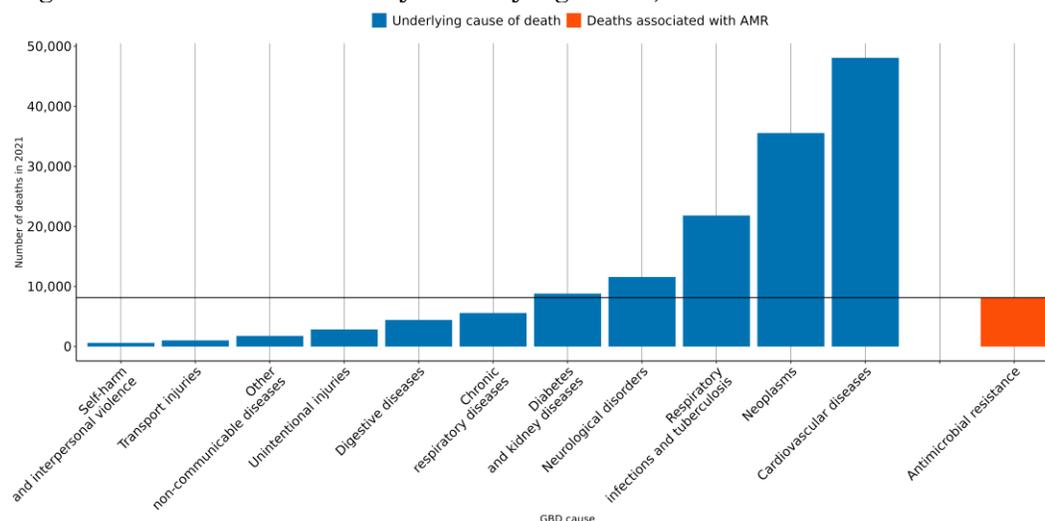


# The burden of antimicrobial resistance (AMR) in Greece

## Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **2,000 lives** have been lost each year since 1990 in Greece due to AMR.
- In 2021, there were an estimated **2,010 UI (1,780-2,250)** deaths attributable to AMR and **8,130 UI (7,190-9,080)** 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



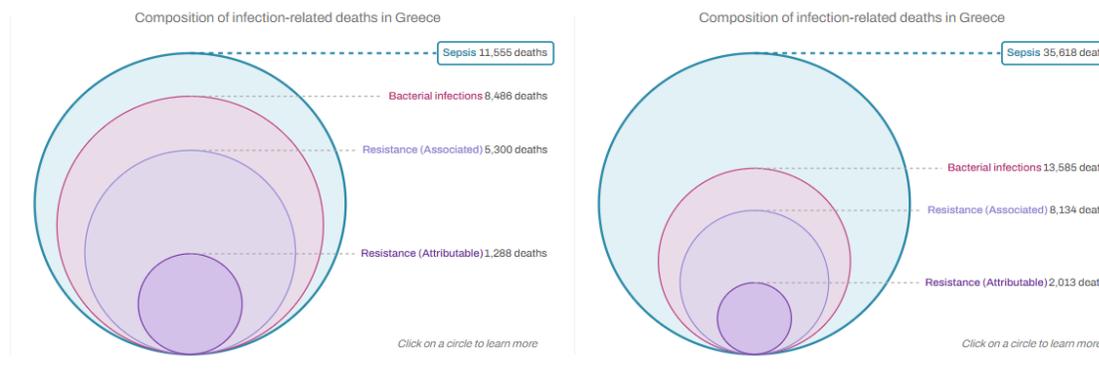
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Greece, a 10% reduction means to decrease the number of deaths associated with AMR to **7,680**, but currently the trend for this country could reach up to **9,260 UI [7,190-11,100]** AMR-associated deaths in 2030.

## AMR in Greece

### 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 Greece between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Greece** in 2021, there were an estimated **2,010 UI (1,780-2,250)** deaths attributable to AMR and **8,130 UI (7,190-9,080)** 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, **Greece has the 33rd 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 3,880 UI (3,430-4,330) ↑	Staphylococcus aureus 2,390 UI (2,090-2,700) ↑	Staphylococcus aureus 649 UI (531-767) ↑
	Escherichia coli 2,250 UI (1,990-2,520) ↑	Escherichia coli 1,430 UI (1,250-1,600) ↑	Klebsiella pneumoniae 296 UI (257-335) ↑
	Streptococcus pneumoniae 1,500 UI (1,320-1,670) ↓	Klebsiella pneumoniae 908 UI (803-1,010) ↑	Escherichia coli 267 UI (217-316) ↑
	Pseudomonas aeruginosa 1,300 UI (1,160-1,450) ↑	Pseudomonas aeruginosa 866 UI (767-965) ↑	Pseudomonas aeruginosa 226 UI (186-266) ↑
	Klebsiella pneumoniae 1,060 UI (939-1,190) ↑	Streptococcus pneumoniae 733 UI (546-921) ↓	Acinetobacter baumannii 199 UI (175-223) ↓
	Acinetobacter baumannii 495 UI (441-548) ↓	Acinetobacter baumannii 491 UI (438-544) ↓	Streptococcus pneumoniae 121 UI (80-163) ↓
	Enterococcus faecalis 445 UI (395-494) ↑	Enterococcus faecium 321 UI (283-358) ↑	Enterococcus faecium 84 UI (70-96) ↑
	Proteus spp. 377 UI (330-423) ↑	Proteus spp. 255 UI (205-305) ↑	Enterobacter spp. 48 UI (41-55) ↓
	Enterobacter spp. 376 UI (334-418) ↑	Enterobacter spp. 180 UI (150-210) ↓	Proteus spp. 34 UI (24-43) ↑
	Group A Streptococcus 361 UI (309-412) ↑	Enterococcus faecalis 161 UI (136-187) ↑	Enterococcus faecalis 30 UI (20-39) ↑

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%

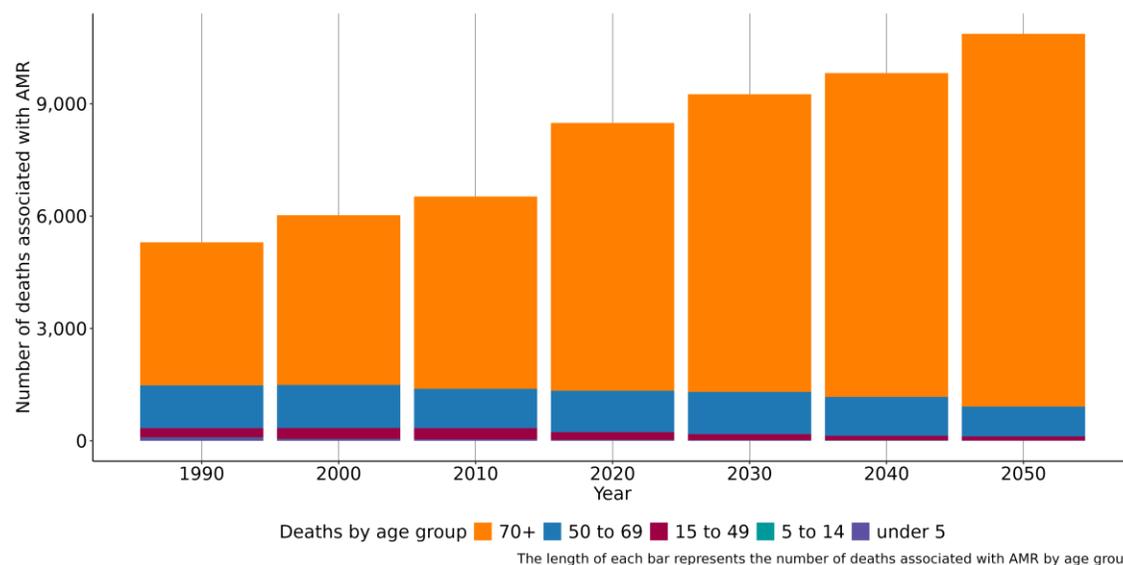
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

	Associated	Attributable
Burden Rank	Staphylococcus aureus Methicillin 1,920 UI (1,460-2,380) ↑	Staphylococcus aureus Methicillin 479 UI (357-600) ↑
	Staphylococcus aureus Macrolides 1,620 UI (1,360-1,870) ↑	Klebsiella pneumoniae Carbapenems 133 UI (103-163) ↑
	Escherichia coli Aminopenicillin 1,190 UI (994-1,390) ↑	Pseudomonas aeruginosa Carbapenems 115 UI (78-152) ↑
	Staphylococcus aureus Fluoroquinolones 1,160 UI (980-1,350) ↑	Acinetobacter baumannii Carbapenems 104 UI (83-125) ↑
	Escherichia coli Fluoroquinolones 767 UI (612-922) ↑	Staphylococcus aureus Fluoroquinolones 73 UI (33-113) ↑
	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. 749 UI (649-849) ↑	Streptococcus pneumoniae Carbapenems 71 UI (44-99) ↑
	Klebsiella pneumoniae Aminoglycosides 725 UI (637-814) ↑	Staphylococcus aureus Macrolides 66 UI (43-89) ↑
	Klebsiella pneumoniae Fluoroquinolones 707 UI (602-812) ↑	Escherichia coli Fluoroquinolones 60 UI (32-88) ↑
	Escherichia coli TMP-SMX 692 UI (554-830) ↑	Klebsiella pneumoniae Fluoroquinolones 59 UI (40-77) ↑
	Klebsiella pneumoniae 3GC 647 UI (561-732) ↑	Acinetobacter baumannii Fluoroquinolones 57 UI (46-68) ↑

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) lower respiratory infection (excl. COVID) (8,230 UI (7,160-9,310)), bloodstream infections (5,980 UI (5,310-6,640)), peritoneal and intra-abdominal infections (2,200 UI (1,930-2,480)), urinary tract infections and pyelonephritis (1,490 UI (1,260-1,720)) and infections of the skin and subcutaneous systems (494 UI (395-593)).

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



- In Greece, 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 6,830 UI (5,930-7,740), whereas the mortality rate per 100,000 was 395 UI (343-447).

### Data sources for Greece

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 Greece by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2021	1,425,094	Isolates
Microbial or laboratory data with outcome	1990-2021	11,675	Isolates
Literature studies	1990-2021	4,211	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	332,567	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](mailto:engage@healthdata.org)
- For media-related inquiries: [media@healthdata.org](mailto:media@healthdata.org)
- **Bluesky:** @ihmeuw.bsky.social
- **Twitter:** @IHME\_UW
- **Facebook:** <https://www.facebook.com/IHMEUW>
- **LinkedIn:** <https://www.linkedin.com/company/institute-for-health-metrics-and-evaluation>