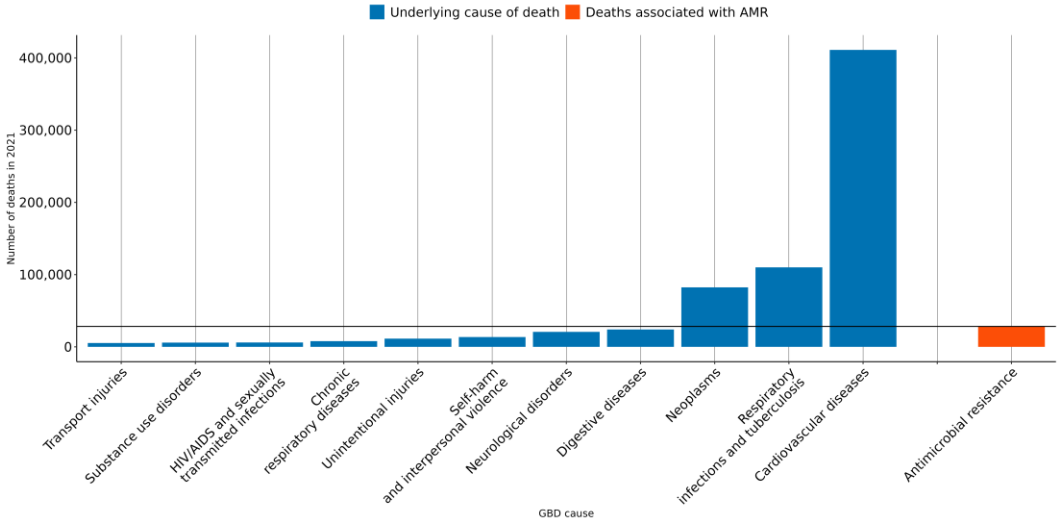
The burden of antimicrobial resistance (AMR) in Ukraine

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **8,000 lives** have been lost each year since 1990 in Ukraine due to AMR.
- In 2021, there were an estimated **7,050 UI (5,060-9,050)** deaths attributable to AMR and **28,300 UI (20,500-36,000)** 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 multi-drug resistant *Mycobacterium tuberculosis* (excluding extensive drug-resistance), *Staphylococcus aureus* resistant to methicillin and *Acinetobacter baumannii* resistant to carbapenems.

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



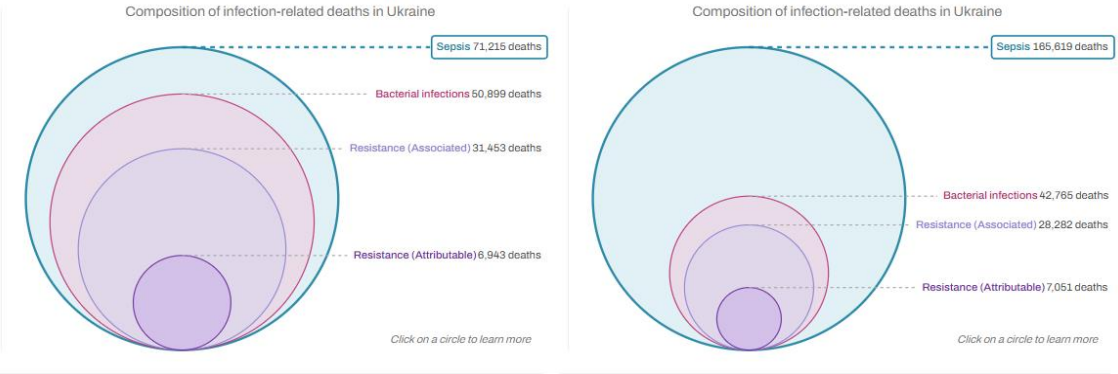
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Ukraine, a 10% reduction means to decrease the number of deaths associated with AMR to **27,300**, but currently the trend for this country could reach up to **31,000 UI [21,600-43,400]** AMR-associated deaths in 2030.

AMR in Ukraine

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 Ukraine between 1990 and 2019.



- To look at these and more visualization interactively visit Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)
- In **Ukraine** in 2021, there were an estimated **7,050 UI (5,060-9,050)** deaths attributable to AMR and **28,300 UI (20,500-36,000)** 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, **Ukraine has the 66th 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
1	Staphylococcus aureus 8,390 UI (6,250-10,500)	Escherichia coli 5,300 UI (3,910-6,690)	Escherichia coli 1,040 UI (732-1,350)
2	Escherichia coli 6,320 UI (4,740-7,900)	Staphylococcus aureus 3,660 UI (2,360-4,950)	Klebsiella pneumoniae 1,010 UI (754-1,260)
3	Streptococcus pneumoniae 4,760 UI (3,470-6,050)	Pseudomonas aeruginosa 3,360 UI (2,450-4,260)	Staphylococcus aureus 983 UI (624-1,340)
4	Pseudomonas aeruginosa 4,130 UI (3,070-5,200)	Streptococcus pneumoniae 3,330 UI (2,310-4,360)	Acinetobacter baumannii 965 UI (749-1,180)
5	Klebsiella pneumoniae 3,850 UI (2,850-4,850)	Klebsiella pneumoniae 3,260 UI (2,410-4,120)	Pseudomonas aeruginosa 880 UI (583-1,180)
6	Acinetobacter baumannii 2,470 UI (1,830-3,100)	Acinetobacter baumannii 2,410 UI (1,790-3,030)	Mycobacterium tuberculosis 605 UI (0-1,360)
7	Mycobacterium tuberculosis 2,440 UI (1,630-3,250)	Enterobacter spp. 1,290 UI (940-1,640)	Streptococcus pneumoniae 545 UI (331-759)
8	Enterococcus faecalis 1,980 UI (1,480-2,490)	Mycobacterium tuberculosis 1,280 UI (488-2,070)	Enterobacter spp. 303 UI (224-381)
9	Enterobacter spp. 1,620 UI (1,200-2,050)	Enterococcus faecium 1,000 UI (739-1,270)	Enterococcus faecalis 160 UI (94-225)
10	Group A Streptococcus 1,170 UI (805-1,530)	Enterococcus faecalis 896 UI (653-1,140)	Enterococcus faecium 135 UI (75-195)

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%

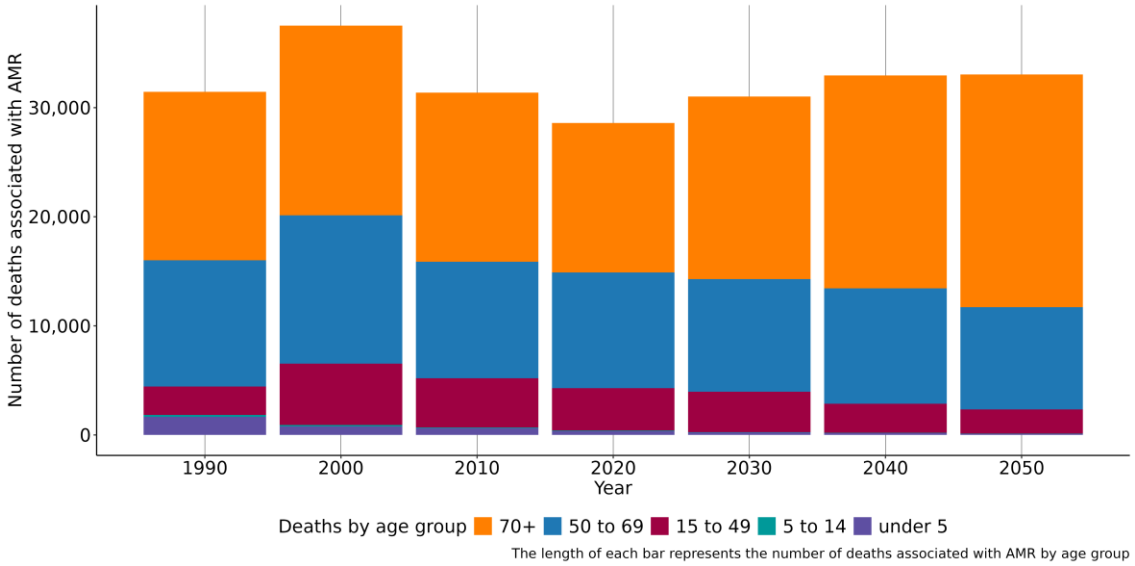
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
1	Escherichia coli Aminopenicillin	4,990 UI (3,580-6,400)	Staphylococcus aureus Methicillin	739 UI (449-1,030)
2	Escherichia coli TMP-SMX	3,410 UI (2,450-4,360)	Acinetobacter baumannii Carbapenems	473 UI (337-609)
3	Escherichia coli Fluoroquinolones	3,330 UI (2,320-4,350)	Mycobacterium tuberculosis MDR excluding XDR	405 UI (0-978)
4	Streptococcus pneumoniae TMP-SMX	2,990 UI (2,010-3,970)	Pseudomonas aeruginosa Carbapenems	396 UI (216-576)
5	Klebsiella pneumoniae Fluoroquinolones	2,970 UI (2,180-3,770)	Klebsiella pneumoniae Carbapenems	370 UI (253-486)
6	Klebsiella pneumoniae Aminoglycosides	2,850 UI (2,080-3,610)	Streptococcus pneumoniae Carbapenems	337 UI (174-499)
7	Staphylococcus aureus Methicillin	2,830 UI (1,610-4,050)	Acinetobacter baumannii Fluoroquinolones	272 UI (208-336)
8	Pseudomonas aeruginosa Carbapenems	2,460 UI (1,760-3,160)	Klebsiella pneumoniae Fluoroquinolones	260 UI (168-353)
9	Pseudomonas aeruginosa Fluoroquinolones	2,430 UI (1,770-3,090)	Escherichia coli Fluoroquinolones	222 UI (108-335)
10	Acinetobacter baumannii 3GC	2,320 UI (1,720-2,920)	Klebsiella pneumoniae Aminoglycosides	217 UI (141-292)

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 (26,400 UI (19,800-33,100)), lower respiratory infection (excl. COVID) (13,900 UI (9,970-17,700)), peritoneal and intra-abdominal infections (6,620 UI (4,790-8,450)), infections of the skin and subcutaneous systems (2,760 UI (1,770-3,740)) and urinary tract infections and pyelonephritis (2,530 UI (1,850-3,220)).

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



- In Ukraine, 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 13,800 UI (10,200-17,300), whereas the mortality rate per 100,000 was 282 UI (209-355).

Data sources for Ukraine

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 Ukraine by source type

Source type	Years	Sample size	Sample size units
Antibiotic use	2010-2021	138	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	84,358	Isolates
Literature studies	1990-2021	4,885	Cases/isolates/susceptibility tests
Single drug resistance profile data	2010-2021	44,637	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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