# The burden of antimicrobial resistance (AMR) in Russian Federation

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **30,000 lives** have been lost each year since 1990 in Russian Federation due to AMR.

- In 2021, there were an estimated **25,800 UI (21,900-29,700)** deaths attributable to AMR and **105,000 UI (93,300-118,000)** deaths associated with AMR in this location.

- The largest number of deaths associated with AMR in 2021 occurred among those aged **70+** in the country.

- Among the most deadly pathogen-drug combinations in 2021 were *Staphylococcus aureus* resistant to methicillin, *Pseudomonas aeruginosa* resistant to carbapenems and *Klebsiella pneumoniae* resistant to carbapenems.

Figure 1 Number of deaths by underlying cause, and those associated with AMR in 2021
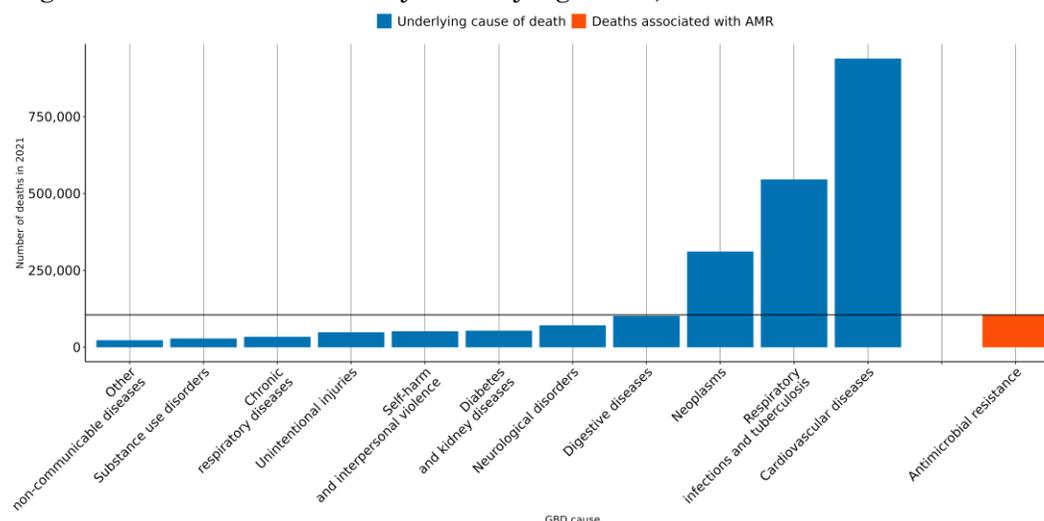

- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying cause of death by itself.

- At the 2024 United Nations General Assembly high level meeting on antimicrobial resistance, country members agreed to aim for a **10% reduction** compared to 2019 baseline **(from 4.95 to 4.45 million)** in the global number of deaths associated with AMR by 2030. But our forecast indicates that in absence of concerted action, deaths associated with AMR could reach **5.5 million** (UI 4.8 - 6.2) if current trends continue. For Russia, a 10% reduction means to decrease the number of deaths associated with AMR to **99,500**, but currently the trend for this country could reach up to **121,000 UI [99,400-145,000]** AMR-associated deaths in 2030.

AMR in Russian Federation

Key takeaways

- Antimicrobial Resistance (AMR) is a major global health threat, over *a million lives* have been lost each year since 1990.

- Globally, 4.71 (95% Uncertainty Interval (UI) 4.2-5.2) million deaths were associated with bacterial drug-resistant infections in 2021.

- And 1.14 (UI 1 - 1.3) million deaths were attributable to bacterial drug-resistant infection in the same year.

- *39 (UI 33 - 46) million deaths* directly attributable to bacterial AMR are projected to occur between 2025-2050 unless concerted action is taken. This equates to three deaths every minute.

Figure 2 Comparing 30 years of infection related deaths, and those associated with and attributable to AMR in Russian Federation between 1990 and 2019.
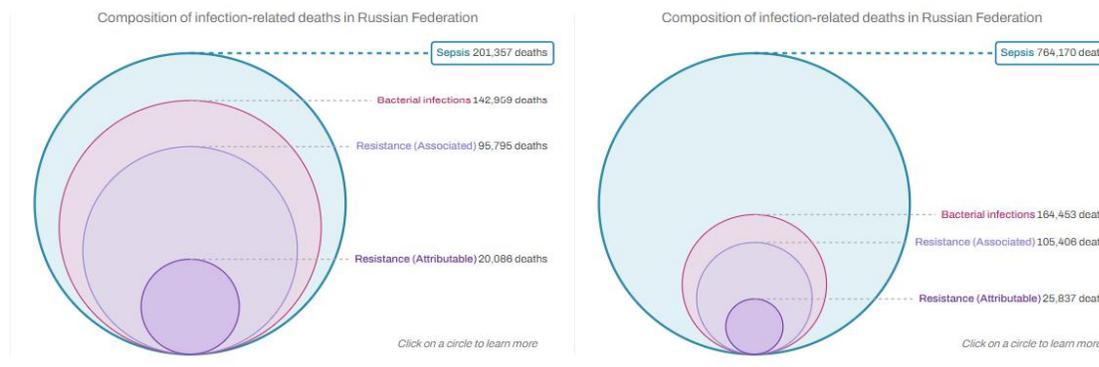
- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)](#)

- In **Russian Federation** in 2021, there were an estimated **25,800 UI (21,900-29,700)** deaths attributable to AMR and **105,000 UI (93,300-118,000)** deaths associated with AMR. Here *"attributable deaths"* are considered to be those that would have been prevented had the drug-resistant bacteria causing the infections not been drug-resistant. *"Associated deaths"* are considered to be those that would not have occurred had the infections been prevented entirely.

- Across 204 countries, **Russian Federation has the 79th lowest** age-standardized mortality rate associated with AMR in 2021.

- *Table 1* shows the bacteria which caused most deaths in 2021 (↑ indicates an increasing estimated annual rate between 1990-2021, ↓ indicates a decreasing annual trend), and *table 2* shows the pathogen-drug combinations which caused most deaths in 2021.

Table 1. Bacteria which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden rank	Overall susceptible and resistant		Associated		Attributable	
	Staphylococcus aureus 32,700 UI (29,700-35,700)	↑	Escherichia coli 24,300 UI (22,000-26,600)	↑	Escherichia coli 4,740 UI (4,060-5,420)	↑
	Escherichia coli 28,900 UI (26,200-31,600)	↑	Staphylococcus aureus 14,200 UI (11,100-17,300)	↓	Staphylococcus aureus 4,010 UI (2,980-5,030)	↑
	Streptococcus pneumoniae 16,900 UI (15,300-18,400)	↓	Pseudomonas aeruginosa 12,700 UI (11,300-14,100)	↑	Klebsiella pneumoniae 3,860 UI (3,350-4,380)	↑
	Pseudomonas aeruginosa 16,100 UI (14,600-17,500)	↑	Klebsiella pneumoniae 12,600 UI (11,300-13,900)	↓	Pseudomonas aeruginosa 3,380 UI (2,730-4,030)	↑
	Klebsiella pneumoniae 14,500 UI (13,100-15,800)	↓	Streptococcus pneumoniae 11,000 UI (9,190-12,800)	↓	Acinetobacter baumannii 2,610 UI (2,290-2,940)	↓
	Enterococcus faecalis 7,560 UI (6,870-8,250)	↑	Acinetobacter baumannii 6,490 UI (5,850-7,130)	↓	Streptococcus pneumoniae 1,970 UI (1,430-2,510)	↓
	Acinetobacter baumannii 6,600 UI (5,960-7,240)	↓	Enterococcus faecium 4,460 UI (4,040-4,890)	↑	Mycobacterium tuberculosis 1,330 UI (0-2,950)	↑
	Mycobacterium tuberculosis 5,730 UI (5,300-6,170)	↓	Enterococcus faecalis 3,510 UI (3,040-3,980)	↑	Enterobacter spp. 841 UI (724-958)	↓
	Enterobacter spp. 5,690 UI (5,160-6,220)	↑	Proteus spp. 3,340 UI (2,800-3,890)	↑	Enterococcus faecium 719 UI (514-925)	↑
	Group A Streptococcus 5,520 UI (4,790-6,250)	↑	Enterobacter spp. 3,300 UI (2,760-3,850)	↓	Enterococcus faecalis 616 UI (420-812)	↑

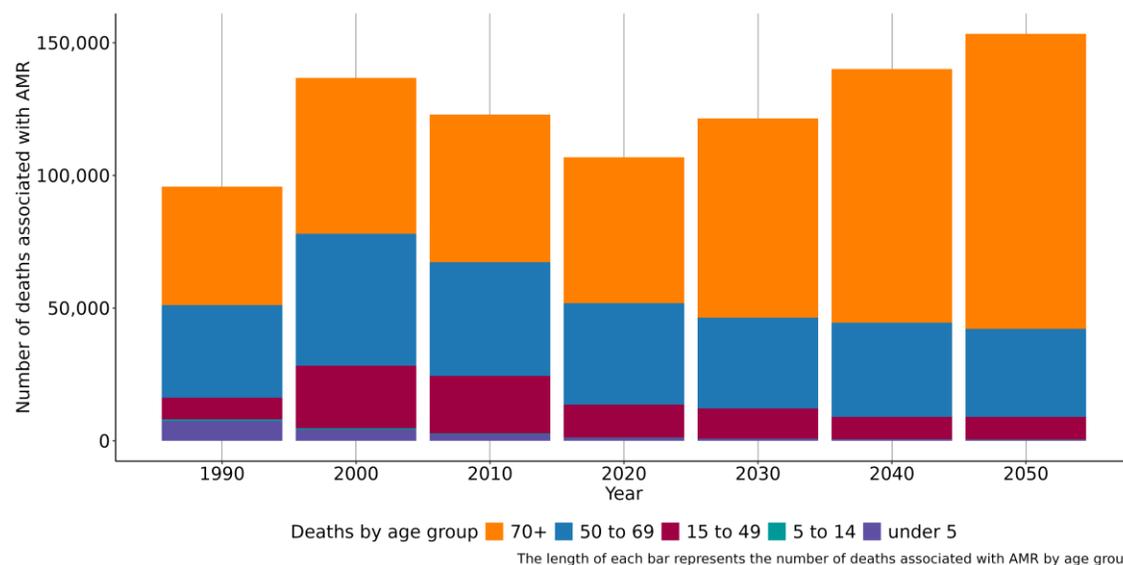Annualized rate of change (1990-2021): <-3% | -3% to -1.5% | -1.5% to 0% | 0% to 1.5% | 1.5% to 3% | 3% to 5% | >5.0%

Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
	Escherichia coli Aminopenicillin	22,100 UI (18,600-25,700) ↑	Staphylococcus aureus Methicillin	2,950 UI (1,960-3,940) ↑
	Escherichia coli Fluoroquinolones	17,400 UI (13,600-21,200) ↑	Pseudomonas aeruginosa Carbapenems	1,700 UI (1,170-2,240) ↑
	Escherichia coli TMP-SMX	13,100 UI (10,400-15,900) ↑	Klebsiella pneumoniae Carbapenems	1,430 UI (1,080-1,790) ↑
	Klebsiella pneumoniae Fluoroquinolones	12,000 UI (10,800-13,300) ↑	Acinetobacter baumannii Carbapenems	1,330 UI (1,040-1,620) ↑
	Staphylococcus aureus Methicillin	11,600 UI (7,540-15,600) ↑	Escherichia coli Fluoroquinolones	1,240 UI (616-1,870) ↑
	Klebsiella pneumoniae TMP-SMX	10,200 UI (8,640-11,800) ↓	Streptococcus pneumoniae Carbapenems	1,160 UI (776-1,540) ↑
	Escherichia coli Beta-Lactam/Lactamase Inhib.	10,200 UI (8,460-11,900) ↑	Klebsiella pneumoniae Fluoroquinolones	1,100 UI (789-1,420) ↑
	Pseudomonas aeruginosa Carbapenems	9,980 UI (8,730-11,200) ↑	Escherichia coli 3GC	1,000 UI (580-1,420) ↑
	Escherichia coli 3GC	9,960 UI (7,570-12,300) ↑	Mycobacterium tuberculosis MDR excluding XDR	892 UI (0-2,120) ↑
	Pseudomonas aeruginosa Fluoroquinolones	9,600 UI (8,390-10,800) ↓	Pseudomonas aeruginosa Fluoroquinolones	856 UI (601-1,110) ↓

Annualized rate of change (1990-2021): <-3% | -3% to -1.5% | -1.5% to 0% | 0% to 1.5% | 1.5% to 3% | 3% to 5% | >5.0%

- Independently of antimicrobial resistance, the infectious syndromes accounting for the most deaths in 2021 were as follows (estimated thousands of deaths in parenthesis) bloodstream infections (95,200 UI (86,200-104,000)), lower respiratory infection (excl. COVID) (50,800 UI (45,100-56,500)), peritoneal and intra-abdominal infections (31,900 UI (28,800-35,100)), urinary tract infections and pyelonephritis (18,100 UI (16,000-20,100)) and infections of the skin and subcutaneous systems (12,200 UI (10,200-14,300)).

Figure 3. Number of deaths associated with AMR by age group between 1990-2020 and 2050 projection

Deaths by age group ■ 70+ ■ 50 to 69 ■ 15 to 49 ■ 5 to 14 ■ under 5
The length of each bar represents the number of deaths associated with AMR by age group

- In Russian Federation, people aged 70+ saw the largest number of deaths associated with AMR both in 1990 and 2021, which indicates that 70+ continues to be particularly vulnerable to infections which are resistant to antibiotics. In 2021, the number of deaths associated with AMR among the 70+ was 54,900 UI (47,800-62,100), whereas the mortality rate per 100,000 was 384 UI (334-434).

Data sources for Russian Federation

In total, 520 million individual records or isolates covering 19,513 study-location-years were used as input data to our estimation process. The subset of input data for this country is shown below.

Table 3. Data inputs for Russian Federation by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	2010-2021	722,697	Isolates
Microbial or laboratory data with outcome	2010-2021	36	Isolates
Literature studies	1990-2021	18,941	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	48,080	Antibiotic susceptibility test

More information

About GRAM:

The purpose of the Global Research on AntiMicrobial resistance (GRAM) project is to **generate accurate and timely estimates of the magnitude and trends in antimicrobial resistance (AMR) burden** across the world, which can be used to inform treatment guidelines and agendas for decision-making and research, detect emerging problems and monitor trends to inform global strategies, as well as facilitate the assessment of interventions over time.

GRAM is the flagship project of the University of Oxford–IHME Strategic Partnership. GRAM was launched with support from the United Kingdom Department of Health and Social Care's Fleming Fund, and the Wellcome Trust.

All resources:

For all resources on AMR analysis at IHME, visit https://www.healthdata.org/antimicrobial-resistance.

To look at these and more visualization interactively visit Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE).

Data sources:

To download the list of data input sources by country, and AMR results by region, visit the Global Health Data Exchange (GHDx).

Contact us:

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