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The State of the World's Antibiotics 2021

A Global Analysis of Antimicrobial Resistance and Its Drivers

Related research and additional information are available at www.cddep.org and https://resistancemap.cddep.org/.

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Preface

Nearly 80 years after an antibiotic was used to treat the first patient, we are still learning about the effects of antibiotics and their usefulness in human and animal health. Antimicrobial resistance (AMR) has now reached epidemic proportions but remains out of sight for most of the general population. Meanwhile, with the disruptions caused by the novel SARS coronavirus (Covid-19), the world has relearned the lesson that infectious diseases shape, and will continue to shape, human destinies. The ability to develop and maintain a portfolio of effective anti-infective treatments and vaccines will likely be necessary as long as humans survive.

In this report, we have updated our work from the *State of the World's Antibiotics 2015*. In that first report, we provided extensive data from around the world on antimicrobial use and resistance, based on our work with ResistanceMap, a global repository that has been widely used by researchers, policymakers, and the media. Much has happened since 2015. The introduction of the Global Action Plan by the World Health Organization (WHO), Food and Agriculture Organization, and Organization for Animal Health gave impetus to the global response.

The subsequent call from the United Nations General Assembly in 2016 amplified the urgency of the problem and the need for proactive solutions and interventions in all countries. Some countries have made significant progress in AMR by developing national action plans and funding them. However, in many countries, there has been little to show for the past five years of global effort.

AMR continues to be challenging for several reasons, but high among them is the need to work multisectorially in human, animal, and environmental health domains. The One Health approach has remained more a concept than a widely adopted practice in managing disease risk. Vaccination coverage, infection control and prevention, and clean water and sanitation are critical for reducing the need for antibiotics in both animals and humans.

Stewardship to reduce the use of antibiotics is an imperative across all sectors but is challenged by the perception that antibiotics are inexpensive and that using them has no downside either for patients or for the rest of society.

This report on the state of antibiotics introduces country dashboards that capture progress on indicators that track AMR and show what remains to be done to decrease the need for antibiotics and their inappropriate use. It is the result of work over the years bringing together the evidence, and on the occasion of CDDEP's 10th anniversary, we are pleased to share this update with you.

We are optimistic that future generations will also witness the miracle of antibiotics. To ensure that privilege, it is incumbent on us to treat the crown jewels of modern medicine with care and respect.

Ramanan Laxminarayan
Director, The Center for Disease Dynamics, Economics & Policy

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Abbreviations

ACT	artemisinin combination therapy
AGAR	Australian Group on Antimicrobial Resistance
AMC	antimicrobial consumption
AMR	antimicrobial resistance
AMU	antimicrobial use
ARV	antiretroviral
ASP	antimicrobial stewardship program
AWaRe	Access, Watch, and Reserve
CAESAR	Central Asian and European Surveillance of Antimicrobial Resistance network
CARA	Canadian Antimicrobial Resistance Alliance
CHASP	Checklist for Hospital Antimicrobial Stewardship Programming
CHINET	China Antimicrobial Surveillance Network
CDC	Centers for Disease Control and Prevention (U.S.)
CDDEP	Center for Disease Dynamics, Economics & Policy
CRE	carbapenem-resistant *Enterobacteriaceae*
DDD	defined daily dose
DID	defined daily doses per 1,000 inhabitants per day
DRI	Drug Resistance Index
DTG	dolutegravir
EARS-Net	European Antimicrobial Resistance Surveillance Network
ECDC	European Centre for Disease Prevention and Control
ESBL	extended-spectrum beta-lactamase
EU	European Union
EU/EEA	European Union/European Economic Area
FAO	Food and Agricultural Organization
GLASS	Global Antimicrobial Resistance Surveillance System
GDP	gross domestic product
HIV	human immunodeficiency virus
IMS MIDAS	Intercontinental Medical Statistics Medical Information Data Analysis System

KPC	*Klebsiella pneumoniae* carbapenemase
K13	Kelch13 domain gene
LMICs	low- and middle-income countries
MDR	multidrug-resistant
MRSA	methicillin-resistant *Staphylococcus aureus*
NAP-AMR	National Action Plan for Antimicrobial Resistance
NDM	New Delhi Metallo-beta-lactamase
NNRTI(s)	non-nucleoside reverse-transcriptase inhibitor(s)
PDR	pre-treatment (HIV) drug resistance
PROVENRA	Program Come ezolano Surveillance Resistance to Antimicrobianos (Venezuelan Antimicrobial Resistance Surveillance Program)
RR-TB	rifampicin-resistant tuberculosis
UNICEF	United Nations Children's Fund
VINARES	Viet Nam Resistance
WASH	water, sanitation, and hygiene
WHO	World Health Organization
XDR	extensively drug-resistant

Executive Summary

As the 2010–2020 decade ended, having witnessed a global effort to control antimicrobial resistance, the Covid-19 pandemic arrived as a reminder of the tremendous economic and social damage that infectious diseases can unleash. Among the casualties of Covid-19 is some of the progress made on antimicrobial resistance (AMR). Antimicrobials continue to be prescribed for viruses, and countries have reported increasingly high rates of resistance among drugs used to treat common infections. Resistance to first-line antimicrobials is now emerging among the pathogens that cause HIV, malaria, and typhoid fever, threatening global progress on health, particularly in low- and middle-income countries (LMICs).

One major driver of resistance is the overuse and misuse of antibiotics in human healthcare. Globally, antimicrobial consumption is accelerating worldwide, particularly in LMICs, as the drugs become more accessible and affordable. The use of antibiotics that the World Health Organization deems critically important for human health increased 91% worldwide and 165% in LMICs between 2000 and 2015. Vaccines against many infectious agents are available, but low vaccination coverage, coupled with unsafe water and sanitation, leave many people vulnerable to infection and dependent on antibiotics for treatment. Investments to increase vaccine coverage, improve water and sanitation, and implement antimicrobial stewardship in health facilities could mitigate AMR worldwide.

The other major factor driving resistance is the widespread use of antibiotics in agriculture and aquaculture. The fast-growing demand for animal protein has increased the use of antimicrobials in the animal health sector, where these drugs are used not only to treat and prevent infection but also to promote rapid growth. All countries need to develop and enforce laws and other policies to reduce the use of antibiotics in both terrestrial and aquatic food animals.

Access to life-saving antibiotics in LMICs remains an issue. Although AMR poses an urgent global public health threat, more people in LMICs die from lack of access to antimicrobials than from resistant infections. Global efforts to mitigate AMR must also increase access to affordable and clinically appropriate antimicrobials. Antibiotic research and development lags behind clinical need: drugs in the pipeline are not sufficient to counter the increasing resistance to current antimicrobials and maintain a strong arsenal of effective antimicrobials.

This report follows on *The State of the World's Antibiotics 2015*, presenting updated data from around the world and summarizing recent research. Two tools are now available:

- The Drug Resistance Index measures the average effectiveness of the antibiotics used to treat a given bacterial infection. This tool can be used to assess and communicate trends in national AMR burden and reveal where resistance poses a significant problem.
- The Country Dashboards show the status of antibiotic resistance and use in humans and animals across 40 countries. AMR-relevant measures characterize each country, representing four indicator categories: (1) policy indicators; (2) antimicrobial resistance indicators; (3) antimicrobial use indicators; and (4) public health indicators. Each indicator category, in turn, comprises a battery of specific indicators.

Antimicrobial resistance is a clear and present danger to global health. The index and dashboards are designed to help government officials, policymakers, and healthcare stakeholders assess and track AMR status over time and in relation to other countries, and then prioritize actions.

Chapter 1. Changing Patterns in Antimicrobial Resistance

Key Messages

1. Antimicrobial resistance continues to rise as countries increasingly report high rates of resistance among antimicrobials used to treat common infections. Weighted average resistance levels are generally higher in low- and middle-income countries (LMICs).

2. Resistance to first-line antimicrobial agents is rapidly emerging among the pathogens that cause HIV, malaria, and typhoid fever, threatening global progress in eliminating these infectious diseases.

3. The Drug Resistance Index (DRI), which measures the average effectiveness of the set of antibiotics used to treat a given bacterial infection, is an effective tool for assessing and communicating trends in national AMR burden.

4. Higher DRI values in LMICs may reflect a relatively lower level of antibiotic effectiveness due to limited access to newer, more effective antibiotics, revealing where resistance poses a more significant problem.

Resistant Pathogens and Genetic Elements

AMR is a natural mechanism that allows microorganisms to survive. The process is accelerated by increasing levels of antibiotic use: selective pressure enables the spread of mutations that promote survival, shortening the time bacteria need to acquire resistance to new drugs. This, coupled with low rates of new antibiotic development, has contributed to alarming rates of resistance for selected pathogens, including priority pathogens for which few treatment options are available.[1,2]

Protective mechanisms that have evolved in bacteria include preventing entry of the antimicrobial, producing enzymes that destroy or modify the antimicrobial, and making changes to the antimicrobial target. Some common bacterial enzymes known to result in antibiotic resistance can be categorized as follows:

- narrow-spectrum beta-lactamases, which act on penicillins and first-generation cephalosporins (TEM-1 and 2, SHV-1, cephalosporinases, OXA-type enzymes);

- extended-spectrum beta-lactamases (ESBL), which act on penicillins and all four generations of cephalosporins (SHV-2, SHV-5, SHV-7, SHV-12, TEM-10, TEM-12, TEM-26, CTX-M, OXA-type ESBLs); and

- carbapenemases, which act on penicillins, all four generations of cephalosporins, and carbapenems (KPC, NDM-1, VIM and IMP carbapenemases, OXA-type carbapenemases).

A recent study from CDDEP showed that resistance rates varied among pathogens (Figure 1); rates of resistant *Acinetobacter baumannii* were higher than those of other bacteria, and rates of resistant *Enterococcus faecium* were highest toward broad-spectrum penicillins.[3] As expected, *Klebsiella pneumoniae* also showed high rates of resistance, and for this reason it is included in the priority pathogens list of the World Health Organization (WHO).[4]

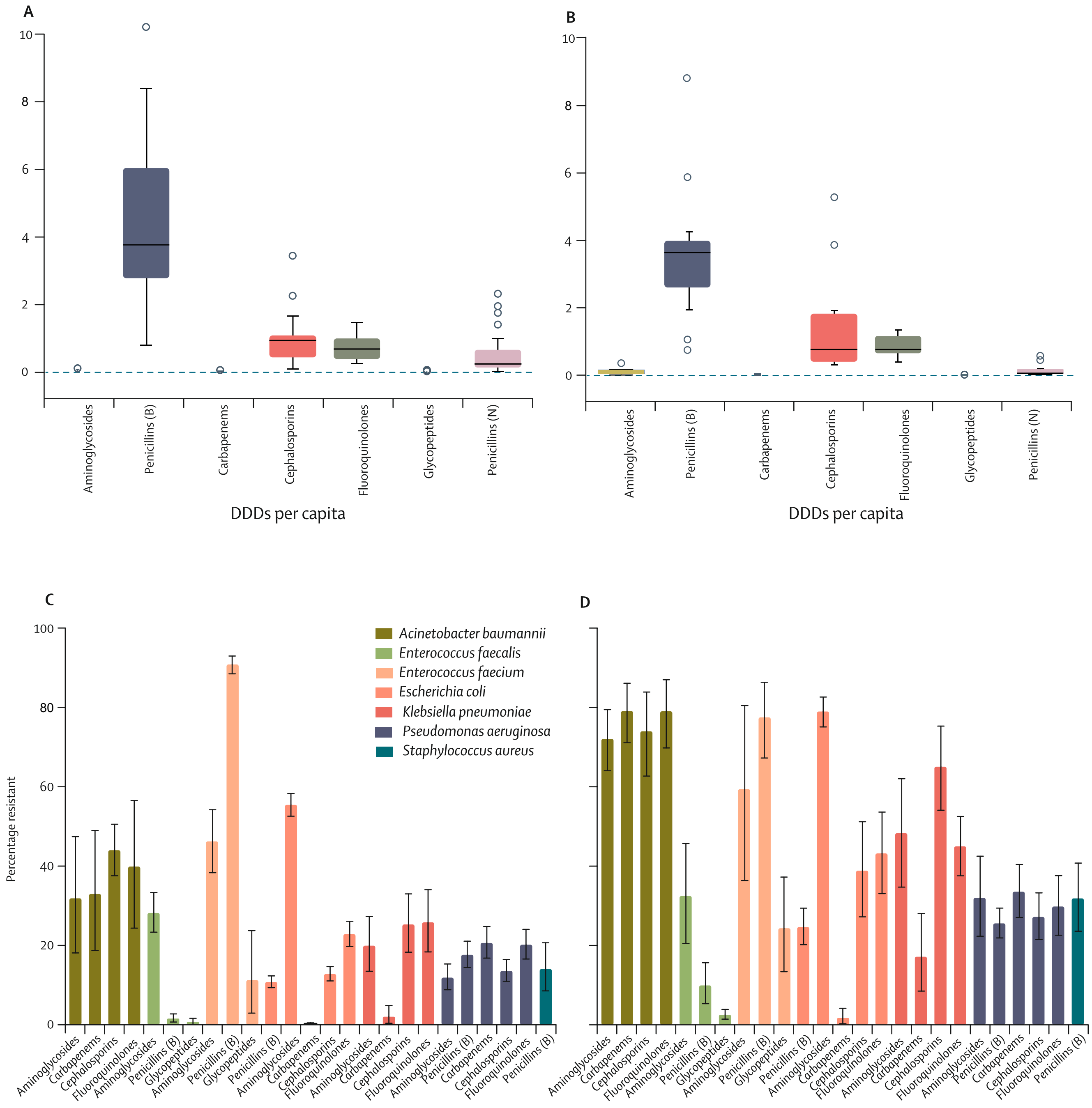


Figure 1. ***Global antibiotic use and resistance, by income class.*** *Variability in per capita antibiotic use measured in defined daily doses for high-income countries (A) and LMICs (B). Weighted average global resistance rate for the specified antibiotic-pathogen combination in high-income countries (C) and LMICs (D), using the most recent data available for 2012–15 and based on pooled worldwide resistance rates for the disease-causing organisms considered by the WHO as priority pathogens. DDD=defined daily doses. Penicillins (B)=broad spectrum. Penicillins (N)=narrow spectrum. Source: Laxminarayan, R. et al. The Lancet Infectious Diseases Commission on antimicrobial resistance: 6 years later. The Lancet Infectious Diseases 20, e51–e60 (2020).*

However, a growing concern is the increase in carbapenem-resistant Gram-negative pathogens encoded by a range of genes, including NDM-1, OXA-48, KPC, VIM, and IMP. Resistance has rapidly spread globally and across bacterial species since the first reported case in *Klebsiella pneumoniae* less than a decade ago[6], demonstrating both our ability to track the spread and the challenges involved in containing it.

A similar concern is the emergence of plasmid-mediated genes (mcr-1, mcr-2, mcr-3, mcr-4, mcr-5, and icr-Mo[7]), which encode resistance to colistin, considered a drug of last resort. MCR-1 was first isolated in 2016 from Escherichia coli cultured from a pig in China,[8] but it has since been reported globally and in numerous bacterial species, including *K. pneumoniae* and *Enterobacter species*.

Additionally, multiple variants of genes encoding extended-spectrum beta-lactamase (ESBL) and conferring resistance to penicillin, cephalosporins, and monobactam have now spread globally. Reports from major surveillance networks, including EARS-Net in Europe, indicate high prevalence in *E. coli* and *K. pneumoniae*. ESBL-positive Gram-negative bacteria are found in livestock, meat products, and companion animals.[9]

In Neisseria gonorrhoeae, resistance to the recommended first-line therapy (azithromycin and ceftriaxone) has been reported in the United Kingdom and Australia[10,11] with the UK isolate showing resistance for all antibiotics recommended for the treatment of *N. gonorrhoeae*. For *Staphylococcus aureus* and *Enterococcus faecium*, no major shifts in resistance have been reported for the global molecular epidemiology of genes encoding methicillin resistance (*mecA*) or vancomycin resistance (*vanA and VanB*) in the past decade. However, the emergence and spread of methicillin resistance in the form of *mecC* has also been reported.[12]

Resistance Rates and Trends

AMR is a global problem, but its prevalence across the globe varies with antibiotic consumption, access to clean water and adequate sanitation, vaccination coverage, and access to quality healthcare. The latest WHO report, based on AMR data from 66 countries, illustrates an alarming picture of the global status of AMR as an increasing number of countries are now reporting high rates of resistance among antimicrobials used to treat common infections. Specifically, resistance rates to ciprofloxacin, commonly used to treat urinary tract infections, varied from 8.4% to 92.9% for *E. coli* and from 4.1% to 79.4% for *K. pneumoniae* in 33 and 34 countries, respectively.[13]

In the United States, an estimated 2.8 million antibiotic-resistant infections each year contribute to more than 35,000 deaths. In 2017, 223,900 cases of *Clostridioides difficile* led to at least 12,800 deaths.[2] Of particular concern in the United States have been the community increases in drug-resistant gonorrhea and extended-spectrum beta-lactamase (ESBL)–producing Enterobacteriaceae (124% and 50%, respectively) since 2000. There have been some gains, however. Since 2013, deaths from AMR-related causes have declined by 18%, and vancomycin-resistant *Enterococcus* and carbapenem-resistant *Acinetobacter* cases have fallen by 41% and 33%, respectively. Nevertheless, the rapidly changing AMR landscape requires continuous surveillance and nimble policymaking to prevent further spread.

In Canada, antibiotic resistance to first-line antimicrobials was 26%, and the number of deaths directly attributed to AMR amounted to 5,400 in 2018. Syndromes with the highest resistance rate were musculoskeletal infections, intra-abdominal infections, pneumonia, skin and soft tissue infections, and urinary tract infections.[14]

Data from 30 countries in the European Union/European Economic Area (EU/EEA) revealed a high level of heterogeneity in AMR trends, with the highest AMR percentages reported by countries in the south and east of Europe. The 2019 European Antimicrobial Resistance Surveillance Network (EARS-Net) report showed that more than half of the *Escherichia coli* isolates and more than a third of the *Klebsiella pneumoniae* isolates were resistant to at least one antimicrobial group.[15]

Additionally, several countries reported carbapenem resistance greater than 10% in *K. pneumoniae*. For *Staphylococcus aureus*, despite the reduction in the percentage of methicillin-resistant (MRSA) isolates, MRSA remains an important pathogen in the EU/EEA. The variation in AMR percentages across EU/EEA countries warrants concerted efforts and close international cooperation.[15]

There are considerable knowledge gaps regarding AMR prevalence globally, especially in LMICs that lack clinical and laboratory capacity and surveillance infrastructure. A systematic review of 144 studies across Africa lacked AMR data for approximately 40% of the African countries.[16] The study showed that resistance to penicillin and amoxicillin was reported in *Streptococcus pneumoniae* (26.7%) and *Haemophilus influenzae* (34.0%), respectively. Additionally, *E. coli* resistance to amoxicillin, trimethoprim, and gentamicin was 88.1%, 80.7%, and 29.8%, respectively. In the Asia and Pacific region, South East Asia is estimated to have the highest risk of AMR emergence and spread, with the highly transferable New Delhi metallo-β-lactamase-1 (NDM-1) as an example. Furthermore, China and India alone accounted for more than one-third of the global incidence of multidrug-resistant (MDR) tuberculosis (TB).[17]

To overcome the gaps in our understanding of AMR prevalence in LMICs, one study used the relationship between AMR prevalence and socioeconomic characteristics to project AMR prevalence for selected pathogens. Taking existing prevalence data from ResistanceMap[18] and socioeconomic profiles constructed from World Bank indicators, the study identified several areas in need of surveillance effort prioritization. For carbapenem-resistant *Acinetobacter baumannii* and third-generation cephalosporin-resistant *E. coli*, specific countries of interest were in the Middle East, sub-Saharan Africa, and the Pacific Islands.[19]

Drug Resistance Index

Communicating trends in national AMR burden is confounded by layers of complexity surrounding drugs' varying efficacy against different pathogens. The Drug Resistance Index (DRI) combines antibiotic use and antibiotic resistance in one measure to quantify and communicate to broader audiences the effectiveness of antibiotics across countries.[3,20] The DRI resembles composite price indices in economics: measurements of antibiotic consumption and resistance are combined across multiple pathogen-organism combinations to create a single metric representing an aggregate level of drug resistance.

Briefly, a composite index score is derived by multiplying the proportion of each antibiotic used to treat a set of pathogens by the proportion of all isolates that were resistant to that drug[3] :

$$\boldsymbol{DRI = \sum_{k} p_k^t q_k^t}$$

where ***pkt*** is the proportion of resistance to drug ***k*** among all included pathogens for time ***t***, and ***qkt*** is the proportion of drug ***k*** used to treat those pathogens in all drugs included in the index for time ***t***. A score of 0 indicates 100% susceptibility, and 100 indicates 100% resistance (Figure 2).

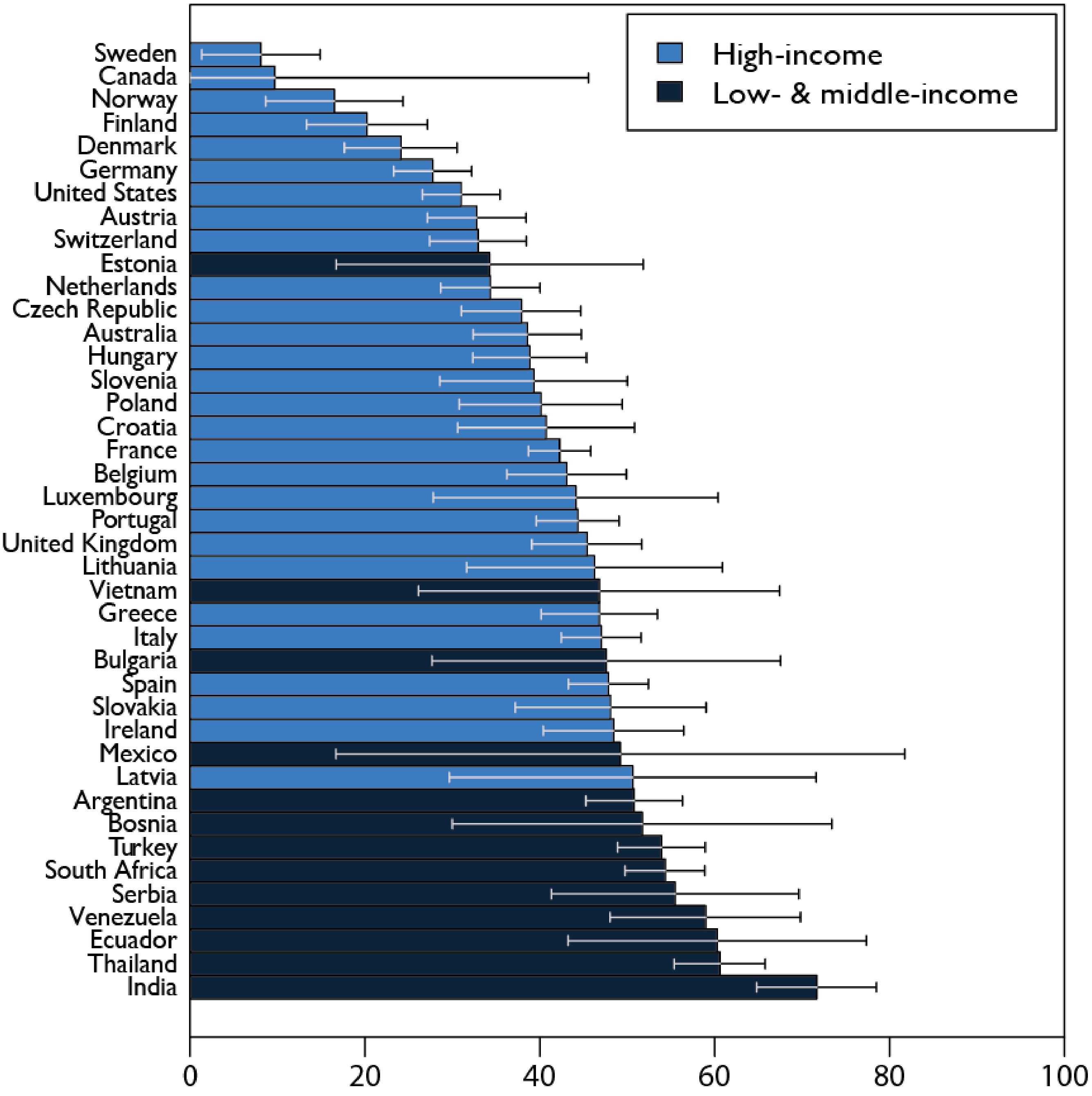


Figure 2. ***Drug Resistance Index across countries.*** *Each bar represents the DRI for countries reporting antibiotic resistance for five or more pathogens and 15 or more pathogen-antibiotic combinations for at least one year between 2012 and 2015. Data for the most recent year are shown. Country income classifications were based on World Bank analytical classifications for fiscal year 2015. Source: Klein, E. Y., Tseng, K. K., Pant, S. & Laxminarayan, R. Tracking global trends in the effectiveness of antibiotic therapy using the Drug Resistance Index. BMJ Glob. Heal. 4, (2019).*

As an aggregate measure, DRI reflects the average effectiveness of a set of antibiotics used to treat a given bacterial infection. For example, a country with high per capita drug use would not have a high DRI if resistance rates to the most frequently used drugs were low. Conversely, high rates of resistance would lead to a high DRI even if per capita antibiotic use was relatively low.[3] In LMICs, higher DRI values may reflect a relatively lower level of antibiotic effectiveness due to limited access to newer, more effective antibiotics, revealing where resistance poses a more significant problem. As shown in Figure 2, high-income countries (among them, Sweden, Canada, Norway, Finland, and Denmark) had the lowest DRIs, and LMICs had the highest, reflecting the very low effectiveness of antibiotic therapy.[3]

Emerging Threats: Resistance in HIV, Malaria, and Typhoid

Addressing AMR requires a particular focus on mitigating drug resistance in three infectious diseases that burden a large part of the global population: human immunodeficiency virus (HIV), malaria, and typhoid.

HIV

As of 2019, approximately 38 million people were living with HIV, and as of June 2020, 26 million had access to antiretroviral (ARV) drugs.[21] Although the unprecedented increase in access to ARVs in the past decade has saved millions of lives, it has also contributed to a significant increase in resistance to HIV drugs. HIV drug resistance is categorized by the WHO as follows: (1) acquired HIV drug resistance, which develops in the presence of ARVs; (2) transmitted HIV drug resistance, which occurs when individuals are infected with a strain containing drug resistance mutations; and (3) pretreatment HIV drug resistance (PDR), which refers to resistance among ARV-naive people initiating ARV therapy or people with previous ARV drug exposure initiating or reinitiating first-line ARV therapy.

According to the 2019 WHO HIV Drug Resistance Report, 12 of 18 countries (Argentina, Eswatini, Cuba, Guatemala, Honduras, Namibia, Nepal, Nicaragua, Papua New Guinea, South Africa, Uganda, and Zimbabwe) showed PDR levels exceeding 10% to non-nucleoside reverse-transcriptase inhibitors (NNRTIs), such as efavirenz and nevirapine.[22] NNRT1 resistance was nearly twice as high in women than in men, and nearly three times higher among people with previous exposure to ARV. In response to this trend, the 2018 WHO ARV guidelines recommended a rapid shift to dolutegravir (DTG)-based regimens as the preferred first-line treatment for adults and children. This change was incorporated in the national guidelines of all countries exceeding a 10% resistance threshold, but the extent of implementation remains uncertain. For instance, although the change to DTG-based regimens for infants and children was recommended in 2013, approximately 77% of young children globally were still receiving nevirapine as first-line ARV therapy in 2017 as a result of limited supplies of child-friendly drug formulations. Findings of emerging levels of PDR underscore the importance of drug resistance surveillance, policy responses, and access to appropriate therapies.[23]

Malaria

Despite remarkable achievements in the global response to malaria in the past two decades, progress since 2015 has reached a plateau, and it is estimated that the 2020 targets of WHO's Global Malaria Strategy on the reduction of disease prevalence and death were missed by 37% and 22%, respectively.[24] The surveillance of resistance to common antimalarial drugs is vital to ensure treatment efficacy and make progress toward malaria elimination.

The discovery of a molecular marker for artemisinin-resistant *Plasmodium falciparum*, the kelch13 domain gene (K13),[25] has enabled large-scale surveillance of artemisinin resistance beyond the capability of parasite clearance studies. The first reported partial resistance to artemisinin combination therapy (ACT) was detected in Asia in 2008, on the border between Thailand and Cambodia.[26] More than a decade later, studies showed that South East Asia remained the epicenter for artemisinin partial-resistance.[27,28] Given the region's high levels of drug resistance, the drastic decrease in the reported number of *P. falciparum* malaria cases (97%) and all malaria (90%) in the Global Malaria Strategy between 2000 and 2019 has been considered a significant gain. Resistance to ACT does not appear to be a substantial problem in African countries. Nevertheless, close surveillance is imperative, since the emergence of resistance to ACT in Africa would probably have devastating consequences. In the WHO African region, the first-line treatment failure rates for the most common type of malaria (P. falciparum) remain below 10%.[24]

Typhoid Fever

Each year, between 11 million and 20 million typhoid fever cases result in approximately 128,000 to 161,000 deaths. At highest risk are populations lacking safe water and adequate sanitation, especially children.[29] Treatment of typhoid with antibiotics is complicated by the increasing AMR in *Salmonella typhi* and the emergence of multidrug-resistant (MDR) and extensively drug-resistant (XDR) strains.[30] As a result, newer antibiotics such as cephalosporins and azithromycin are used in high-burden regions.[29] Suboptimal treatment from emerging AMR could increase transmission because of prolonged bacterial shedding, complications, and death. In Pakistan, between 2016 and 2018, an XDR *S. typhi* strain resistant to all recommended treatment led to an outbreak, causing great concern about its potential to spread globally. Although the cause was likely contaminated drinking water, the outbreak highlighted the consequences of vaccine hesitancy in the region.[31] To reduce disease burden, the use of antibiotics, and emerging resistance, the WHO approved a conjugate vaccine for typhoid in 2017, which is currently recommended for children older than six months.[29]

Chapter 2. Drivers of Resistance: Antibiotics in Human Healthcare

Key Messages

1. The misuse and overuse of antimicrobials in the human health sector is a major driver of AMR.

2. Globally, the use of antimicrobials is accelerating worldwide, particularly in LMICs, as antimicrobials become readily accessible and affordable. The use of WHO Watch antibiotics increased 90.0% worldwide and 165% in LMICs between 2000 and 2015.

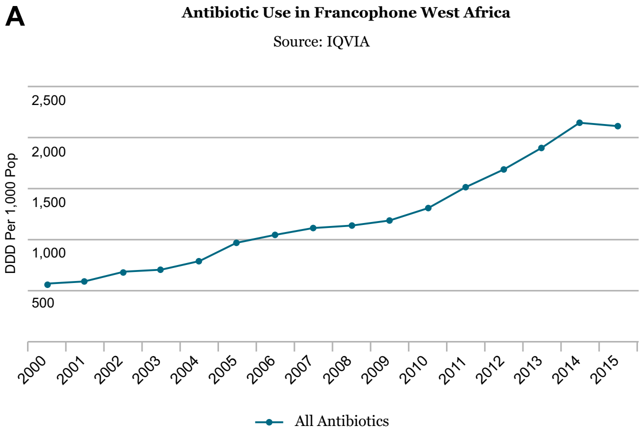
3. Vaccines against many infectious agents are available, but low vaccination coverage, coupled with poor water, sanitation, and hygiene (WASH) infrastructure, leave many people vulnerable to infection and dependent on antibiotics for treatment.

4. Investments to increase vaccine coverage, develop WASH infrastructure, and implement antimicrobial stewardship in health facilities could mitigate AMR worldwide.

Global Antibiotic Consumption and Projected Consumption

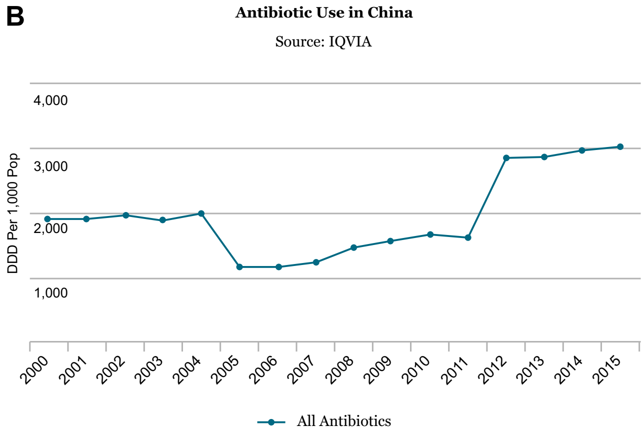
Antibiotics are the most commonly prescribed medicines in the world. The use of these drugs has soared over recent decades in many countries, particularly in LMICs. Global antibiotic consumption increased by 65% between 2000 and 2015, and the rate of antibiotic consumption increased by 39%, from 11.3 to 15.7 defined daily doses (DDDs) per 1,000 people.[32]

Antimicrobial use in Brazil increased from 2,535 DDDs per 1,000 people in the year 2000 to 6,763 in 2015, according to most recent data available.[18] Over that same time period, antimicrobial use increased from 1,910 to 3,060 DDDs per 1,000 people in China, from 557 to 2,112 in Francophone West African countries, and doubled from 5,647 to 10,934 DDDs per 1,000 people in Saudi Arabia (Figure 3).



Antibiotic Use in Francophone West Africa

Source: IQVIA



Antibiotic Use in China

Source: IQVIA

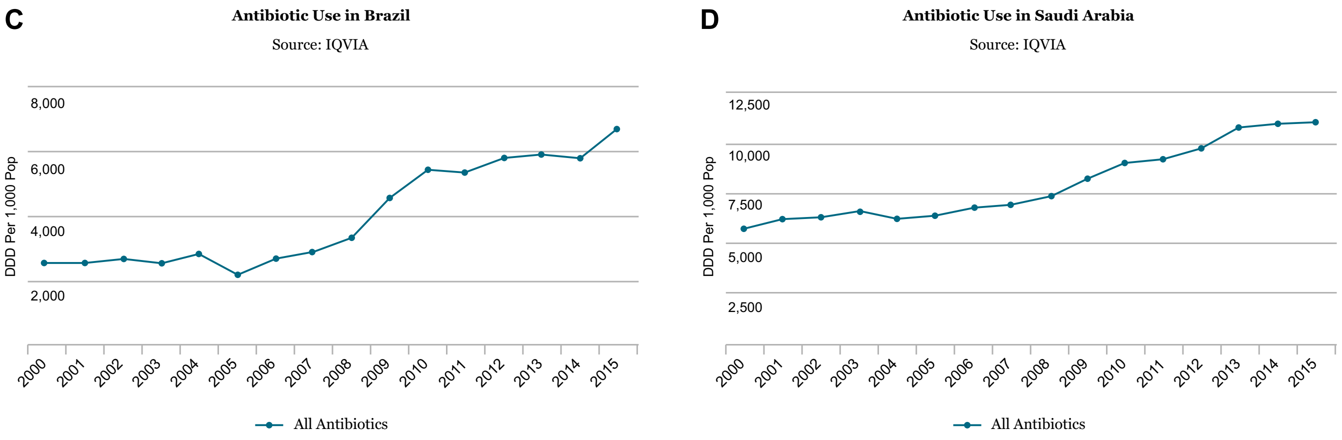


*Figure 3. **Increases in total antibiotic use, 2000–2015.** Total antibiotic use in DDDs per 1,000 people in (A) Francophone West Africa, (B) Brazil, (C) China, and (D) Saudi Arabia. Source: Center for Disease Dynamics Economics and Policy. ResistanceMap. Available at: https://resistancemap.cddep.org/. (Accessed: 25th January 2021)*

In high-income countries total consumption increased between 2000 and 2015, but DDDs per 1,000 inhabitants increased only slowly or even declined. For example, in Switzerland, antimicrobial use rose by only 716 DDDs per 1,000 people in a 15-year time period. In the United States, antimicrobial use remains high but declined from 12,030 to 10,298 DDDs per 1,000 people between 2000 and 2015. A study by CDDEP researchers evaluating increases in global antibiotic consumption between 2000 and 2015 revealed that per capita antibiotic consumption in LMICs was lower than in high-income countries; increasing access to antibiotics is leading to the converging consumption rates.[32] Furthermore, rapid increases in last-resort compounds such as glycylcyclines, oxazolidinones, carbapenems, and polymyxins, in all countries underscores the urgent need for regulation of antibiotic use. The same study projected that in the absence of policy changes, global antibiotic consumption could double by 2030.

To mitigate AMR, the WHO developed the Access, Watch, and Reserve (AwaRe) antibiotic classification system.[33] Access antibiotics are those that can treat a wide range of common pathogens and have lower resistance potential and should therefore be considered first-line options over antibiotics in the other categories. Watch antibiotics are those with higher resistance potential and those deemed “critically important antimicrobials for human medicine.” Reserve antibiotics should be used only for multidrug-resistant infections that cannot be treated by any other antibiotic. As the burden of AMR rises globally and pathogens become increasingly resistant to common first-line antibiotics, clinicians must turn to more expensive, second-line antibiotics. Between 2000 and 2015, the global per capita consumption of Watch antibiotics increased by 90.9%, driven largely by LMICs, which saw a 165% increase (from 2.0 to 5.3 DDDs per 1,000 people), versus a 27.9 percent in high-income countries (from 6.1 to 7.8 DDDs). In the same time period, the use of Access antibiotics increased only 26.2% globally.[34]

Factors Driving Consumption

In high-income countries, widescale improper use drives the growing resistance to antimicrobials around the world. In LMICs, the primary factors are increased access to antibiotics, distinct national disease burden, and seasonal patterns. As mentioned above, the considerable increase in the proportion of Watch antibiotic consumption occurred primarily in LMICs (Figure 4). Densely populated regions with a high incidence of infectious diseases are likely to have the highest antibiotic consumption and selective pressure for AMR emergence.

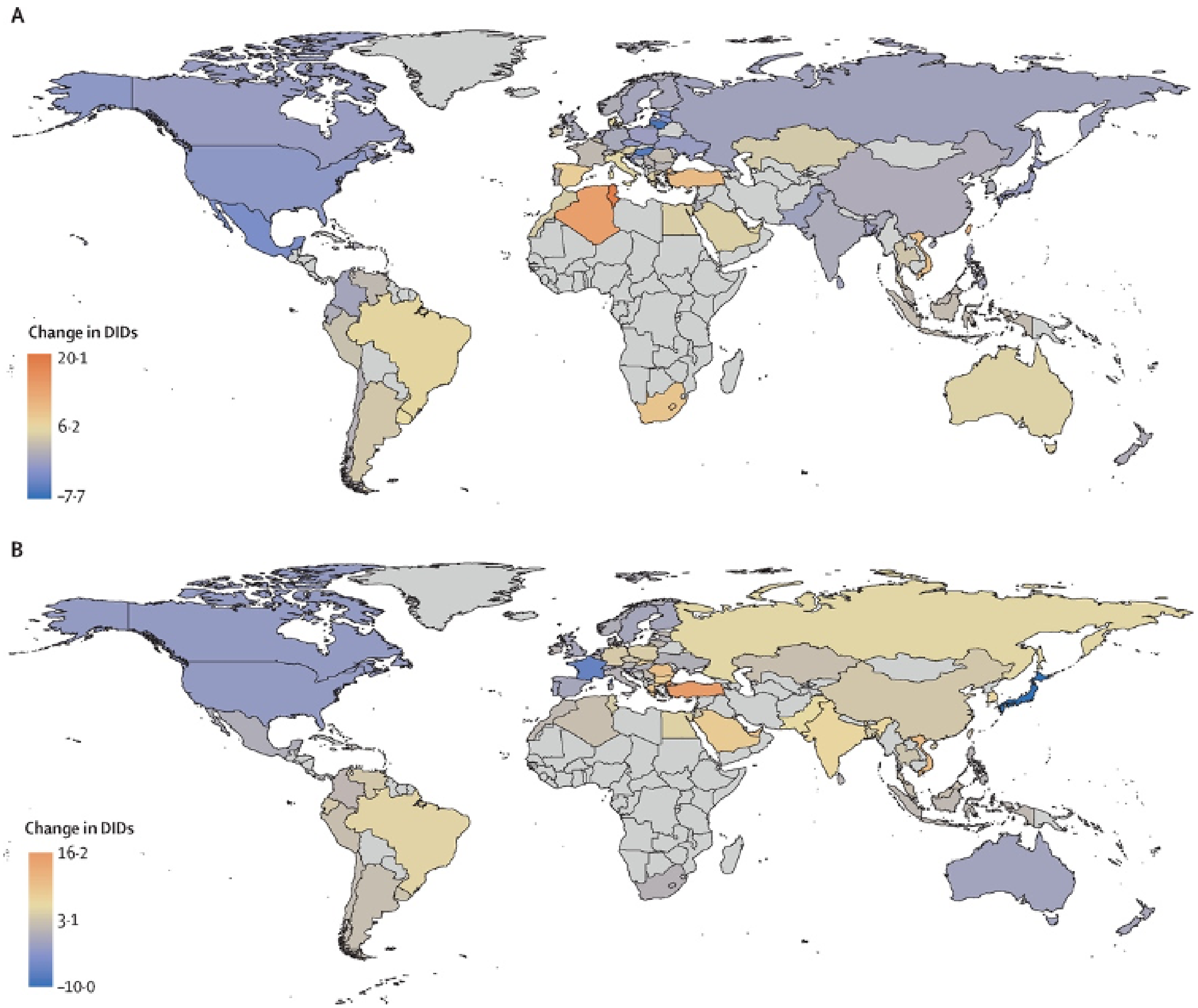


Figure 4. ***Change in the national consumption of Access and Watch antibiotics in DDDs per 1000 inhabitants (DIDs) 2000–2015*** *Source: Klein, E. Y. et al. Assessment of WHO antibiotic consumption and access targets in 76 countries, 2000–15: an analysis of pharmaceutical sales data. Lancet Infect. Dis. 21, 107–115 (2020).*

Seasonal variation is another factor that affects antibiotic prescribing, which generally peaks during the winter months traditionally associated with influenza.[35] Both appropriate use (e.g., to treat secondary bacterial infections) and inappropriate use (e.g., to treat viral infections caused by influenza or other viruses) may account for the winter increase. A recent study by CDDEP researchers exploring the relationship between influenza vaccination and antibiotic use found that a 10% increase in influenza vaccination coverage was associated with a 6.5 % reduction in antibiotic use during the influenza season, indicating that a reduction in influenza cases could lead to a reduction in antibiotic use. Increased vaccination rates were associated with reductions in antibiotic prescribing rates among pediatric (6%), elderly (5.2%), and adult populations (4.2%).[36]

The Covid-19 pandemic may be encouraging the overuse of antibiotics, partly because of misinformation about antibiotics' benefits as treatment options for Covid-19 patients.[37,38] Empiric use of antibiotics in such patients has been widespread. A study reported that 71% of the patients received at least one dose of antibiotics, despite just 3.6% co-infection cases.[39] Furthermore, data from an international survey completed by experts in 23 countries reported clinical presentation as the most critical reason for the start of antibiotic therapy, followed by laboratory markers of inflammation and radiology findings. The widespread use of broad-spectrum antibiotics in patients with Covid-19 warranted implementation of antimicrobial stewardship principles to mitigate the negative consequences of unnecessary antibiotic therapy.[40]

Overuse and Misuse

The overuse and misuse of antimicrobials in the human health sector are major drivers of AMR. Surveillance data worldwide are limited, but emerging evidence suggests that overuse and misuse are higher in certain clinical settings, for certain patient demographics and clinical indications, and in LMICs, particularly in the African region.

The 2015 Global Point Prevalence Survey assessed antimicrobial prescribing to patients admitted to more than 300 hospitals across 53 countries, including 25 LMICs.[41] The study found that antimicrobial prescribing practices varied by geographic region and by type of clinical setting. In Eastern Europe, 27.4% of inpatients were prescribed an antimicrobial, whereas in Africa, which had the highest prescription rate, 50% of inpatients received an antimicrobial. The high rate of prescriptions for antimicrobials in Africa may be explained by the region's higher burden of infectious diseases.

In many LMICs in Africa and Asia, antimicrobials are readily available without a prescription. Although many countries require prescriptions for such drugs, oversight and enforcement of the laws and policies are lax. As a result, patients seeking antimicrobials can bypass clinicians and diagnostics and directly purchase antimicrobials, which may not be clinically appropriate.[42] Moreover, many countries have private sector healthcare providers and pharmacies, which are not always well regulated by the national governments and may recommend prolonged antimicrobial therapy for economic rather than clinical reasons. The scale and consequences of nonprescription antimicrobial use and private sector sales are, however, not well known.

Generally, antimicrobial use and misuse are higher in specific settings, such as the primary and acute care wards, and for clinicians treating neonatal and pediatric patients or specific infections or syndromes. Previous studies have found that the rate of inappropriate antibiotic use in the primary healthcare setting is as high as 55% in South Africa,[43] 88% in Pakistan,[44] 61% in China,[45] and 15.4% in Canada.[46]

A study published in 2019 found that in the primary healthcare setting in Louisiana, USA, up to 60% of antimicrobial prescriptions given to patients with acute respiratory tract infections were clinically inappropriate,[47] not only rendering the immediate treatment ineffective but also fueling the emergence and spread of AMR. Other conditions that are commonly mistreated with an inappropriate type or duration of antibiotic therapy include acute bronchitis, sinusitis, and otitis media.[46]

Vaccines

WHO estimates that every year, vaccines avert 2 million to 3 million deaths from diphtheria, tetanus, pertussis (whooping cough), and measles. An additional 1.5 million deaths could be avoided if global vaccination coverage increased.[48] Vaccines can reduce AMR via two mechanisms: by reducing the transmission of resistant infections, and by reducing the selection pressure for AMR, since antimicrobial usage falls with the number of total infections (Figure 5).[49]

Ultimately, this reduction in resistant cases will lead to fewer untreatable infections and more lives saved.

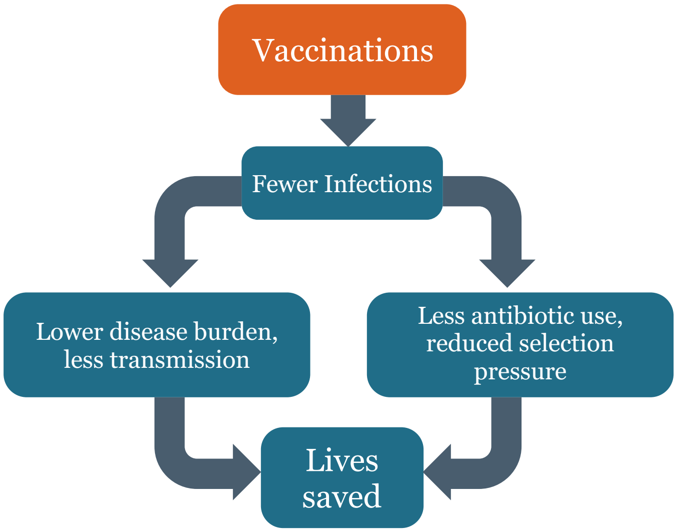


Figure 5. ***Two routes by which vaccination can reduce incidence of AMR.*** *Source: The Centerfor Disease Dynamics, Economics & Policy. Available at: https://cddep.org/projects/arvac-consortium/ (Accessed: 5th January 2021)*

Many vaccines in current use (against pneumococcal disease, seasonal influenza, typhoid, and rotavirus) and in the pipeline (against tuberculosis, shigella, and Gram-negative bacteria) can help reduce the AMR disease burden and thereby save lives.[50-52] In general, efforts to assess the benefits of vaccines in terms of deaths averted and reduction in medical impoverishment have not considered the effects on AMR.[53] Over the past few years, efforts to better quantify the gains of vaccination for AMR have been made through the ARVac Consortium and the WHO, along with the Bill & Melinda Gates Foundation and the Wellcome Trust.

A recent global study from the ARVac consortium reported that the pneumococcal conjugate vaccines and live attenuated rotavirus vaccines confer 19.7% (3.4–43.4%) and 11.4% (4.0–18.6%) protection against antibiotic-treated episodes of acute respiratory infection and diarrhea, respectively, in age groups with the greatest disease burden attributable to the vaccine-targeted pathogens.[54] Each year, pneumococcal and rotavirus vaccines currently prevent 23.8 million and 13.6 million antibiotic-treated illness episodes, respectively, among children under five in LMICs. Remarkably, achieving universal coverage with these two vaccines could prevent an additional estimated 40.0 million episodes of antibiotic-treated illness. Another study from this consortium found that implementation of pneumococcal vaccines has reduced the proportion of circulating pneumococci resistant to first-line antibiotic treatment for pneumonia, as has been found by other studies.[55,56]

Another study from ARVac found that a postexposure TB vaccine (when it becomes available) with 50% efficacy in reducing active disease could avert about 10% of rifampicin-resistant tuberculosis (RR-TB) cases and 7.3% of deaths over 2020–2030 in the 30 countries that collectively accounted for 90% of RR-TB incidence worldwide in 2018 (Fu et al., forthcoming in Nature Communications). The benefits were projected to be even greater if the vaccine was combined with improvements in RR-TB diagnosis and treatment, relative to a scenario of no vaccine and no such improvements.

Infection Prevention and Control

Infection prevention and control is a continuing challenge in healthcare settings. Although there is greater awareness about hand hygiene as a result of Covid-19, it is unclear whether the behavioral changes will outlast the pandemic. Lack of access to clean water and improved hygiene and sanitation causes nearly 500,000 deaths each year from waterborne diarrheal diseases, the majority of which occur in LMICs.[10] Investing in WASH infrastructure in the community and in healthcare facilities is one of the most beneficial and cost-effective interventions to reduce the burden of infectious and drug-resistant diseases and thereby decrease the need for antibiotic treatment—a major driver of AMR.

Antimicrobial Stewardship

The SCMID Study Group for Antimicrobial Stewardship recently reviewed the emergence and evolution of the term 'antimicrobial stewardship programs' and suggested defining the strategy comprising antimicrobial stewardship programs (ASP) as a *"...coherent set of actions which promote using antimicrobials in ways that ensure sustainable access to effective therapy for all who need them"*.

ASP implement evidence-based interventions at local, national, and global levels that promote appropriate antimicrobial management in human and animal health . ASP interventions include: limiting antibiotic use to bacterial indications, avoiding use of broad-spectrum antibiotics and unauthorized combinations, and ensuring that antibiotics are administered per the recommended dose and duration. The WHO AWaRe classification of antibiotics serves as essential guidance for developing ASP tools, improving both access and clinical outcomes.[59]

Establishing an ASP at any level, requires political will and leadership, collaborative efforts between programs and divisions, identification of resources, monitoring and surveillance, effective interventions, training, education, and reporting. Researchers at CDDEP, in collaboration with an expert panel, developed a checklist for hospital-based ASPs, based on the review of published scientific research and existing checklists.[60] Development of the Checklist for Hospital Antimicrobial Stewardship Programming (CHASP) aimed to guide the establishment of hospital-based ASP in both high-income and low- and middle-income countries (Figure 6).

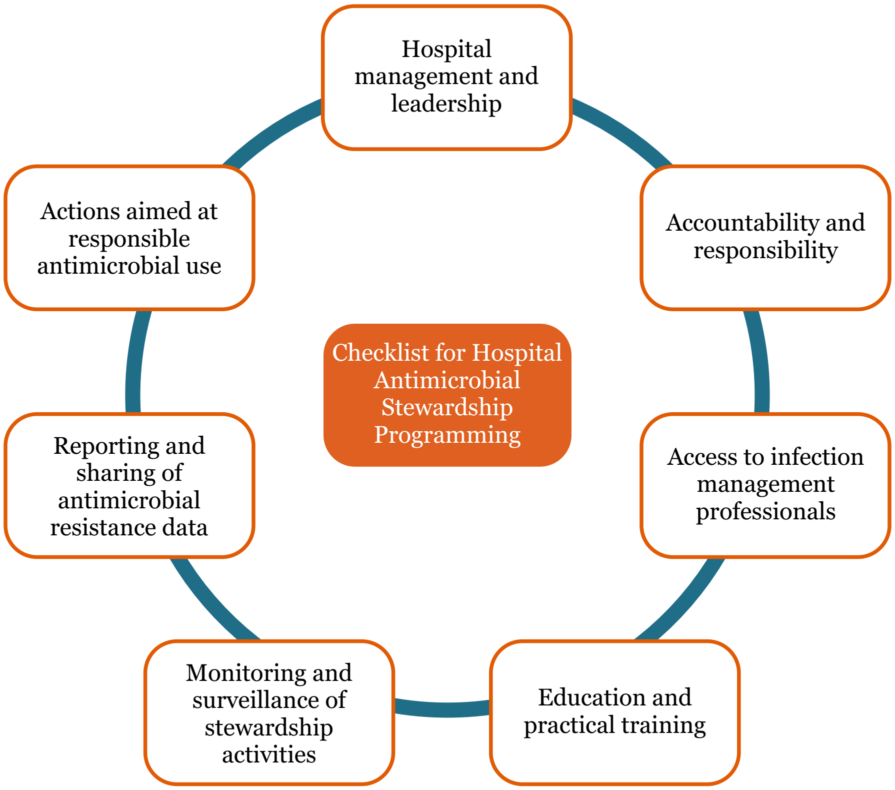


Figure 6: ***Core components of the Checklist for Hospital Antimicrobial Stewardship Programming (CHASP).*** *Source: Pulcini, C. et al. Developing core elements and checklist items for global hospital antimicrobial stewardship programmes: a consensus approach. Clin. Microbiol. Infect. 25, 20 (2019).*

The checklist's feasibility was then investigated by surveying twelve Leading Health Systems Network hospitals across nine countries (including two low-income countries), utilizing a questionnaire informing on the hospitals' ability to meet a set of criteria related to the core elements of the checklist.[61] None of the checklist elements were absent in all of the hospitals assessed, indicating the survey's practicality. While senior leadership in ten out of twelve hospitals agreed that ASP is a key performance indicator, only three hospitals reported having staffing standards to support ASP implementation. Barriers to ASP were assessed to be lack of expertise, limited financial resources, suboptimal use of IT, insufficient collaboration, and absence of hospital leadership commitment. Similar barriers to ASP implementation in hospitals were also observed in a cross-sectional, multicenter study in three Kenyan hospitals.[62]

ASP is considered one of the pillars of an integrated approach to health systems strengthening, its ultimate goal being the optimization of antimicrobial prescribing and use, improvement of patient quality of life, and reduction of AMR and its economic burden.[58] In light of the SARS-CoV-2 pandemic, there is evidence of a surge in the inappropriate use of antibiotics.[40] In one multi-hospital cohort study, nearly two-thirds of COVID-19 patients received early empiric antibiotics, while only 3.5 percent had a confirmed community-onset bacterial infection.[63] Therefore, experts urge for existing ASPs to continue to operate without disruptions and for new programs to be established to mitigate exacerbation of the threat of AMR.[64,65]

Chapter 3. Drivers of Resistance: Antibiotics in Agriculture

Key Messages

1. The enormous increase in the demand for animal protein has rapidly increased the use of antimicrobials in the animal health sector, where these drugs are used not only to treat and prevent infection but also to promote rapid growth.

2. China and India represented the largest hotspots of resistance, with new hotspots emerging in Brazil and Kenya.

3. All countries need to develop and implement legislation and other policies to reduce the use of antibiotics in both terrestrial and aquatic food animals.

Antibiotic Use in Agriculture

The global rise in demand for animal protein is among the salient changes of our time. Like the increase in carbon emissions from industrial activity, the enormous increase in the consumption of animal protein has profound effects on both environmental and human health. Animals raised for human consumption constitute nearly 60% of the total mammalian biomass on the planet, and poultry makes up more than 90% of the avian biomass.[66]

Antimicrobial consumption in animals is nearly triple that of humans and is a primary driver of the scale-up in animal protein production.[67] Since 2000, meat production has reached a plateau in high-income countries but has grown by 64%, 53%, and 66% in Asia, Africa, and South America, respectively. Research from CDDEP and collaborators find that in 2013, the global consumption of all antimicrobials in food animals was 131,109 tons (95% C.I. [100,812–190,492]) and is projected to reach 200,235 tons (95% CI [150,848–297,034]) by 2030.[32] Consumption levels varied considerably between countries, ranging from 8 mg/PCU (a kilogram of animal product) in Norway to 318 mg/PCU in China (SM). China is the world's largest consumer of veterinary antimicrobials, in both relative (per PCU) and absolute terms.[68]

Aquaculture consumption is increasing at a rate even faster than meat and dairy consumption. Globally, aquaculture contributes 8% of animal protein intake to the human diet. Global antimicrobial use in the rapidly expanding aquaculture industry has been estimated at 10,259 tons (95% uncertainty interval [UI] 3,163–44,727 tons) in 2017 and is projected to increase by a third to 13,600 tons in 2030 (UI 4,193–59,295) (Figure 7).[69] Global antimicrobial consumption in aquaculture is concentrated in the Asia-Pacific region, at more than 93%, with China alone contributing 57.9% of global consumption in 2017.[69]

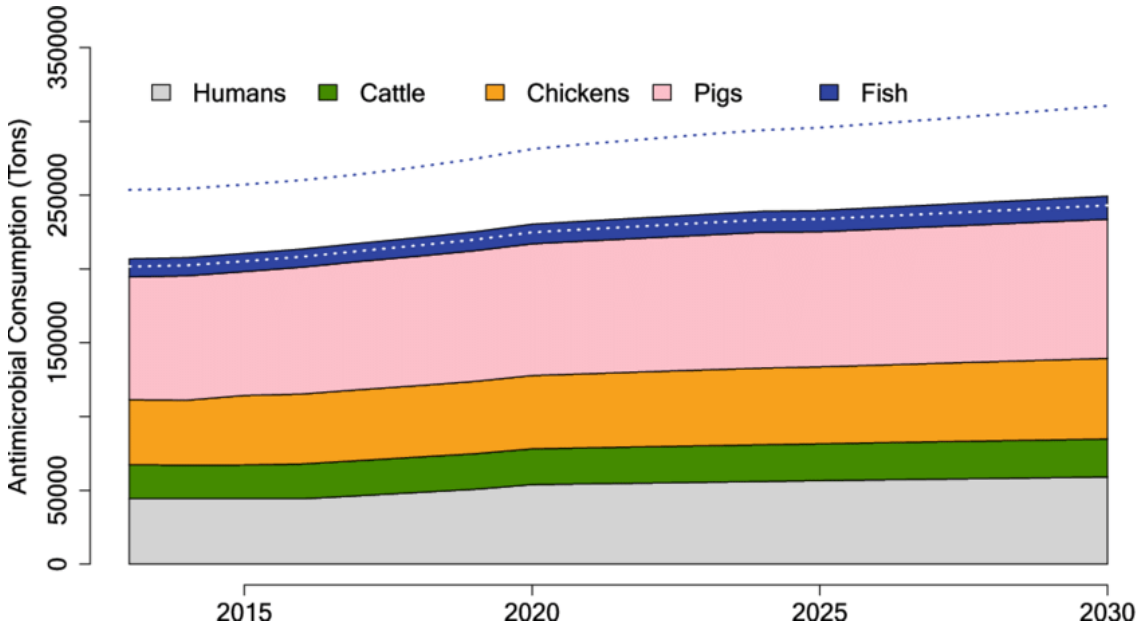


Figure 7: ***Global antimicrobial consumption, 2013–2030. Dotted lines represent the 95% uncertainty interval for antimicrobial consumption estimates in fish.*** *Source: Schar, D., Klein, E. Y., Laxminarayan, R., Gilbert, M. & Van Boeckel, T. P. Global trends in antimicrobial use in aquaculture. Sci. Rep. 10, 21878 (2020).*

Antibiotic Resistance in Food Animals

Research from CDDEP and collaborating institutions has found that from 2000 to 2018, the proportion of antimicrobials showing resistance above 50% increased from 0.15 to 0.41 in chickens and from 0.13 to 0.34 in pigs[70] (Figure 8). China and India represented the largest hotspots of resistance, with new hotspots emerging in Brazil and Kenya.

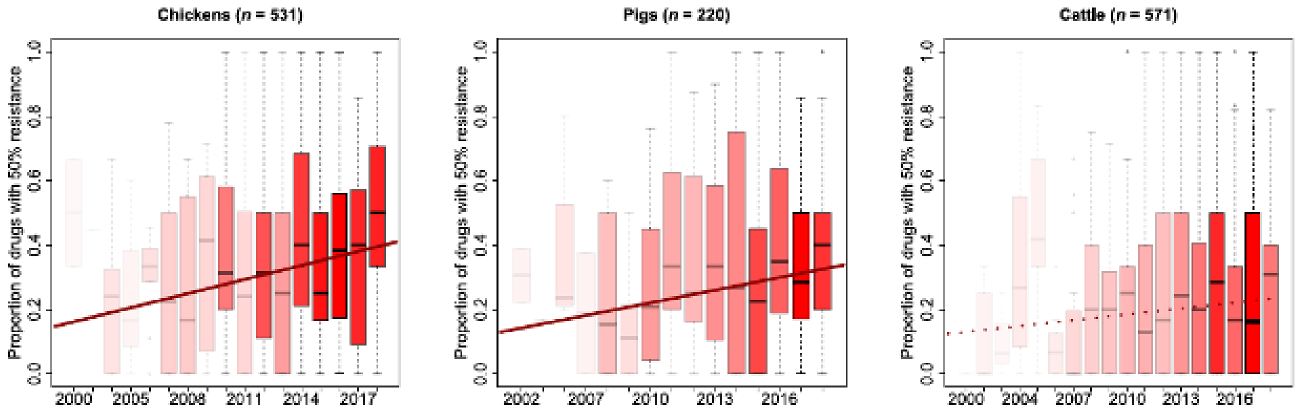
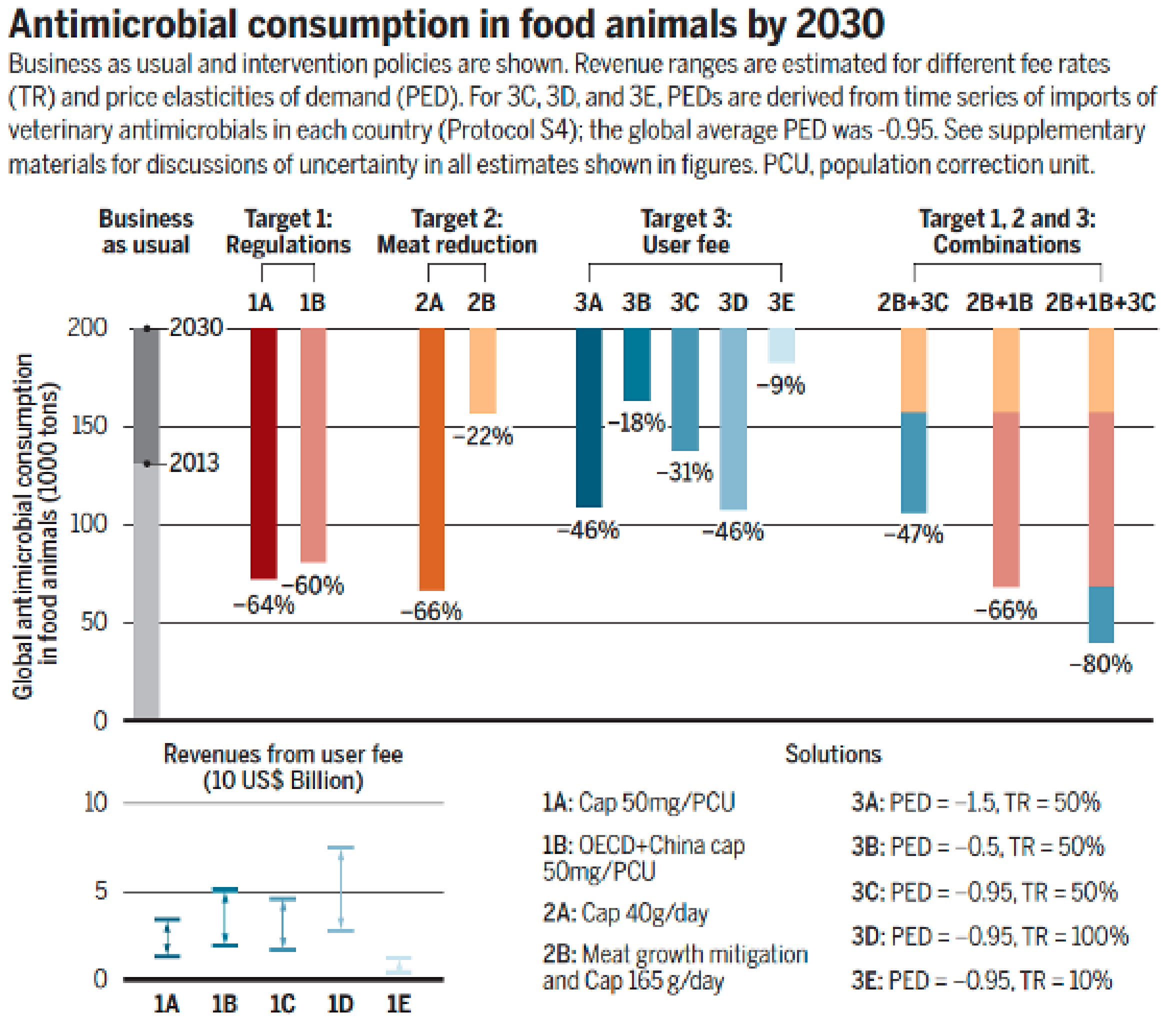


Figure 8. ***Increase in antimicrobial resistance in LMICs. The proportion of antimicrobial compounds with resistance higher than 50% is shown.*** *Source: Van Boeckel, T. P. et al. Global trends in antimicrobial resistance in animals in low- And middle-income countries. Science (80-.). 365, (2019).*

The past five years has seen a greater acceptance of the One Health approach to managing antibiotic effectiveness across countries. The structure of the Global Action Plan, which involves the WHO, the Food and Agricultural Organization, and the Organization for Animal Health, has set the stage for a similar approach at the national level.[71,72] Covid-19, a zoonotic disease, has improved public recognition and understanding that the health of humans, animals, and the environment are intricately connected.

Regulation of Antibiotics in Food Animals

Policies to reduce the use of antibiotics in both terrestrial and aquatic animals are needed. Effective policies could reduce the use of antimicrobials in terrestrial food animals by 9% to 80% by 2030, compared with a business-as-usual increase in the livestock sector with current levels of antimicrobial use (Figure 9).[68] This could be achieved by reducing either the quantity of drugs used per animal (targets 1 and 3) or the number of animals raised for food (target 2). Similar policies could be employed in aquaculture as well.



Antimicrobial consumption in food animals by 2030

Business as usual and intervention policies are shown. Revenue ranges are estimated for different fee rates (TR) and price elasticities of demand (PED). For 3C, 3D, and 3E, PEDs are derived from time series of imports of veterinary antimicrobials in each country (Protocol S4); the global average PED was -0.95. See supplementary materials for discussions of uncertainty in all estimates shown in figures. PCU, population correction unit.

*Figure 9. **Antimicrobial consumption in food animals by 2030** Source: Van Boeckel, T. P. et al. Reducing antimicrobial use in food animals. Sci. Mag. 1350–1352 (2017). doi:10.1126/science.aao1495*

The coming few years offer a window of opportunity to reduce antibiotic use to raise food animals before these practices become entrenched and difficult to change. In the United States, the Food and Drug Administration's Guidance 213 rulings[73] have been observed to have a tempering effect on the use of antibiotics as growth promoters.[74] Reducing and eventually phasing out all use of antibiotics for animal growth promotion should be a global goal to ensure that both animal and human health are safeguarded.

Chapter 4. Access to Antibiotics and the Global Antibiotic Supply

Key Messages

1. Although AMR poses an urgent global public health threat, more people in LMICs die from lack of access to antimicrobials than from resistant infections.

2. Global efforts to reduce the inappropriate use of antimicrobials and to mitigate AMR must also increase consistent access to affordable and clinically appropriate antimicrobials.

3. Antibiotic research and development lags behind clinical need, and the antibiotic pipeline is not equipped to mitigate the effect of increasing resistance o current antimicrobials.

Access to Antibiotics

AMR poses an increasingly urgent global public health threat, yet thousands of people continue to die from preventable and treatable infectious diseases because they lack access to clinically appropriate antimicrobials. It is estimated that each year, treatable infectious diseases cause more than 5 million deaths, the majority in LMICs, where the morbidity and mortality burden from treatable infectious disease far outweighs the AMR burden.[75]

In a 2019 report, CDDEP researchers conducted literature reviews and stakeholder interviews to assess access barriers to antimicrobials in Germany, India, and Uganda.[76] This work identified three major barriers to antimicrobial access in these settings: the unaffordability of drugs and health services, with limited government funding for health services; a lack of regulations and processes for bringing new drugs to local markets; and weak local and national drug supply chains causing frequent drug stock-outs.

LMICs face dual burdens of mortality from treatable infectious diseases and resistant pathogens in the immediate future. Moreover, AMR may compound the challenge in accessing antimicrobials as pathogens become resistant to commonly used first-line drugs. Clinicians must then rely on second-line agents that may be unavailable in LMICs and are more expensive.[77] Solutions and policies to address the rising AMR burden must also consider the need for continued access to clinically appropriate antimicrobials, as well as increased access to antimicrobials and their appropriate use.

Current and Future Antibiotic Supply

The antibiotic era began in the 1930s, when the discovery of bactericidal compounds in soil-dwelling organisms introduced the golden age of antibiotic drug discovery. Over the next few decades, more than 65 antibiotics in nine classes were developed.[78] The naturally occurring antibiotics of the early years have given way to synthetic compounds,, and current research and development efforts focus on creating derivatives of older classes of antibiotics.[78]

Recently, antibiotic shortages have been observed. The United States alone has seen 148 antibiotic shortages from 2001 to 2013.[79] Recently, penicillin shortages affected at least 39 countries in Asia, South America, North America, and Europe.[80] As of June 29, 2020, 10.5% of all drug shortages listed

The declining effectiveness and shortages of current antibiotics could both be offset by several antibiotics in clinical development. As of December 2019, 41 new antibiotics are in development: 15 in Phase 1 clinical trials, 12 in Phase 2, and 13 in Phase 3. Of these developmental-stage antibiotics, approximately 18 have the potential to fight against Gram-negative pathogens including Gram-negative ESKAPE pathogens include *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter* species, all of which have shown demonstrable increases in drug-resistant variants over the past few decades and are responsible for serious infections.[82] Of these new drugs, 13 have demonstrated a potential to act against carbapenem-resistant and ESBL-producing Enterobacteriaceae, pathogens deemed by the WHO to be critical threats because they are resistant to nearly all antibiotics.[83]

Only about 20% of infectious disease drugs that reach clinical testing phases will be approved by organizations like the US Food and Drug Administration.[84] However, historically, approximately 60% of drugs that enter Phase 3 clinical trials have been approved, generating some optimism about the outlook for new antibiotics.[84]

Antibiotic Research and Development

Pharmaceutical research and development has not responded to external pressure for new antibiotics, even though the antibiotic development pipeline has shown some improvement since 2013.[5,83,85] Over the past 20 years, only two new drug classes, lipopeptides and oxazolidinones, which protect against Gram-negative bacteria, have been developed and approved by the European Medicines Agency and the US Food and Drug Administration.[86] Before this, the first synthetic antibiotics to be developed against Gram-negative bacteria were quinolones, in 1962.[87] Apparently, then, barriers exist that disincentivize further antibiotic development—barriers that may be economical, regulatory, and scientific.[4] From a technical perspective, finding new classes of antibiotics that are safe, have acceptable pharmacokinetic properties, and are appropriately active is a challenging issue.[4] Additionally, the profit margins for producing antibiotics are relatively low given the high cost for production and the lengthy timeline for research, testing, and approval.[4]

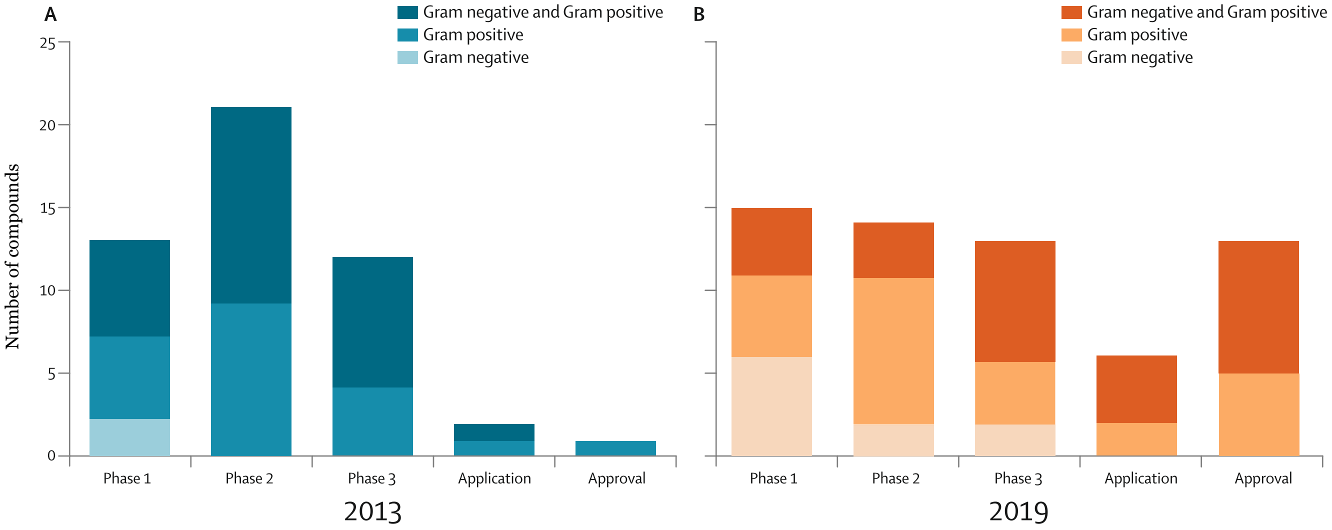


*Figure 10: **Antibiotic development between 2013 and 2019.** Adapted from Laxminarayan et al. Source: Laxminarayan, R. et al. The Lancet Infectious Diseases Commission on antimicrobial resistance: 6 years later. The Lancet Infectious Diseases 20, e51–e60 (2020).*

Appendix 1

Country Dashboards

Country Dashboards

The 2010–2020 decade witnessed an unprecedented global political coordination for control of antimicrobial resistance. The Covid-19 pandemic has undermined antimicrobial stewardship programs as antimicrobials continue to be prescribed for viruses. Current investments in public health largely favor AMR-centric studies, including research, new product development, and clinical programs. It is imperative to collect a set of standardized indicators that allow countries to set measurable goals and track national progress.

'The State of the World's Antibiotics Country Dashboards' show the status of antibiotic resistance and use in humans and animals across 40 countries. AMR-relevant measures characterize each country, representing four indicator categories: (1) policy indicators; (2) antimicrobial resistance indicators; (3) antimicrobial use indicators; and (4) public health indicators. Each indicator category, in turn, consists of a battery of specific indicators. Where available, scores for the Drug Resistance Index, an aggregate measure of antibiotic effectiveness, for two groups of important bacterial pathogens have also been provided. Indicator values are based on current data.

The dashboards are designed to help countries assess and track their AMR status over time and in relation to other countries, and then prioritize actions.

Argentina

Latin America & Caribbean | Upper-middle income

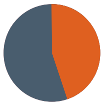
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓	National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✗	AMU surveillance in animals	✓
AMR surveillance in humans	✓	AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

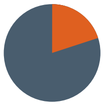
Humans



45.29% of isolates tested

MRSA

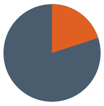
Methicillin-resistant *Staphylococcus aureus*



20.98% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



20.39% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	0
Ciprofoxacin	0
Colistin	0
Tetracycline	0

E.coli

Ampicillin	25%
Ciprofoxacin	N/A
Colistin	49%
Tetracycline	22.5%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Argentina

Antimicrobial Use Indicators

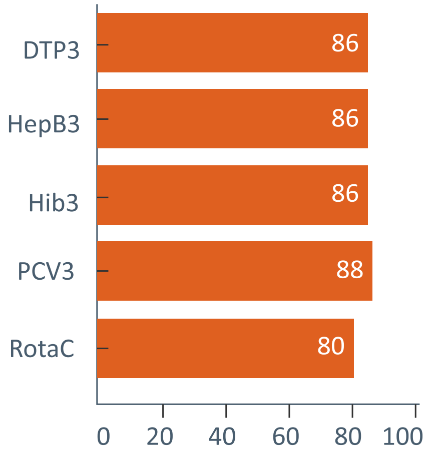
Humans

Total Use, 2010 (DDDs in Mill)	243	**Per Capita Use, 2010** (DDD)	5.91
Total Use, 2020 (DDDs in Mill)	338	**Per Capita Use, 2020** (DDD)	7.43
Change in total use, 2010-20 (DDDs in Mill)	94.36	**Change in per capita use, 2010-20** (DDD)	1.52
% Change in total use, 2010-20	38.72%	**% Change in per capita use, 2010-2020**	25.63%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	26.09%	**Regional average of % change in per capita use, 2010-20**	11.67%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	1438.92
Estimated Total Antimicrobial Use, 2030 (Tonnes)	1562.82

Public Health Indicators



% of children vaccinated
(2019)

8.2
Infant Mortality Rate
per 1,000 live births
(2019)

12.93
Under-five pneumococcal death rate
per 100,000 children
(2017)

124.22
Under-five deaths from diarrheal diseases
(2017)

29
Incidence of tuberculosis
per 100,000 people
(2019)

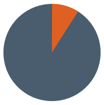
99.08
Access to improved drinking water source (%)
(2017)

96.77
Access to improved sanitation facilities (%)
(2017)

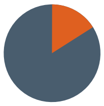
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

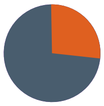
N/A
Nurses and midwives
per 1,000 people
(2018)



9.62%
Current health expenditure
% of GDP
(2018)



15.19%
Domestic general government health expenditure
% of general government expenditure
(2018)



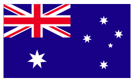
27.73%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 1127.91
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Australia

East Asia & Pacific | High income



Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

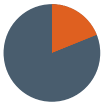
AMR surveillance in humans ✓

AMR surveillance in animals ✓

As per information available by December 2020

Antimicrobial Resistance Indicators*

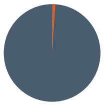
Humans



19.01% of isolates tested

MRSA

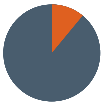
Methicillin-resistant *Staphylococcus aureus*



00.80% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



11.32% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

- *a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.*
- *b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.*
- *c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.*

Animals

***Salmonella* spp.**		***E.coli***	
Ampicillin	N/A	Ampicillin	N/A
Ciprofoxacin	N/A	Ciprofoxacin	N/A
Colistin	N/A	Colistin	N/A
Tetracycline	N/A	Tetracycline	N/A

As per information available by December 2020

Note: N/A stands for Not Applicable

Australia

Antimicrobial Use Indicators

Humans

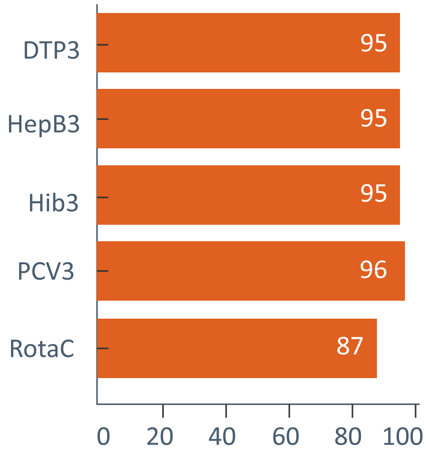
Total Use, 2010 (DDDs in Mill)	238
Total Use, 2020 (DDDs in Mill)	289
Change in total use, 2010-20 (DDDs in Mill)	50.29
% Change in total use, 2010-20	21.05%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	158.87%

Per Capita Use, 2010 (DDD)	10.84
Per Capita Use, 2020 (DDD)	11.40
Change in per capita use, 2010-20 (DDD)	0.56
% Change in per capita use, 2010-2020	5.17%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	139.61%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	306.30
Estimated Total Antimicrobial Use, 2030 (Tonnes)	310.22

Public Health Indicators



% of children vaccinated
(2019)

3.1
Infant Mortality Rate
per 1,000 live births
(2019)

2.27
Under-five pneumococcal death rate
per 100,000 children
(2017)

9.92
Under-five deaths from diarrheal diseases
(2017)

6.9
Incidence of tuberculosis
per 100,000 people
(2019)

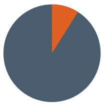
99.97
Access to improved drinking water source (%)
(2017)

99.99
Access to improved sanitation facilities (%)
(2017)

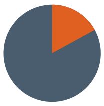
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

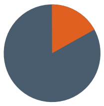
N/A
Nurses and midwives
per 1,000 people
(2018)



9.28%
Current health expenditure
% of GDP
(2018)



17.94%
Domestic general government health expenditure
% of general government expenditure
(2018)



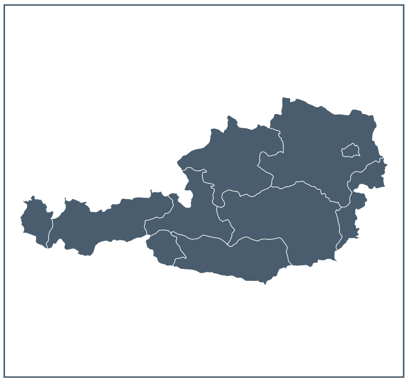
17.72%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 5425.34
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Austria

Europe & Central Asia| High income



Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

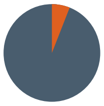
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

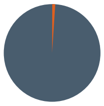
Humans



6.41% of isolates tested

MRSA

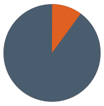
Methicillin-resistant *Staphylococcus aureus*



01.81% of isolates tested

CRE

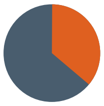
Carbapenem-resistant *Klebsiella pneumoniae*



10.63% of isolates tested

ESBL

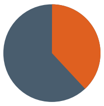
3G cephalosporin-resistant *Escherichia coli*



36.36

DRI

Drug Resistance Index for WHO Critical pathogens 2020



38.14

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

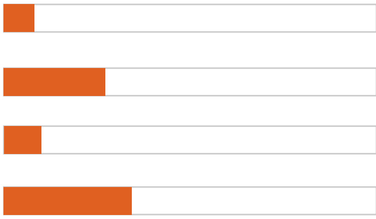
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

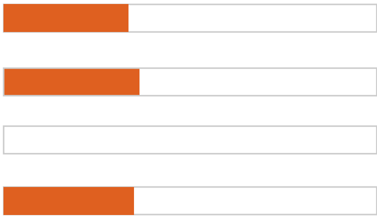
Animals

Salmonella spp.



Ampicillin	8.23%
Ciprofoxacin	27.23%
Colistin	10.03
Tetracycline	34.37%

E.coli



Ampicillin	33.4%
Ciprofoxacin	36.35%
Colistin	0
Tetracycline	34.85%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Austria

Antimicrobial Use Indicators

Humans

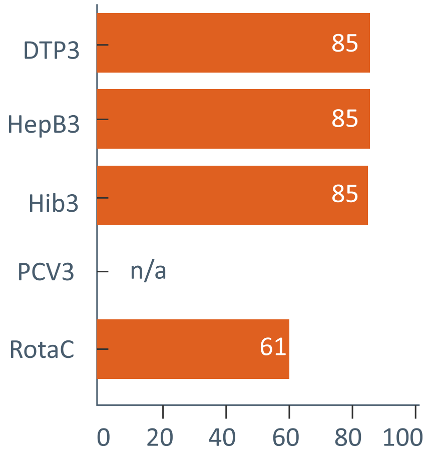
Total Use, 2010 (DDDs in Mill)	63
Total Use, 2020 (DDDs in Mill)	57
Change in total use, 2010-20 (DDDs in Mill)	-6.16
% Change in total use, 2010-20	-9.65%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%

Per Capita Use, 2010 (DDD)	7.63
Per Capita Use, 2020 (DDD)	6.61
Change in per capita use, 2010-20 (DDD)	-1.02
% Change in per capita use, 2010-2020	-13.37%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	44.36
Estimated Total Antimicrobial Use, 2030 (Tonnes)	43.22

Public Health Indicators



% of children vaccinated
(2019)

2.8
Infant Mortality Rate
per 1,000 live births
(2019)

1.02
Under-five pneumococcal death rate
per 100,000 children
(2017)

2.08
Under-five deaths from diarrheal diseases
(2017)

6.2
Incidence of tuberculosis
per 100,000 people
(2019)

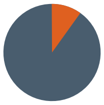
100.00
Access to improved drinking water source (%)
(2017)

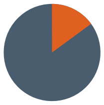
99.97
Access to improved sanitation facilities (%)
(2017)

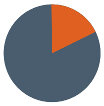
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

N/A
Nurses and midwives
per 1,000 people
(2018)


10.33%
Current health expenditure
% of GDP
(2018)


15.50%
Domestic general government health expenditure
% of general government expenditure
(2018)

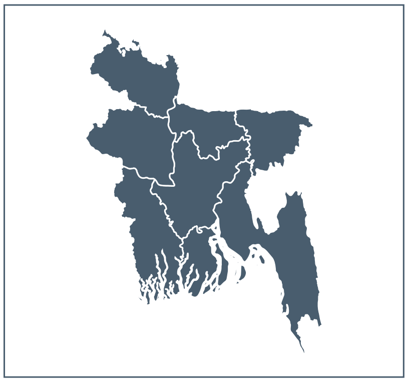

18.37%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 5326.44
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Bangladesh

South Asia | Lower middle income



Policy Indicators*

- Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓
- National Action Plan on AMR (NAP) Published ✓
- AMU surveillance in humans ✓
- AMU surveillance in animals ✓
- AMR surveillance in humans ✓
- AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

Humans

N/A
MRSA
Methicillin-resistant *Staphylococcus aureus*

N/A
CRE
Carbapenem-resistant *Klebsiella pneumoniae*

N/A
ESBL
3G cephalosporin-resistant *Escherichia coli*

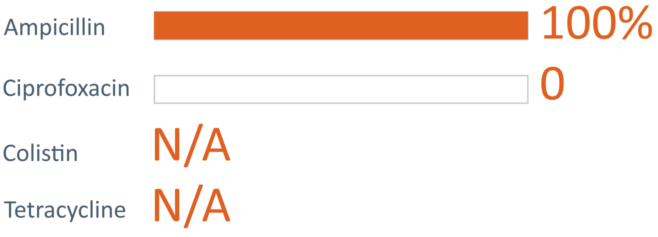
N/A
DRI
Drug Resistance Index for WHO Critical pathogens
2020

N/A
DRI
Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli*
2020

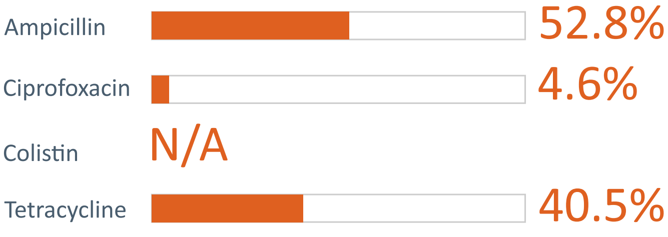
Note:
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.
b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**



E.coli



*As per information available by December 2020

Note: N/A stands for Not Applicable

Bangladesh

Antimicrobial Use Indicators

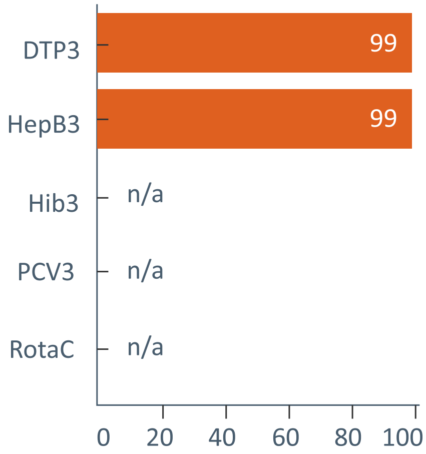
Humans

Total Use, 2010 (DDDs in Mill)	590	**Per Capita Use, 2010** (DDD)	3.89
Total Use, 2020 (DDDs in Mill)	755	**Per Capita Use, 2020** (DDD)	4.43
Change in total use, 2010-20 (DDDs in Mill)	165.04	**Change in per capita use, 2010-20** (DDD)	0.54
% Change in total use, 2010-20	27.97%	**% Change in per capita use, 2010-2020**	13.82%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	38.34%	**Regional average of % change in per capita use, 2010-20**	20.44%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	165.39
Estimated Total Antimicrobial Use, 2030 (Tonnes)	180.93

Public Health Indicators



% of children vaccinated
(2019)

6.8
Infant Mortality Rate
per 1,000 live births
(2019)

26.32
Under-five pneumococcal death rate
per 100,000 children
(2017)

2343.18
Under-five deaths from diarrheal diseases
(2017)

221
Incidence of tuberculosis
per 100,000 people
(2019)

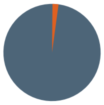
93.68
Access to improved drinking water source (%)
(2017)

90.74
Access to improved sanitation facilities (%)
(2017)

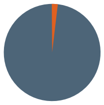
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

0.5
Physicians
per 1,000 people
(2018)

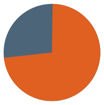
0.4
Nurses and midwives
per 1,000 people
(2018)



2.34%
Current health expenditure
% of GDP
(2018)



2.98%
Domestic general government health expenditure
% of general government expenditure
(2018)



73.87%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 41.91
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Brazil

Latin America & Caribbean | Upper middle income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

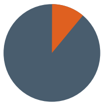
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

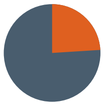
Humans



11.11% of isolates tested

MRSA

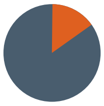
Methicillin-resistant *Staphylococcus aureus*



24.42% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



15.85% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

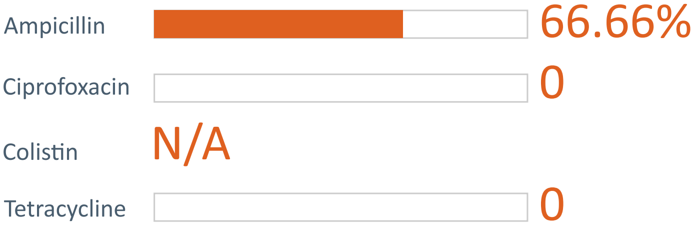
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

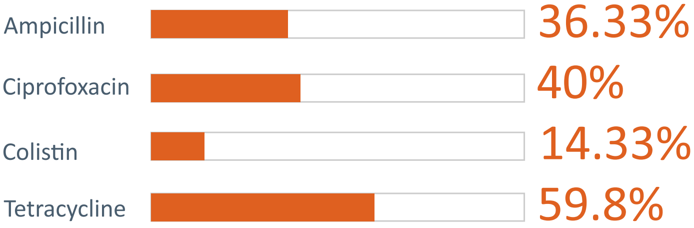
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**



E.coli



*As per information available by December 2020

Note: N/A stands for Not Applicable

Brazil

Antimicrobial Use Indicators

Humans

Total Use, 2010 (DDDs in Mill) 1085

Total Use, 2020 (DDDs in Mill) 1906

Change in total use, 2010-20 (DDDs in Mill) 820.85

% Change in total use, 2010-20 75.61%

Global average of % change in total use, 2010-20 74.49%

Regional average of % change in total use, 2010-20 26.09%

Per Capita Use, 2010 (DDD) 5.46

Per Capita Use, 2020 (DDD) 8.83

Change in per capita use, 2010-20 (DDD) 3.36

% Change in per capita use, 2010-2020 61.48%

Global average of % change in per capita use, 2010-20 35.12%

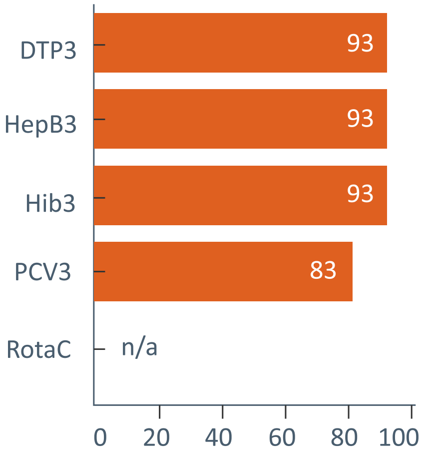
Regional average of % change in per capita use, 2010-20 11.67%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes) 7533.67

Estimated Total Antimicrobial Use, 2030 (Tonnes) 8192.68

Public Health Indicators



% of children vaccinated
(2019)

25.6
Infant Mortality Rate
per 1,000 live births
(2019)

129
Under-five pneumococcal death rate
per 100,000 children
(2017)

752.71
Under-five deaths from diarrheal diseases
(2017)

46
Incidence of tuberculosis
per 100,000 people
(2019)

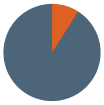
91.47
Access to improved drinking water source (%)
(2017)

75.74
Access to improved sanitation facilities (%)
(2017)

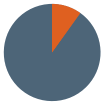
47.78
Access to basic handwashing facilities including soap and water (%)
(2017)

2.1
Physicians
per 1,000 people
(2018)

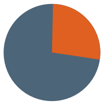
10.1
Nurses and midwives
per 1,000 people
(2018)



9.51%
Current health expenditure
% of GDP
(2018)



10.30%
Domestic general government health expenditure
% of general government expenditure
(2018)



27.54%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 848.39
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Bulgaria

Europe & Central Asia | Upper-middle income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✗

National Action Plan on AMR (NAP) Published ✗

AMU surveillance in humans ✓

AMU surveillance in animals ✓

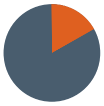
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

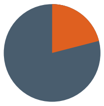
Humans



17.57% of isolates tested

MRSA

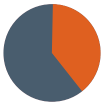
Methicillin-resistant *Staphylococcus aureus*



21.76% of isolates tested

CRE

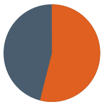
Carbapenem-resistant *Klebsiella pneumoniae*



39.04% of isolates tested

ESBL

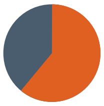
3G cephalosporin-resistant *Escherichia coli*



54.94

DRI

Drug Resistance Index for WHO Critical pathogens 2020



61.27

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

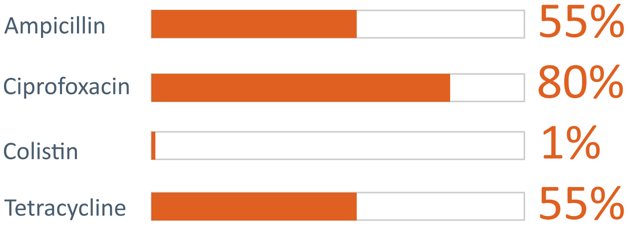
b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

E.coli



*As per information available by December 2020

Note: N/A stands for Not Applicable

Bulgaria

Antimicrobial Use Indicators

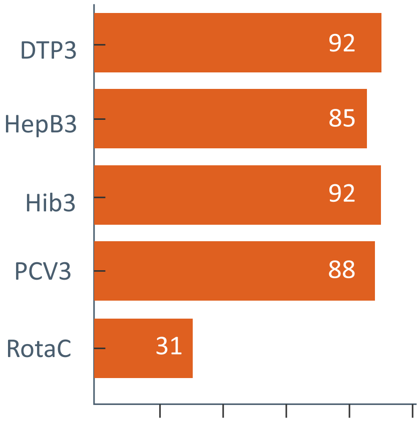
Humans

Total Use, 2010 (DDDs in Mill)	59
Total Use, 2020 (DDDs in Mill)	77
Change in total use, 2010-20 (DDDs in Mill)	18.19
% Change in total use, 2010-20	30.51%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%
Per Capita Use, 2010 (DDD)	8.06
Per Capita Use, 2020 (DDD)	11.24
Change in per capita use, 2010-20 (DDD)	3.19
% Change in per capita use, 2010-2020	39.52%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	48.35
Estimated Total Antimicrobial Use, 2030 (Tonnes)	43.51

Public Health Indicators



% of children vaccinated
(2019)

5.6
Infant Mortality Rate
per 1,000 live births
(2019)

19.25
Under-five pneumococcal death rate
per 100,000 children
(2017)

8.35
Under-five deaths from diarrheal diseases
(2017)

21
Incidence of tuberculosis
per 100,000 people
(2019)

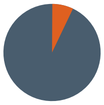
99.11
Access to improved drinking water source (%)
(2017)

100.00
Access to improved sanitation facilities (%)
(2017)

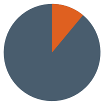
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

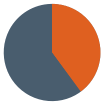
N/A
Nurses and midwives
per 1,000 people
(2018)



7.35%
Current health expenditure
% of GDP
(2018)



11.59%
Domestic general government health expenditure
% of general government expenditure
(2018)



40.52%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 689.91
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Canada

North America | High income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

AMR surveillance in humans ✓

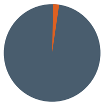
AMR surveillance in animals ✓

*As per information available by December 2020

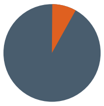
Antimicrobial Resistance Indicators*

Humans

N/A
MRSA
Methicillin-resistant
Staphylococcus aureus



02.13% of isolates tested
CRE
Carbapenem-resistant
Klebsiella pneumoniae



8.93% of isolates tested
ESBL
3G cephalosporin-resistant
Escherichia coli

N/A
DRI
Drug Resistance Index for WHO Critical pathogens
2020

N/A
DRI
Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli*
2020

Note:
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.
b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**	
Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli	
Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

*As per information available by December 2020

Note: N/A stands for Not Applicable

Canada

Antimicrobial Use Indicators

Humans

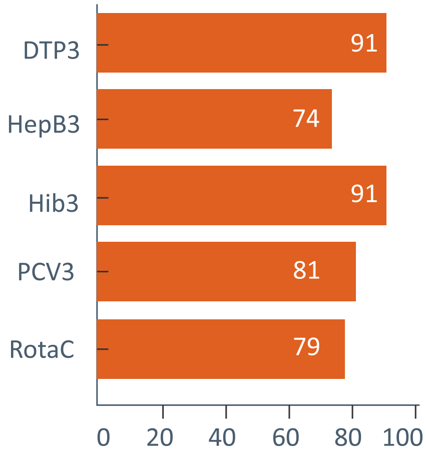
Total Use, 2010 (DDDs in Mill)	243
Total Use, 2020 (DDDs in Mill)	261
Change in total use, 2010-20 (DDDs in Mill)	17.61
% Change in total use, 2010-20	7.23%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	-6.27%

Per Capita Use, 2010 (DDD)	7.16
Per Capita Use, 2020 (DDD)	6.97
Change in per capita use, 2010-20 (DDD)	-0.19
% Change in per capita use, 2010-2020	-2.67%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	-14.09%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	966.02
Estimated Total Antimicrobial Use, 2030 (Tonnes)	1023.81

Public Health Indicators



% of children vaccinated
(2019)

4.2
Infant Mortality Rate
per 1,000 live births
(2019)

2.34
Under-five pneumococcal death rate
per 100,000 children
(2017)

17.22
Under-five deaths from diarrheal diseases
(2017)

5.5
Incidence of tuberculosis
per 100,000 people
(2019)

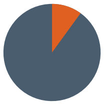
99.44
Access to improved drinking water source (%)
(2017)

99.29
Access to improved sanitation facilities (%)
(2017)

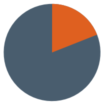
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

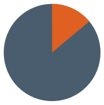
9.9
Nurses and midwives
per 1,000 people
(2018)



10.79%
Current health expenditure
% of GDP
(2018)



19.55%
Domestic general government health expenditure
% of general government expenditure
(2018)



14.73%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 4994.90
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

China

East Asia & Pacific | Upper middle income

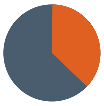
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✗	National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓	AMU surveillance in animals	✓
AMR surveillance in humans	✓	AMR surveillance in animals	✓

**As per information available by December 2020*

Antimicrobial Resistance Indicators*

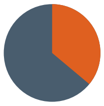
Humans



37.90% of isolates tested

MRSA

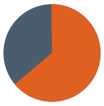
Methicillin-resistant *Staphylococcus aureus*



36.10% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



64.40% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

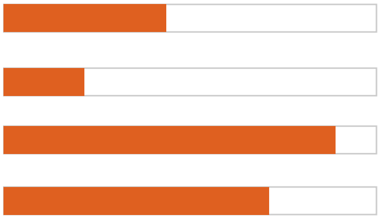
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

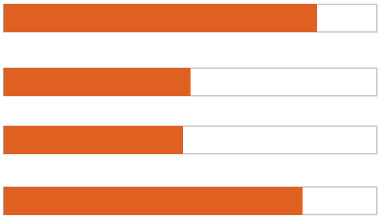
Animals

***Salmonella* spp.**



Ampicillin	43.6%
Ciprofoxacin	21.60%
Colistin	89.00%
Tetracycline	71.25%

E.coli



Ampicillin	84%
Ciprofoxacin	50%
Colistin	48%
Tetracycline	80%

**As per information available by December 2020*

Note: N/A stands for Not Applicable

China

Antimicrobial Use Indicators

Humans

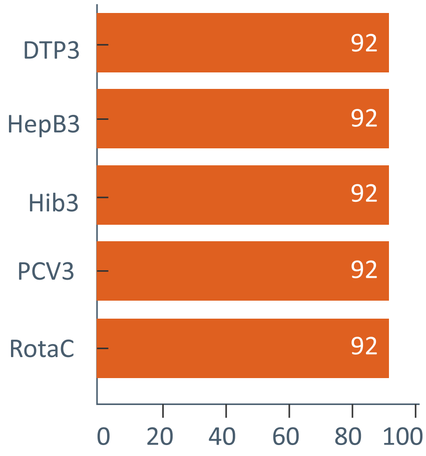
Total Use, 2010 (DDDs in Mill)	2262
Total Use, 2020 (DDDs in Mill)	8990
Change in total use, 2010-20 (DDDs in Mill)	6727.46
% Change in total use, 2010-20	297.32%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	158.87%

Per Capita Use, 2010 (DDD)	1.69
Per Capita Use, 2020 (DDD)	6.43
Change in per capita use, 2010-20 (DDD)	4.74
% Change in per capita use, 2010-2020	280.40%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	139.61%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	43024.24
Estimated Total Antimicrobial Use, 2030 (Tonnes)	45038.85

Public Health Indicators



% of children vaccinated
(2019)

31.9
Infant Mortality Rate
per 1,000 live births
(2019)

146.5
Under-five pneumococcal death rate
per 100,000 children
(2017)

9551.78
Under-five deaths from diarrheal diseases
(2017)

58
Incidence of tuberculosis
per 100,000 people
(2019)

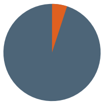
67.98
Access to improved drinking water source (%)
(2017)

51.18
Access to improved sanitation facilities (%)
(2017)

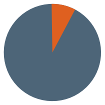
24.65
Access to basic handwashing facilities including soap and water (%)
(2017)

2.5
Physicians
per 1,000 people
(2018)

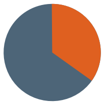
N/A
Nurses and midwives
per 1,000 people
(2018)



5.35%
Current health expenditure
% of GDP
(2018)



8.85%
Domestic general government health expenditure
% of general government expenditure
(2018)



35.75%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 501.06
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Croatia

Europe & Central Asia | Upper middle income

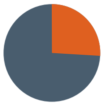
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓
National Action Plan on AMR (NAP) Published	✗
AMU surveillance in humans	✓
AMU surveillance in animals	✓
AMR surveillance in humans	✓
AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

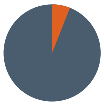
Humans



26.42% of isolates tested

MRSA

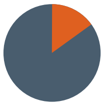
Methicillin-resistant *Staphylococcus aureus*



06.77% of isolates tested

CRE

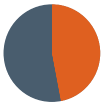
Carbapenem-resistant *Klebsiella pneumoniae*



15.67% of isolates tested

ESBL

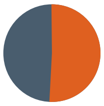
3G cephalosporin-resistant *Escherichia coli*



47.46

DRI

Drug Resistance Index for WHO Critical pathogens 2020



51.16

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

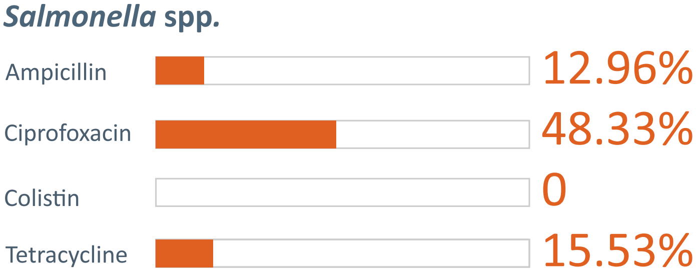
Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

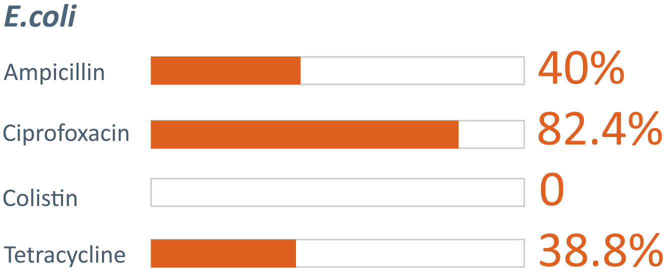
b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals



***Salmonella* spp.**	
Ampicillin	12.96%
Ciprofoxacin	48.33%
Colistin	0
Tetracycline	15.53%



E.coli	
Ampicillin	40%
Ciprofoxacin	82.4%
Colistin	0
Tetracycline	38.8%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Croatia

Antimicrobial Use Indicators

Humans

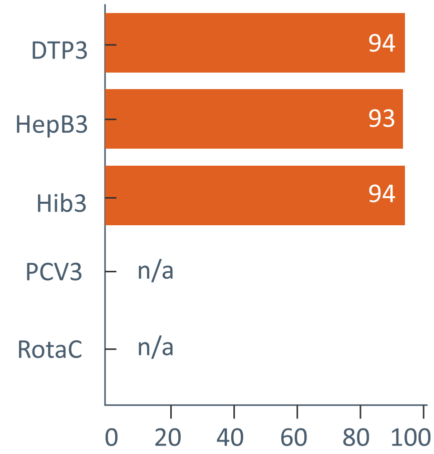
Total Use, 2010 (DDDs in Mill)	45
Total Use, 2020 (DDDs in Mill)	40
Change in total use, 2010-20 (DDDs in Mill)	-5.06
% Change in total use, 2010-20	-11.11%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%

Per Capita Use, 2010 (DDD)	10.30
Per Capita Use, 2020 (DDD)	9.76
Change in per capita use, 2010-20 (DDD)	-0.54
% Change in per capita use, 2010-2020	-5.21%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	21.45
Estimated Total Antimicrobial Use, 2030 (Tonnes)	22.33

Public Health Indicators



% of children vaccinated
(2019)

4.1
Infant Mortality Rate
per 1,000 live births
(2019)

1.76
Under-five pneumococcal death rate
per 100,000 children
(2017)

1.79
Under-five deaths from diarrheal diseases
(2017)

8
Incidence of tuberculosis
per 100,000 people
(2019)

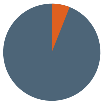
99.59
Access to improved drinking water source (%)
(2017)

99.02
Access to improved sanitation facilities (%)
(2017)

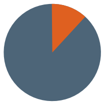
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

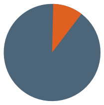
N/A
Nurses and midwives
per 1,000 people
(2018)



6.83%
Current health expenditure
% of GDP
(2018)



12.35%
Domestic general government health expenditure
% of general government expenditure
(2018)



10.48%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 1014.22
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Ecuador

Latin America & Caribbean |Low- & lower-middle income

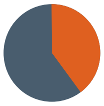
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✗	National Action Plan on AMR (NAP) Published	✗
AMU surveillance in humans	✓	AMU surveillance in animals	✓
AMR surveillance in humans	✓	AMR surveillance in animals	✓

*As per information available by December 2020

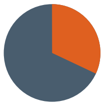
Antimicrobial Resistance Indicators*

Humans



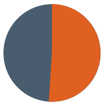
40.87% of isolates tested

MRSA
Methicillin-resistant
Staphylococcus aureus



32.67% of isolates tested

CRE
Carbapenem-resistant
Klebsiella pneumoniae



51.34% of isolates tested

ESBL
3G cephalosporin-resistant
Escherichia coli

N/A

DRI
Drug Resistance Index for
WHO Critical pathogens
2020

N/A

DRI
Drug Resistance Index for MRSA,
CRE, and ESBL positive *E.coli*
2020

Note:
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.
b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli

Ampicillin	27%
Ciprofoxacin	18%
Colistin	N/A
Tetracycline	47%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Ecuador

Antimicrobial Use Indicators

Humans

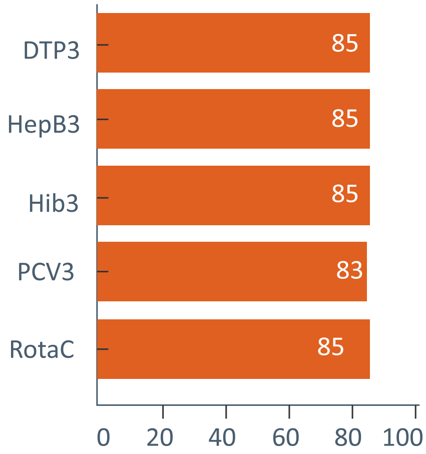
Total Use, 2010 (DDDs in Mill)	92
Total Use, 2020 (DDDs in Mill)	98
Change in total use, 2010-20 (DDDs in Mill)	5.33
% Change in total use, 2010-20	5.74%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	26.09%

Per Capita Use, 2010 (DDD)	6.53
Per Capita Use, 2020 (DDD)	5.67
Change in per capita use, 2010-20 (DDD)	-0.86
% Change in per capita use, 2010-2020	-13.24%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	11.67%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	259.55
Estimated Total Antimicrobial Use, 2030 (Tonnes)	291.80

Public Health Indicators



% of children vaccinated
(2019)

12.0
Infant Mortality Rate
per 1,000 live births
(2019)

51.06
Under-five pneumococcal death rate
per 100,000 children
(2017)

149.42
Under-five deaths from diarrheal diseases
(2017)

46
Incidence of tuberculosis
per 100,000 people
(2019)

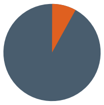
94.11
Access to improved drinking water source (%)
(2017)

97.06
Access to improved sanitation facilities (%)
(2017)

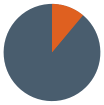
80.63
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

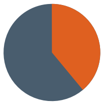
2.5
Nurses and midwives
per 1,000 people
(2018)



8.14%
Current health expenditure
% of GDP
(2018)



11.42%
Domestic general government health expenditure
% of general government expenditure
(2018)



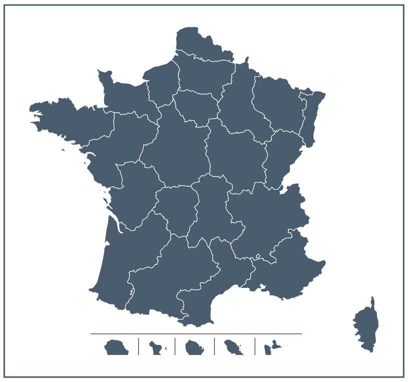
39.84%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 516.25
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

France

Europe & Central Asia |High income



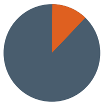
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓	National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓	AMU surveillance in animals	✓
AMR surveillance in humans	✓	AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

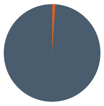
Humans



12.11% of isolates tested

MRSA

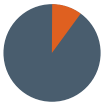
Methicillin-resistant *Staphylococcus aureus*



00.93% of isolates tested

CRE

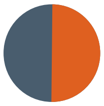
Carbapenem-resistant *Klebsiella pneumoniae*



10.23% of isolates tested

ESBL

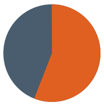
3G cephalosporin-resistant *Escherichia coli*



50.60

DRI

Drug Resistance Index for WHO Critical pathogens 2020



56.42

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

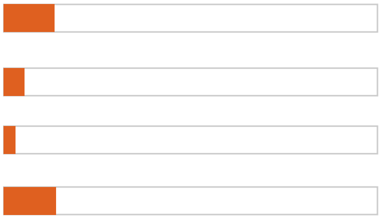
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

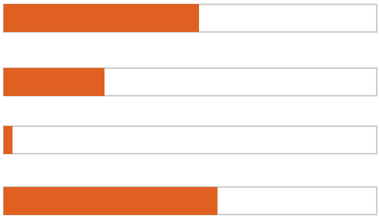
Animals

***Salmonella* spp.**



Ampicillin	13.63%
Ciprofoxacin	5.53%
Colistin	3.10%
Tetracycline	14.03%

E.coli



Ampicillin	52.3%
Ciprofoxacin	26.95%
Colistin	2.3%
Tetracycline	57.3%

*As per information available by December 2020

Note: N/A stands for Not Applicable

France

Antimicrobial Use Indicators

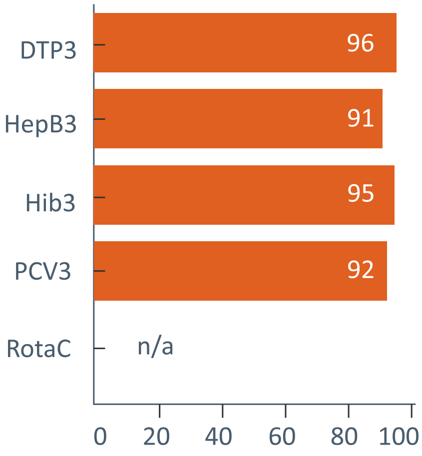
Humans

Total Use, 2010 (DDDs in Mill)	822
Total Use, 2020 (DDDs in Mill)	921
Change in total use, 2010-20 (DDDs in Mill)	98.43
% Change in total use, 2010-20	11.96%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%
Per Capita Use, 2010 (DDD)	12.65
Per Capita Use, 2020 (DDD)	13.53
Change in per capita use, 2010-20 (DDD)	0.88
% Change in per capita use, 2010-2020	6.96%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	477.59
Estimated Total Antimicrobial Use, 2030 (Tonnes)	456.79

Public Health Indicators



% of children vaccinated
(2019)

3.8
Infant Mortality Rate
per 1,000 live births
(2019)

1.17
Under-five pneumococcal death rate
per 100,000 children
(2017)

27.60
Under-five deaths from diarrheal diseases
(2017)

8.7
Incidence of tuberculosis
per 100,000 people
(2019)

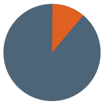
100
Access to improved drinking water source (%)
(2017)

100
Access to improved sanitation facilities (%)
(2017)

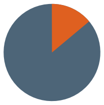
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

3.3
Physicians
per 1,000 people
(2018)

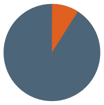
11.5
Nurses and midwives
per 1,000 people
(2018)



11.26%
Current health expenditure
% of GDP
(2018)



14.79%
Domestic general government health expenditure
% of general government expenditure
(2018)



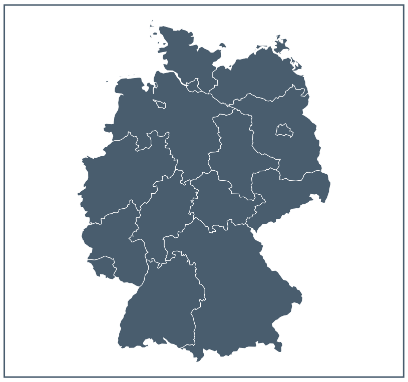
9.25%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 4690.07
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Germany

Europe & Central Asia| High income



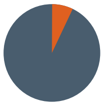
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓
National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓
AMU surveillance in animals	✓
AMR surveillance in humans	✓
AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

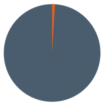
Humans



7.56% of isolates tested

MRSA

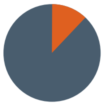
Methicillin-resistant *Staphylococcus aureus*



00.49% of isolates tested

CRE

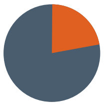
Carbapenem-resistant *Klebsiella pneumoniae*



12.55% of isolates tested

ESBL

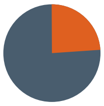
3G cephalosporin-resistant *Escherichia coli*



22.55

DRI

Drug Resistance Index for WHO Critical pathogens 2020



24.48

DRI

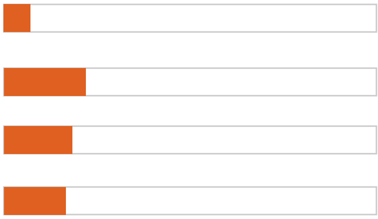
Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

- *a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.*
- *b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.*
- *c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.*

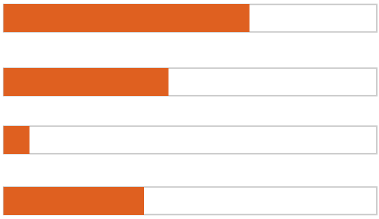
Animals

***Salmonella* spp.**



Ampicillin	7.2%
Ciprofoxacin	21.95%
Colistin	18.35%
Tetracycline	16.60%

E.coli



Ampicillin	65.9%
Ciprofoxacin	44.15%
Colistin	6.85%
Tetracycline	37.55%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Germany

Antimicrobial Use Indicators

Humans

Total Use, 2010 (DDDs in Mill) 571

Total Use, 2020 (DDDs in Mill) 505

Change in total use, 2010-20 (DDDs in Mill) -65.11

% Change in total use, 2010-20 -11.40%

Global average of % change in total use, 2010-20 74.49%

Regional average of % change in total use, 2010-20 81.85%

Per Capita Use, 2010 (DDD) 6.98

Per Capita Use, 2020 (DDD) 6.24

Change in per capita use, 2010-20 (DDD) -0.73

% Change in per capita use, 2010-2020 -10.51%

Global average of % change in per capita use, 2010-20 35.12%

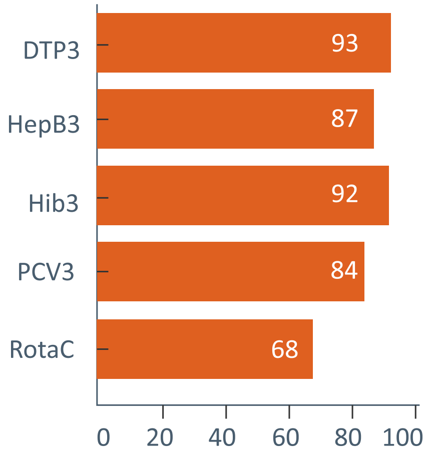
Regional average of % change in per capita use, 2010-20 22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes) 773.73

Estimated Total Antimicrobial Use, 2030 (Tonnes) 792.64

Public Health Indicators



% of children vaccinated
(2019)

3.2
Infant Mortality Rate
per 1,000 live births
(2019)

1.29
Under-five pneumococcal death rate
per 100,000 children
(2017)

18.53
Under-five deaths from diarrheal diseases
(2017)

5.8
Incidence of tuberculosis
per 100,000 people
(2019)

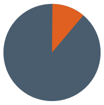
100
Access to improved drinking water source (%)
(2017)

100
Access to improved sanitation facilities (%)
(2017)

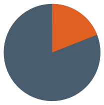
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

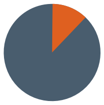
N/A
Nurses and midwives
per 1,000 people
(2018)



11.43%
Current health expenditure
% of GDP
(2018)



19.99%
Domestic general government health expenditure
% of general government expenditure
(2018)



12.65%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 5472.20
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Greece

Europe & Central Asia| High income

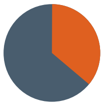
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓
National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓
AMU surveillance in animals	✓
AMR surveillance in humans	✓
AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

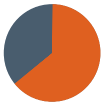
Humans



36.37% of isolates tested

MRSA

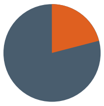
Methicillin-resistant *Staphylococcus aureus*



64.22% of isolates tested

CRE

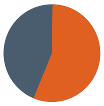
Carbapenem-resistant *Klebsiella pneumoniae*



21.28% of isolates tested

ESBL

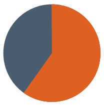
3G cephalosporin-resistant *Escherichia coli*



56.03

DRI

Drug Resistance Index for WHO Critical pathogens 2020



60.29

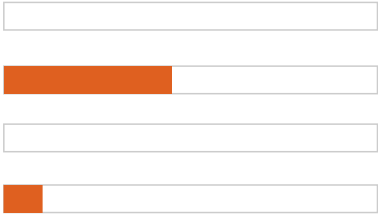
DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:
- *a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.*
- *b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.*
- *c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.*

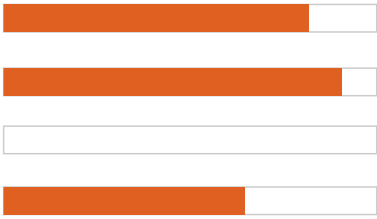
Animals

***Salmonella* spp.**



Ampicillin	0
Ciprofoxacin	45.00%
Colistin	0
Tetracycline	10.40%

E.coli



Ampicillin	81.8%
Ciprofoxacin	90.6%
Colistin	0
Tetracycline	64.7%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Greece

Antimicrobial Use Indicators

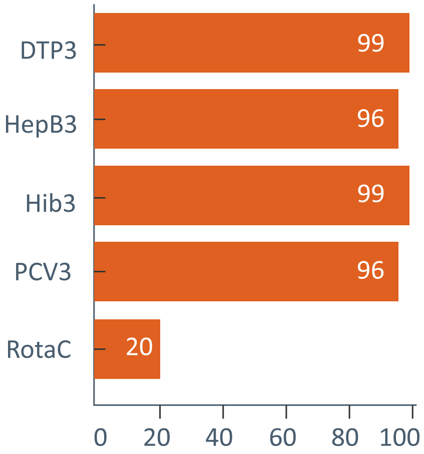
Humans

Total Use, 2010 (DDDs in Mill)	160	**Per Capita Use, 2010** (DDD)	14.44
Total Use, 2020 (DDDs in Mill)	181	**Per Capita Use, 2020** (DDD)	17.01
Change in total use, 2010-20 (DDDs in Mill)	20.94	**Change in per capita use, 2010-20** (DDD)	2.56
% Change in total use, 2010-20	13.03%	**% Change in per capita use, 2010-2020**	17.73%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	81.85%	**Regional average of % change in per capita use, 2010-20**	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	118.10
Estimated Total Antimicrobial Use, 2030 (Tonnes)	122.25

Public Health Indicators



% of children vaccinated
(2019)

3.3
Infant Mortality Rate
per 1,000 live births
(2019)

3.78
Under-five pneumococcal death rate
per 100,000 children
(2017)

1.00
Under-five deaths from diarrheal diseases
(2017)

4.3
Incidence of tuberculosis
per 100,000 people
(2019)

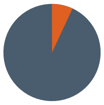
100
Access to improved drinking water source (%)
(2017)

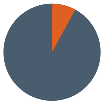
100
Access to improved sanitation facilities (%)
(2017)

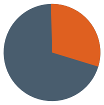
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

N/A
Nurses and midwives
per 1,000 people
(2018)


7.72%
Current health expenditure
% of GDP
(2018)


8.53%
Domestic general government health expenditure
% of general government expenditure
(2018)

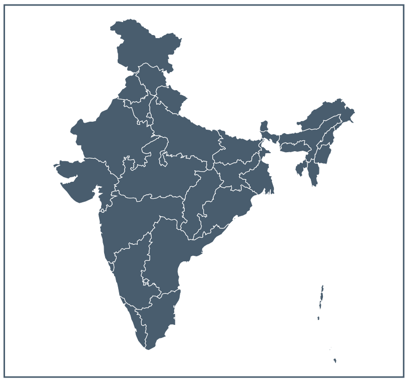

36.44%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 1566.90
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

India

South Asia| Low- & lower-middle income



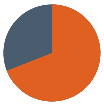
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓	National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓	AMU surveillance in animals	✗
AMR surveillance in humans	✓	AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

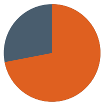
Humans



69.97% of isolates tested

MRSA

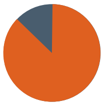
Methicillin-resistant *Staphylococcus aureus*



72.06% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



87.71% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

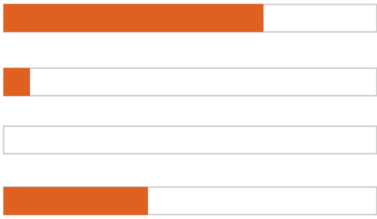
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

Salmonella spp.

Ampicillin	16.5%
Ciprofoxacin	0
Colistin	n/a
Tetracycline	16.50%

E.coli



Ampicillin	69.6%
Ciprofoxacin	7%
Colistin	0
Tetracycline	38.66%

*As per information available by December 2020

Note: N/A stands for Not Applicable

India

Antimicrobial Use Indicators

Humans

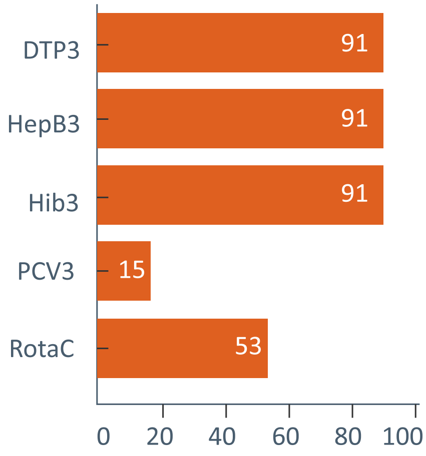
Total Use, 2010 (DDDs in Mill)	5411
Total Use, 2020 (DDDs in Mill)	7976
Change in total use, 2010-20 (DDDs in Mill)	2564.77
% Change in total use, 2010-20	47.40%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	38.34%

Per Capita Use, 2010 (DDD)	4.40
Per Capita Use, 2020 (DDD)	5.74
Change in per capita use, 2010-20 (DDD)	1.35
% Change in per capita use, 2010-2020	30.64%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	20.44%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	2160.02
Estimated Total Antimicrobial Use, 2030 (Tonnes)	2236.74

Public Health Indicators



% of children vaccinated
(2019)

28.3
Infant Mortality Rate
per 1,000 live births
(2019)

143.37
Under-five pneumococcal death rate
per 100,000 children
(2017)

102677.89
Under-five deaths from diarrheal diseases
(2017)

193
Incidence of tuberculosis
per 100,000 people
(2019)

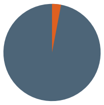
93.44
Access to improved drinking water source (%)
(2017)

72.05
Access to improved sanitation facilities (%)
(2017)

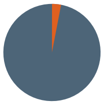
59.54
Access to basic handwashing facilities including soap and water (%)
(2017)

0.9
Physicians
per 1,000 people
(2018)

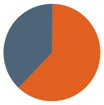
1.7
Nurses and midwives
per 1,000 people
(2018)



3.54%
Current health expenditure
% of GDP
(2018)



3.39%
Domestic general government health expenditure
% of general government expenditure
(2018)



62.67%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 72.83
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Indonesia

South Asia | Upper middle income

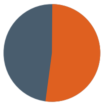
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓
National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓
AMU surveillance in animals	✓
AMR surveillance in humans	✓
AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

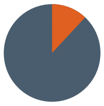
Humans



52.29% of isolates tested

MRSA

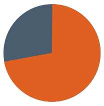
Methicillin-resistant *Staphylococcus aureus*



12.23% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



72.54% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

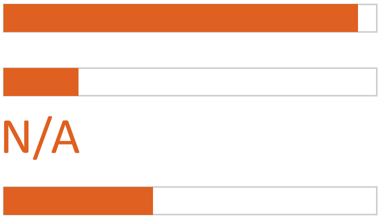
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli



Ampicillin	95%
Ciprofoxacin	20%
Colistin	N/A
Tetracycline	40%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Indonesia

Antimicrobial Use Indicators

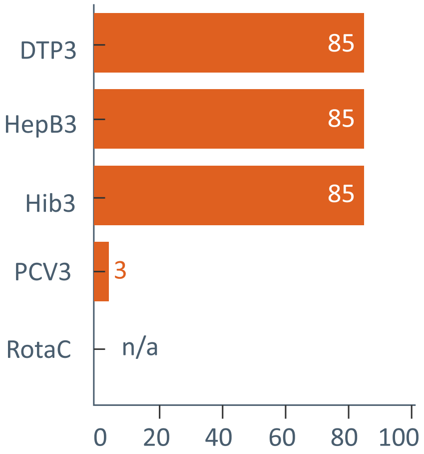
Humans

Total Use, 2010 (DDDs in Mill)	959	**Per Capita Use, 2010** (DDD)	3.97
Total Use, 2020 (DDDs in Mill)	582	**Per Capita Use, 2020** (DDD)	2.14
Change in total use, 2010-20 (DDDs in Mill)	-377.07	**Change in per capita use, 2010-20** (DDD)	-1.83
% Change in total use, 2010-20	-39.30%	**% Change in per capita use, 2010-2020**	-46.05%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	38.34%	**Regional average of % change in per capita use, 2010-20**	20.44%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	761.27
Estimated Total Antimicrobial Use, 2030 (Tonnes)	913.94

Public Health Indicators



% of children vaccinated
(2019)

20.2
Infant Mortality Rate
per 1,000 live births
(2019)

51.89
Under-five pneumococcal death rate
per 100,000 children
(2017)

10568.42
Under-five deaths from diarrheal diseases
(2017)

312
Incidence of tuberculosis
per 100,000 people
(2019)

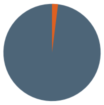
90.76
Access to improved drinking water source (%)
(2017)

85.37
Access to improved sanitation facilities (%)
(2017)

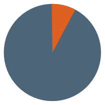
64.2
Access to basic handwashing facilities including soap and water (%)
(2017)

0.4
Physicians
per 1,000 people
(2018)

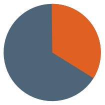
2.4
Nurses and midwives
per 1,000 people
(2018)



2.87%
Current health expenditure
% of GDP
(2018)



8.51%
Domestic general government health expenditure
% of general government expenditure
(2018)



34.85%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 111.68
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Italy

Europe & Central Asia| High income

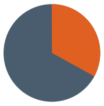
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓	National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓	AMU surveillance in animals	✓
AMR surveillance in humans	✓	AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

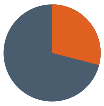
Humans



33.98% of isolates tested

MRSA

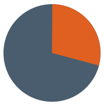
Methicillin-resistant *Staphylococcus aureus*



29.84% of isolates tested

CRE

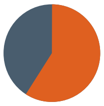
Carbapenem-resistant *Klebsiella pneumoniae*



29.69% of isolates tested

ESBL

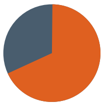
3G cephalosporin-resistant *Escherichia coli*



59.65

DRI

Drug Resistance Index for WHO Critical pathogens 2020



68.49

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

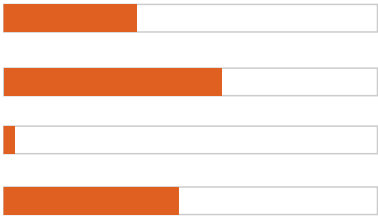
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

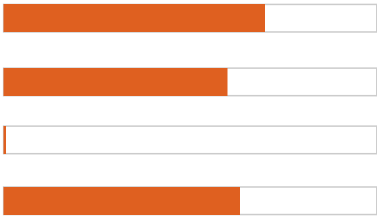
Animals

***Salmonella* spp.**



Ampicillin	35.73%
Ciprofoxacin	58.26%
Colistin	2.96%
Tetracycline	46.86%

E.coli



Ampicillin	70.05%
Ciprofoxacin	60
Colistin	0.6%
Tetracycline	63.25%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Italy

Antimicrobial Use Indicators

Humans

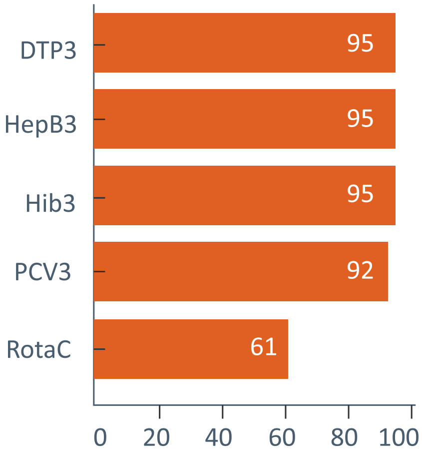
Total Use, 2010 (DDDs in Mill)	694
Total Use, 2020 (DDDs in Mill)	640
Change in total use, 2010-20 (DDDs in Mill)	-53.97
% Change in total use, 2010-20	-7.77%%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%

Per Capita Use, 2010 (DDD)	11.71
Per Capita Use, 2020 (DDD)	10.00
Change in per capita use, 2010-20 (DDD)	-1.15
% Change in per capita use, 2010-2020	-9.78%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	1057.18
Estimated Total Antimicrobial Use, 2030 (Tonnes)	1055.09

Public Health Indicators



% of children vaccinated
(2019)

2.7
Infant Mortality Rate
per 1,000 live births
(2019)

1.43
Under-five pneumococcal death rate
per 100,000 children
(2017)

12.86
Under-five deaths from diarrheal diseases
(2017)

7.1
Incidence of tuberculosis
per 100,000 people
(2019)

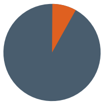
99.44
Access to improved drinking water source (%)
(2017)

98.87
Access to improved sanitation facilities (%)
(2017)

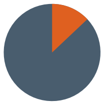
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

4.0
Physicians
per 1,000 people
(2018)

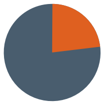
5.7
Nurses and midwives
per 1,000 people
(2018)



8.67%
Current health expenditure
% of GDP
(2018)



13.24%
Domestic general government health expenditure
% of general government expenditure
(2018)



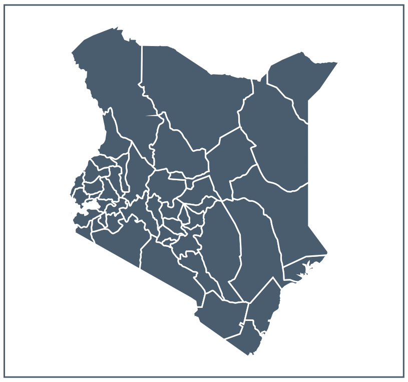
23.55%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 2989.00
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Kenya

Sub-Saharan Africa | Lower middle income



Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

AMR surveillance in humans ✓

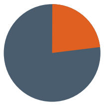
AMR surveillance in animals ✓

*As per information available by December 2020

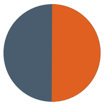
Antimicrobial Resistance Indicators*

Humans

N/A
MRSA
Methicillin-resistant
Staphylococcus aureus



23.08% of isolates tested
CRE
Carbapenem-resistant
Klebsiella pneumoniae



50.88% of isolates tested
ESBL
3G cephalosporin-resistant
Escherichia coli

N/A
DRI
Drug Resistance Index for WHO Critical pathogens
2020

N/A
DRI
Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli*
2020

Note:
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.
b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli

Ampicillin		32.5%
Ciprofoxacin	N/A	
Colistin	N/A	
Tetracycline	N/A	

*As per information available by December 2020

Note: N/A stands for Not Applicable

Kenya

Antimicrobial Use Indicators

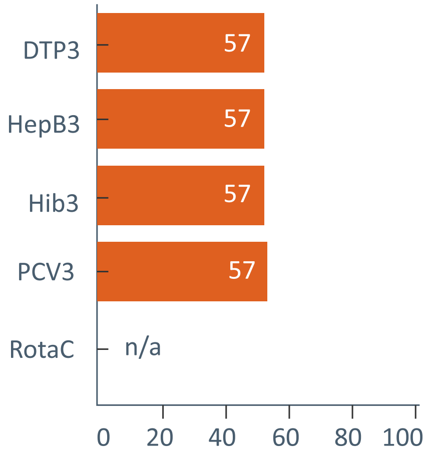
Humans

Total Use, 2010 (DDDs in Mill)	183	**Per Capita Use, 2010** (DDD)	4.56
Total Use, 2020 (DDDs in Mill)	387	**Per Capita Use, 2020** (DDD)	7.43
Change in total use, 2010-20 (DDDs in Mill)	203.89	**Change in per capita use, 2010-20** (DDD)	2.87
% Change in total use, 2010-20	110.97%	**% Change in per capita use, 2010-2020**	63.03%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	71.99%	**Regional average of % change in per capita use, 2010-20**	35.67%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	390.62
Estimated Total Antimicrobial Use, 2030 (Tonnes)	464.22

Public Health Indicators



% of children vaccinated
(2019)

74.2
Infant Mortality Rate
per 1,000 live births
(2019)

444.38
Under-five pneumococcal death rate
per 100,000 children
(2017)

104266.88
Under-five deaths from diarrheal diseases
(2017)

267
Incidence of tuberculosis
per 100,000 people
(2019)

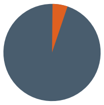
77.94
Access to improved drinking water source (%)
(2017)

59.68
Access to improved sanitation facilities (%)
(2017)

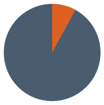
41.94
Access to basic handwashing facilities including soap and water (%)
(2017)

0.1
Physicians
per 1,000 people
(2018)

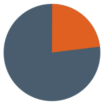
1.1
Nurses and midwives
per 1,000 people
(2018)



5.17%
Current health expenditure
% of GDP
(2018)



8.55%
Domestic general government health expenditure
% of general government expenditure
(2018)



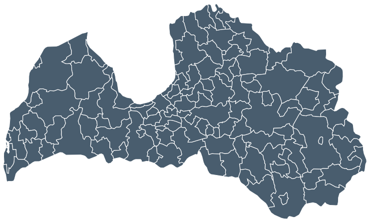
23.62%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 88.39
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Latvia

Europe & Central Asia| Upper-middle income



Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✗

AMU surveillance in humans ✓

AMU surveillance in animals ✓

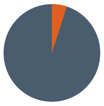
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

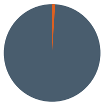
Humans



5.71% of isolates tested

MRSA

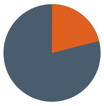
Methicillin-resistant *Staphylococcus aureus*



00.98% of isolates tested

CRE

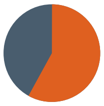
Carbapenem-resistant *Klebsiella pneumoniae*



21.26% of isolates tested

ESBL

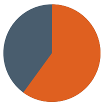
3G cephalosporin-resistant *Escherichia coli*



58.13

DRI

Drug Resistance Index for WHO Critical pathogens 2020



60.71

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

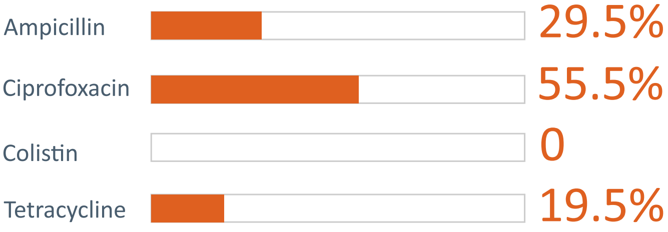
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli



*As per information available by December 2020

Note: N/A stands for Not Applicable

Latvia

Antimicrobial Use Indicators

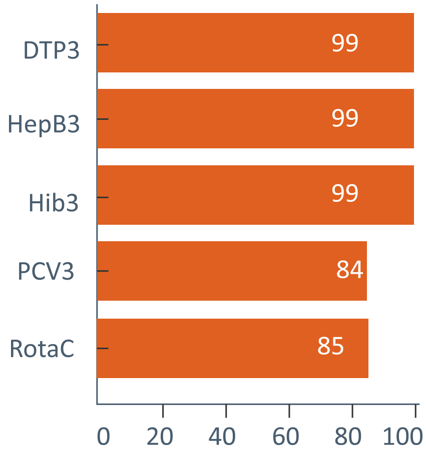
Humans

Total Use, 2010 (DDDs in Mill)	8	**Per Capita Use, 2010** (DDD)	4.19
Total Use, 2020 (DDDs in Mill)	14	**Per Capita Use, 2020** (DDD)	7.41
Change in total use, 2010-20 (DDDs in Mill)	5.49	**Change in per capita use, 2010-20** (DDD)	3.22
% Change in total use, 2010-20	62.54%	**% Change in per capita use, 2010-2020**	76.93%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	81.85%	**Regional average of % change in per capita use, 2010-20**	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	5.82
Estimated Total Antimicrobial Use, 2030 (Tonnes)	5.63

Public Health Indicators



% of children vaccinated
(2019)

3.1
Infant Mortality Rate
per 1,000 live births
(2019)

5.89
Under-five pneumococcal death rate
per 100,000 children
(2017)

0.64
Under-five deaths from diarrheal diseases
(2017)

26
Incidence of tuberculosis
per 100,000 people
(2019)

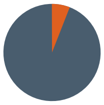
99.31
Access to improved drinking water source (%)
(2017)

94.33
Access to improved sanitation facilities (%)
(2017)

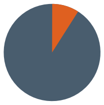
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

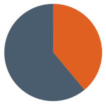
N/A
Nurses and midwives
per 1,000 people
(2018)



6.19%
Current health expenditure
% of GDP
(2018)



9.60%
Domestic general government health expenditure
% of general government expenditure
(2018)



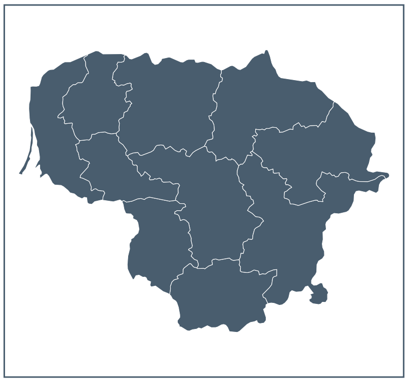
39.34%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 1101.49
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Lithuania

Europe & Central Asia| Upper-middle income



Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

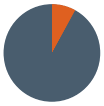
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

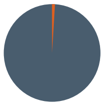
Antimicrobial Resistance Indicators*

Humans



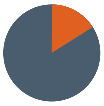
8.39% of isolates tested

MRSA
Methicillin-resistant
Staphylococcus aureus



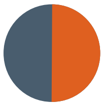
00.54% of isolates tested

CRE
Carbapenem-resistant
Klebsiella pneumoniae



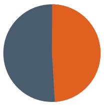
16.59% of isolates tested

ESBL
3G cephalosporin-resistant
Escherichia coli



50.96

DRI
Drug Resistance Index for WHO Critical pathogens
2020



49.98

DRI
Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli*
2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

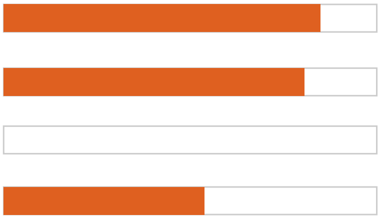
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli



Ampicillin	84.9%
Ciprofoxacin	80.6%
Colistin	0
Tetracycline	53.8%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Lithuania

Antimicrobial Use Indicators

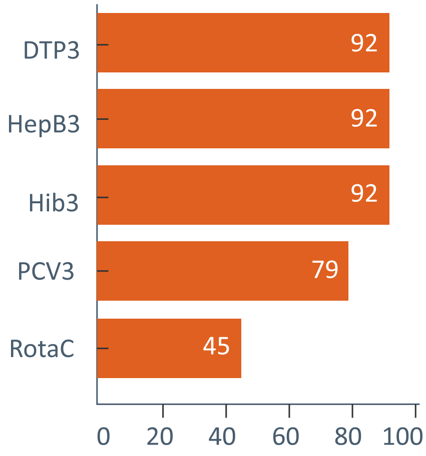
Humans

Total Use, 2010 (DDDs in Mill)	22	**Per Capita Use, 2010** (DDD)	7.19
Total Use, 2020 (DDDs in Mill)	24	**Per Capita Use, 2020** (DDD)	8.53
Change in total use, 2010-20 (DDDs in Mill)	1.83	**Change in per capita use, 2010-20** (DDD)	1.33
% Change in total use, 2010-20	8.21%	**% Change in per capita use, 2010-2020**	18.55%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	81.85%	**Regional average of % change in per capita use, 2010-20**	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	11.45
Estimated Total Antimicrobial Use, 2030 (Tonnes)	10.93

Public Health Indicators



% of children vaccinated
(2019)

3.0
Infant Mortality Rate
per 1,000 live births
(2019)

7.91
Under-five pneumococcal death rate
per 100,000 children
(2017)

1.06
Under-five deaths from diarrheal diseases
(2017)

42
Incidence of tuberculosis
per 100,000 people
(2019)

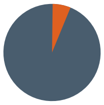
97.54
Access to improved drinking water source (%)
(2017)

95.46
Access to improved sanitation facilities (%)
(2017)

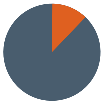
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

6.4
Physicians
per 1,000 people
(2018)

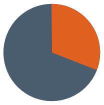
9.8
Nurses and midwives
per 1,000 people
(2018)



6.57%
Current health expenditure
% of GDP
(2018)



12.70%
Domestic general government health expenditure
% of general government expenditure
(2018)



31.64%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 1249.25
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Mexico

Latin America & Caribbean| Upper-middle income

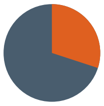
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✗	National Action Plan on AMR (NAP) Published	✗
AMU surveillance in humans	N/A	AMU surveillance in animals	N/A
AMR surveillance in humans	N/A	AMR surveillance in animals	N/A

*As per information available by December 2020

Antimicrobial Resistance Indicators*

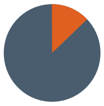
Humans



30.65% of isolates tested

MRSA

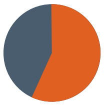
Methicillin-resistant *Staphylococcus aureus*



13.83% of isolates tested

CRE

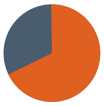
Carbapenem-resistant *Klebsiella pneumoniae*



57.81% of isolates tested

ESBL

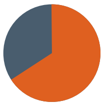
3G cephalosporin-resistant *Escherichia coli*



68.73

DRI

Drug Resistance Index for WHO Critical pathogens 2020



66.21

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	95.66%
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli

Ampicillin	72%
Ciprofoxacin	44%
Colistin	100%
Tetracycline	72.2%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Mexico

Antimicrobial Use Indicators

Humans

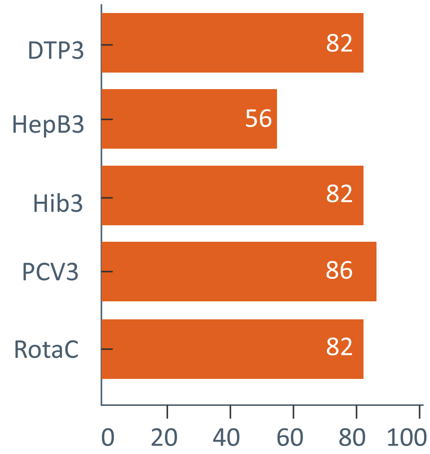
Total Use, 2010 (DDDs in Mill)	356
Total Use, 2020 (DDDs in Mill)	248
Change in total use, 2010-20 (DDDs in Mill)	-108.30
% Change in total use, 2010-20	-30.36%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	26.09%

Per Capita Use, 2010 (DDD)	3.01
Per Capita Use, 2020 (DDD)	1.84
Change in per capita use, 2010-20 (DDD)	-1.16
% Change in per capita use, 2010-2020	-38.74%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	11.67%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	1668.41
Estimated Total Antimicrobial Use, 2030 (Tonnes)	1850.85

Public Health Indicators



% of children vaccinated
(2019)

12.2
Infant Mortality Rate
per 1,000 live births
(2019)

28.06
Under-five pneumococcal death rate
per 100,000 children
(2017)

1246.58
Under-five deaths from diarrheal diseases
(2017)

23
Incidence of tuberculosis
per 100,000 people
(2019)

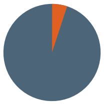
99.32
Access to improved drinking water source (%)
(2017)

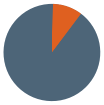
97.80
Access to improved sanitation facilities (%)
(2017)

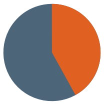
87.84
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

2.4
Nurses and midwives
per 1,000 people
(2018)


5.37%
Current health expenditure
% of GDP
(2018)


10.47%
Domestic general government health expenditure
% of general government expenditure
(2018)

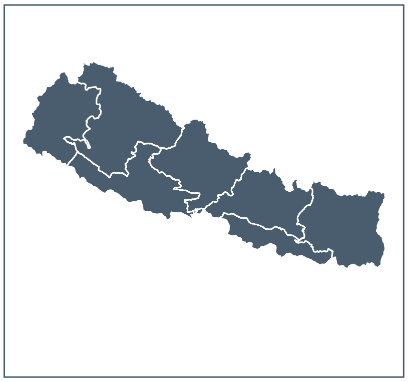

42.07%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 519.61
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Nepal

South Asia | Lower middle income



Policy Indicators*

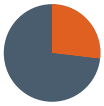
- Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓
- National Action Plan on AMR (NAP) Published ✓
- AMU surveillance in humans ✗
- AMU surveillance in animals ✓
- AMR surveillance in humans ✓
- AMR surveillance in animals ✓

*As per information available by December 2020

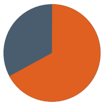
Antimicrobial Resistance Indicators*

Humans

N/A
MRSA
Methicillin-resistant
Staphylococcus aureus



27.27% of isolates tested
CRE
Carbapenem-resistant
Klebsiella pneumoniae



67.21% of isolates tested
ESBL
3G cephalosporin-resistant
Escherichia coli

N/A
DRI
Drug Resistance Index for WHO Critical pathogens
2020

N/A
DRI
Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli*
2020

Note:
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.
b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	100%
Ciprofoxacin	46.00%
Colistin	27.00%
Tetracycline	N/A

E.coli

Ampicillin	100%
Ciprofoxacin	N/A
Colistin	80
Tetracycline	N/A

*As per information available by December 2020

Note: N/A stands for Not Applicable

Nepal

Antimicrobial Use Indicators

Humans

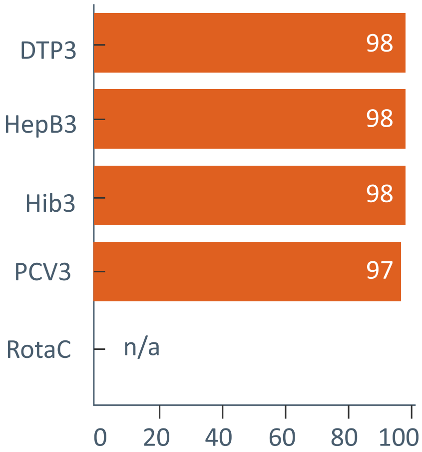
Total Use, 2010 (DDDs in Mill)	122
Total Use, 2020 (DDDs in Mill)	224
Change in total use, 2010-20 (DDDs in Mill)	101.75
% Change in total use, 2010-20	83.10%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	38.34%

Per Capita Use, 2010 (DDD)	4.56
Per Capita Use, 2020 (DDD)	7.43
Change in per capita use, 2010-20 (DDD)	2.87
% Change in per capita use, 2010-2020	63.03%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	20.44%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	59.17
Estimated Total Antimicrobial Use, 2030 (Tonnes)	68.11

Public Health Indicators



% of children vaccinated
(2019)

25.6
Infant Mortality Rate
per 1,000 live births
(2019)

134.8
Under-five pneumococcal death rate
per 100,000 children
(2017)

3061.52
Under-five deaths from diarrheal diseases
(2017)

238
Incidence of tuberculosis
per 100,000 people
(2019)

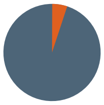
98.43
Access to improved drinking water source (%)
(2017)

70.88
Access to improved sanitation facilities (%)
(2017)

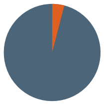
34.8
Access to basic handwashing facilities including soap and water (%)
(2017)

0.7
Physicians
per 1,000 people
(2018)

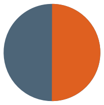
3.1
Nurses and midwives
per 1,000 people
(2018)



5.84%
Current health expenditure
% of GDP
(2018)



4.58%
Domestic general government health expenditure
% of general government expenditure
(2018)



50.80%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 57.85
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Netherlands

Europe & Central Asia| High income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

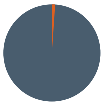
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

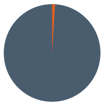
Humans



1.18% of isolates tested

MRSA

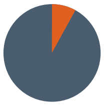
Methicillin-resistant *Staphylococcus aureus*



00.54% of isolates tested

CRE

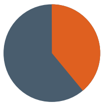
Carbapenem-resistant *Klebsiella pneumoniae*



08.02% of isolates tested

ESBL

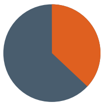
3G cephalosporin-resistant *Escherichia coli*



39.08

DRI

Drug Resistance Index for WHO Critical pathogens 2020



37.02

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

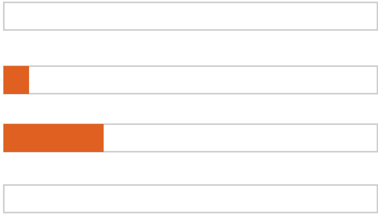
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

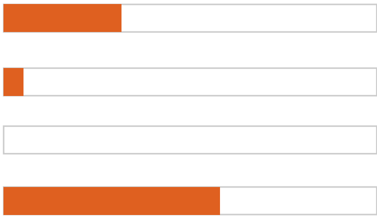
Animals

***Salmonella* spp.**



Ampicillin	0
Ciprofoxacin	6.70%
Colistin	26.70%
Tetracycline	0

E.coli



Ampicillin	31.6%
Ciprofoxacin	5.3%
Colistin	0
Tetracycline	57.9%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Netherlands

Antimicrobial Use Indicators

Humans

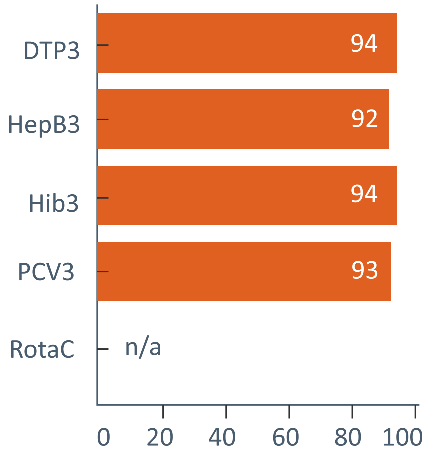
Total Use, 2010 (DDDs in Mill)	72
Total Use, 2020 (DDDs in Mill)	66
Change in total use, 2010-20 (DDDs in Mill)	-6.42
% Change in total use, 2010-20	-8.85%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%

Per Capita Use, 2010 (DDD)	4.37
Per Capita Use, 2020 (DDD)	3.85
Change in per capita use, 2010-20 (DDD)	-0.52
% Change in per capita use, 2010-2020	-11.89%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	190.44
Estimated Total Antimicrobial Use, 2030 (Tonnes)	197.11

Public Health Indicators



% of children vaccinated
(2019)

3.5
Infant Mortality Rate
per 1,000 live births
(2019)

1.28
Under-five pneumococcal death rate
per 100,000 children
(2017)

3.86
Under-five deaths from diarrheal diseases
(2017)

5
Incidence of tuberculosis
per 100,000 people
(2019)

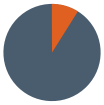
n/a
Access to improved drinking water source (%)
(2017)

100
Access to improved sanitation facilities (%)
(2017)

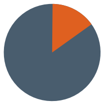
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

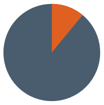
N/A
Nurses and midwives
per 1,000 people
(2018)



9.97%
Current health expenditure
% of GDP
(2018)



15.40%
Domestic general government health expenditure
% of general government expenditure
(2018)



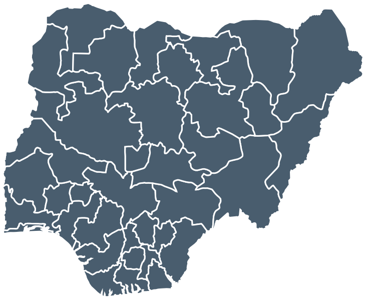
10.80%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 5306.53
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Nigeria

Sub-Saharan Africa | Lower middle income



Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✗

AMU surveillance in humans ✓

AMU surveillance in animals ✓

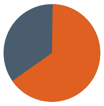
AMR surveillance in humans ✓

AMR surveillance in animals ✗

*As per information available by December 2020

Antimicrobial Resistance Indicators*

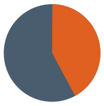
Humans



65.77% of isolates tested

MRSA

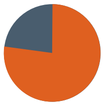
Methicillin-resistant *Staphylococcus aureus*



42.86% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



77.27% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

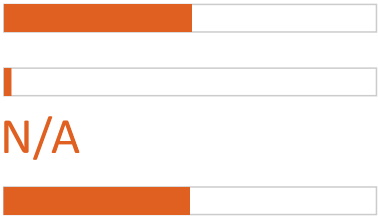
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

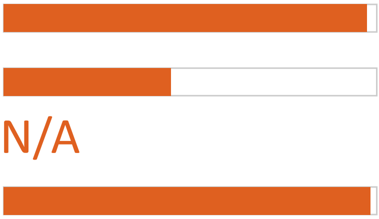
Animals

***Salmonella* spp.**



Ampicillin	50.5%
Ciprofoxacin	2.00%
Colistin	N/A
Tetracycline	50.00%

E.coli



Ampicillin	97.37%
Ciprofoxacin	44.77%
Colistin	N/A
Tetracycline	98.25%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Nigeria

Antimicrobial Use Indicators

Humans

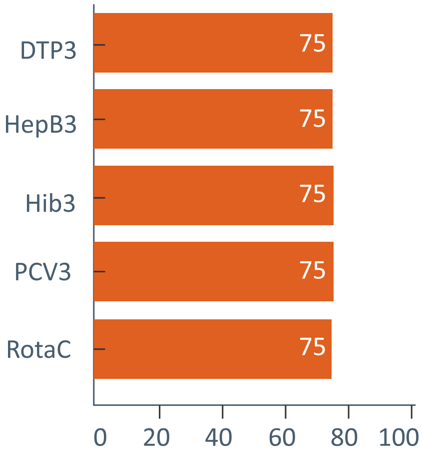
Total Use, 2010 (DDDs in Mill)	726
Total Use, 2020 (DDDs in Mill)	1536
Change in total use, 2010-20 (DDDs in Mill)	809.94
% Change in total use, 2010-20	111.51%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	71.99%

Per Capita Use, 2010 (DDD)	4.56
Per Capita Use, 2020 (DDD)	7.43
Change in per capita use, 2010-20 (DDD)	2.87
% Change in per capita use, 2010-2020	63.03%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	35.67%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	365.50
Estimated Total Antimicrobial Use, 2030 (Tonnes)	479.28

Public Health Indicators



% of children vaccinated
(2019)

55.7
Infant Mortality Rate
per 1,000 live births
(2019)

148.16
Under-five pneumococcal death rate
per 100,000 children
(2017)

28890.46
Under-five deaths from diarrheal diseases
(2017)

219
Incidence of tuberculosis
per 100,000 people
(2019)

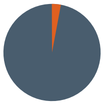
92.06
Access to improved drinking water source (%)
(2017)

70.05
Access to improved sanitation facilities (%)
(2017)

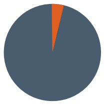
59.6
Access to basic handwashing facilities including soap and water (%)
(2017)

0.3
Physicians
per 1,000 people
(2018)

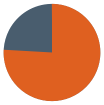
1.1
Nurses and midwives
per 1,000 people
(2018)



3.89%
Current health expenditure
% of GDP
(2018)



4.44%
Domestic general government health expenditure
% of general government expenditure
(2018)



76.60%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 83.75
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Norway

Europe & Central Asia| High income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

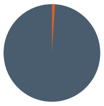
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

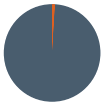
Humans



00.90% of isolates tested

MRSA

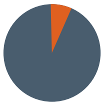
Methicillin-resistant *Staphylococcus aureus*



00.27% of isolates tested

CRE

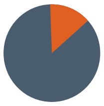
Carbapenem-resistant *Klebsiella pneumoniae*



07.09% of isolates tested

ESBL

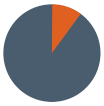
3G cephalosporin-resistant *Escherichia coli*



29.90

DRI

Drug Resistance Index for WHO Critical pathogens
2020



17.15

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli*
2020

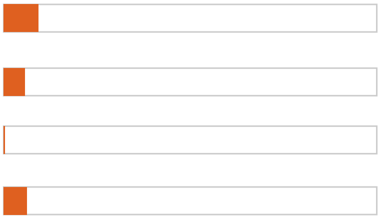
Note:
- *a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.*
- *b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.*
- *c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.*

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli



Ampicillin	9.35%
Ciprofoxacin	5.75%
Colistin	0.35%
Tetracycline	6.25%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Norway

Antimicrobial Use Indicators

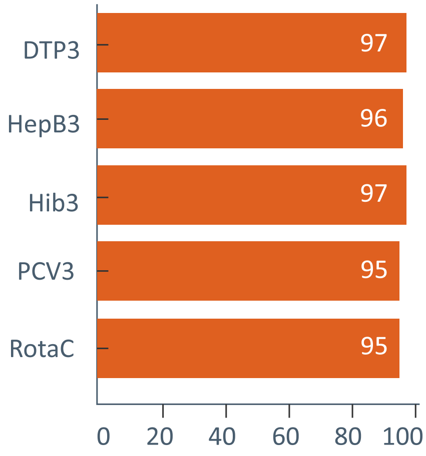
Humans

Total Use, 2010 (DDDs in Mill)	29.3	**Per Capita Use, 2010** (DDD)	6.00
Total Use, 2020 (DDDs in Mill)	28.8	**Per Capita Use, 2020** (DDD)	5.27
Change in total use, 2010-20 (DDDs in Mill)	-0.53	**Change in per capita use, 2010-20** (DDD)	-0.73
% Change in total use, 2010-20	-1.81%	**% Change in per capita use, 2010-2020**	-12.19%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	81.85%	**Regional average of % change in per capita use, 2010-20**	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	5.94
Estimated Total Antimicrobial Use, 2030 (Tonnes)	6.05

Public Health Indicators



% of children vaccinated
(2019)

2.0
Infant Mortality Rate
per 1,000 live births
(2019)

0.72
Under-five pneumococcal death rate
per 100,000 children
(2017)

1.05
Under-five deaths from diarrheal diseases
(2017)

3.3
Incidence of tuberculosis
per 100,000 people
(2019)

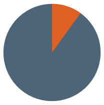
100.00
Access to improved drinking water source (%)
(2017)

100.00
Access to improved sanitation facilities (%)
(2017)

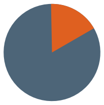
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

2.9
Physicians
per 1,000 people
(2018)

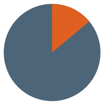
18.2
Nurses and midwives
per 1,000 people
(2018)



10.05%
Current health expenditure
% of GDP
(2018)



17.44%
Domestic general government health expenditure
% of general government expenditure
(2018)



14.31%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 8239.10
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Pakistan

South Asia | Lower middle income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

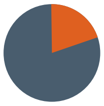
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

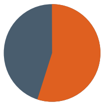
Humans



20.30% of isolates tested

MRSA

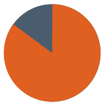
Methicillin-resistant *Staphylococcus aureus*



55.82% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



85.26% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

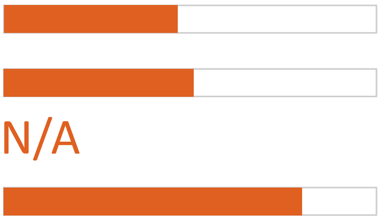
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**



Ampicillin	46.66%
Ciprofoxacin	51.00%
Colistin	N/A
Tetracycline	80.00%

E.coli

Ampicillin	96%
Ciprofoxacin	N/A
Colistin	100%
Tetracycline	100%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Pakistan

Antimicrobial Use Indicators

Humans

Total Use, 2010 (DDDs in Mill) 1042

Total Use, 2020 (DDDs in Mill) 1799

Change in total use, 2010-20 (DDDs in Mill) 756.40

% Change in total use, 2010-20 72.54%

Global average of % change in total use, 2010-20 74.49%

Regional average of % change in total use, 2010-20 38.34%

Per Capita Use, 2010 (DDD) 6.13

Per Capita Use, 2020 (DDD) 8.63

Change in per capita use, 2010-20 (DDD) 2.50

% Change in per capita use, 2010-2020 40.76%

Global average of % change in per capita use, 2010-20 35.12%

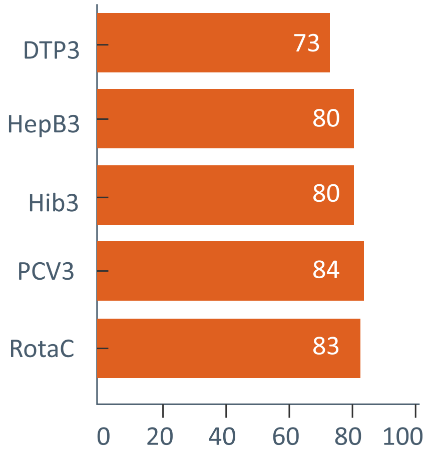
Regional average of % change in per capita use, 2010-20 20.44%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes) 879.15

Estimated Total Antimicrobial Use, 2030 (Tonnes) 1150.50

Public Health Indicators



% of children vaccinated
(2019)

12.4
Infant Mortality Rate
per 1,000 live births
(2019)

29.24
Under-five pneumococcal death rate
per 100,000 children
(2017)

1795.33
Under-five deaths from diarrheal diseases
(2017)

263
Incidence of tuberculosis
per 100,000 people
(2019)

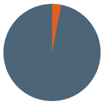
98.24
Access to improved drinking water source (%)
(2017)

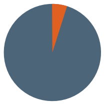
88.54
Access to improved sanitation facilities (%)
(2017)

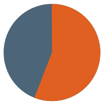
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

0.9
Physicians
per 1,000 people
(2018)

0.66
Nurses and midwives
per 1,000 people
(2018)


3.20%
Current health expenditure
% of GDP
(2018)


5.26%
Domestic general government health expenditure
% of general government expenditure
(2018)


56.24%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 42.87
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Poland

Europe & Central Asia| High income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✗

AMU surveillance in humans ✓

AMU surveillance in animals ✓

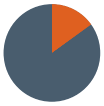
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

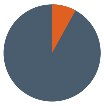
Humans



15.88% of isolates tested

MRSA

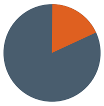
Methicillin-resistant *Staphylococcus aureus*



08.96% of isolates tested

CRE

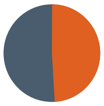
Carbapenem-resistant *Klebsiella pneumoniae*



18.21% of isolates tested

ESBL

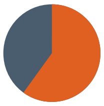
3G cephalosporin-resistant *Escherichia coli*



49.78

DRI

Drug Resistance Index for WHO Critical pathogens 2020



60.21

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

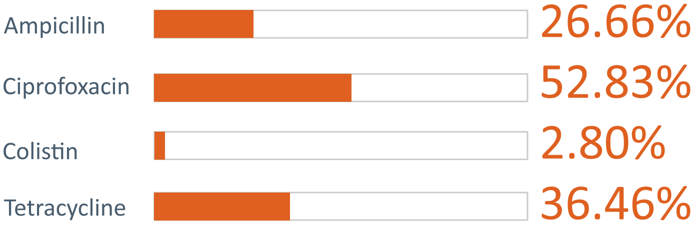
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

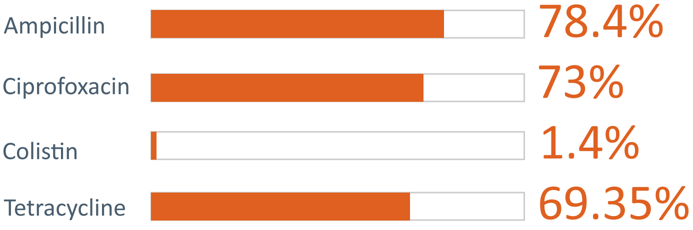
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**



E.coli



*As per information available by December 2020

Note: N/A stands for Not Applicable

Poland

Antimicrobial Use Indicators

Humans

Total Use, 2010 (DDDs in Mill) 29

Total Use, 2020 (DDDs in Mill) 362

Change in total use, 2010-20 (DDDs in Mill) 333.09

% Change in total use, 2010-20 1134.96%

Global average of % change in total use, 2010-20 74.49%

Regional average of % change in total use, 2010-20 81.85%

Per Capita Use, 2010 (DDD) 9.36

Per Capita Use, 2020 (DDD) 9.60

Change in per capita use, 2010-20 (DDD) 0.24

% Change in per capita use, 2010-2020 2.56%

Global average of % change in per capita use, 2010-20 35.12%

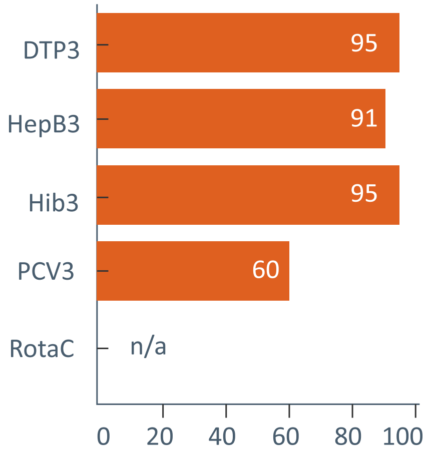
Regional average of % change in per capita use, 2010-20 22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes) 744.94

Estimated Total Antimicrobial Use, 2030 (Tonnes) 724.49

Public Health Indicators



% of children vaccinated
(2019)

3.8
Infant Mortality Rate
per 1,000 live births
(2019)

3.41
Under-five pneumococcal death rate
per 100,000 children
(2017)

6.28
Under-five deaths from diarrheal diseases
(2017)

15
Incidence of tuberculosis
per 100,000 people
(2019)

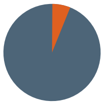
99.72
Access to improved drinking water source (%)
(2017)

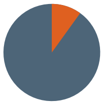
99.84
Access to improved sanitation facilities (%)
(2017)

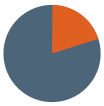
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

6.9
Nurses and midwives
per 1,000 people
(2018)


6.33%
Current health expenditure
% of GDP
(2018)


10.83%
Domestic general government health expenditure
% of general government expenditure
(2018)


20.79%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 978.74
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Russia

Europe & Central Asia| Upper-middle income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✗

AMU surveillance in humans ✓

AMU surveillance in animals ✓

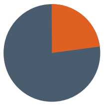
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

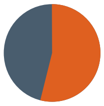
Humans



23.12% of isolates tested

MRSA

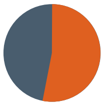
Methicillin-resistant *Staphylococcus aureus*



53.97% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



53.01% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**	
Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli	
Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

*As per information available by December 2020

Note: N/A stands for Not Applicable

Russia

Antimicrobial Use Indicators

Humans

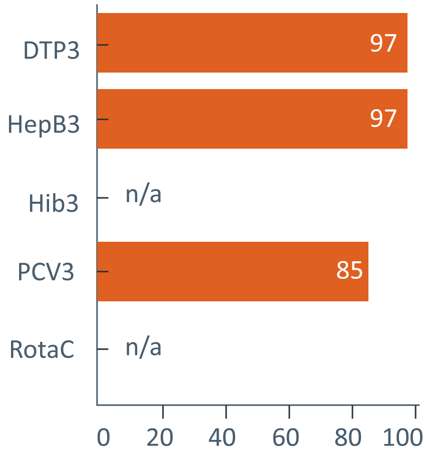
Total Use, 2010 (DDDs in Mill)	722
Total Use, 2020 (DDDs in Mill)	1093
Change in total use, 2010-20 (DDDs in Mill)	371.36
% Change in total use, 2010-20	51.41%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%

Per Capita Use, 2010 (DDD)	5.06
Per Capita Use, 2020 (DDD)	7.62
Change in per capita use, 2010-20 (DDD)	2.57
% Change in per capita use, 2010-2020	50.80%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	1789.94
Estimated Total Antimicrobial Use, 2030 (Tonnes)	2036.10

Public Health Indicators



% of children vaccinated
(2019)

4.9
Infant Mortality Rate
per 1,000 live births
(2019)

10.99
Under-five pneumococcal death rate
per 100,000 children
(2017)

113.40
Under-five deaths from diarrheal diseases
(2017)

50
Incidence of tuberculosis
per 100,000 people
(2019)

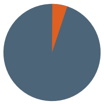
N/A
Access to improved drinking water source (%)
(2017)

90.48
Access to improved sanitation facilities (%)
(2017)

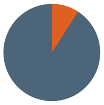
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

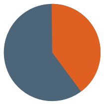
N/A
Nurses and midwives
per 1,000 people
(2018)



5.32%
Current health expenditure
% of GDP
(2018)



9.76%
Domestic general government health expenditure
% of general government expenditure
(2018)



38.31%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 609.01
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Saudi Arabia

Middle East & North Africa | High income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✗

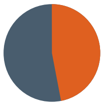
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

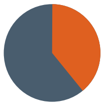
Humans



47.07% of isolates tested

MRSA

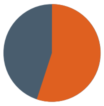
Methicillin-resistant *Staphylococcus aureus*



39.18% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



55.12% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

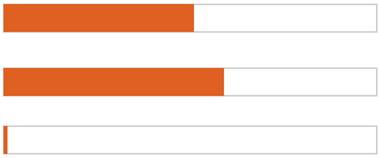
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli



Ampicillin	51%
Ciprofoxacin	59%
Colistin	1%
Tetracycline	N/A

*As per information available by December 2020

Note: N/A stands for Not Applicable

Saudi Arabia

Antimicrobial Use Indicators

Humans

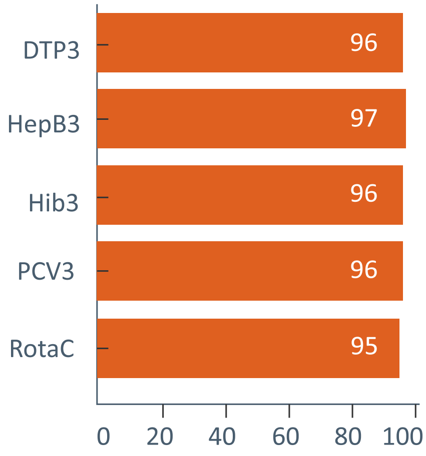
Total Use, 2010 (DDDs in Mill)	249
Total Use, 2020 (DDDs in Mill)	486
Change in total use, 2010-20 (DDDs in Mill)	236.98
% Change in total use, 2010-20	94.90%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	131.73%

Per Capita Use, 2010 (DDD)	8.89
Per Capita Use, 2020 (DDD)	14.16
Change in per capita use, 2010-20 (DDD)	5.27
% Change in per capita use, 2010-2020	59.31%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	93.53%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	88.08
Estimated Total Antimicrobial Use, 2030 (Tonnes)	94.97

Public Health Indicators



% of children vaccinated
(2019)

5.7
Infant Mortality Rate
per 1,000 live births
(2019)

1.82
Under-five pneumococcal death rate
per 100,000 children
(2017)

36.48
Under-five deaths from diarrheal diseases
(2017)

9.9
Incidence of tuberculosis
per 100,000 people
(2019)

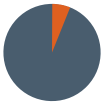
100.00
Access to improved drinking water source (%)
(2017)

100.00
Access to improved sanitation facilities (%)
(2017)

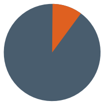
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

2.6
Physicians
per 1,000 people
(2018)

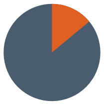
5.4
Nurses and midwives
per 1,000 people
(2018)



6.36%
Current health expenditure
% of GDP
(2018)



10.86%
Domestic general government health expenditure
% of general government expenditure
(2018)



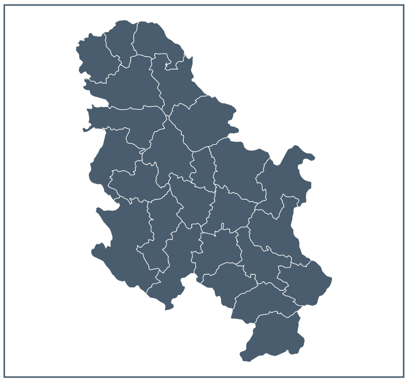
14.37%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 1484.59
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Serbia

Europe & Central Asia| Upper-middle income



Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✗

National Action Plan on AMR (NAP) Published ✗

AMU surveillance in humans ✓

AMU surveillance in animals ✓

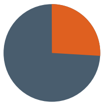
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

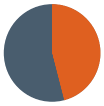
Humans



25.95% of isolates tested

MRSA

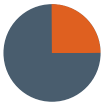
Methicillin-resistant *Staphylococcus aureus*



46.09% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



24.94% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

*As per information available by December 2020

Note: N/A stands for Not Applicable

Serbia

Antimicrobial Use Indicators

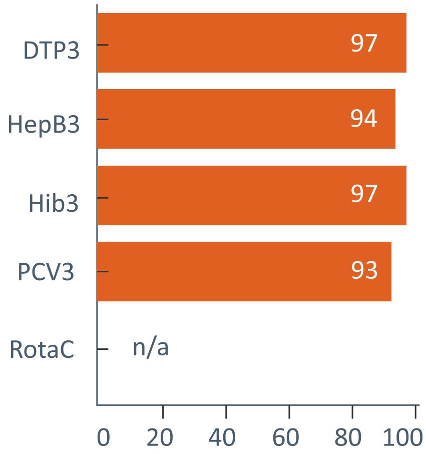
Humans

Total Use, 2010 (DDDs in Mill)	51	**Per Capita Use, 2010** (DDD)	7.07
Total Use, 2020 (DDDs in Mill)	159	**Per Capita Use, 2020** (DDD)	23.02
Change in total use, 2010-20 (DDDs in Mill)	108.41	**Change in per capita use, 2010-20** (DDD)	15.96
% Change in total use, 2010-20	210.33%	**% Change in per capita use, 2010-2020**	225.77%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	81.85%	**Regional average of % change in per capita use, 2010-20**	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	N/A
Estimated Total Antimicrobial Use, 2030 (Tonnes)	N/A

Public Health Indicators



% of children vaccinated
(2019)

4.6
Infant Mortality Rate
per 1,000 live births
(2019)

3.85
Under-five pneumococcal death rate
per 100,000 children
(2017)

3.21
Under-five deaths from diarrheal diseases
(2017)

14
Incidence of tuberculosis
per 100,000 people
(2019)

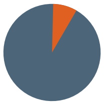
99.22
Access to improved drinking water source (%)
(2017)

97.57
Access to improved sanitation facilities (%)
(2017)

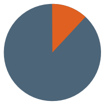
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

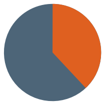
N/A
Nurses and midwives
per 1,000 people
(2018)



8.54%
Current health expenditure
% of GDP
(2018)



12.45%
Domestic general government health expenditure
% of general government expenditure
(2018)



38.31%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 617.09
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

South Africa

Sub-Saharan Africa| Upper-middle income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

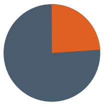
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

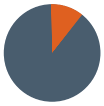
Humans



24.63% of isolates tested

MRSA

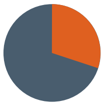
Methicillin-resistant *Staphylococcus aureus*



11.06% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



30.48% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**	
Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli	
Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

**As per information available by December 2020*

Note: N/A stands for Not Applicable

South Africa

Antimicrobial Use Indicators

Humans

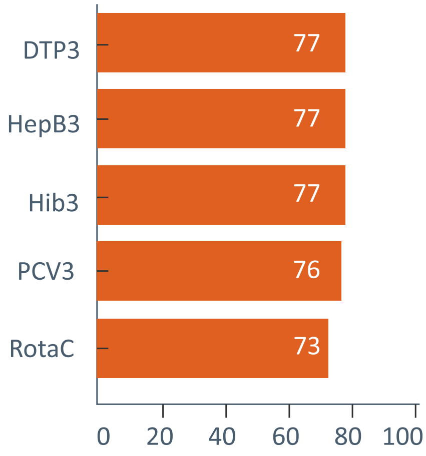
Total Use, 2010 (DDDs in Mill)	511
Total Use, 2020 (DDDs in Mill)	478
Change in total use, 2010-20 (DDDs in Mill)	-33.31
% Change in total use, 2010-20	-6.51%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	71.99%

Per Capita Use, 2010 (DDD)	10.00
Per Capita Use, 2020 (DDD)	8.16
Change in per capita use, 2010-20 (DDD)	-1.92
% Change in per capita use, 2010-2020	-19.04%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	35.67%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	872.13
Estimated Total Antimicrobial Use, 2030 (Tonnes)	1137.82

Public Health Indicators



% of children vaccinated
(2019)

27.5
Infant Mortality Rate
per 1,000 live births
(2019)

75.50
Under-five pneumococcal death rate
per 100,000 children
(2017)

4616.31
Under-five deaths from diarrheal diseases
(2017)

615
Incidence of tuberculosis
per 100,000 people
(2019)

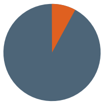
95.47
Access to improved drinking water source (%)
(2017)

90.60
Access to improved sanitation facilities (%)
(2017)

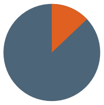
43.99
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

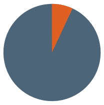
N/A
Nurses and midwives
per 1,000 people
(2018)



8.25%
Current health expenditure
% of GDP
(2018)



13.34%
Domestic general government health expenditure
% of general government expenditure
(2018)



7.72%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 525.96
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Spain

Europe & Central Asia| High income

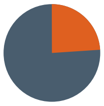
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✗	National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓	AMU surveillance in animals	✓
AMR surveillance in humans	✓	AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

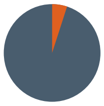
Humans



24.22% of isolates tested

MRSA

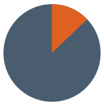
Methicillin-resistant *Staphylococcus aureus*



05.26% of isolates tested

CRE

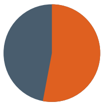
Carbapenem-resistant *Klebsiella pneumoniae*



13.93% of isolates tested

ESBL

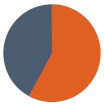
3G cephalosporin-resistant *Escherichia coli*



53.46

DRI

Drug Resistance Index for WHO Critical pathogens
2020



58.79

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli*
2020

Note:

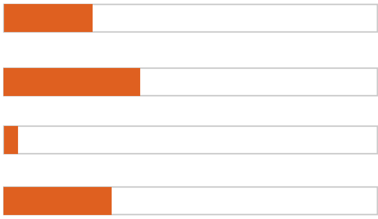
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

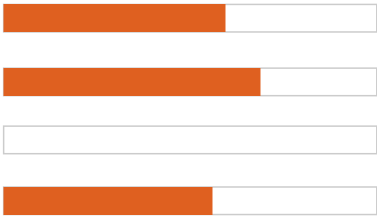
Animals

***Salmonella* spp.**



Ampicillin	23.7%
Ciprofoxacin	36.50%
Colistin	3.73%
Tetracycline	28.83%

E.coli



Ampicillin	59.4%
Ciprofoxacin	68.8%
Colistin	0
Tetracycline	55.9%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Spain

Antimicrobial Use Indicators

Humans

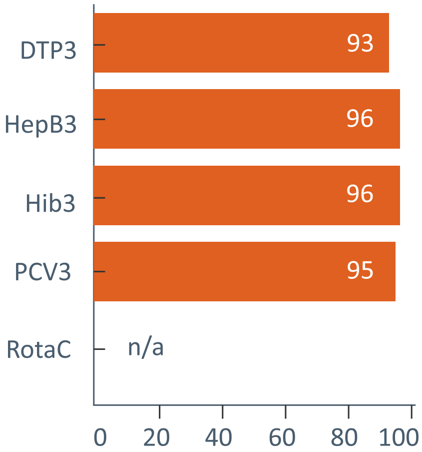
Total Use, 2010 (DDDs in Mill)	566
Total Use, 2020 (DDDs in Mill)	857
Change in total use, 2010-20 (DDDs in Mill)	290.55
% Change in total use, 2010-20	51.28%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%

Per Capita Use, 2010 (DDD)	12.16
Per Capita Use, 2020 (DDD)	18.43
Change in per capita use, 2010-20 (DDD)	6.27
% Change in per capita use, 2010-2020	51.56%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	1804.31
Estimated Total Antimicrobial Use, 2030 (Tonnes)	1943.32

Public Health Indicators



% of children vaccinated
(2019)

2.6
Infant Mortality Rate
per 1,000 live births
(2019)

1.51
Under-five pneumococcal death rate
per 100,000 children
(2017)

11.25
Under-five deaths from diarrheal diseases
(2017)

9.3
Incidence of tuberculosis
per 100,000 people
(2019)

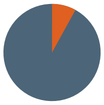
99.93
Access to improved drinking water source (%)
(2017)

99.98
Access to improved sanitation facilities (%)
(2017)

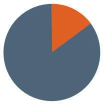
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

3.9
Physicians
per 1,000 people
(2018)

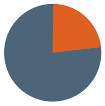
N/A
Nurses and midwives
per 1,000 people
(2018)



8.98%
Current health expenditure
% of GDP
(2018)



15.18%
Domestic general government health expenditure
% of general government expenditure
(2018)



22.16%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 2736.32
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Sweden

Europe & Central Asia| High income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

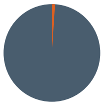
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

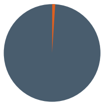
Humans



01.92% of isolates tested

MRSA

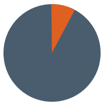
Methicillin-resistant *Staphylococcus aureus*



00.92% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



08.66% of isolates tested

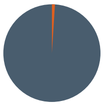
ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020



0.18

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

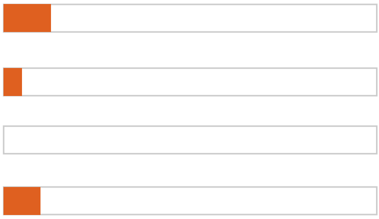
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli



Ampicillin	12.7%
Ciprofoxacin	4.85%
Colistin	0
Tetracycline	9.8%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Sweden

Antimicrobial Use Indicators

Humans

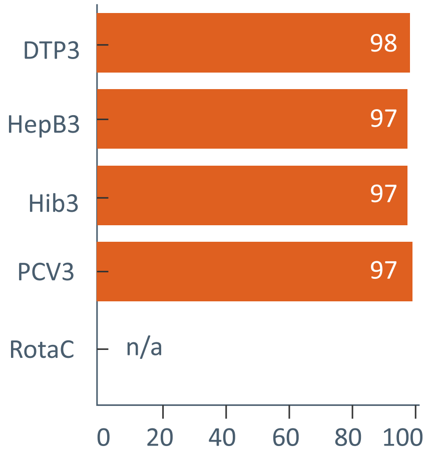
Total Use, 2010 (DDDs in Mill)	51
Total Use, 2020 (DDDs in Mill)	39
Change in total use, 2010-20 (DDDs in Mill)	-11.46
% Change in total use, 2010-20	-22.33%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%

Per Capita Use, 2010 (DDD)	5.47
Per Capita Use, 2020 (DDD)	3.93
Change in per capita use, 2010-20 (DDD)	-1.54
% Change in per capita use, 2010-2020	-28.18%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	10.24
Estimated Total Antimicrobial Use, 2030 (Tonnes)	10.01

Public Health Indicators



% of children vaccinated
(2019)

2.1
Infant Mortality Rate
per 1,000 live births
(2019)

1.21
Under-five pneumococcal death rate
per 100,000 children
(2017)

2.54
Under-five deaths from diarrheal diseases
(2017)

5.5
Incidence of tuberculosis
per 100,000 people
(2019)

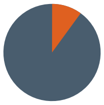
100.00
Access to improved drinking water source (%)
(2017)

99.99
Access to improved sanitation facilities (%)
(2017)

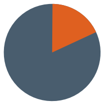
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

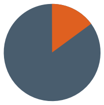
N/A
Nurses and midwives
per 1,000 people
(2018)



10.90%
Current health expenditure
% of GDP
(2018)



18.60%
Domestic general government health expenditure
% of general government expenditure
(2018)



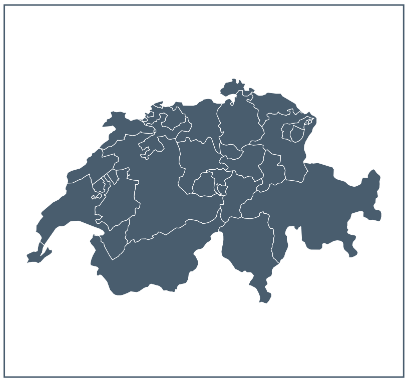
13.78%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 5981.71
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Switzerland

Europe & Central Asia| High income



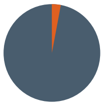
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓	National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓	AMU surveillance in animals	✓
AMR surveillance in humans	✓	AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

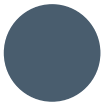
Humans



3.00% of isolates tested

MRSA

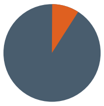
Methicillin-resistant *Staphylococcus aureus*



0 isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



9.99% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

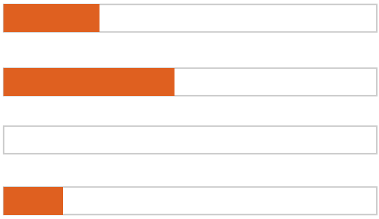
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli



Ampicillin	25.7%
Ciprofoxacin	45.8%
Colistin	0
Tetracycline	15.9%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Switzerland

Antimicrobial Use Indicators

Humans

Total Use, 2010 (DDDs in Mill) 41

Total Use, 2020 (DDDs in Mill) 42

Change in total use, 2010-20 (DDDs in Mill) 1.91

% Change in total use, 2010-20 4.64%

Global average of % change in total use, 2010-20 74.49%

Regional average of % change in total use, 2010-20 81.85%

Per Capita Use, 2010 (DDD) 5.25

Per Capita Use, 2020 (DDD) 4.98

Change in per capita use, 2010-20 (DDD) -0.26

% Change in per capita use, 2010-2020 -5.03%

Global average of % change in per capita use, 2010-20 35.12%

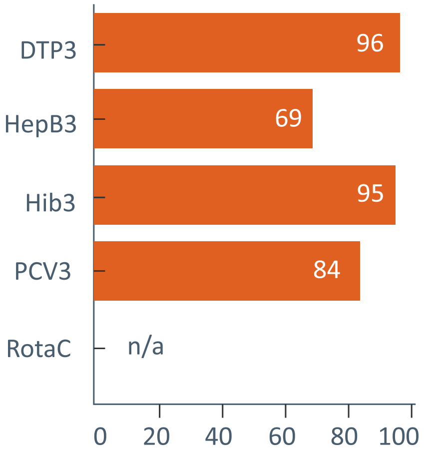
Regional average of % change in per capita use, 2010-20 22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes) 32.28

Estimated Total Antimicrobial Use, 2030 (Tonnes) 33.12

Public Health Indicators



% of children vaccinated
(2019)

3.6
Infant Mortality Rate
per 1,000 live births
(2019)

1.21
Under-five pneumococcal death rate
per 100,000 children
(2017)

4.48
Under-five deaths from diarrheal diseases
(2017)

5.4
Incidence of tuberculosis
per 100,000 people
(2019)

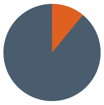
100.00
Access to improved drinking water source (%)
(2017)

99.99
Access to improved sanitation facilities (%)
(2017)

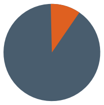
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

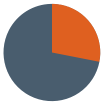
N/A
Nurses and midwives
per 1,000 people
(2018)



11.88%
Current health expenditure
% of GDP
(2018)



10.99%
Domestic general government health expenditure
% of general government expenditure
(2018)



27.98%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 9870.66
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Thailand

East Asia & Pacific| Low- & lower-middle income

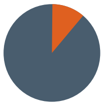
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✓	National Action Plan on AMR (NAP) Published	✓
AMU surveillance in humans	✓	AMU surveillance in animals	✓
AMR surveillance in humans	✓	AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

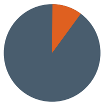
Humans



11.34% of isolates tested

MRSA

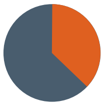
Methicillin-resistant *Staphylococcus aureus*



10.46% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



37.03% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

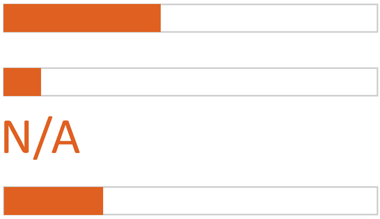
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

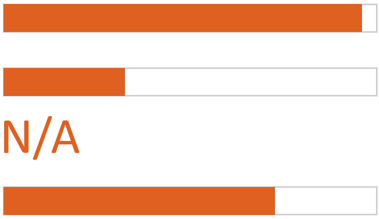
Animals

Salmonella spp.



Ampicillin	42%
Ciprofoxacin	10.00%
Colistin	N/A
Tetracycline	26.50%

E.coli



Ampicillin	96%
Ciprofoxacin	32.5%
Colistin	N/A
Tetracycline	72.75%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Thailand

Antimicrobial Use Indicators

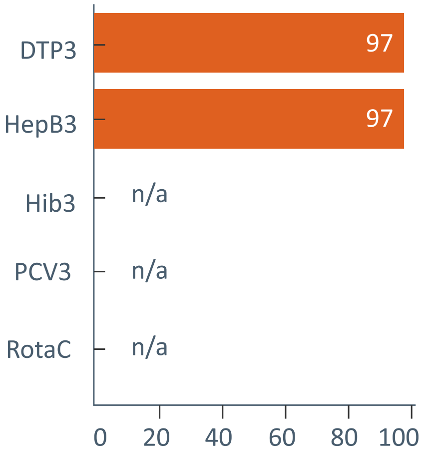
Humans

Total Use, 2010 (DDDs in Mill)	475	**Per Capita Use, 2010** (DDD)	7.13
Total Use, 2020 (DDDs in Mill)	422	**Per Capita Use, 2020** (DDD)	6.16
Change in total use, 2010-20 (DDDs in Mill)	-53.31	**Change in per capita use, 2010-20** (DDD)	-0.97
% Change in total use, 2010-20	-11.21%	**% Change in per capita use, 2010-2020**	-13.66%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	158.87%	**Regional average of % change in per capita use, 2010-20**	139.61%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	3832.78
Estimated Total Antimicrobial Use, 2030 (Tonnes)	4207.92

Public Health Indicators



% of children vaccinated
(2019)

7.7
Infant Mortality Rate
per 1,000 live births
(2019)

14.98
Under-five pneumococcal death rate
per 100,000 children
(2017)

129.31
Under-five deaths from diarrheal diseases
(2017)

150
Incidence of tuberculosis
per 100,000 people
(2019)

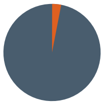
100.00
Access to improved drinking water source (%)
(2017)

99.94
Access to improved sanitation facilities (%)
(2017)

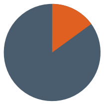
83.92
Access to basic handwashing facilities including soap and water (%)
(2017)

0.8
Physicians
per 1,000 people
(2018)

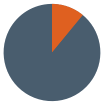
2.7
Nurses and midwives
per 1,000 people
(2018)



3.79%
Current health expenditure
% of GDP
(2018)



15.03%
Domestic general government health expenditure
% of general government expenditure
(2018)



11.01%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 275.92
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Turkey

Europe & Central Asia| Upper-middle income

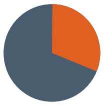
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	✗	National Action Plan on AMR (NAP) Published	✗
AMU surveillance in humans	✓	AMU surveillance in animals	✓
AMR surveillance in humans	✓	AMR surveillance in animals	✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

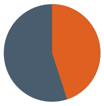
Humans



31.00% of isolates tested

MRSA

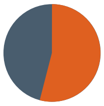
Methicillin-resistant *Staphylococcus aureus*



45.00% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



54.00% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

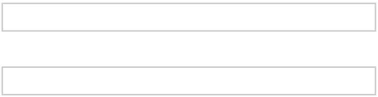
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

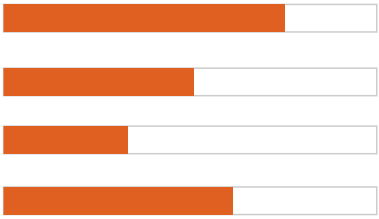
Animals

Salmonella spp.



Ampicillin	0
Ciprofoxacin	0
Colistin	N/A
Tetracycline	N/A

E.coli



Ampicillin	75.4%
Ciprofoxacin	51%
Colistin	33.33%
Tetracycline	61.5%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Turkey

Antimicrobial Use Indicators

Humans

Total Use, 2010 (DDDs in Mill) 1221

Total Use, 2020 (DDDs in Mill) 1622

Change in total use, 2010-20 (DDDs in Mill) 401.36

% Change in total use, 2010-20 32.87%

Global average of % change in total use, 2010-20 74.49%

Regional average of % change in total use, 2010-20 81.85%

Per Capita Use, 2010 (DDD) 16.88

Per Capita Use, 2020 (DDD) 19.72

Change in per capita use, 2010-20 (DDD) 2.84

% Change in per capita use, 2010-2020 16.80%

Global average of % change in per capita use, 2010-20 35.12%

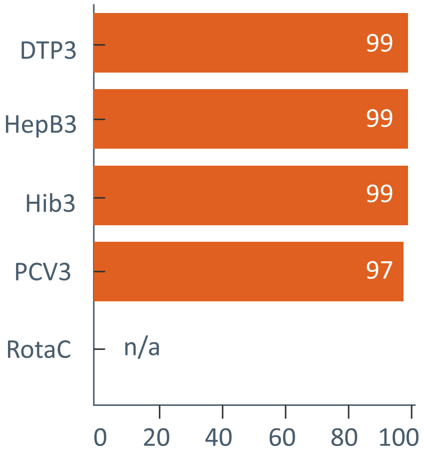
Regional average of % change in per capita use, 2010-20 22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes) 674.82

Estimated Total Antimicrobial Use, 2030 (Tonnes) 851.48

Public Health Indicators



% of children vaccinated
(2019)

8.6
Infant Mortality Rate
per 1,000 live births
(2019)

10.91
Under-five pneumococcal death rate
per 100,000 children
(2017)

151.28
Under-five deaths from diarrheal diseases
(2017)

16
Incidence of tuberculosis
per 100,000 people
(2019)

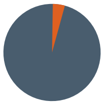
98.88
Access to improved drinking water source (%)
(2017)

97.88
Access to improved sanitation facilities (%)
(2017)

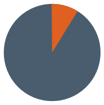
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

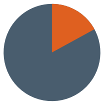
N/A
Nurses and midwives
per 1,000 people
(2018)



4.12%
Current health expenditure
% of GDP
(2018)



9.30%
Domestic general government health expenditure
% of general government expenditure
(2018)



17.49%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 389.87
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

UAE

Middle East & North Africa | High income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✗

AMU surveillance in humans ✓

AMU surveillance in animals ✓

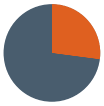
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

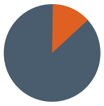
Humans



27.52% of isolates tested

MRSA

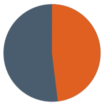
Methicillin-resistant *Staphylococcus aureus*



13.14% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



48.46% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens
2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli*
2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**	
Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli	
Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

**As per information available by December 2020*

Note: N/A stands for Not Applicable

UAE

Antimicrobial Use Indicators

Humans

Total Use, 2010 (DDDs in Mill) 66

Total Use, 2020 (DDDs in Mill) 178

Change in total use, 2010-20 (DDDs in Mill) 112.02

% Change in total use, 2010-20 168.56%

Global average of % change in total use, 2010-20 74.49%

Regional average of % change in total use, 2010-20 131.73%

Per Capita Use, 2010 (DDD) 7.98

Per Capita Use, 2020 (DDD) 18.17

Change in per capita use, 2010-20 (DDD) 10.19

% Change in per capita use, 2010-2020 127.75%

Global average of % change in per capita use, 2010-20 35.12%

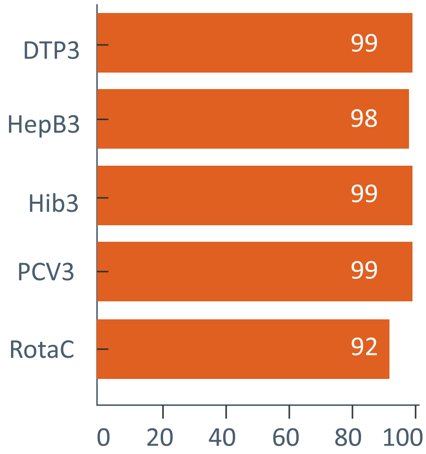
Regional average of % change in per capita use, 2010-20 93.53%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes) 11.15

Estimated Total Antimicrobial Use, 2030 (Tonnes) 12.58

Public Health Indicators



% of children vaccinated
(2019)

6.4
Infant Mortality Rate
per 1,000 live births
(2019)

4.03
Under-five pneumococcal death rate
per 100,000 children
(2017)

6.13
Under-five deaths from diarrheal diseases
(2017)

1
Incidence of tuberculosis
per 100,000 people
(2019)

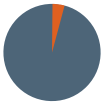
100.00
Access to improved drinking water source (%)
(2017)

99.35
Access to improved sanitation facilities (%)
(2017)

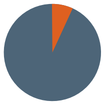
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

2.5
Physicians
per 1,000 people
(2018)

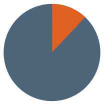
5.7
Nurses and midwives
per 1,000 people
(2018)



4.23%
Current health expenditure
% of GDP
(2018)



7.25%
Domestic general government health expenditure
% of general government expenditure
(2018)



12.70%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 1817.35
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

United Kingdom

Europe & Central Asia| High income

Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

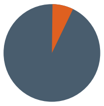
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

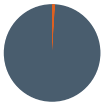
Humans



7.29% of isolates tested

MRSA

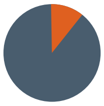
Methicillin-resistant *Staphylococcus aureus*



00.84% of isolates tested

CRE

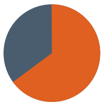
Carbapenem-resistant *Klebsiella pneumoniae*



11.80% of isolates tested

ESBL

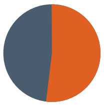
3G cephalosporin-resistant *Escherichia coli*



65.06

DRI

Drug Resistance Index for WHO Critical pathogens 2020



52.40

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

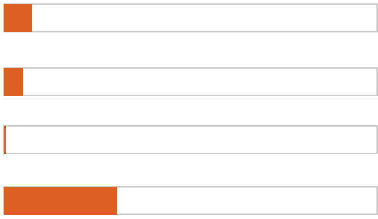
a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

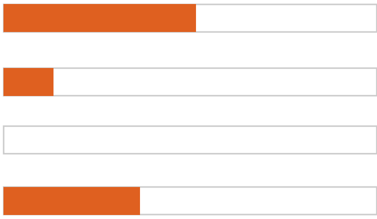
Animals

***Salmonella* spp.**



Ampicillin	7.6%
Ciprofoxacin	5.16%
Colistin	0.40%
Tetracycline	30.30%

E.coli



Ampicillin	51.5%
Ciprofoxacin	13.35%
Colistin	0
Tetracycline	36.55%

*As per information available by December 2020

Note: N/A stands for Not Applicable

United Kingdom

Antimicrobial Use Indicators

Humans

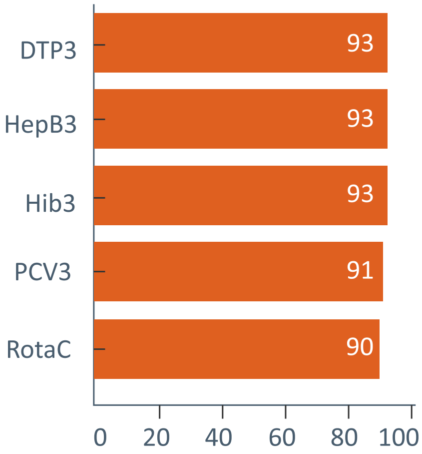
Total Use, 2010 (DDDs in Mill)	525
Total Use, 2020 (DDDs in Mill)	611
Change in total use, 2010-20 (DDDs in Mill)	86.03
% Change in total use, 2010-20	16.37%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	81.85%

Per Capita Use, 2010 (DDD)	8.38
Per Capita Use, 2020 (DDD)	9.11
Change in per capita use, 2010-20 (DDD)	0.74
% Change in per capita use, 2010-2020	8.82%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	22.10%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	248.36
Estimated Total Antimicrobial Use, 2030 (Tonnes)	248.84

Public Health Indicators



% of children vaccinated
(2019)

3.7
Infant Mortality Rate
per 1,000 live births
(2019)

3.14
Under-five pneumococcal death rate
per 100,000 children
(2017)

19.49
Under-five deaths from diarrheal diseases
(2017)

8
Incidence of tuberculosis
per 100,000 people
(2019)

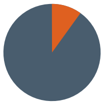
100
Access to improved drinking water source (%)
(2017)

99.83
Access to improved sanitation facilities (%)
(2017)

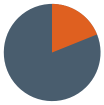
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

2.8
Physicians
per 1,000 people
(2018)

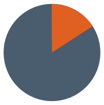
8.1
Nurses and midwives
per 1,000 people
(2018)



10.00%
Current health expenditure
% of GDP
(2018)



19.20%
Domestic general government health expenditure
% of general government expenditure
(2018)



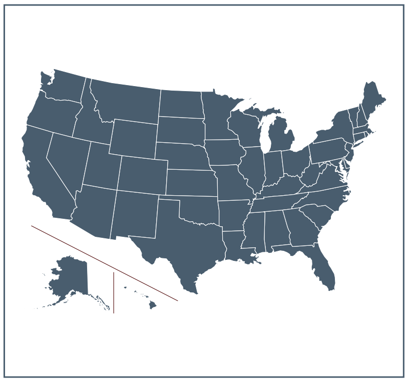
16.71%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 4315.43
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

United States

North America | High income



Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✓

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

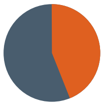
AMR surveillance in humans ✓

AMR surveillance in animals ✓

*As per information available by December 2020

Antimicrobial Resistance Indicators*

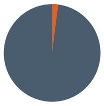
Humans



44.92% of isolates tested

MRSA

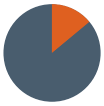
Methicillin-resistant *Staphylococcus aureus*



2.98% of isolates tested

CRE

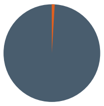
Carbapenem-resistant *Klebsiella pneumoniae*



14.84% of isolates tested

ESBL

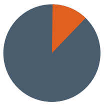
3G cephalosporin-resistant *Escherichia coli*



8.09

DRI

Drug Resistance Index for WHO Critical pathogens 2020



26.66

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

Salmonella **spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

*As per information available by December 2020

Note: N/A stands for Not Applicable

United States

Antimicrobial Use Indicators

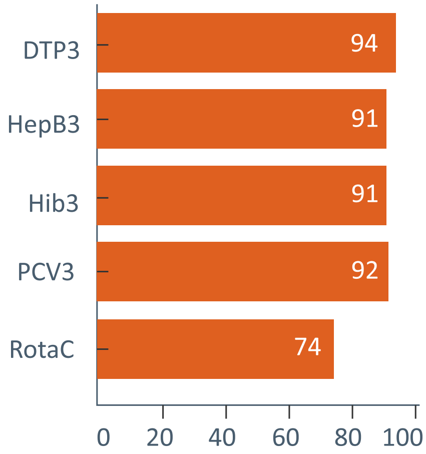
Humans

Total Use, 2010 (DDDs in Mill)	3630	**Per Capita Use, 2010** (DDD)	11.73
Total Use, 2020 (DDDs in Mill)	2913	**Per Capita Use, 2020** (DDD)	8.74
Change in total use, 2010-20 (DDDs in Mill)	-717.78	**Change in per capita use, 2010-20** (DDD)	-2.99
% Change in total use, 2010-20	-19.77%	**% Change in per capita use, 2010-2020**	-25.51%
Global average of % change in total use, 2010-20	74.49%	**Global average of % change in per capita use, 2010-20**	35.12%
Regional average of % change in total use, 2010-20	-6.27%	**Regional average of % change in per capita use, 2010-20**	-14.09%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	6596.31
Estimated Total Antimicrobial Use, 2030 (Tonnes)	6786.24

Public Health Indicators



% of children vaccinated
(2019)

5.6
Infant Mortality Rate
per 1,000 live births
(2019)

3.26
Under-five pneumococcal death rate
per 100,000 children
(2017)

353.16
Under-five deaths from diarrheal diseases
(2017)

3
Incidence of tuberculosis
per 100,000 people
(2019)

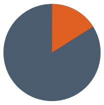
99.26
Access to improved drinking water source (%)
(2017)

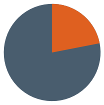
99.97
Access to improved sanitation facilities (%)
(2017)

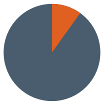
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

2.6
Physicians
per 1,000 people
(2018)

N/A
Nurses and midwives
per 1,000 people
(2018)


16.89%
Current health expenditure
% of GDP
(2018)


22.50%
Domestic general government health expenditure
% of general government expenditure
(2018)


10.81%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 10623.85
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Venezuela

Latin America & Caribbean | Upper-middle income

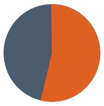
Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	☒	National Action Plan on AMR (NAP) Published	☒
AMU surveillance in humans	N/A	AMU surveillance in animals	N/A
AMR surveillance in humans	N/A	AMR surveillance in animals	N/A

*As per information available by December 2020

Antimicrobial Resistance Indicators*

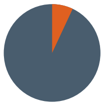
Humans



54.29% of isolates tested

MRSA

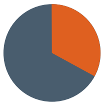
Methicillin-resistant *Staphylococcus aureus*



07.69% of isolates tested

CRE

Carbapenem-resistant *Klebsiella pneumoniae*



33.56% of isolates tested

ESBL

3G cephalosporin-resistant *Escherichia coli*

N/A

DRI

Drug Resistance Index for WHO Critical pathogens 2020

N/A

DRI

Drug Resistance Index for MRSA, CRE, and ESBL positive *E.coli* 2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

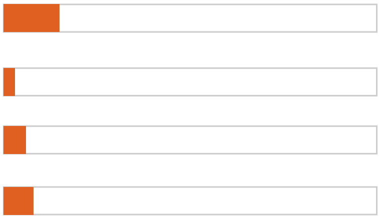
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	N/A
Ciprofoxacin	N/A
Colistin	N/A
Tetracycline	N/A

E.coli



Ampicillin	15%
Ciprofoxacin	3%
Colistin	6%
Tetracycline	8%

*As per information available by December 2020

Note: N/A stands for Not Applicable

Venezuela

Antimicrobial Use Indicators

Humans

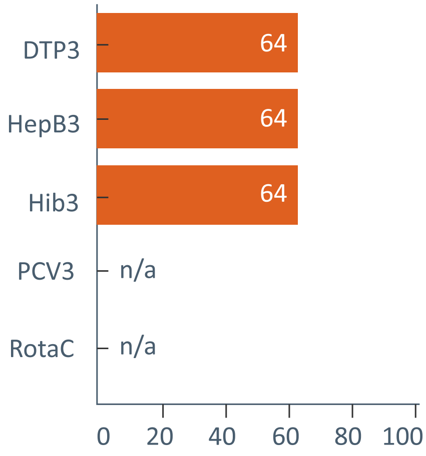
Total Use, 2010 (DDDs in Mill)	163
Total Use, 2020 (DDDs in Mill)	229
Change in total use, 2010-20 (DDDs in Mill)	66.52
% Change in total use, 2010-20	40.74%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	26.09%

Per Capita Use, 2010 (DDD)	5.63
Per Capita Use, 2020 (DDD)	6.94
Change in per capita use, 2010-20 (DDD)	1.31
% Change in per capita use, 2010-2020	23.23%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	11.67%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	324.21
Estimated Total Antimicrobial Use, 2030 (Tonnes)	589.56

Public Health Indicators



% of children vaccinated
(2019)

21.0
Infant Mortality Rate
per 1,000 live births
(2019)

29.24
Under-five pneumococcal death rate
per 100,000 children
(2017)

442.99
Under-five deaths from diarrheal diseases
(2017)

45
Incidence of tuberculosis
per 100,000 people
(2019)

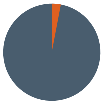
96.20
Access to improved drinking water source (%)
(2017)

93.94
Access to improved sanitation facilities (%)
(2017)

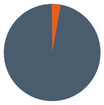
N/A
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

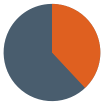
0.9
Nurses and midwives
per 1,000 people
(2018)



3.56%
Current health expenditure
% of GDP
(2018)



3.68%
Domestic general government health expenditure
% of general government expenditure
(2018)



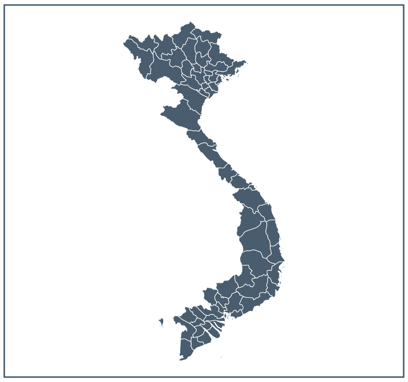
38.20%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 256.95
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Vietnam

East Asia & Pacific | Low- & lower-middle income



Policy Indicators*

Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS) ✗

National Action Plan on AMR (NAP) Published ✓

AMU surveillance in humans ✓

AMU surveillance in animals ✓

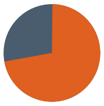
AMR surveillance in humans ✓

AMR surveillance in animals ✓

**As per information available by December 2020*

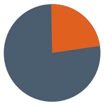
Antimicrobial Resistance Indicators*

Humans



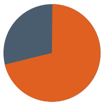
72.54% of isolates tested

MRSA
Methicillin-resistant
Staphylococcus aureus



23.51% of isolates tested

CRE
Carbapenem-resistant
Klebsiella pneumoniae



71.17% of isolates tested

ESBL
3G cephalosporin-resistant
Escherichia coli

N/A

DRI
Drug Resistance Index for
WHO Critical pathogens
2020

N/A

DRI
Drug Resistance Index for MRSA,
CRE, and ESBL positive *E.coli*
2020

Note:

a) Resistance rates include isolates categorized as either resistant or intermediate on antimicrobial susceptibility testing.

b) The Drug Resistance Index (DRI) is an aggregate measure that combines antibiotic use and resistance into a single metric, with a value of 0 indicating 100% susceptibility and a value of 100 indicating 100% resistance. DRI values for the year 2020 are projections based on DRI values for 2005- 2015.

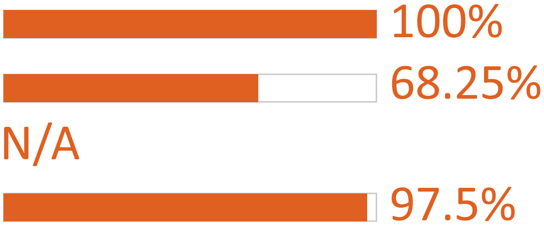
c) WHO critical pathogens are ESBL positive Enterobacteriaceae, carbapenem-resistant Enterobacteriaceae, carbapenem-resistant Acinetobacter baumannii, & carbapenem-resistant Pseudomonas aeruginosa.

Animals

***Salmonella* spp.**

Ampicillin	26%
Ciprofoxacin	2.00%
Colistin	N/A
Tetracycline	40.00%

E.coli



Ampicillin	100%
Ciprofoxacin	68.25%
Colistin	N/A
Tetracycline	97.5%

**As per information available by December 2020*

Note: N/A stands for Not Applicable

Vietnam

Antimicrobial Use Indicators

Humans

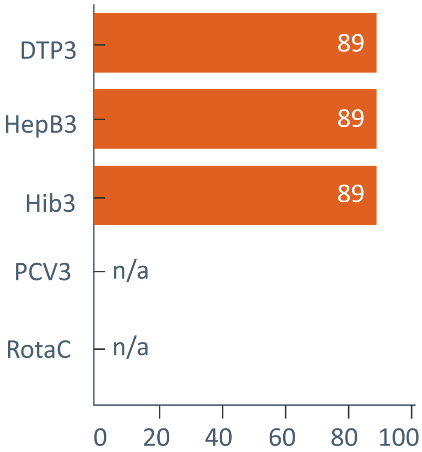
Total Use, 2010 (DDDs in Mill)	547
Total Use, 2020 (DDDs in Mill)	2343
Change in total use, 2010-20 (DDDs in Mill)	1796.64
% Change in total use, 2010-20	328.33%
Global average of % change in total use, 2010-20	74.49%
Regional average of % change in total use, 2010-20	158.87%

Per Capita Use, 2010 (DDD)	6.29
Per Capita Use, 2020 (DDD)	24.32
Change in per capita use, 2010-20 (DDD)	18.04
% Change in per capita use, 2010-2020	286.52%
Global average of % change in per capita use, 2010-20	35.12%
Regional average of % change in per capita use, 2010-20	139.61%

Animals

Estimated Total Antimicrobial Use, 2020 (Tonnes)	1016.23
Estimated Total Antimicrobial Use, 2030 (Tonnes)	1177.90

Public Health Indicators



% of children vaccinated
(2019)

15.9
Infant Mortality Rate
per 1,000 live births
(2019)

31.29
Under-five pneumococcal death rate
per 100,000 children
(2017)

127.68
Under-five deaths from diarrheal diseases
(2017)

176
Incidence of tuberculosis
per 100,000 people
(2019)

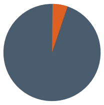
94.72
Access to improved drinking water source (%)
(2017)

87.28
Access to improved sanitation facilities (%)
(2017)

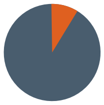
85.84
Access to basic handwashing facilities including soap and water (%)
(2017)

N/A
Physicians
per 1,000 people
(2018)

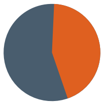
N/A
Nurses and midwives
per 1,000 people
(2018)



5.92%
Current health expenditure
% of GDP
(2018)



9.35%
Domestic general government health expenditure
% of general government expenditure
(2018)



44.90%
Out-of-pocket expenditure
% of current health expenditure
(2018)

$ 151.69
Current health expenditure per capita
(2018)

Note: N/A stands for Not Applicable

Appendix 2

Indicators

Indicators

Policy Indicators	**Antimicrobial Resistance Indicators**		**Antimicrobial Use Indicators**		**Public Health Indicators**	
	(humans)	**(animals)**	**(humans)**	**(animals)**		
Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	MRSA (Methicillin-resistant *Staphylococcus aureus*)	*Salmonella* spp. & Ampicillin	Total use, 2010 (DDDs in Mill)	Estimated Total Antimicrobial Use, 2020 (tonnes)	DTP3 coverage rate	Access to improved drinking water source
National Action Plan on AMR (NAP) Published	CRE (Carbapenem-resistant *Klebsiella pneumoniae*)	*Salmonella* spp. & Ciprofloxacin	Total use, 2020 (DDDs in Mill)	Estimated Total Antimicrobial Use, 2030 (tonnes)	HepB3 coverage rate	Access to improved sanitation facilities
AMU surveillance in humans	ESBL (Cephalosporin 3^{rd} generation resistant *Escherichia coli)*	*Salmonella* spp. & Colistin	Change in total use, 2010-2020 (DDDs in Mill)		Hib3 coverage rate	Access to basic handwashing facilities including soap and water
AMU surveillance in animals	DRI (Drug Resistance Index for WHO Critical pathogens 2020)	*Salmonella* spp. & Tetracycline	% Change in total use, 2010-2020		PCV3 coverage rate	Physicians (per 1,000 people)
AMR surveillance in humans	DRI (Drug Resistance Index for MRSA, CRE, ESBL positive *E.coli* 2020)	*E. coli* & Ampicillin	Global average of % change in total use, 2010-2020		RotaC coverage rate	Nurses and midwives (per 1,000 people)
AMR surveillance in animals		*E. coli* & Ciprofloxacin	Regional average of % change in total use, 2010-2020		Infant Mortality Rate (per 1000 live births)	Current health expenditure (% of GDP)
		E. coli & Colistin	Per capita use, 2010 (DDD)		Under-five pneumococcal death rate (per 100,000 children)	Domestic general government health expenditure (% of general government expenditure)
		E. coli & Tetracycline	Per capita use, 2020 (DDD)		Under-five deaths from diarrheal diseases	Out-of-pocket expenditure (% of current health expenditure)
			Change in per capita use, 2010-2020 (DDD)			Current health expenditure per capita
			% Change in per capita use, 2010-2020			
			Global average of % change in per capita use, 2010-2020			
			Regional average of % change in per capita use, 2010-2020			

Appendix 3

Indicator Description and Information Source

Indicator Description and Information Source

1. Policy Indicators

Indicator	**Indicator description**	**Source** (Dashboards reflect information available as of December 2020)	**Weblinks**
Enrolment in Global Antimicrobial Resistance Surveillance System (GLASS)	Whether the country has enrolled in GLASS?	GLASS portal of the WHO website	https://www.who.int/glass/country-participation/en/
National Action Plan on AMR (NAP) Published	Whether the National Action Plan on AMR has been published in the country?	“Library of national action plans” portal of the WHO website	https://www.who.int/antimicrobial-resistance/national-action-plans/library/en/
AMR surveillance in humans	Whether the country has any kind of capacity for building a national surveillance system for AMR in humans?	Global Database for the Tripartite Antimicrobial Resistance (AMR) Country Self-assessment Survey (TrACSS)	http://amrcountryprogress.org/
AMR surveillance in animals	Whether the country has any kind of capacity for building a national surveillance system for AMR in animals (terrestrial/aquatic)?	Global Database for the Tripartite Antimicrobial Resistance (AMR) Country Self-assessment Survey (TrACSS)	http://amrcountryprogress.org/
AMU surveillance in humans	Whether the country has any kind of capacity for building a national monitoring system for consumption and rational use of antimicrobials in human health?	Global Database for the Tripartite Antimicrobial Resistance (AMR) Country Self-assessment Survey (TrACSS)	http://amrcountryprogress.org/
AMU surveillance in animals	Whether the country has any kind of capacity for building a national monitoring system for antimicrobials intended to be used in animals (sales/use)?	Global Database for the Tripartite Antimicrobial Resistance (AMR) Country Self-assessment Survey (TrACSS)	http://amrcountryprogress.org/

2. Antimicrobial Resistance Indicators

AMR in Humans

Indicator	Indicator description	Source (Dashboards reflect information available as of December 2020)	Weblinks
MRSA (Methicillin-resistant *Staphylococcus aureus*)	Resistance rates of MRSA in the country	Resistance rates as available on ResistanceMap, GLASS, AGAR, ECDC, CARA, Civil Hospitals of Guadalajara, CAESAR, PROVENRA, VINARES, CHINET	https://resistancemap.cddep.org/AntibioticResistance.php https://www.who.int/data/gho/data/themes/topics/global-antimicrobial-resistance-surveillance-system-(glass) https://agargroup.org.au/ https://www.ecdc.europa.eu/en/about-us/partnerships-and-networks/disease-and-laboratory-networks/ears-net http://www.can-r.com/ http://www.hcg.udg.mx/ https://www.euro.who.int/en/health-topics/disease-prevention/antimicrobial-resistance/surveillance/central-asian-and-european-surveillance-of-antimicrobial-resistance-caesar https://provenra.com.ve/#:~:text=Programa%20Venezolano%20de%20Vigilancia%20de,causan%20infecciones%20en%20el%20pa%C3%ADs. https://www.sciencedirect.com/science/article/pii/S2213716519301456#:~:text=The%20Viet%20Nam%20Resistance%20network,across%20the%20country%20%5B8%5D. http://www.chinets.com/
CRE (Carbapenem-resistant *Klebsiella pneumoniae*)	Resistance rates of CRE in the country	Resistance rates as available on ResistanceMap, GLASS, AGAR, ECDC, CARA, Civil Hospitals of Guadalajara, CAESAR, PROVENRA, VINARES, CHINET	
ESBL (Cephalosporin 3rd generation resistant *Escherichia coli*)	Resistance rates of ESBL positive *E.coli* in the country	Resistance rates as available on ResistanceMap, GLASS, AGAR, ECDC, CARA, Civil Hospitals of Guadalajara, CAESAR, PROVENRA, VINARES, CHINET	

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* Data are obtained from ResistanceMap and include only invasive isolates isolated from blood, cerebrospinal fluid or both; resistance data include all non-susceptible isolates (I+R), and only when 30 or more isolates are tested against an antibiotic; resistance rates (%) are calculated as sum of number of resistant isolates divided by sum of number of isolates tested, expressed as a percentage. This is aggregated at the country level for the latest year of available data.

DRI (Drug Resistance Index for WHO Critical pathogens 2020)	DRI value for WHO Critical pathogens	CDDEP calculations: DRI (WHO Critical pathogens) values for the year 2020 are projections based on DRI values for 2005-2015; AMC data was obtained from IMS Midas (2005-2015)	https://resistancemap.cddep.org/DRI.php
DRI (Drug Resistance Index for MRSA, CRE, ESBL positive *E.coli* 2020)	DRI values for MRSA, CR-*K.pneumoniae* and ESBL positive *E.Coli*	CDDEP calculations: DRI (for MRSA, CRE, ESBL positive *E.coli*) values for the year 2020 are projections based on DRI values for 2005-2015; AMC data was obtained from IMS Midas (2005-2015)	https://resistancemap.cddep.org/DRI.php

AMR in Animals

Indicator	**Indicator description**	**Source** (Dashboards reflect information available as of December 2020)	**Weblinks**
Salmonella spp. & Ampicillin	Resistance rates of Ampicillin-resistant *Salmonella* spp. in animals	CDDEP calculations: Source information was obtained from Resistance Bank and European food Safety Authority. Resistance Bank values were available for chicken, cattle, pigs and sheep; rates were averaged for the drug-bug combinations listed. European Food Safety Authority values were available for broilers, laying hens and turkeys; rates were averaged for the drug-bug combinations listed.	https://resistancebank.org/ https://www.efsa.europa.eu/en/interactive-pages/AMR-Report-2018
Salmonella spp. & Ciprofloxacin	Resistance rates of Ciprofloxacin-resistant *Salmonella* spp. in animals		
Salmonella spp. & Colistin	Resistance rates of Colistin-resistant *Salmonella* spp. in animals		
Salmonella spp. & Tetracycline	Resistance rates of Tetracycline -resistant *Salmonella* spp. in animals		
E. coli & Ampicillin	Resistance rates of Ampicillin-resistant *E. coli* in animals		
E. coli & Ciprofloxacin	Resistance rates of Ciprofloxacin-resistant *E. coli* in animals		
E. coli & Colistin	Resistance rates of Colistin-*resistant E. coli* in animals		
E. coli & Tetracycline	Resistance rates of Tetracycline -resistant *E. coli* in animals		

3. Antimicrobial Use Indicators

AMU in Humans

Indicator	Indicator description	Source	Weblinks
Total use, 2010 (DDDs in Mill)	Total use of antibiotics in 2010	Data from 'Global increase and geographic convergence in antibiotic consumption between 2000 and 2015'	https://www.pnas.org/content/115/15/E3463
Total use, 2020 (DDDs in Mill)	Projected total use of antibiotics in 2020	Data from 'Global increase and geographic convergence in antibiotic consumption between 2000 and 2015'	https://www.pnas.org/content/115/15/E3463
Change in total use, 2010-2020 (DDDs in Mill)	Change in total use of antibiotics estimated for the period 2010-2020	CDDEP calculations: x2 - x1 where x2= Projected total antibiotics use in 2020; x1= Total antibiotics use in 2010. (Source information was obtained from weblink provided)	https://www.pnas.org/content/115/15/E3463
% Change in total use, 2010-2020	% Change in total use of antibiotics estimated for the period 2010-2020	CDDEP calculations: D% = 100 (x2 - x1) / x1 where x2= Projected total antibiotics use in 2020; x1= Total antibiotics use in 2010 (Source information was obtained from weblink provided)	https://www.pnas.org/content/115/15/E3463
Regional average of % change in total use, 2010-2020	Regional average of % change in total use of antibiotics estimated for the period 2010-2020	CDDEP calculations: Countries were grouped based on regional classification; regional average of % change in total use of antibiotics was calculated as 'sum total of % change in total use of antibiotics across countries in a defined region/number of countries in that region'. (Source information was obtained from weblink provided)	https://www.pnas.org/content/115/15/E3463
Global average of % change in total use, 2010-2020	Global average of % change in total use of antibiotics estimated for the period 2010-2020	CDDEP calculations: Global average of % change in total use of antibiotics was calculated as 'sum total of % change in total use of antibiotics across all countries/ number of countries'. (Source information was obtained from weblink provided)	https://www.pnas.org/content/115/15/E3463
Per capita use, 2010 (DDD)	Per capita use of antibiotics in 2010	Data from 'Global increase and geographic convergence in antibiotic consumption between 2000 and 2015'	https://www.pnas.org/content/115/15/E3463
Per capita use, 2020 (DDD)	Projected per capita use of antibiotics in 2020	Data from 'Global increase and geographic convergence in antibiotic consumption between 2000 and 2015'	https://www.pnas.org/content/115/15/E3463

Change in per capita use, 2010-2020 (DDD)	Change in per capita use of antibiotics estimated for the period 2010-2020	CDDEP calculations: Difference in per capita antibiotics' use between 2010 and 2020. (Source information was obtained from weblink provided)	https://www.pnas.org/content/115/15/E3463
% Change in per capita use, 2010-2020	% Change in per capita use of antibiotics estimated for the period 2010-2020	CDDEP calculations: Change in per capita antibiotics use over time (D%) = 100 (x2 - x1) / x1; where x2= Projected per capita antibiotics use in 2020; x1= Per capita antibiotics use in 2010. (Source information was obtained from weblink provided)	https://www.pnas.org/content/115/15/E3463
Regional average of % change in per capita use, 2010-2020	Regional average of % change in per capita use of antibiotics estimated for the period 2010-2020	CDDEP calculations: Countries were grouped based on regional classification; regional average of % change in per capita use of antibiotics was calculated as sum total of % change in per capita use of antibiotics. (Source information was obtained from weblink provided)	https://www.pnas.org/content/115/15/E3463
Global average of % change in per capita use, 2010-2020	Global average of % change in per capita use of antibiotics, estimated for the period 2010-2020	CDDEP calculations: Global average of % change in per capita use of antibiotics was calculated as: sum total of % change in per capita use of antibiotics across all countries/ number of countries. (Source information was obtained from weblink provided)	https://www.pnas.org/content/115/15/E3463

AMU in Animals

Indicator	**Indicator description**	**Source**	**Weblinks**
Estimated Total Antimicrobial Use, 2020 (tonnes)	Estimated total amount of antimicrobials used in food-producing animals in the year 2020, expressed in tonnes.	Data from 'Global trends in antimicrobial use in food animals from 2017 to 2030'	https://www.mdpi.com/2079-6382/9/12/918/htm
Estimated Total Antimicrobial Use, 2030 (tonnes)	Estimated total amount of antimicrobials used in food-producing animals in the year 2030, expressed in tonnes.	Data from 'Global trends in antimicrobial use in food animals from 2017 to 2030'	https://www.mdpi.com/2079-6382/9/12/918/htm

4. Public Health Indicators

Indicator	Indicator description	Source	Weblinks
DTP3 coverage rate	% of surviving infants who received the 3rd dose of diphtheria and tetanus toxoid with pertussis containing vaccine % of surviving infants who received the 3rd dose of hepatitis B containing vaccine following the birth dose	WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) (Data from 2019)	https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=IMMUNISATION&ver=1.0&dq=...&startPeriod=2019&endPeriod=2019
HepB3 coverage rate	% of surviving infants who received the 3rd dose of hepatitis B containing vaccine following the birth dose	WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) (Data from 2019)	https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=IMMUNISATION&ver=1.0&dq=...&startPeriod=2019&endPeriod=2019
Hib3 coverage rate	% of surviving infants who received the 3rd dose of Haemophilus influenzae type b containing vaccine	WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) (Data from 2019)	https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=IMMUNISATION&ver=1.0&dq=...&startPeriod=2019&endPeriod=2019
PCV3 coverage rate	% of surviving infants who received the 3rd dose of pneumococcal conjugate vaccine. In countries where the national schedule recommends two doses during infancy and a booster dose at 12 months or later based on the epidemiology of disease in the country, coverage estimates may reflect the percentage of surviving infants who received two doses of PCV prior to the 1st birthday	WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) (Data from 2019)	https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=IMMUNISATION&ver=1.0&dq=...&startPeriod=2019&endPeriod=2019
RotaC coverage rate	% of surviving infants who received the final recommended dose of rotavirus vaccine, which can be either the 2nd or the 3rd dose depending on the vaccine	WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) (Data from 2019)	https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=IMMUNISATION&ver=1.0&dq=...&startPeriod=2019&endPeriod=2019
Access to improved drinking water source	Proportion of the population using an improved drinking water source (improved sources include piped water; boreholes or tube wells; protected dug wells; protected springs; rainwater; and packaged or delivered water)	UNICEF (Data from 2017)	https://data.unicef.org/indicator-profile/WS_PPL_W-I/

Access to improved sanitation facilities	Proportion of the population using an improved sanitation facility (improved facilities include flush/pour flush to piped sewerage systems, septic tanks or pit latrines; ventilated improved pit latrines; composting toilets or pit latrines with slabs)	UNICEF (Data from 2017)	https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=GLOBAL_DATAFLOW&ver=1.0&dq=.WS_PPL_S-I..&startPeriod=2015&endPeriod=2020
Access to basic handwashing facilities including soap and water	The percentage of people living in households that have a handwashing facility with soap and water available on the premises. Handwashing facilities may be fixed or mobile and include a sink with tap water, buckets with taps, tippy-taps, and jugs or basins designated for handwashing. Soap includes bar soap, liquid soap, powder detergent, and soapy water but does not include ash, soil, sand or other handwashing agents	World Bank (Data from 2017)	https://data.worldbank.org/indicator/SH.STA.HYGN.ZS?end=2015&start=2015&view=bar
Infant Mortality Rate (per 1,000 live births)	Infant mortality rate is defined as the number of infants dying before reaching one year of age, per 1,000 live births in a given year	World Bank (Data from 2019)	https://data.worldbank.org/indicator/SP.DYN.IMRT.IN
Under-five pneumococcal death rate (per 100,000 children)	Annual deaths from pneumonia per 100,000 children under 5	Our World in Data (sourced from Global Burden of Disease Collaborative Network) (Data from 2017)	https://ourworldindata.org/pneumonia
Under-five deaths from diarrheal diseases	Annual deaths from diarrheal diseases among children under 5	Our World in Data (sourced from Global Burden of Disease Collaborative Network) (Data from 2017)	https://ourworldindata.org/grapher/deaths-from-diarrheal-diseases-by-age?time=earliest..latest

Incidence of tuberculosis per 100,000 people	Incidence of tuberculosis is the estimated number of new and relapse tuberculosis cases arising in a given year, expressed as the rate per 100,000 population. All forms of TB are included, including cases in people living with HIV. Estimates for all years are recalculated as new information becomes available and techniques are refined, so they may differ from those published previously.	World Bank (Data from 2019)	https://data.worldbank.org/indicator/SH.TBS.INCD
Current health expenditure per capita	Current expenditures on health per capita in current US dollars. Estimates of current health expenditures include healthcare goods and services consumed during each year	World Bank (Data from 2018)	https://data.worldbank.org/indicator/SH.XPD.CHEX.PC.CD
Current health expenditure (% of GDP)	Level of current health expenditure expressed as a percentage of GDP. Estimates of current health expenditures include healthcare goods and services consumed during each year. This indicator does not include capital health expenditures such as buildings, machinery, IT and stocks of vaccines for emergency or outbreaks.	World Bank (Data from 2018)	https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS
Domestic general government health expenditure (% of general government expenditure)	Public expenditure on health from domestic sources as a share of total public expenditure. It indicates the priority of the government to spend on health from own domestic public resources.	World Bank (Data from 2018)	https://data.worldbank.org/indicator/SH.XPD.GHED.GE.ZS
Out-of-pocket expenditure (% of current health expenditure)	Share of out-of-pocket payments of total current health expenditures. Out-of-pocket payments are spending on health directly out-of-pocket by households.	World Bank (Data from 2018)	https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS
Physicians (per 1,000 people)	Number of physicians per 1000 people (physicians include generalist and specialist medical practitioners)	World Bank (Data from 2018; N/A means data not available for 2018)	https://data.worldbank.org/indicator/SH.MED.PHYS.ZS?end=2018&start=2016&view=map
Nurses and midwives (per 1,000 people)	Number of nurses and midwives per 1000 people (nurses and midwives include professional nurses,	World Bank (Data from 2018; N/A means data not available for 2018)	https://data.worldbank.org/indicator/SH.MED.NUMW.P3?end=2018&start=2016&view=map

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