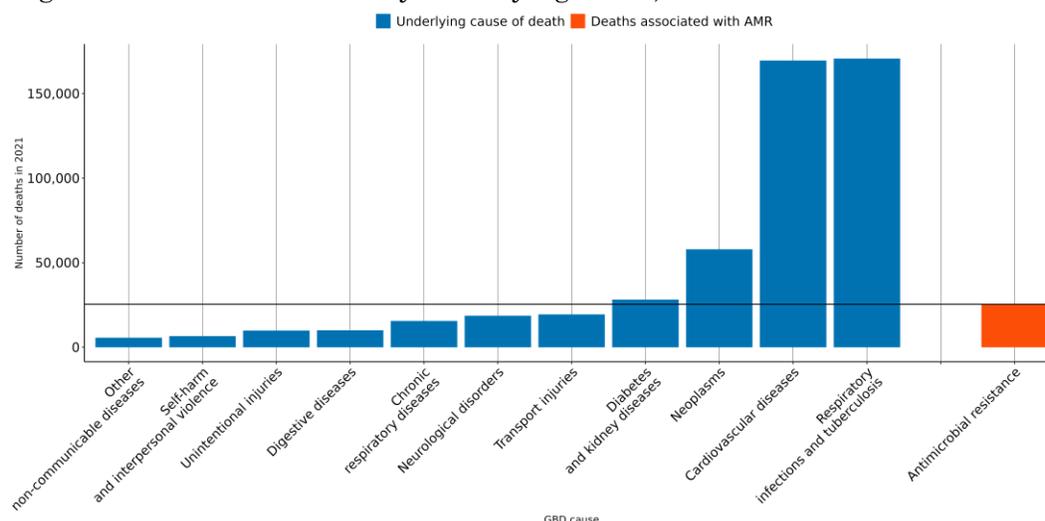


The burden of antimicrobial resistance (AMR) in Iran (Islamic Republic of)

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **7,000 lives** have been lost each year since 1990 in Iran (Islamic Republic of) due to AMR.
- In 2021, there were an estimated **6,930 UI (5,850-8,010)** deaths attributable to AMR and **25,400 UI (22,400-28,400)** 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, *Acinetobacter baumannii* resistant to carbapenems and *Streptococcus pneumoniae* resistant to carbapenems.

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



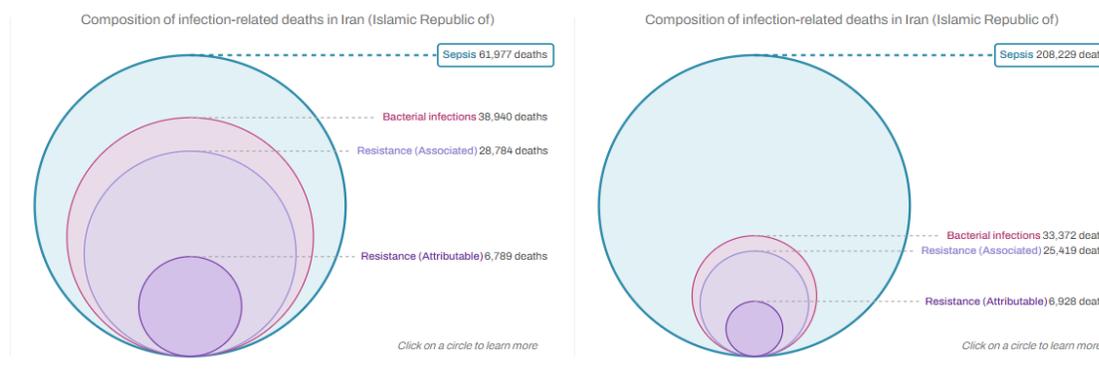
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Iran, a 10% reduction means to decrease the number of deaths associated with AMR to **25,100**, but currently the trend for this country could reach up to **33,600 UI [27,400-39,200]** AMR-associated deaths in 2030.

AMR in Iran (Islamic Republic of)

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 Iran (Islamic Republic of) between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Iran (Islamic Republic of)** in 2021, there were an estimated **6,930 UI (5,850-8,010)** deaths attributable to AMR and **25,400 UI (22,400-28,400)** 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, **Iran (Islamic Republic of)** has the **59th 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 6,980 UI (6,400-7,560) ↑	Streptococcus pneumoniae 5,570 UI (4,960-6,190) ↓	Staphylococcus aureus 1,560 UI (1,230-1,880) ↑
Streptococcus pneumoniae 6,240 UI (5,720-6,770) ↓	Staphylococcus aureus 5,220 UI (4,350-6,080) ↑	Streptococcus pneumoniae 1,280 UI (969-1,590) ↓	
Escherichia coli 3,460 UI (3,160-3,770) ↑	Escherichia coli 3,210 UI (2,890-3,540) ↑	Acinetobacter baumannii 1,020 UI (917-1,120) ↑	
Pseudomonas aeruginosa 3,350 UI (3,090-3,620) ↓	Acinetobacter baumannii 2,520 UI (2,320-2,720) ↑	Escherichia coli 791 UI (672-911) ↑	
Klebsiella pneumoniae 2,990 UI (2,750-3,230) ↓	Pseudomonas aeruginosa 2,410 UI (2,030-2,780) ↓	Pseudomonas aeruginosa 649 UI (516-782) ↓	
Acinetobacter baumannii 2,570 UI (2,370-2,770) ↑	Klebsiella pneumoniae 2,370 UI (2,080-2,660) ↓	Klebsiella pneumoniae 643 UI (542-745) ↓	
Enterococcus faecalis 1,110 UI (1,010-1,210) ↑	Enterococcus faecalis 985 UI (896-1,070) ↑	Enterococcus faecalis 307 UI (260-353) ↑	
Enterobacter spp. 1,000 UI (922-1,080) ↑	Enterococcus faecium 706 UI (646-766) ↑	Enterococcus faecium 202 UI (174-229) ↑	
Group A Streptococcus 842 UI (727-956) ↓	Enterobacter spp. 582 UI (500-665) ↓	Enterobacter spp. 160 UI (138-182) ↓	
Mycobacterium tuberculosis 811 UI (656-965) ↓	Proteus spp. 490 UI (391-589) ↑	Serratia spp. 83 UI (70-96) ↓	

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

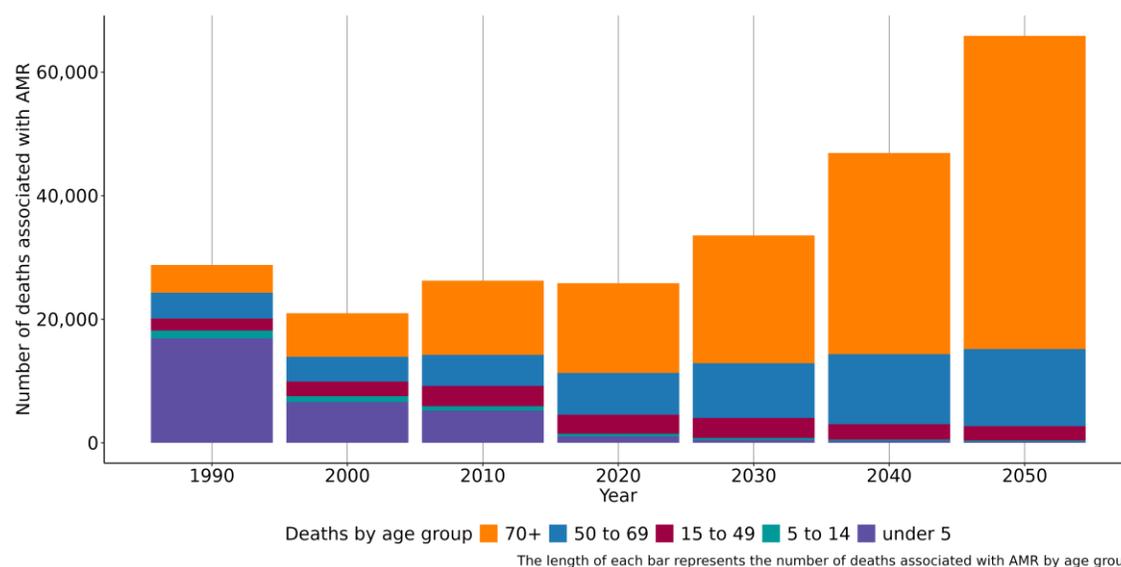
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated	Attributable
	Streptococcus pneumoniae TMP-SMX 5,040 UI (4,340-5,740) ↓	Staphylococcus aureus Methicillin 1,190 UI (906-1,480) ↑
Staphylococcus aureus Methicillin 4,730 UI (3,560-5,890) ↑	Streptococcus pneumoniae Carbapenems 653 UI (397-909) ↓	
Streptococcus pneumoniae Penicillin 3,970 UI (3,060-4,890) ↓	Acinetobacter baumannii Carbapenems 536 UI (436-637) ↑	
Staphylococcus aureus Macrolides 3,000 UI (2,440-3,560) ↑	Pseudomonas aeruginosa Carbapenems 307 UI (213-402) ↑	
Escherichia coli Aminopenicillin 2,980 UI (2,330-3,640) ↑	Acinetobacter baumannii Fluoroquinolones 300 UI (246-354) ↑	
Streptococcus pneumoniae Macrolides 2,690 UI (2,110-3,270) ↑	Streptococcus pneumoniae Penicillin 244 UI (198-289) ↓	
Acinetobacter baumannii 3GC 2,490 UI (2,280-2,690) ↑	Escherichia coli Carbapenems 214 UI (134-295) ↑	
Streptococcus pneumoniae Carbapenems 2,460 UI (1,600-3,310) ↓	Enterococcus faecalis Vancomycin 208 UI (161-256) ↑	
Acinetobacter baumannii 4GC 2,440 UI (2,220-2,650) ↑	Escherichia coli 3GC 183 UI (124-242) ↑	
Acinetobacter baumannii Carbapenems 2,420 UI (2,200-2,630) ↑	Klebsiella pneumoniae Carbapenems 175 UI (134-216) ↑	

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

- Independently of antimicrobial resistance, the infectious syndromes accounting for the most deaths in 2021 were as follows (estimated thousands of deaths in parenthesis) lower respiratory infection (excl. COVID) (17,100 UI (15,400-18,700)), bloodstream infections (16,700 UI (15,200-18,100)), peritoneal and intra-abdominal infections (3,190 UI (2,850-3,530)), urinary tract infections and pyelonephritis (2,590 UI (2,020-3,150)) and infections of the skin and subcutaneous systems (2,000 UI (1,650-2,340)).

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



- In Iran (Islamic Republic of), 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 14,300 UI (12,200-16,400), whereas the mortality rate per 100,000 was 392 UI (335-449).

Data sources for Iran (Islamic Republic of)

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 Iran (Islamic Republic of) by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2009	6	Isolates
Literature studies	1990-2021	36,007	Cases/isolates/susceptibility tests
Single drug resistance profile data	2010-2021	72,465	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:

- For inquiries about the analysis and questions from government officials, health departments, or research institutions: engage@healthdata.org
- For media-related inquiries: media@healthdata.org
- **Bluesky:** @ihmeuw.bsky.social
- **Twitter:** @IHME_UW
- **Facebook:** <https://www.facebook.com/IHMEUW>
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