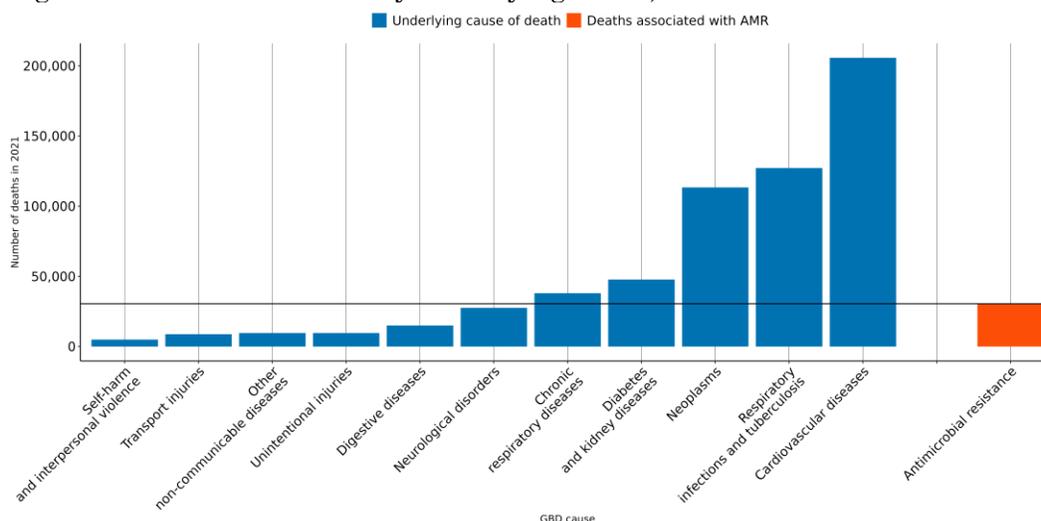


The burden of antimicrobial resistance (AMR) in Türkiye

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **8,000 lives** have been lost each year since 1990 in Türkiye due to AMR.
- In 2021, there were an estimated **7,610 UI (6,140-9,070)** deaths attributable to AMR and **30,500 UI (25,100-35,900)** 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 *Streptococcus pneumoniae* resistant to carbapenems.

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



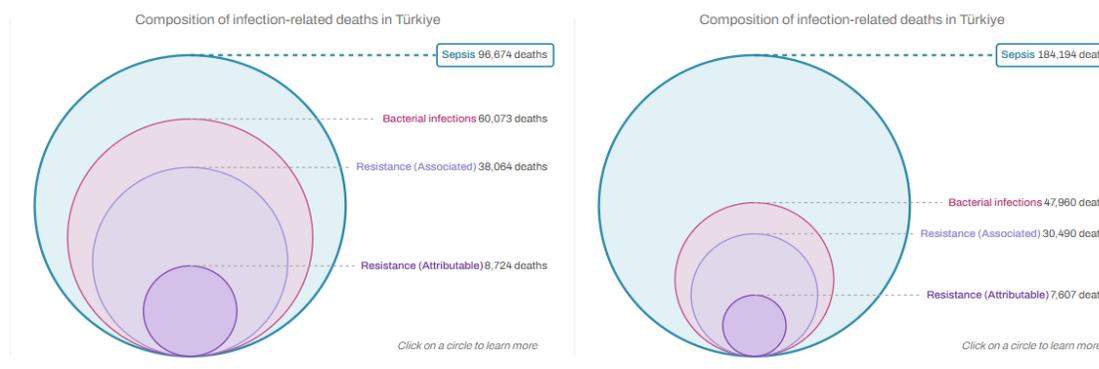
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Türkiye, a 10% reduction means to decrease the number of deaths associated with AMR to **28,600**, but currently the trend for this country could reach up to **35,300 UI [28,200-43,500]** AMR-associated deaths in 2030.

AMR in Türkiye

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 Türkiye between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Türkiye** in 2021, there were an estimated **7,610 UI (6,140-9,070)** deaths attributable to AMR and **30,500 UI (25,100-35,900)** 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, **Türkiye has the 58th 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)

	Overall susceptible and resistant	Associated	Attributable
Burden rank	Staphylococcus aureus 11,000 UI (9,150-12,800) ↑	Escherichia coli 6,220 UI (5,120-7,320) ↑	Staphylococcus aureus 1,800 UI (1,330-2,270) ↑
	Escherichia coli 7,480 UI (6,240-8,720) ↑	Staphylococcus aureus 6,170 UI (4,620-7,730) ↑	Escherichia coli 1,250 UI (983-1,530) ↑
	Pseudomonas aeruginosa 5,280 UI (4,400-6,150) ↓	Klebsiella pneumoniae 3,910 UI (3,230-4,600) ↓	Klebsiella pneumoniae 1,120 UI (918-1,330) ↓
	Klebsiella pneumoniae 4,850 UI (4,050-5,660) ↓	Streptococcus pneumoniae 3,380 UI (2,730-4,040) ↓	Pseudomonas aeruginosa 864 UI (637-1,090) ↓
	Streptococcus pneumoniae 4,530 UI (3,780-5,280) ↓	Pseudomonas aeruginosa 3,270 UI (2,660-3,890) ↓	Acinetobacter baumannii 778 UI (646-911) ↓
	Acinetobacter baumannii 1,970 UI (1,630-2,300) ↓	Acinetobacter baumannii 1,930 UI (1,600-2,250) ↓	Streptococcus pneumoniae 764 UI (562-967) ↓
	Group A Streptococcus 1,630 UI (1,330-1,940) ↑	Enterococcus faecium 1,060 UI (867-1,250) ↑	Enterococcus faecium 188 UI (134-242) ↑
	Enterococcus faecalis 1,550 UI (1,270-1,830) ↑	Proteus spp. 944 UI (756-1,130) ↑	Enterobacter spp. 162 UI (129-194) ↓
	Enterobacter spp. 1,350 UI (1,120-1,580) ↓	Enterococcus faecalis 721 UI (585-857) ↑	Enterococcus faecalis 161 UI (114-207) ↑
	Proteus spp. 1,280 UI (1,060-1,510) ↑	Enterobacter spp. 678 UI (530-826) ↓	Proteus spp. 130 UI (95-166) ↑

Annualized rate of change (1990-2021): <-3% (dark blue), -1.5% to 0% (light blue), 1.5% to 3% (red), >5.0% (dark red), -3% to -1.5% (medium blue), 0% to 1.5% (orange), 3% to 5% (brown)

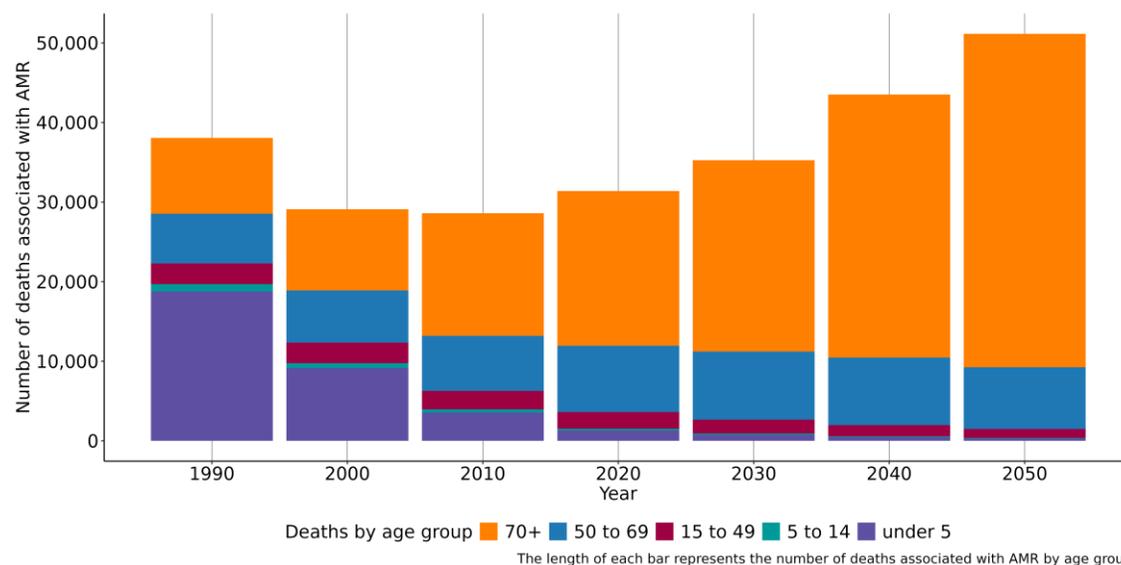
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

	Associated	Attributable
Burden Rank	Escherichia coli Aminopenicillin 5,660 UI (4,390-6,930) ↑	Staphylococcus aureus Methicillin 1,450 UI (1,010-1,890) ↑
	Staphylococcus aureus Methicillin 5,430 UI (3,680-7,180) ↑	Streptococcus pneumoniae Carbapenems 547 UI (374-721) ↓
	Escherichia coli Fluoroquinolones 4,210 UI (3,220-5,200) ↑	Pseudomonas aeruginosa Carbapenems 484 UI (309-658) ↑
	Escherichia coli Beta-Lactam/Lactamase Inhib. 3,860 UI (3,130-4,590) ↑	Acinetobacter baumannii Carbapenems 410 UI (303-517) ↑
	Staphylococcus aureus Macrolides 3,450 UI (2,650-4,240) ↑	Klebsiella pneumoniae Carbapenems 379 UI (273-485) ↑
	Escherichia coli TMP-SMX 3,280 UI (2,520-4,030) ↑	Escherichia coli Fluoroquinolones 298 UI (179-417) ↑
	Klebsiella pneumoniae Fluoroquinolones 3,040 UI (2,490-3,600) ↑	Klebsiella pneumoniae Fluoroquinolones 258 UI (180-337) ↑
	Klebsiella pneumoniae TMP-SMX 2,980 UI (2,410-3,540) ↓	Escherichia coli 3GC 230 UI (137-323) ↑
	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. 2,860 UI (2,190-3,540) ↓	Acinetobacter baumannii Fluoroquinolones 227 UI (185-269) ↓
	Klebsiella pneumoniae Aminoglycosides 2,860 UI (2,310-3,410) ↓	Klebsiella pneumoniae Aminoglycosides 212 UI (152-273) ↓

Annualized rate of change (1990-2021): <-3% (dark blue), -1.5% to 0% (light blue), 1.5% to 3% (red), >5.0% (dark red), -3% to -1.5% (medium blue), 0% to 1.5% (orange), 3% to 5% (brown)

- 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 (28,600 UI (23,900-33,200)), lower respiratory infection (excl. COVID) (26,000 UI (21,400-30,500)), peritoneal and intra-abdominal infections (6,120 UI (4,920-7,320)), urinary tract infections and pyelonephritis (3,100 UI (2,470-3,740)) and infections of the skin and subcutaneous systems (2,750 UI (2,080-3,410)).

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



- In Türkiye, people aged under 5 experienced the largest number of deaths associated with AMR in 1990 but this changed by 2021 as the largest number of deaths occurred among the 70+. This indicates that prevention of infections among the under 5 has contributed to the reduction in the number of AMR associated deaths. In 2021, the number of deaths associated with AMR among the 70+ was 18,700 UI (15,300-22,100), whereas the mortality rate per 100,000 was 368 UI (301-434).

Data sources for Türkiye

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 Türkiye by source type

Source type	Years	Sample size	Sample size units
Antibiotic use	1990-2009	636	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	688,459	Isolates
Microbial or laboratory data with outcome	1990-2021	13,850	Isolates
Literature studies	1990-2021	157,253	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	172,062	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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