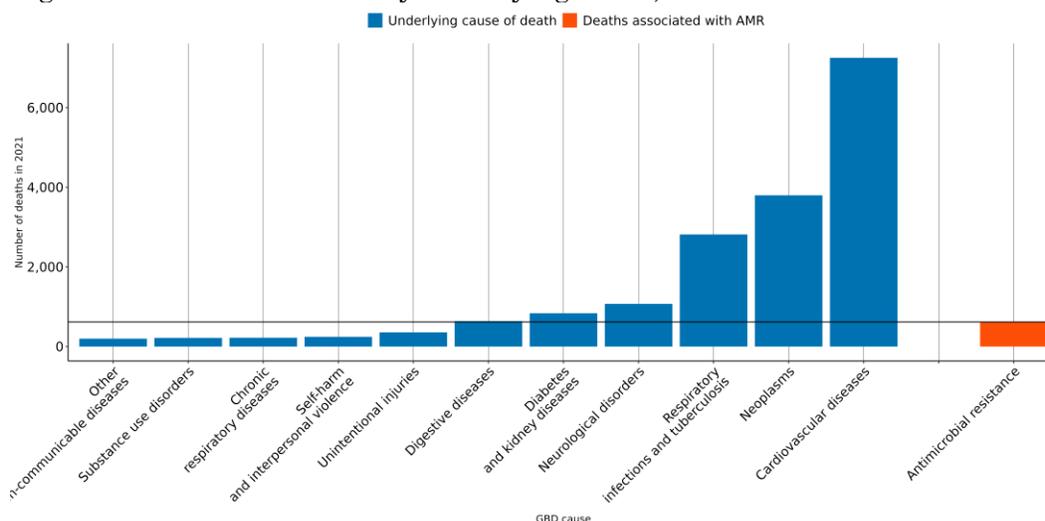


The burden of antimicrobial resistance (AMR) in Estonia

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **200 lives** have been lost each year since 1990 in Estonia due to AMR.
- In 2021, there were an estimated **127 UI (102-151)** deaths attributable to AMR and **616 UI (479-754)** 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 *Pseudomonas aeruginosa* resistant to carbapenems, *Acinetobacter baumannii* resistant to carbapenems and *Enterococcus faecalis* resistant to fluoroquinolones.

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 Estonia, a 10% reduction means to decrease the number of deaths associated with AMR to **562**, but currently the trend for this country could reach up to **640 UI [489-821]** AMR-associated deaths in 2030.

AMR in Estonia

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 Estonia between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Estonia** in 2021, there were an estimated **127 UI (102-151)** deaths attributable to AMR and **616 UI (479-754)** 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, **Estonia has the 23rd 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 350 UI (308-392) ↑	Escherichia coli 134 UI (109-159) ↓	Acinetobacter baumannii 23 UI (20-26) ↓
	Escherichia coli 219 UI (191-246) ↓	Staphylococcus aureus 82 UI (55-109) ↓	Escherichia coli 23 UI (18-28) ↓
	Streptococcus pneumoniae 148 UI (131-166) ↓	Streptococcus pneumoniae 59 UI (33-84) ↓	Pseudomonas aeruginosa 14 UI (10-19) ↓
	Pseudomonas aeruginosa 129 UI (113-144) ↓	Acinetobacter baumannii 58 UI (50-65) ↓	Staphylococcus aureus 14 UI (11-17) ↓
	Klebsiella pneumoniae 108 UI (95-122) ↓	Klebsiella pneumoniae 55 UI (41-70) ↓	Klebsiella pneumoniae 12 UI (9-15) ↓
	Enterococcus faecalis 65 UI (57-73) ↓	Pseudomonas aeruginosa 55 UI (43-67) ↓	Streptococcus pneumoniae 8 UI (4-13) ↓
	Acinetobacter baumannii 60 UI (52-68) ↓	Enterococcus faecalis 44 UI (38-49) ↓	Enterococcus faecalis 7 UI (5-10) ↓
	Enterobacter spp. 49 UI (43-55) ↓	Enterococcus faecium 34 UI (28-38) ↑	Enterobacter spp. 6 UI (5-7) ↓
	Enterococcus faecium 41 UI (36-46) ↑	Enterobacter spp. 24 UI (18-30) ↓	Enterococcus faecium 5 UI (3-7) ↑
	Group A Streptococcus 40 UI (34-46) ↑	Proteus spp. 22 UI (14-29) ↓	Mycobacterium tuberculosis 3 UI (0-8) ↑

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% (light orange), 3% to 5% (dark orange), >5.0% (red)

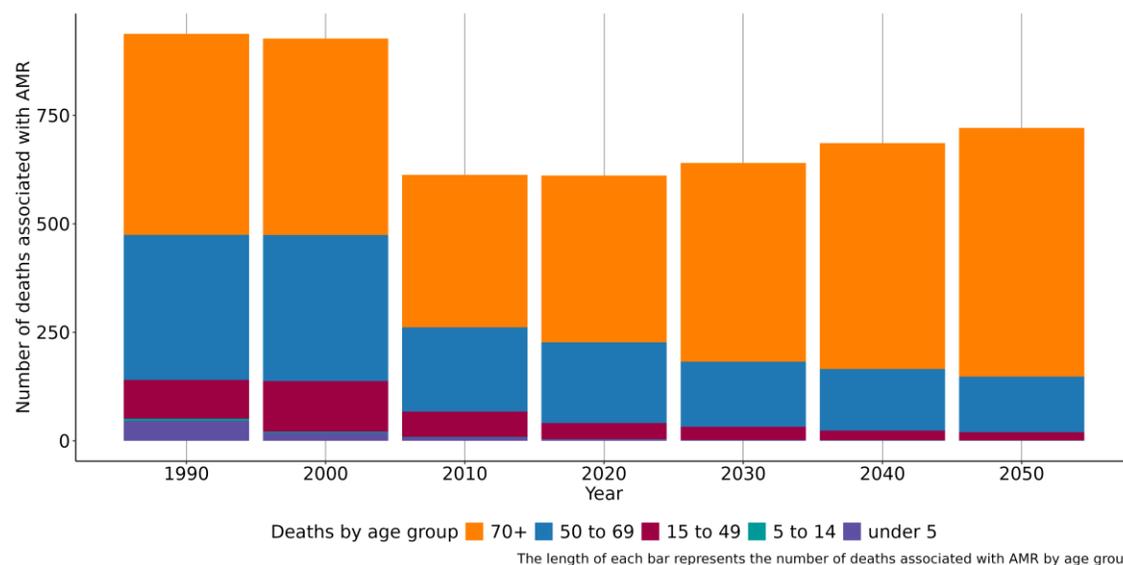
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

	Associated	Attributable
Burden Rank	Escherichia coli Aminopenicillin 111 UI (81-140) ↓	Acinetobacter baumannii Carbapenems 15 UI (13-18) ↓
	Escherichia coli TMP-SMX 87 UI (57-117) ↓	Pseudomonas aeruginosa Carbapenems 8 UI (5-11) ↓
	Staphylococcus aureus Macrolides 61 UI (41-81) ↓	Enterococcus faecalis Fluoroquinolones 7 UI (4-9) ↓
	Acinetobacter baumannii Carbapenems 56 UI (48-63) ↓	Staphylococcus aureus Methicillin 6 UI (3-8) ↑
	Acinetobacter baumannii 3GC 54 UI (46-62) ↓	Escherichia coli TMP-SMX 5 UI (3-8) ↓
	Streptococcus pneumoniae TMP-SMX 53 UI (27-79) ↓	Escherichia coli Aminopenicillin 5 UI (3-8) ↑
	Acinetobacter baumannii Beta-Lactam/Lactamase Inhib. 51 UI (44-58) ↓	Streptococcus pneumoniae Carbapenems 5 UI (2-8) ↓
	Escherichia coli Fluoroquinolones 51 UI (35-67) ↑	Acinetobacter baumannii Fluoroquinolones 4 UI (3-5) ↓
	Acinetobacter baumannii 4GC 50 UI (41-59) ↓	Enterococcus faecium Fluoroquinolones 4 UI (2-5) ↑
	Escherichia coli Beta-Lactam/Lactamase Inhib. 49 UI (39-60) ↓	Escherichia coli Fluoroquinolones 3 UI (1-6) ↑

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% (light orange), 3% to 5% (dark orange), >5.0% (red)

- 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 (722 UI (636-809)), lower respiratory infection (excl. COVID) (441 UI (384-498)), peritoneal and intra-abdominal infections (269 UI (234-305)), urinary tract infections and pyelonephritis (167 UI (141-193)) and infections of the skin and subcutaneous systems (83 UI (69-97)).

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



- In Estonia, 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 401 UI (309-494), whereas the mortality rate per 100,000 was 210 UI (161-258).

Data sources for Estonia

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 Estonia by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2021	95,436	Isolates
Microbial or laboratory data with outcome	1990-2021	29,920	Isolates
Single drug resistance profile data	1990-2021	14,041	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>
- **LinkedIn:** <https://www.linkedin.com/company/institute-for-health-metrics-and-evaluation>