Strategy Group for Antimicrobial Resistance, an initiative of the University of Oxford, and the Working Group for Collaborations and Outreach of the ITU-WHO Focus Group for AI for Health in partnership with:



# Toolkit of access strategies



# Access Thinking

(especially with Fred  
McElwee, Jean-Christophe  
Spiliotis-Saquet, and  
Humayra Bashir)

2024 report

## SECURE INTERIM REPORT

- 4: SECURE Pricing and Payment models** .....36
  - 4.1: Introduction** .....36
  - 4.2: Optimal usage of antimicrobials**.....38
  - 4.3: Tiered Pricing** .....39
  - 4.4: Overview of payment options** .....40
  - 4.5: Subscription approach: de-linking volumes and payment** .....46
    - Some questions for subscription models applied to LMICs and especially LICs50
    - Subscription payments and stewardship downstream in the health system .....52
  - 4.6: Pricing Considerations**.....55
    - Downstream pricing issues .....55
    - Factors influencing optimal unit price .....57
    - Pricing, Supply Chains, Stock-Outs, and Availability.....62
  - 4.7: Overall Country Antibiotic Payment Model Recommendation**.....63
  - 4.8: Some broader design issues**.....67
    - Tiered country pricing in the face of highly variable country pricing .....67
    - Impact on rest of SECURE portfolio or global antibiotic portfolio of subscription-fee based products .....68
    - Informational demands of delinked and subscription models in LMICs .....69
  - 4.9: Subscription models for diagnostics**.....69
  - 4.10: Designing contracts between SECURE and licensors** .....71
    - Providing incentives for the patentholder .....72
    - A (self-)sustainable business model for the SECURE intermediary as procurer.73
    - Effectiveness of the composition of the procurer’s portfolio.....75
    - Implications of a pooled volume guarantee.....75
    - Can a global procurement mechanism promote antimicrobial R&D? .....77
  - 4.11: What do companies really want anyway?**.....79
  - 4.12: References:**.....80

# Testing, treatment, and stewardship

		Africa				LATAM				MEA			Europe		
		ZA	KE	EG	NG	MX	BR	CO	GT	PA	IN	JO	PK	GE	RS
ASP	<b>Presence of an active ASP plan</b> <i>(Widespread implementation / moderate level implementation / in writing)</i>	Dark Blue	Light Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Light Blue	Light Blue	Light Blue
	<b>Presence of treatment guidelines</b> <i>(National level / local or hospital level implementation of international guidelines / no guidelines)</i>	Dark Blue	Light Blue	Light Blue	Dark Blue	Light Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Light Blue	Light Blue	Dark Blue
Treatment guidelines	<b>Compliance to guidelines</b> <i>(Full compliance across hospitals / moderate compliance / low or no compliance)</i>	Light Blue	Light Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Dark Blue
	<b>Level of diagnostic and sensitivity testing performed</b> <i>(Widespread testing in most hospitals / moderate level of testing / no testing)</i>	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Light Blue
Testing	<b>Testing resources available</b> <i>(Automated testing widely available / mainly manual testing available / no testing in any hospitals)</i>	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue



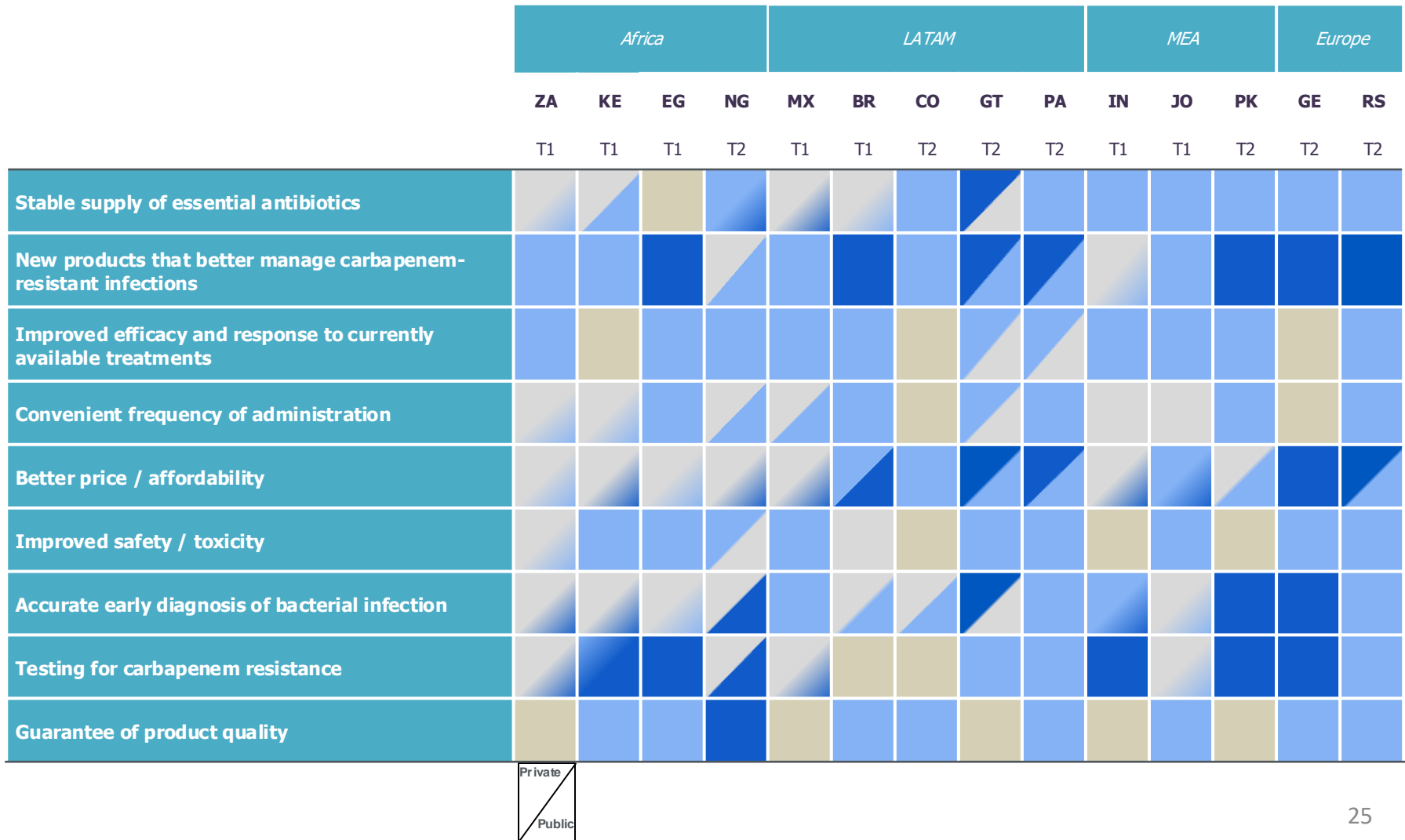
# Testing, treatment, and stewardship

		Africa				LATAM					MEA			Europe	
		ZA	KE	EG	NG	MX	BR	CO	GT	PA	IN	JO	PK	GE	RS
ASPs	<b>Presence of an active ASP plan</b> <i>(Widespread implementation / moderate level implementation / in writing)</i>	Dark Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Light Blue	Dark Blue	Dark Blue
	<b>Presence of treatment guidelines</b> <i>(National level / local or hospital level implementation of international guidelines / no guidelines)</i>	Dark Blue	Dark Blue	Light Blue	Dark Blue	Light Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Light Blue	Light Blue	Dark Blue
Treatment guidelines	<b>Compliance to guidelines</b> <i>(Full compliance across hospitals / moderate compliance / low or no compliance)</i>	Dark Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Light Blue
	<b>Level of diagnostic and sensitivity testing performed</b> <i>(Widespread testing in most hospitals / moderate level of testing / no testing)</i>	Dark Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Dark Blue	Light Blue	Light Blue	Light Blue	Light Blue
Testing	<b>Testing resources available</b> <i>(Automated testing widely available / mainly manual testing available / no testing in any hospitals)</i>	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
		Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue

Others  
Tertiary



# Unmet needs: Public v Private Sector



# Not short of groups engaged

## What are we short of?

### MANUFACTURING<sup>1</sup>

Research-based pharmaceutical companies



Generic medicine manufacturers



### ADVOCACY & AWARENESS



### PROCUREMENT<sup>2</sup>



### POLICY



Animal, agriculture & food



### RESEARCH & DEVELOPMENT



### FUNDING



### SURVEILLANCE



# Alternative thinking?

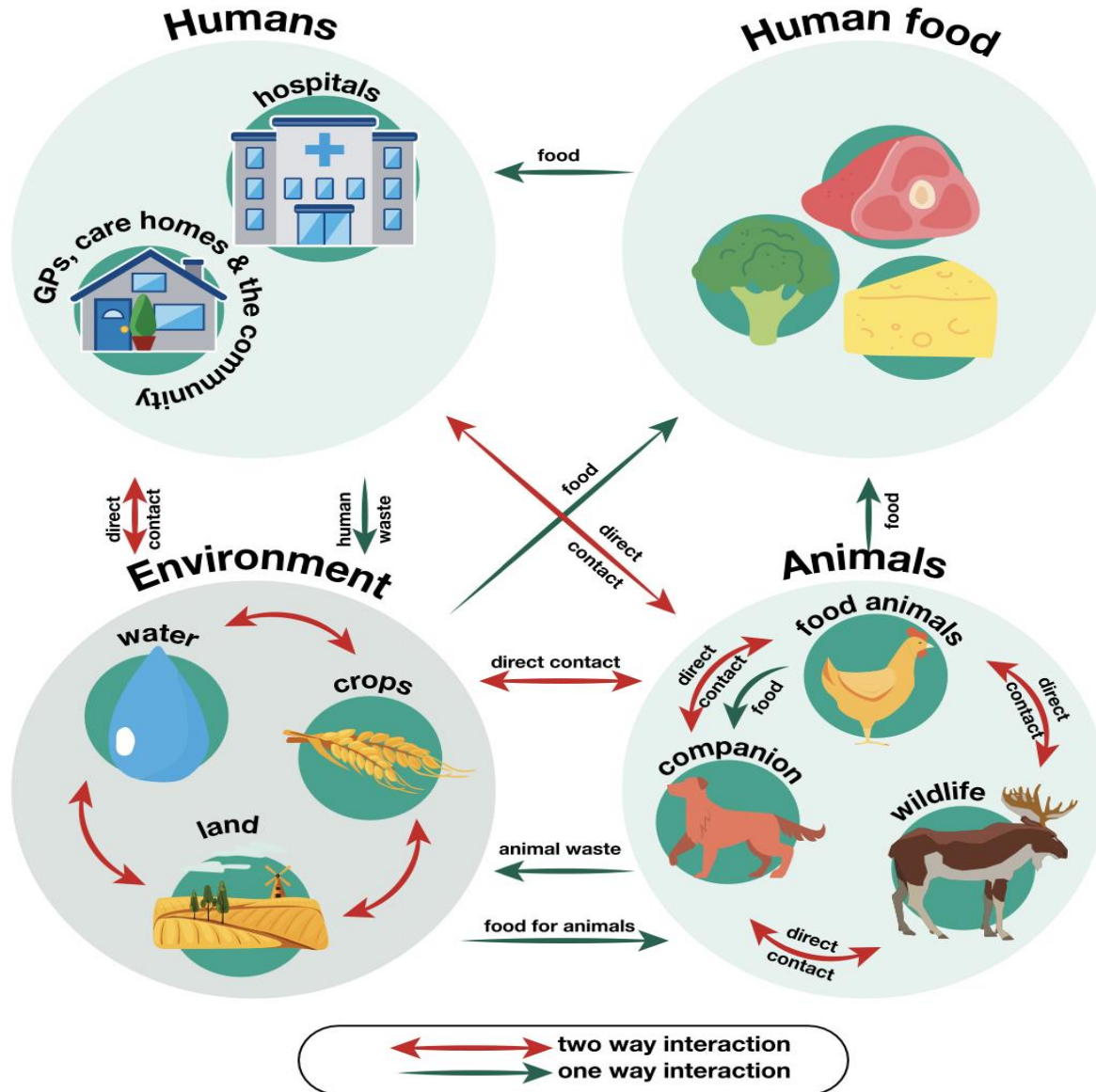
Final Report of a Scoping and Brainstorming Exercise to explore:

Possible core components of SECURE based on economics principles

Andrew Farlow  
University of Oxford  
September 2023

<b>Introduction .....</b>	<b>3</b>
<b>1. SECURE's antibiotics contracts with firms .....</b>	<b>4</b>
<b>2. SECURE's antibiotics contracts with countries .....</b>	<b>8</b>
<b>3. SECURE's country antibiotics pricing framework .....</b>	<b>11</b>
<b>4. Rules for countries and firms joining SECURE and rules for their behaviour to protect SECURE.....</b>	<b>15</b>
<b>5. SECURE's product-flow and financial-flow balance sheet: liquidity and mismatches .....</b>	<b>17</b>
<b>6. SECURE's antibiotics product-flow cushions and antibiotics stockpiles .....</b>	<b>19</b>
<b>7. SECURE's financial-flow cushions and liquidity .....</b>	<b>25</b>
<b>8. SECURE's product-flow and financial-flow insurance and the role of a Financer of Last Rest (FLR) .....</b>	<b>28</b>
<b>9. Using SECURE's diversification to reduce firm and country risks</b>	<b>34</b>
<b>10. SECURE's forecast and market intelligence functions .....</b>	<b>36</b>
<b>11. Pooling antibiotics, economies of scale, competition, and affordability .....</b>	<b>39</b>
<b>12. SECURE's antibiotics access-supporting investments .....</b>	<b>43</b>

# One Health



# Evolving UK/Germany/Africa Food and AMR network

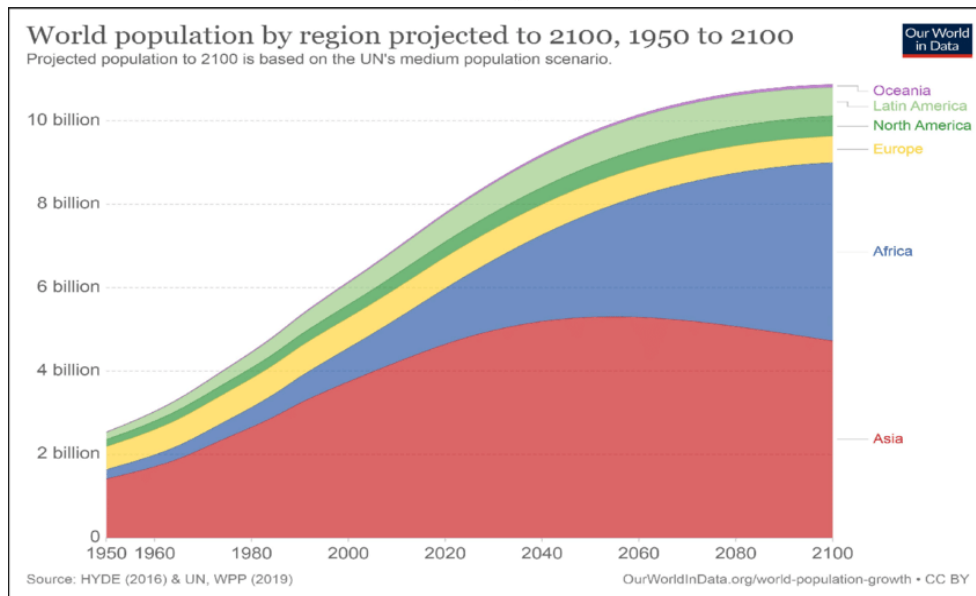
(especially with Sam Shepard, Harriet Bartlett, Chioma Achi, Humayra Bashir)

## Food Systems and Antimicrobial Resistance:

**Making food systems more robust  
to reduce AMR risk globally**

Thursday 27<sup>th</sup> and Friday 28<sup>th</sup> June 2024

Max Liebermann Haus, Berlin and online



- Global population growth.
- Life-style aspirations lead to greater meat consumption and pressure on farmers to deliver low-cost animal protein even if AMR risk.
- Global meat production grew 45% between 2000 and 2020.
- Many food production systems rely on antimicrobials as a less costly substitute for infection prevention.
- AMR risk.
- Green-house gas and climate change risks too.

# Volumes of antimicrobial use in food producing animals



**Fig 2. Antimicrobial consumption per country in 2020 and 2030.** Circles are proportional to quantity of antimicrobials used. Red circles correspond to the quantity used in 2020, and outer dark red ring corresponds to the projected increase in consumption in 2030. Country boundaries were obtained from GADM ([https://gadm.org/download\\_world40.html](https://gadm.org/download_world40.html)).

## Global trends in antimicrobial use in food-producing animals: 2020 to 2030

Ranya Mulchandani<sup>1</sup>, Yu Wang<sup>1</sup>, Marius Gilbert<sup>2</sup>, Thomas P. Van Boeckel<sup>1,4\*</sup>

<sup>1</sup> Health Geography and Policy Group, ETH Zürich, Zurich, Switzerland, <sup>2</sup> Spatial Epidemiology Lab, Université Libre de Bruxelles, Brussels, Belgium, <sup>3</sup> Fonds National de la Recherche Scientifique, Brussels, Belgium, <sup>4</sup> Center for Diseases Dynamics, Economics, and Policy, New Delhi, India

- By volume, the largest contributor to antimicrobial consumption.
- About 70-75% of all antimicrobials worldwide.
- 99,502 tonnes (95% CI 68,535–198,052) in 2020.
- Based on current trends, increase 8.0% to 107,472 tonnes (95% CI: 75,927–202,661) by 2030.
- Hotspots overwhelmingly in Asia (67%).
- <1% were in Africa.



# Hotspots of veterinary antimicrobial consumption

PLOS GLOBAL PUBLIC HEALTH

Global trends in antimicrobial use in animals in 2020 and 2030

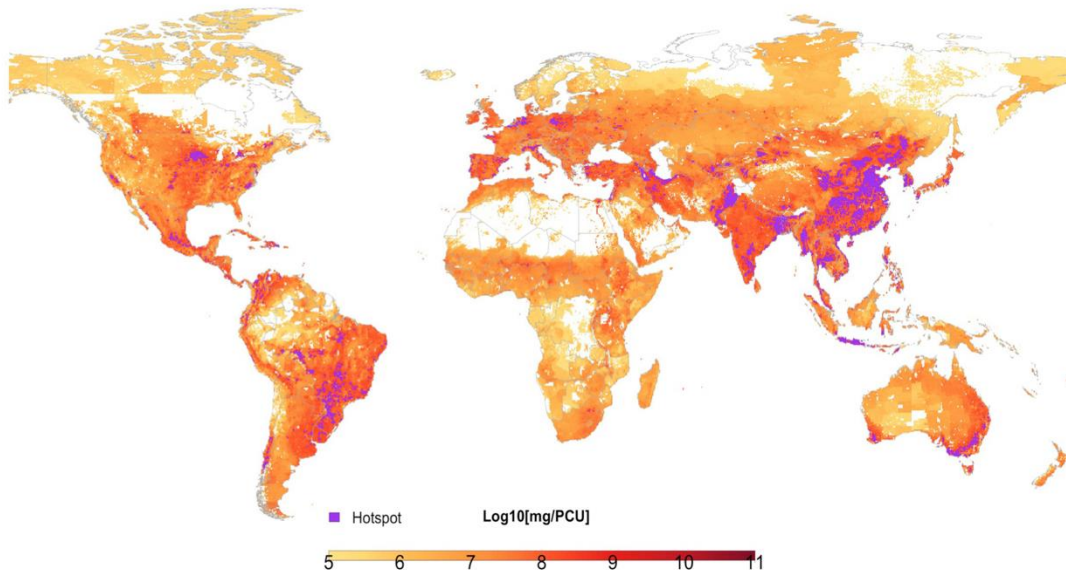


Fig 3. Global distribution of veterinary antimicrobial consumption at 10 x 10 kilometers resolution expressed in milligrams per biomass (population correction units). Purple indicates hotspot areas (top 95% percentile). Country boundaries were obtained from GADM ([https://gadm.org/download\\_world40.html](https://gadm.org/download_world40.html)).

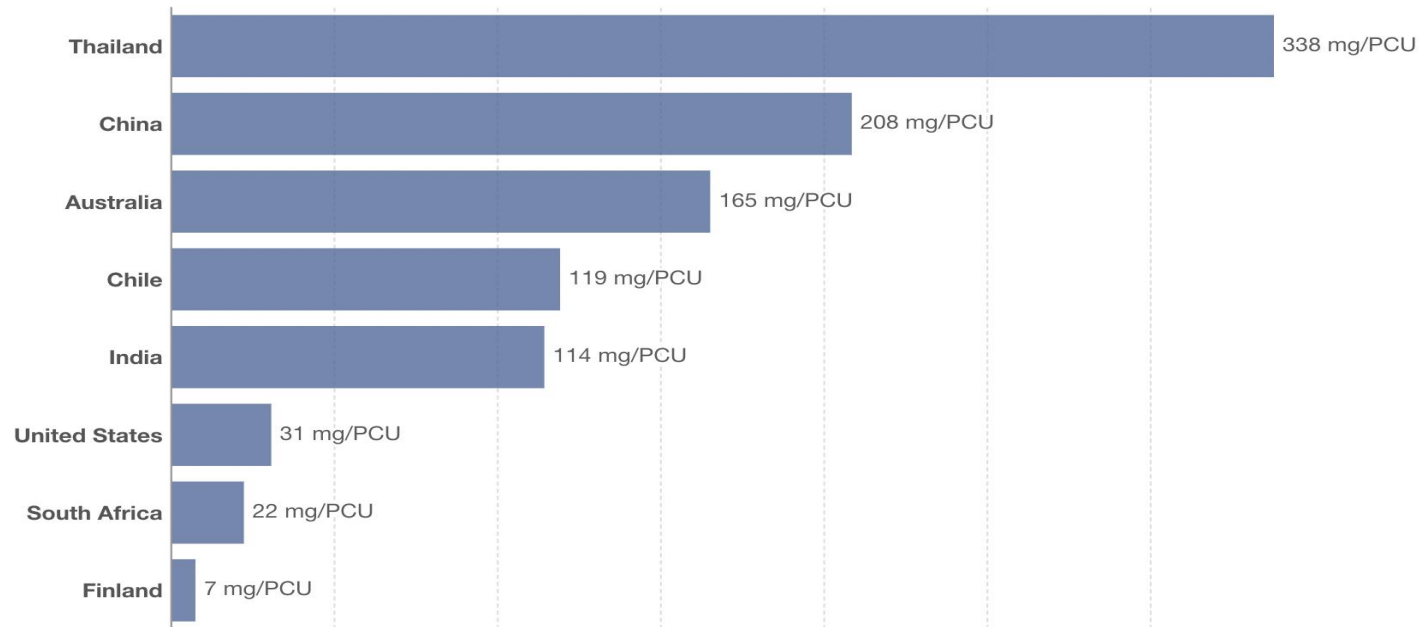
- Variability:
  - UK: 75% of farm antibiotics used in feed or water.
  - Less than a quarter given by injections, to treat individual animals.
  - Sweden: less than half the farm antibiotics administered in the UK.
  - proportion of antibiotics given via feed or drinking <10%.
  - three quarters given by injection.

# Per kilo of livestock (more variability)

## Antibiotic usage in livestock, 2020



Milligrams of total antibiotic use per kilogram of livestock. This is adjusted for differences in livestock numbers and species by standardizing to a population-corrected unit (PCU). A suggested global cap of antibiotic use in livestock is set at 50mg/PCU.



Data source: Mulchandani et al. (2023)

OurWorldInData.org/pandemics | CC BY



# Big evidence gaps

- AMU in animals highly variable geographically, by type of antimicrobial, over time.
- **Relative contribution of animal AMU versus human AMU in driving AMR unknown.**
- Need evidence on drug-pathogens combinations in animals that pose the most serious threat to human health from AMR.
- Poor understanding of constraints/incentives that shape choices, especially pressure farmers face to use antibiotics, actual and perceived risks, how to mitigate those risks, and pressures inside food supply chain.
- Socioeconomics: resistance rates and effect on health differ with countries' socioeconomics, health-care systems, patient populations, and antibiotic consumption.
- Most outcomes the result of the systems, needs multi-sectoral and cross-disciplinary systems thinking.
- Implement challenge. Just having good evidence is not enough to change behaviour.

# National Action Plans

(especially with Yuzana Khine Zaw and Numyra Bashir)



The image shows a screenshot of the Financial Times website. At the top, there is a navigation bar with the Financial Times logo, a search icon, and a 'Subscribe' button. Below the navigation bar, there is a horizontal menu with various categories: HOME, WORLD, UK, COMPANIES, TECH, MARKETS, CLIMATE, OPINION, WORK & CAREERS, LIFE & ARTS, and HTSI. The main content area is split into two parts. On the left, there is a dark red background with white text that reads 'Special Report' and 'FT Health: Future of Antibiotics'. Below this, there is a short paragraph of text. On the right, there is a photograph of a woman in a white lab coat, wearing a white surgical mask and white gloves, working in a laboratory or pharmacy setting. She is looking down at something she is holding in her hands. The background of the photo shows shelves filled with various bottles and boxes, likely containing pharmaceuticals.

FINANCIAL TIMES

Subscribe

HOME WORLD UK COMPANIES TECH MARKETS CLIMATE OPINION WORK & CAREERS LIFE & ARTS HTSI

Special Report

FT Health: Future of Antibiotics

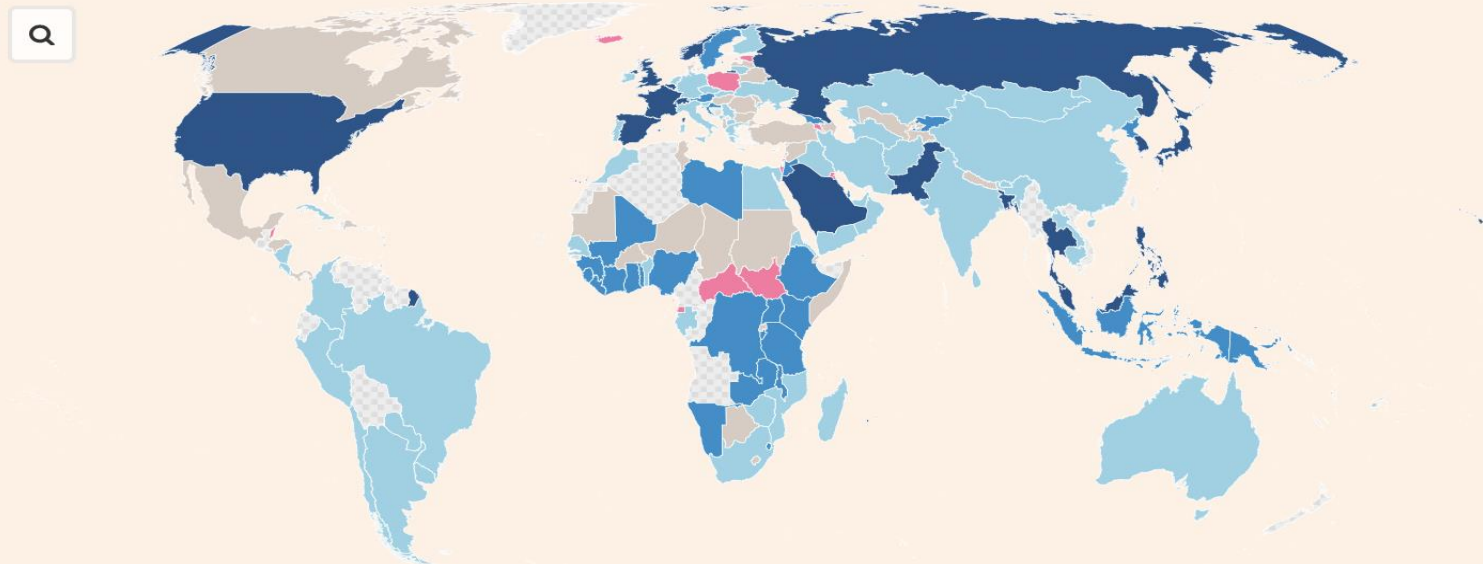
This report examines the causes and effects of an increasing global resistance to antibiotics: from the pressures doctors are under to prescribe them even for viral infections, to what new treatments are currently in the pipeline, as well as what role can the consumer play in reducing antibiotic use in the food chain

# State of development of NAPs

## A snapshot of AMR self-assessment

Country progress with development of a national action plan on AMR

- A - No national action plan or plan under development
- B - National action plan developed
- C - National action plan approved by government and being implemented
- D - National action plan has operational plan and monitoring mechanism in place
- E - Financial provision for the national action plan implementation included in national plans and budgets



FINANCIAL TIMES

Source: [WHO Country Self-assessment Survey \(TrACSS\), Oct 2022](#)

# State of development of NAPs

Nearly fifty countries still have no national system for monitoring the use of antimicrobials in human health

- A - No national plan or system for monitoring use of antimicrobials
- B - System designed for surveillance of antimicrobial use, includes monitoring national sales or consumption of antibiotics in health services
- C - Total sales of antimicrobials are monitored at national level and/or some monitoring of antibiotic use at sub-national level
- D - Prescribing practices and appropriate antibiotic use are monitored in a national sample of healthcare settings
- E - Regular data reported on antimicrobial sales/consumption for human use and antibiotic prescribing and appropriate/rational use

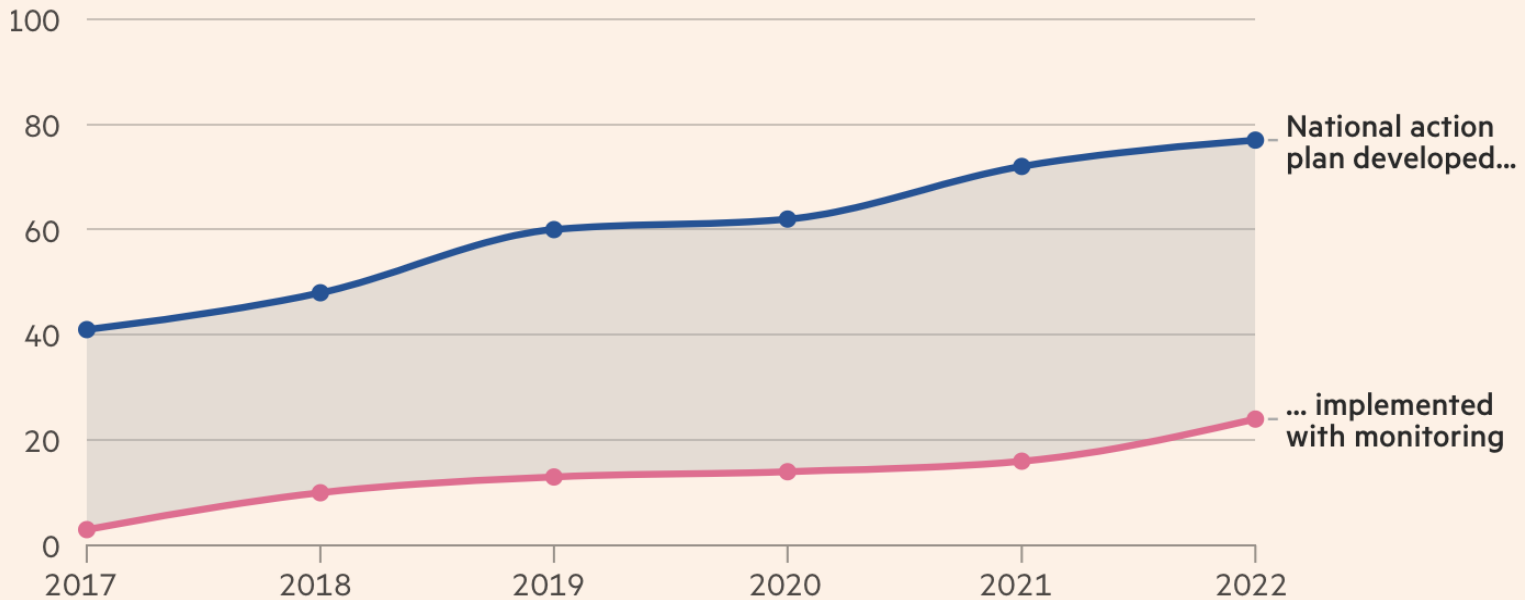
Number of countries



# The implementation gap

## The AMR implementation gap

Share of countries (%)

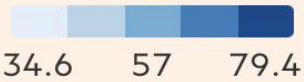


FINANCIAL TIMES

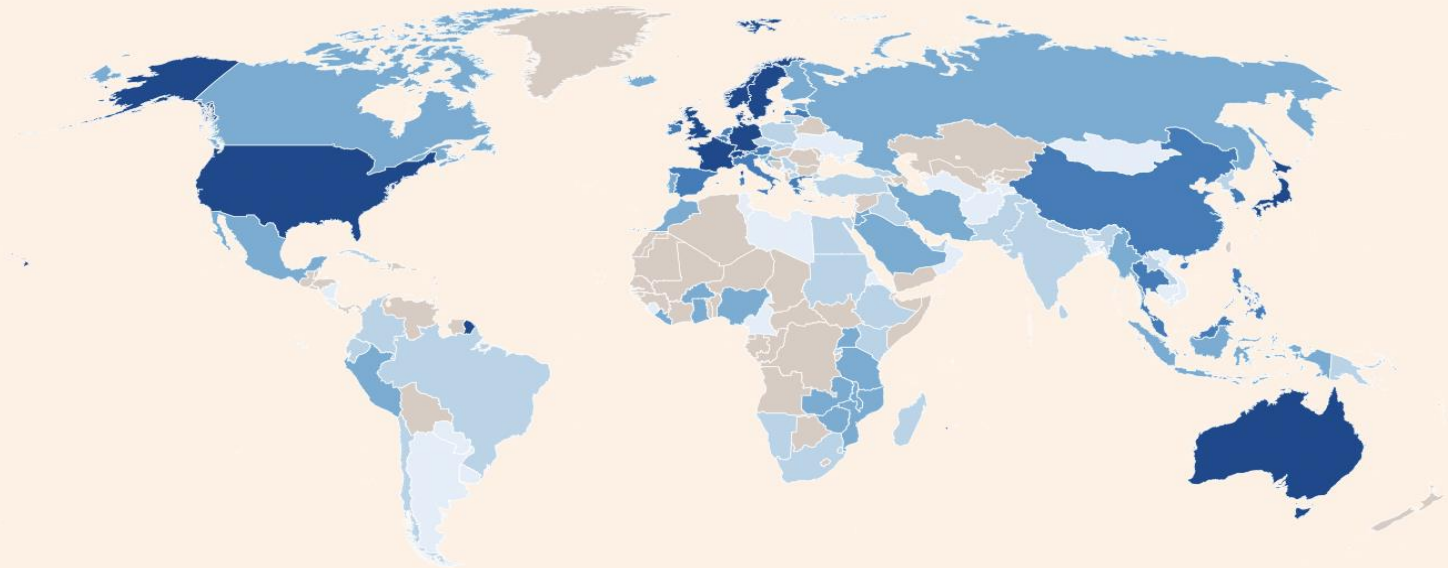
Source: WHO Country Self-assessment Survey (TrACSS), October 2022

# Governance scores

Governance score from 0 (worst) to 100 (best), as assessed by a study of 114 countries' data and national action plans in 2021-22

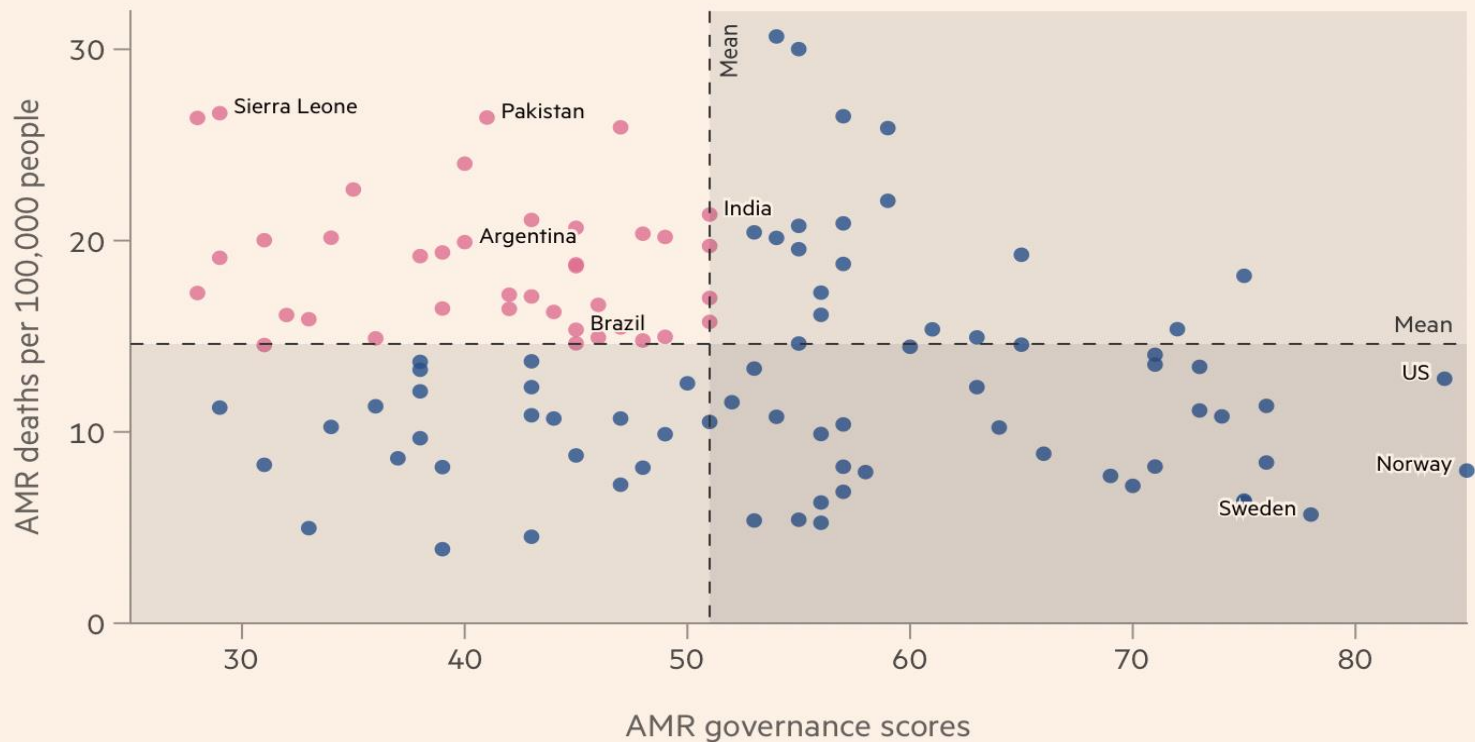


🔍 Search...



# Highly variable performance

● Country with below-average governance and above-average resistance



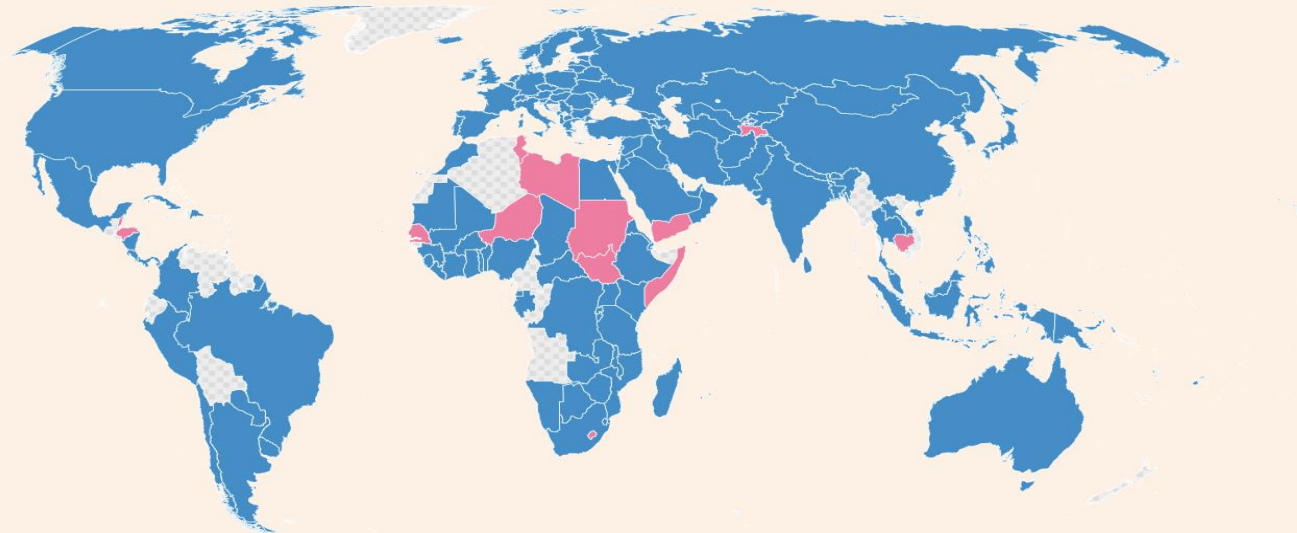
# Legislation

## Country legislation on antimicrobial use

Presence of laws or regulations covering:

Prescription and sale of antimicrobials for human use

■ Yes  
■ No



FINANCIAL TIMES

Source: [WHO Country Self-assessment Survey \(TrACSS\), October 2022](#) • \*For terrestrial and/or aquatic animals



# Legislation

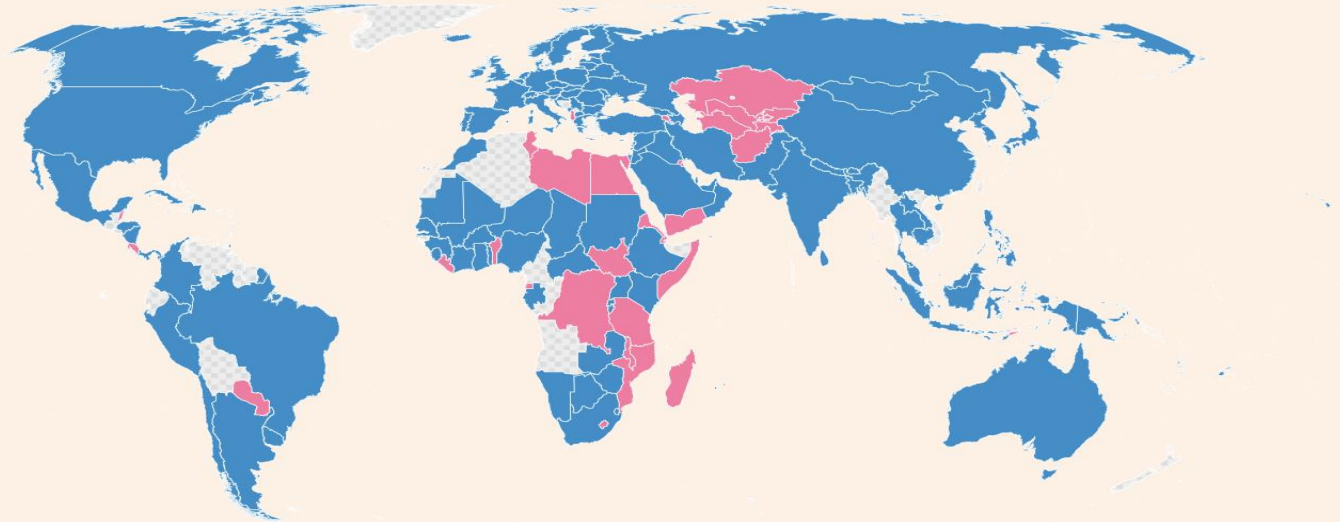
## Country legislation on antimicrobial use

Presence of laws or regulations covering:

Prescription and sale of antimicrobials for terrestrial animal use

Yes  
No

Q



FINANCIAL TIMES

Source: [WHO Country Self-assessment Survey \(TrACSS\), October 2022](#) • \*For terrestrial and/or aquatic animals

# Legislation

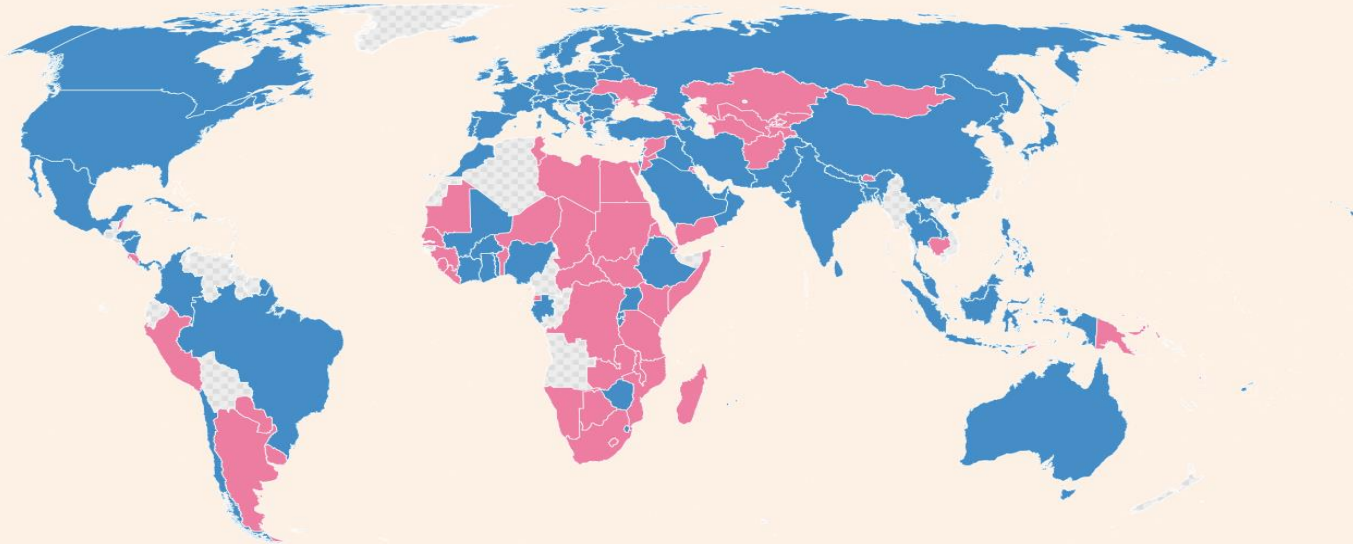
## Country legislation on antimicrobial use

Presence of laws or regulations covering:

Prescription and sale of antimicrobials for aquatic animals

■ Yes  
■ No

Q



FINANCIAL TIMES

Source: [WHO Country Self-assessment Survey \(TrACSS\), October 2022](#) • \*For terrestrial and/or aquatic animals

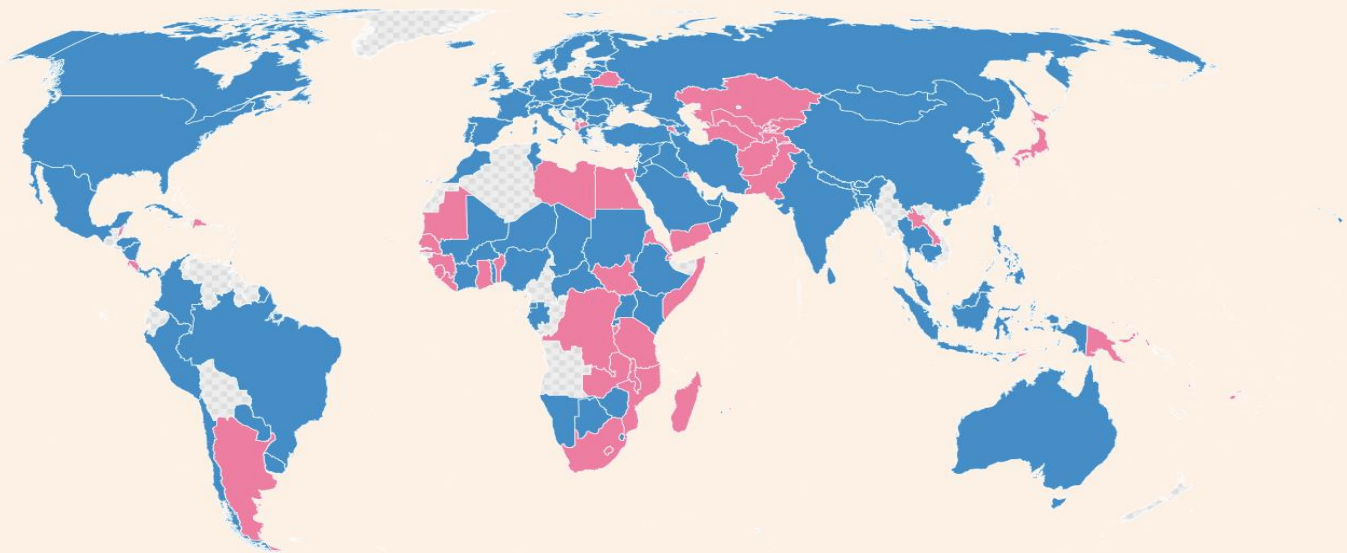
# Legislation

## Country legislation on antimicrobial use

Presence of laws or regulations covering:

Prescription and sale of medicated feed\*

- Yes
- No



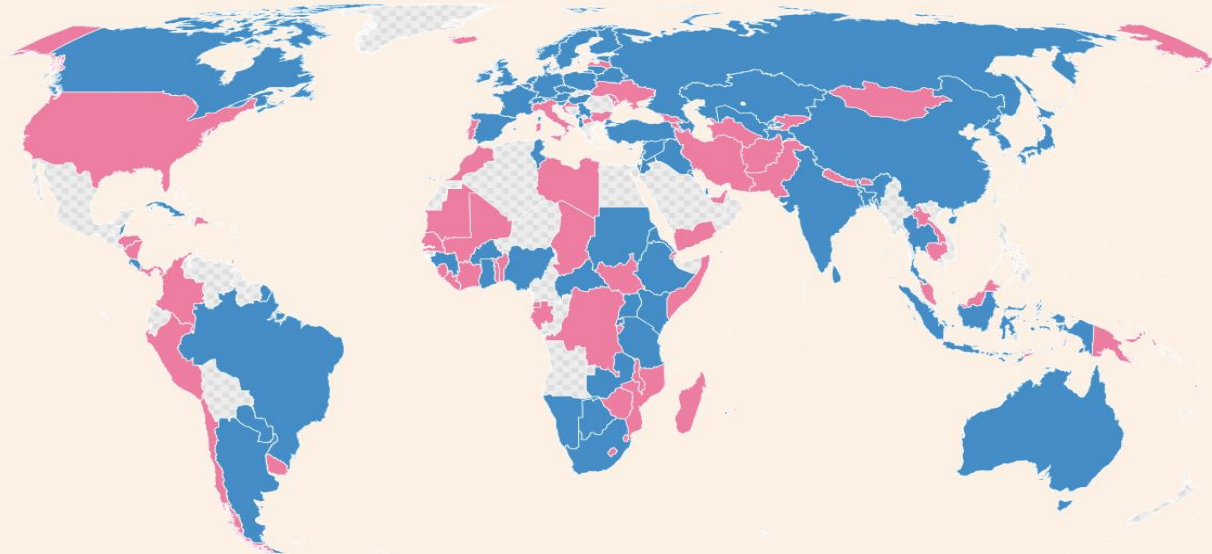
# Environmental protection

Legal protection for the environment is patchy

Legislation and/or regulations in place:

Prevent contamination of the environment with antimicrobials

Yes  
No



FINANCIAL TIMES

Source: [WHO Country Self-assessment Survey \(TrACSS\), October 2022](#)

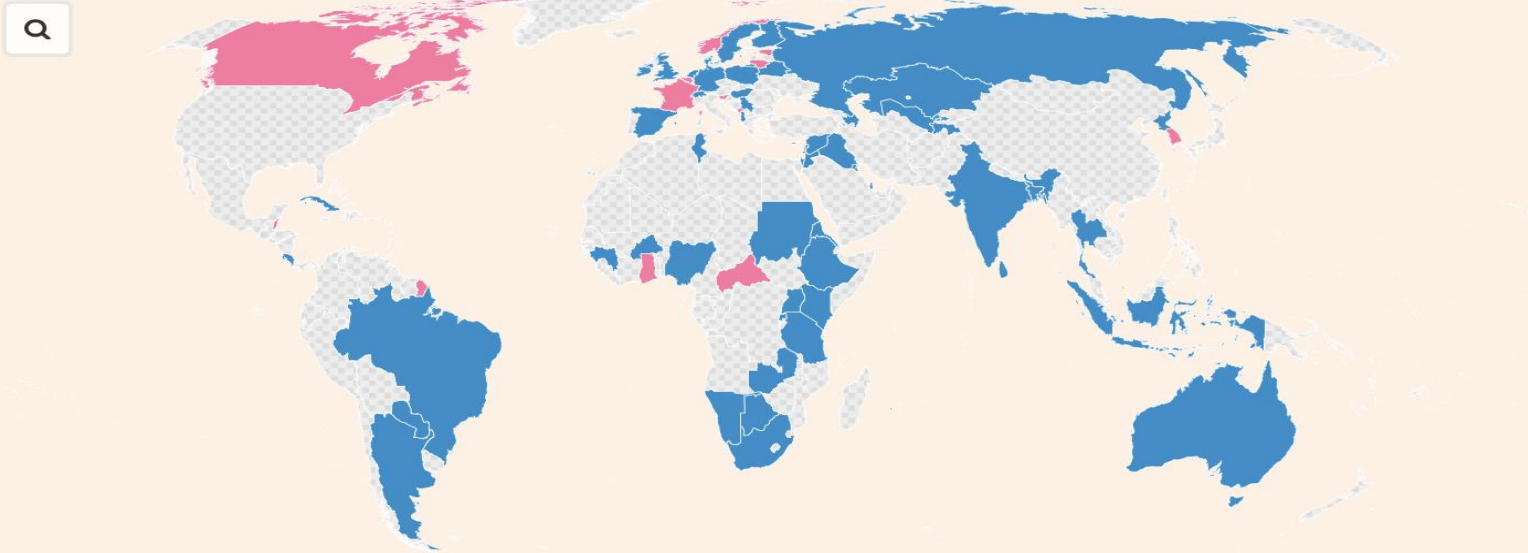
# Environmental protection

Legal protection for the environment is patchy

Legislation and/or regulations in place:

...human sewage treatment quality

Yes  
No



FINANCIAL TIMES

Source: [WHO Country Self-assessment Survey \(TrACSS\), October 2022](#)

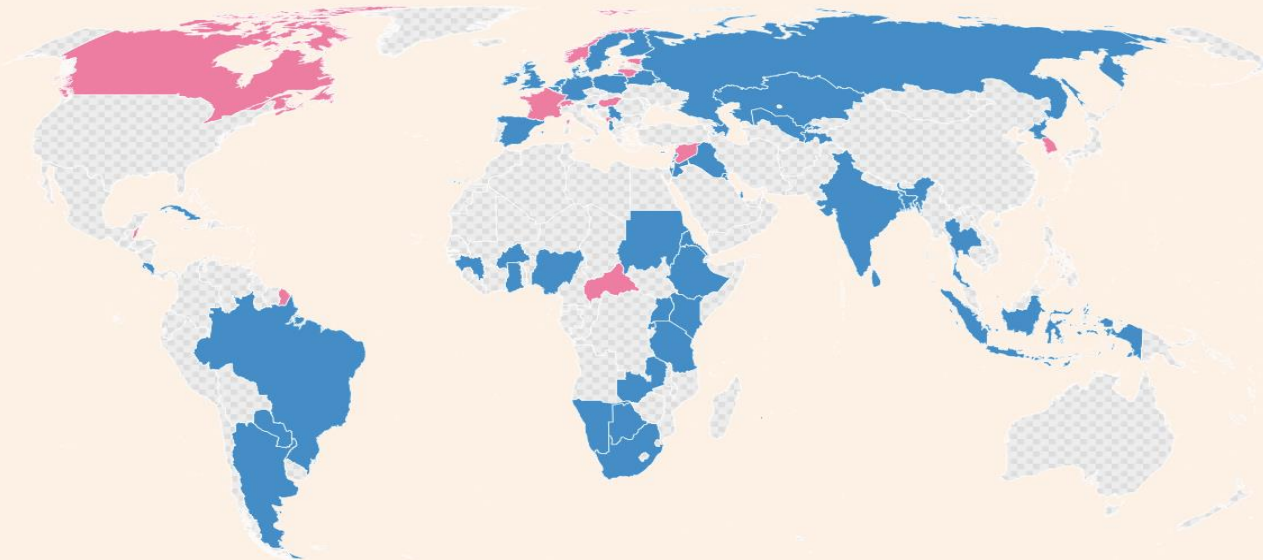
# Environmental protection

Legal protection for the environment is patchy

Legislation and/or regulations in place:

...wastewater discharges from health facilities for disposal in the environment

Yes  
No



FINANCIAL TIMES

Source: [WHO Country Self-assessment Survey \(TrACSS\), October 2022](#)

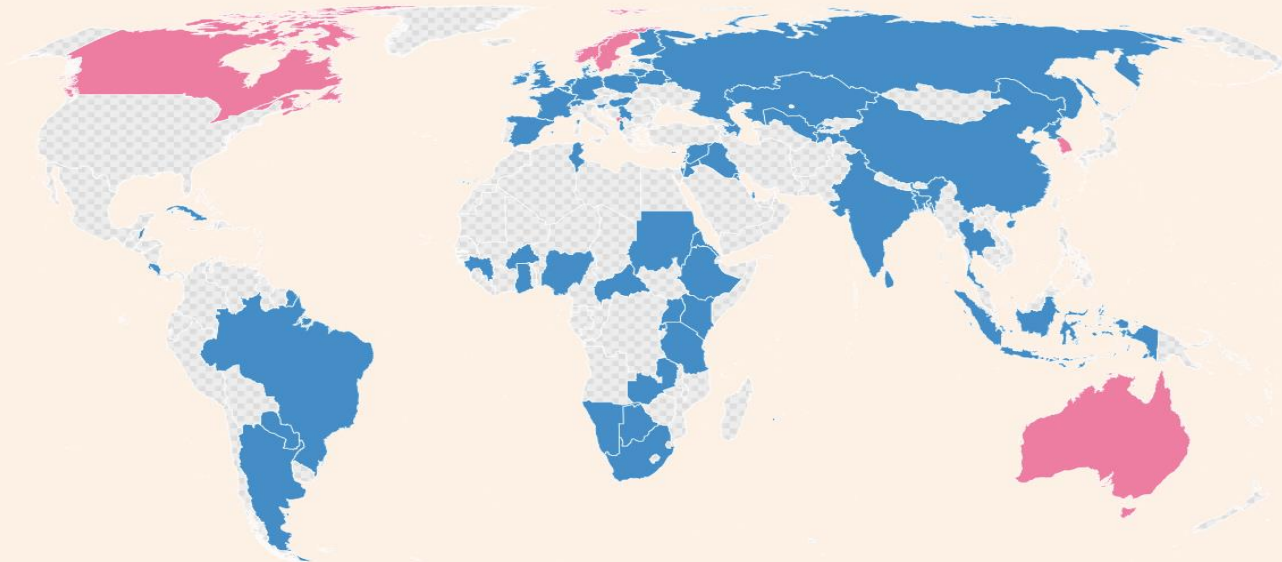
# Environmental protection

Legal protection for the environment is patchy

Legislation and/or regulations in place:

...management of solid clinical waste from health facilities to be destroyed by incineration

Yes  
No



FINANCIAL TIMES

Source: [WHO Country Self-assessment Survey \(TrACSS\), October 2022](#)

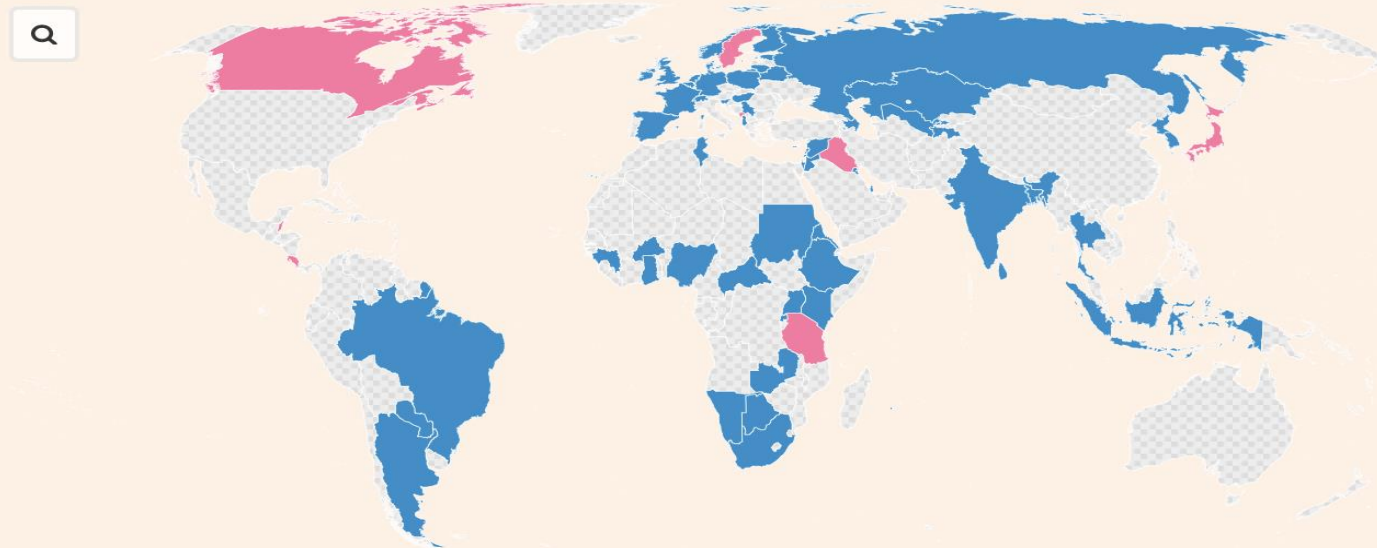
# Environmental protection

Legal protection for the environment is patchy

Legislation and/or regulations in place:

...disposal of medicines, antimicrobial agents for human use

Yes  
No





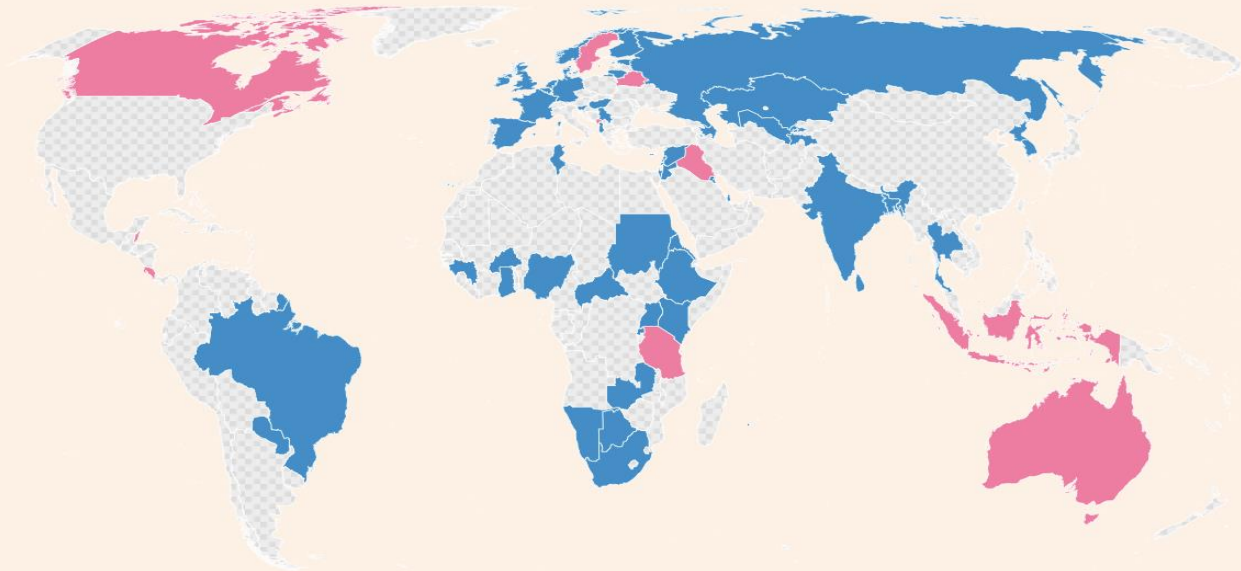
# Environmental protection

Legal protection for the environment is patchy

Legislation and/or regulations in place:

...disposal of medicines, antimicrobial agents for animal use]

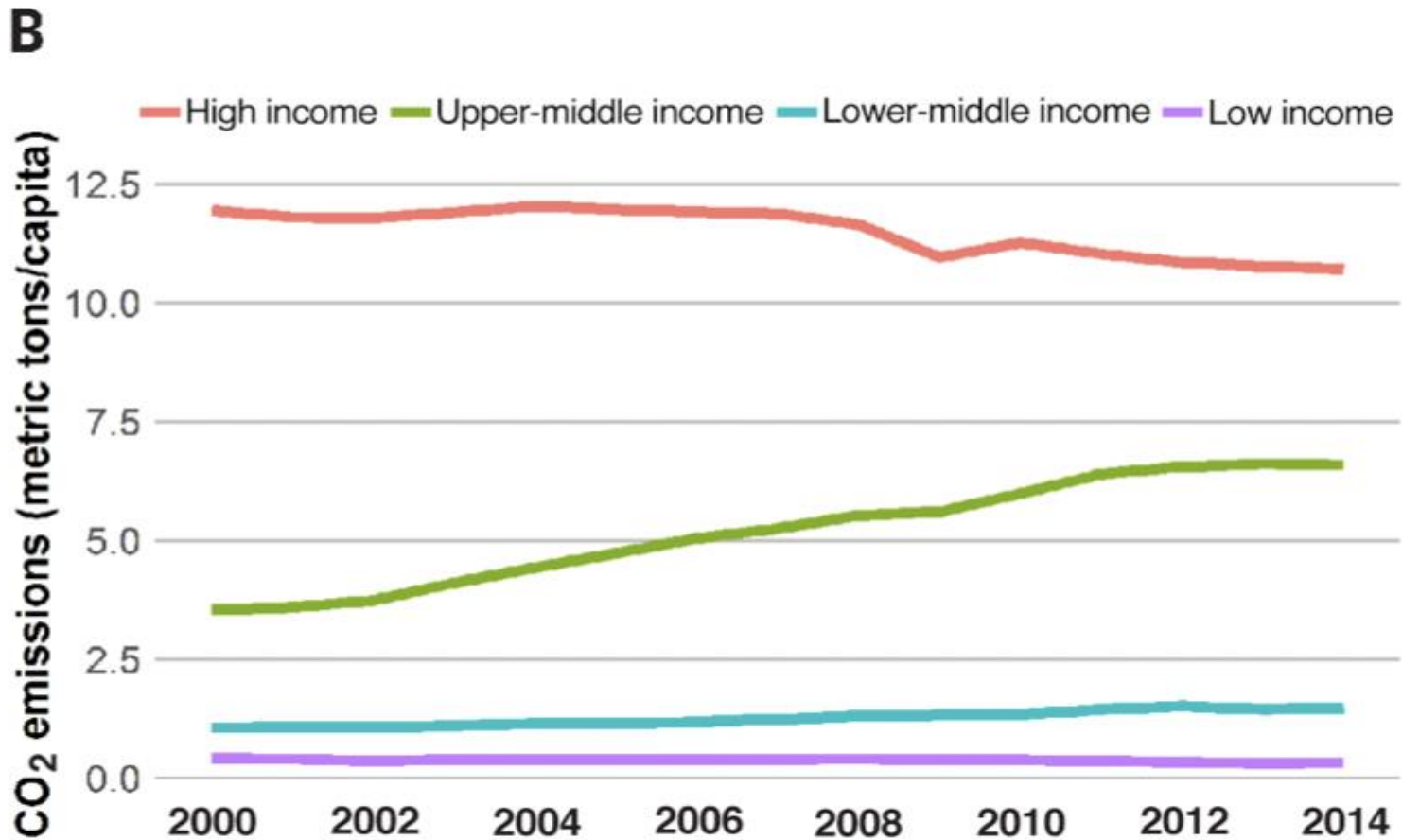
Yes  
No



FINANCIAL TIMES

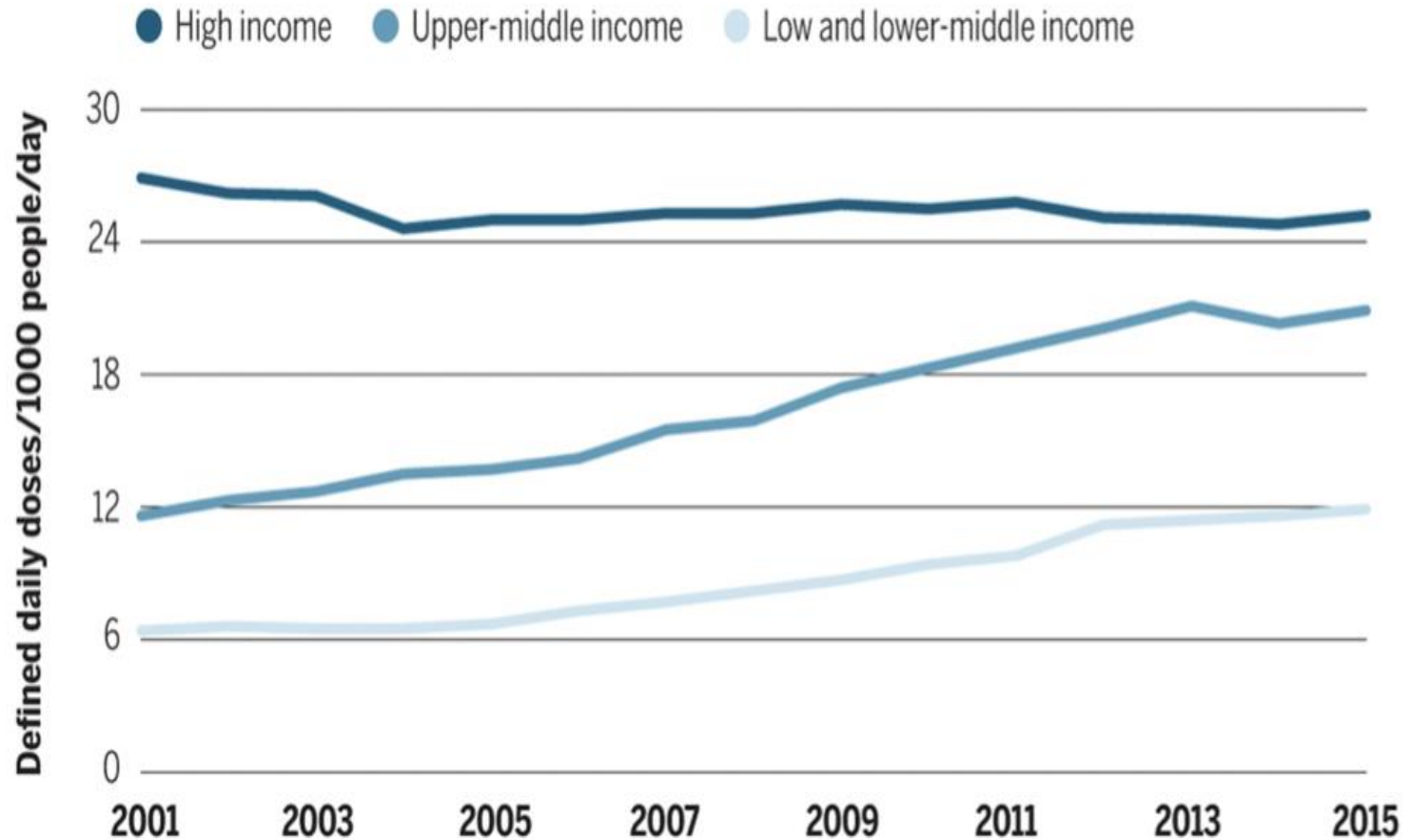
Source: [WHO Country Self-assessment Survey \(TrACSS\), October 2022](#)

# Is this like tackling global heating?



# Who uses lots of antibiotics?

A



# Similarities with climate change

- Both are global **“tragedy of the commons,”**
- Both driven by consumption generating short-term benefits but **long-term costs**
- Individuals have little incentive to forego short-term benefits:
  - costs are highly uncertain
  - harmful events may happen far in the future which they discount
- The costs are unlikely to be avoided **unless many other people also** decide to reduce their carbon and antibiotic consumption.
- **Costs and benefits are not distributed unequally**
- **intergenerational equity**
- **Equitable and optimal antibiotics access critical to overcoming tragedy of the commons**

A close-up photograph of a petri dish containing various bacterial colonies. The colonies are in different stages of growth, with some appearing as small, round, yellowish spots and others as larger, more complex, and textured structures. The colors range from pale yellow to bright orange and red. The petri dish is held by a gloved hand, and the background is a blurred laboratory setting.

THANK YOU