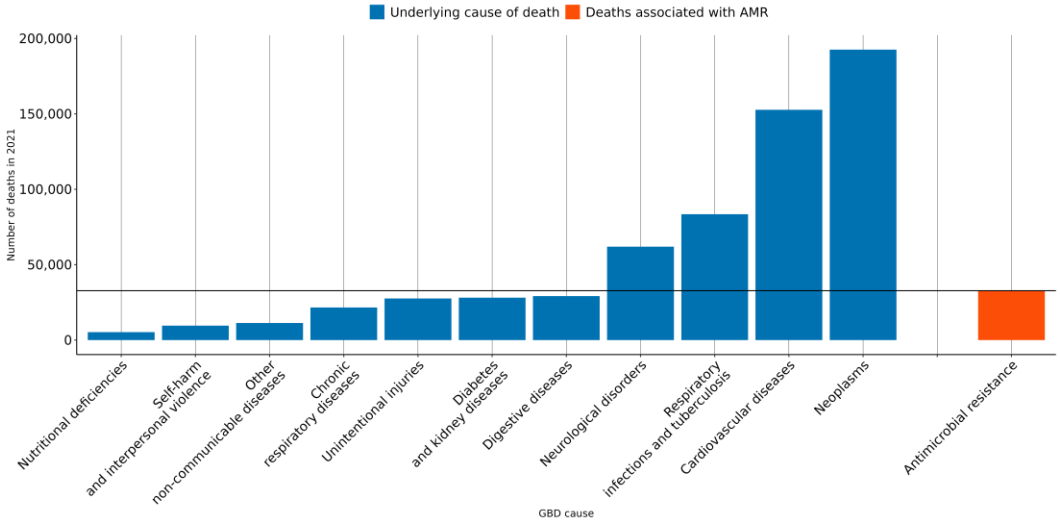
The burden of antimicrobial resistance (AMR) in France

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **9,000 lives** have been lost each year since 1990 in France due to AMR.
- In 2021, there were an estimated **7,340 UI (6,360-8,330)** deaths attributable to AMR and **32,700 UI (28,500-36,900)** 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, *Escherichia coli* resistant to beta lactam / beta-lactamase inhibitors and *Streptococcus pneumoniae* resistant to carbapenems.

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



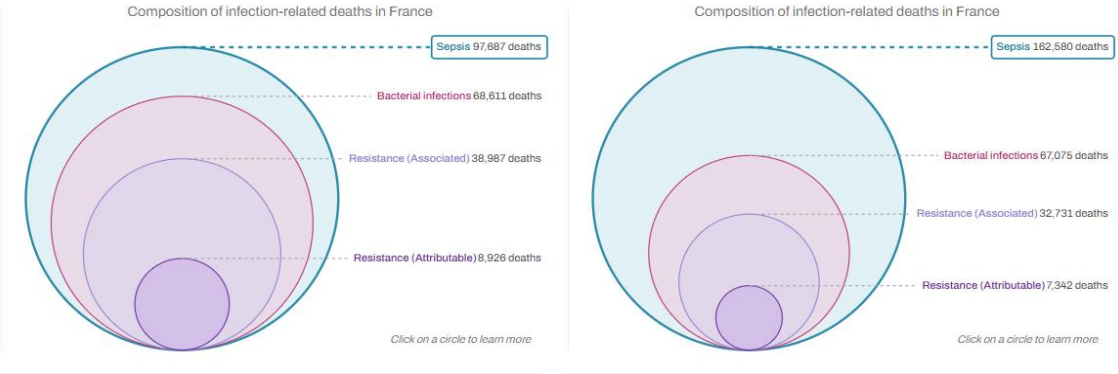
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 France, a 10% reduction means to decrease the number of deaths associated with AMR to **32,000**, but currently the trend for this country could reach up to **37,300 UI [29,500-44,300]** AMR-associated deaths in 2030.

AMR in France

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 France between 1990 and 2019.



- To look at these and more visualization interactively visit Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)
- In **France** in 2021, there were an estimated **7,340 UI (6,360-8,330)** deaths attributable to AMR and **32,700 UI (28,500-36,900)** 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, **France has the 19th 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
1	Staphylococcus aureus 19,700 UI (17,200-22,200) ↑	Staphylococcus aureus 9,350 UI (7,950-10,700) ↑	Staphylococcus aureus 2,530 UI (2,000-3,060) ↑
2	Escherichia coli 13,100 UI (11,400-14,700) ↑	Escherichia coli 8,510 UI (7,420-9,610) ↑	Escherichia coli 1,520 UI (1,200-1,840) ↑
3	Pseudomonas aeruginosa 6,250 UI (5,480-7,020) ↓	Streptococcus pneumoniae 2,850 UI (2,410-3,300) ↓	Pseudomonas aeruginosa 712 UI (584-839) ↓
4	Streptococcus pneumoniae 4,580 UI (4,000-5,170) ↓	Pseudomonas aeruginosa 2,730 UI (2,390-3,070) ↓	Streptococcus pneumoniae 680 UI (545-815) ↓
5	Klebsiella pneumoniae 4,580 UI (4,010-5,160) ↓	Klebsiella pneumoniae 2,500 UI (2,020-2,970) ↓	Klebsiella pneumoniae 559 UI (435-683) ↓
6	Group A Streptococcus 2,960 UI (2,490-3,420) ↑	Enterococcus faecium 1,560 UI (1,340-1,780) ↑	Acinetobacter baumannii 373 UI (321-424) ↓
7	Enterococcus faecalis 2,230 UI (1,960-2,500) ↓	Proteus spp. 1,060 UI (815-1,300) ↑	Enterobacter spp. 247 UI (209-284) ↓
8	Enterococcus faecium 1,970 UI (1,720-2,220) ↑	Enterobacter spp. 1,000 UI (848-1,160) ↓	Enterococcus faecium 221 UI (143-299) ↑
9	Proteus spp. 1,950 UI (1,680-2,210) ↑	Acinetobacter baumannii 1,000 UI (828-1,170) ↓	Proteus spp. 146 UI (106-186) ↑
10	Enterobacter spp. 1,780 UI (1,560-2,000) ↓	Citrobacter spp. 363 UI (279-447) ↓	Citrobacter spp. 93 UI (71-114) ↓

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)

Burden Rank	Associated		Attributable	
1	Escherichia coli Aminopenicillin	7,760 UI (6,620-8,910) ↑	Staphylococcus aureus Methicillin	1,880 UI (1,320-2,430) ↑
2	Staphylococcus aureus Methicillin	7,330 UI (5,330-9,340) ↑	Streptococcus pneumoniae Carbapenems	386 UI (284-487) ↓
3	Staphylococcus aureus Macrolides	5,440 UI (4,500-6,390) ↑	Escherichia coli Beta-Lactam/Lactamase Inhib.	364 UI (109-619) ↑
4	Escherichia coli TMP-SMX	4,780 UI (3,870-5,690) ↑	Pseudomonas aeruginosa Carbapenems	360 UI (245-475) ↓
5	Escherichia coli Beta-Lactam/Lactamase Inhib.	4,430 UI (3,670-5,190) ↑	Escherichia coli Aminopenicillin	341 UI (232-450) ↓
6	Staphylococcus aureus Fluoroquinolones	4,100 UI (3,180-5,020) ↓	Escherichia coli TMP-SMX	285 UI (157-412) ↑
7	Escherichia coli Fluoroquinolones	2,430 UI (1,880-2,980) ↑	Staphylococcus aureus Fluoroquinolones	271 UI (94-448) ↓
8	Klebsiella pneumoniae Aminoglycosides	1,850 UI (1,480-2,210) ↑	Staphylococcus aureus Macrolides	234 UI (155-313) ↑
9	Pseudomonas aeruginosa Carbapenems	1,830 UI (1,560-2,100) ↓	Enterococcus faecium Fluoroquinolones	166 UI (87-246) ↑
10	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib.	1,760 UI (1,320-2,210) ↑	Escherichia coli 3GC	165 UI (92-239) ↓

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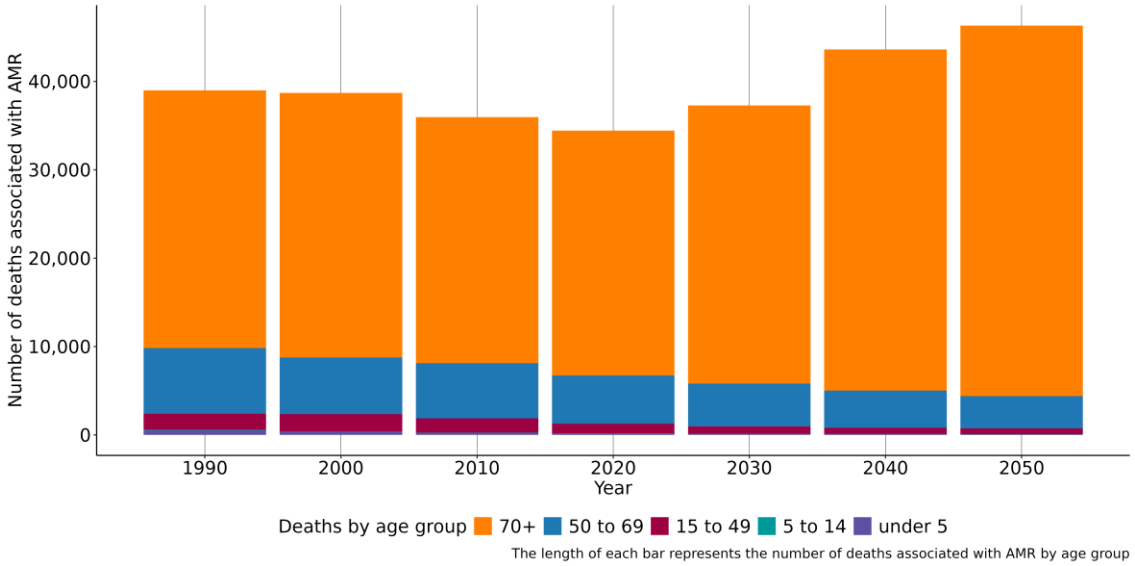
- Independently of antimicrobial resistance, the infectious syndromes accounting for the most deaths in 2021 were as follows (estimated thousands of deaths in parenthesis) bloodstream infections (34,000 UI (30,000-38,100)), lower respiratory infection (excl. COVID) (28,900 UI (24,700-33,100)), peritoneal and intra-abdominal infections (12,700 UI (11,000-14,400)), urinary tract infections and pyelonephritis (5,800 UI (4,840-6,760)) and infections of the skin and subcutaneous systems (5,070 UI (4,150-6,000)).

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



- In France, 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 26,400 UI (22,400-30,300), whereas the mortality rate per 100,000 was 265 UI (225-305).

Data sources for France

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 France by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2021	5,197,459	Isolates
Microbial or laboratory data with outcome	1990-2021	83,607	Isolates
Literature studies	1990-2021	39,889	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	388,871	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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