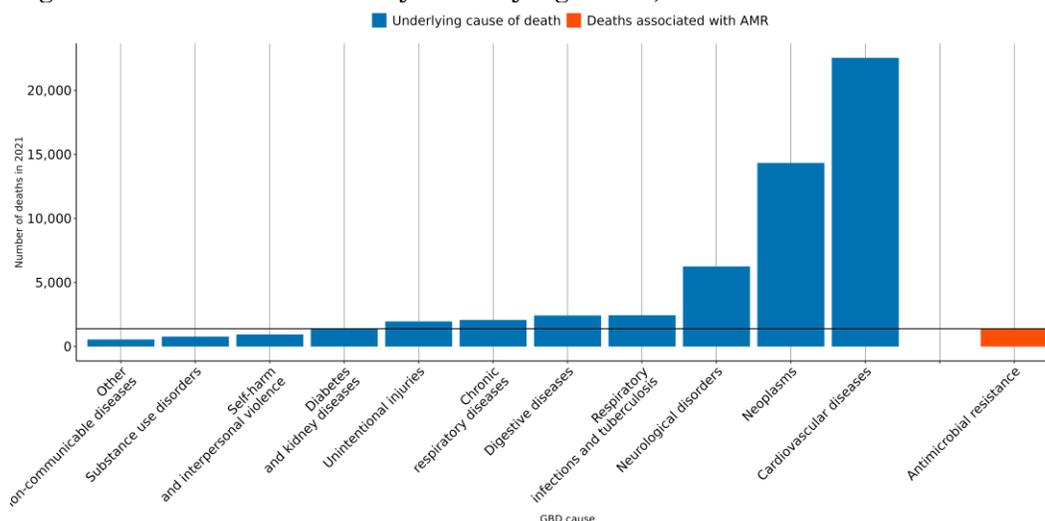


The burden of antimicrobial resistance (AMR) in Finland

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **400 lives** have been lost each year since 1990 in Finland due to AMR.
- In 2021, there were an estimated **274 UI (227-321)** deaths attributable to AMR and **1,390 UI (1,160-1,630)** 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 *Escherichia coli* resistant to carbapenems, *Escherichia coli* resistant to third-generation cephalosporins and *Pseudomonas aeruginosa* resistant to carbapenems.

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



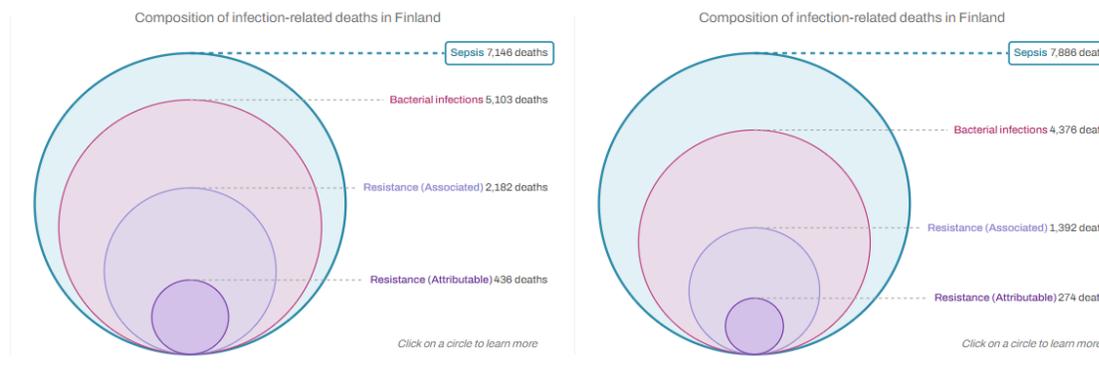
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Finland, a 10% reduction means to decrease the number of deaths associated with AMR to **1,290**, but currently the trend for this country could reach up to **1,570 UI [1,200-1,950]** AMR-associated deaths in 2030.

AMR in Finland

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 Finland between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Finland** in 2021, there were an estimated **274 UI (227-321)** deaths attributable to AMR and **1,390 UI (1,160-1,630)** 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, **Finland has the 1st 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	
	Bacteria (UI)	Change	Bacteria (UI)	Change	Bacteria (UI)	Change
	Staphylococcus aureus 1,210 UI (1,060-1,360)	↑	Escherichia coli 397 UI (343-451)	↑	Escherichia coli 79 UI (64-94)	↑
	Escherichia coli 864 UI (758-971)	↑	Staphylococcus aureus 197 UI (152-241)	↓	Staphylococcus aureus 35 UI (29-41)	↓
	Pseudomonas aeruginosa 412 UI (363-462)	↓	Enterococcus faecium 126 UI (110-141)	↑	Pseudomonas aeruginosa 32 UI (23-40)	↓
	Streptococcus pneumoniae 337 UI (295-379)	↓	Pseudomonas aeruginosa 125 UI (99-150)	↓	Acinetobacter baumannii 29 UI (22-35)	↓
	Klebsiella pneumoniae 298 UI (261-334)	↓	Streptococcus pneumoniae 114 UI (93-134)	↓	Streptococcus pneumoniae 21 UI (16-26)	↓
	Enterococcus faecalis 177 UI (156-197)	↓	Acinetobacter baumannii 81 UI (62-101)	↓	Enterococcus faecium 16 UI (10-22)	↑
	Group A Streptococcus 156 UI (133-179)	↑	Proteus spp. 79 UI (57-101)	↑	Klebsiella pneumoniae 16 UI (12-20)	↓
	Enterococcus faecium 137 UI (120-154)	↑	Klebsiella pneumoniae 77 UI (56-97)	↓	Enterobacter spp. 10 UI (8-12)	↓
	Enterobacter spp. 131 UI (116-147)	↓	Enterobacter spp. 42 UI (31-54)	↓	Proteus spp. 10 UI (6-13)	↓
	Proteus spp. 123 UI (107-140)	↑	Enterococcus faecalis 29 UI (25-33)	↓	Citrobacter spp. 7 UI (5-9)	↓

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% (orange)

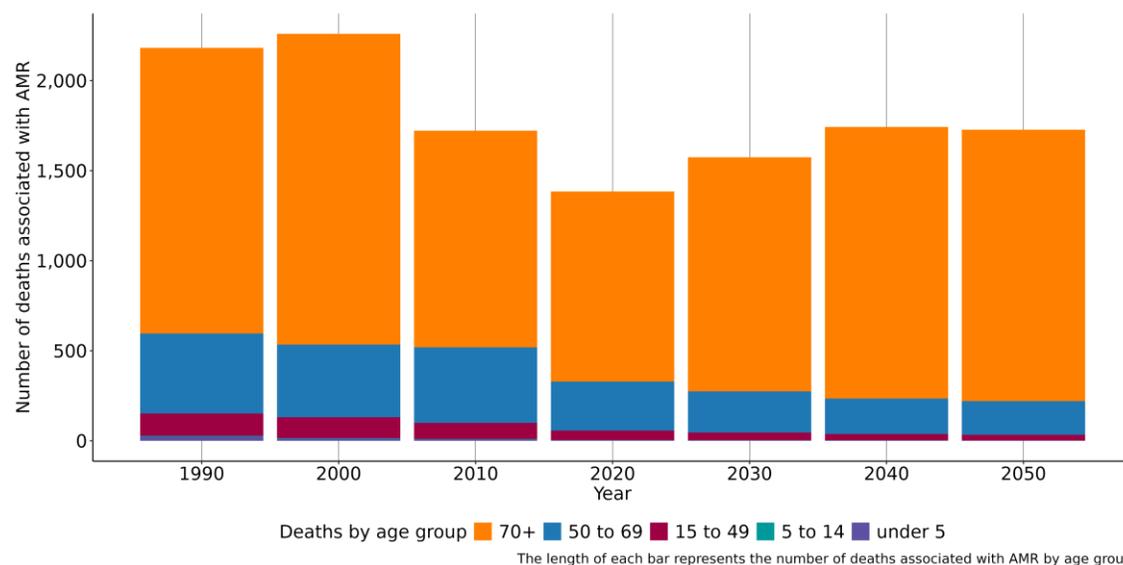
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
	Combination (UI)	Change	Combination (UI)	Change
	Escherichia coli Aminopenicillin 299 UI (227-371)	↓	Pseudomonas aeruginosa Carbapenems 16 UI (10-23)	↑
	Escherichia coli TMP-SMX 191 UI (149-234)	↓	Escherichia coli Carbapenems 15 UI (9-22)	↑
	Escherichia coli Beta-Lactam/Lactamase Inhib. 177 UI (136-217)	↓	Escherichia coli 3GC 14 UI (7-21)	↑
	Escherichia coli Fluoroquinolones 132 UI (98-166)	↑	Enterococcus faecium Fluoroquinolones 14 UI (7-20)	↑
	Staphylococcus aureus Macrolides 130 UI (86-173)	↓	Escherichia coli Beta-Lactam/Lactamase Inhib. 13 UI (3-23)	↓
	Enterococcus faecium Fluoroquinolones 119 UI (104-134)	↑	Escherichia coli TMP-SMX 12 UI (7-17)	↓
	Escherichia coli 3GC 117 UI (84-150)	↑	Escherichia coli Aminopenicillin 12 UI (5-18)	↓
	Pseudomonas aeruginosa Carbapenems 79 UI (60-98)	↓	Staphylococcus aureus Methicillin 11 UI (8-14)	↑
	Proteus spp. Aminopenicillin 74 UI (62-86)	↓	Staphylococcus aureus Vancomycin 11 UI (7-15)	↑
	Pseudomonas aeruginosa Fluoroquinolones 74 UI (58-90)	↓	Streptococcus pneumoniae Carbapenems 10 UI (5-15)	↓

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% (orange)

- 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 (2,490 UI (2,200-2,770)), lower respiratory infection (excl. COVID) (1,520 UI (1,300-1,740)), peritoneal and intra-abdominal infections (937 UI (816-1,060)), urinary tract infections and pyelonephritis (362 UI (300-423)) and infections of the skin and subcutaneous systems (260 UI (215-305)).

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



- In Finland, 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 1,070 UI (868-1,270), whereas the mortality rate per 100,000 was 114 UI (93-136).

Data sources for Finland

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 Finland by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2021	739,318	Isolates
Microbial or laboratory data with outcome	1990-2021	21,400	Isolates
Literature studies	1990-2009	2,916	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	1,546,807	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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- **LinkedIn:** <https://www.linkedin.com/company/institute-for-health-metrics-and-evaluation>