# The burden of antimicrobial resistance (AMR) in the United Kingdom

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **9,000 lives** have been lost each year since 1990 in the United Kingdom due to AMR.

- In 2021, there were an estimated **5,840 UI (5,060-6,620)** deaths attributable to AMR and **28,900 UI (25,600-32,300)** 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 *Pseudomonas aeruginosa* resistant to carbapenems.

Figure 1 Number of deaths by underlying cause, and those associated with AMR in 2021
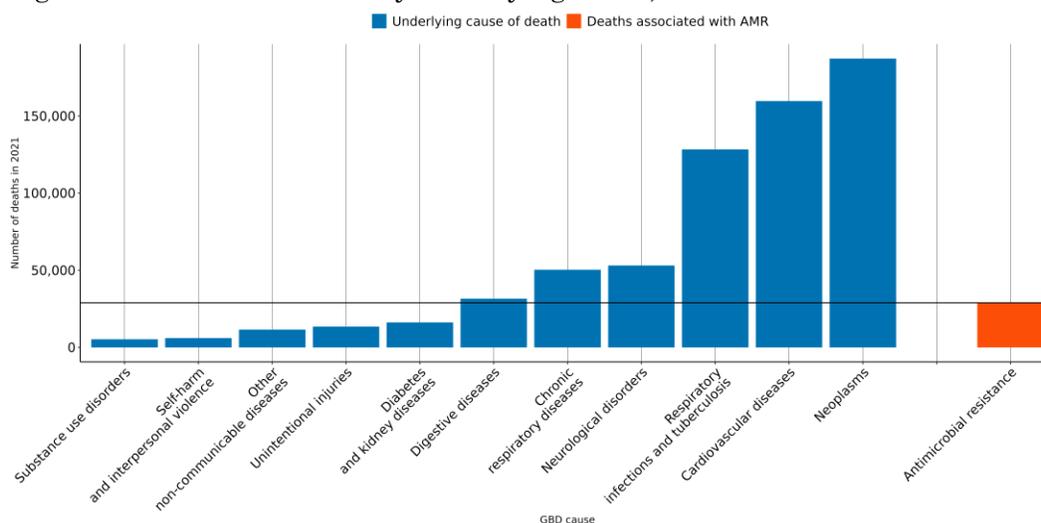
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 the United Kingdom, a 10% reduction means to decrease the number of deaths associated with AMR to **28,900**, but currently the trend for this country could reach up to **34,000 UI [27,500-39,200]** AMR-associated deaths in 2030.

AMR in the United Kingdom

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 the United Kingdom between 1990 and 2019.
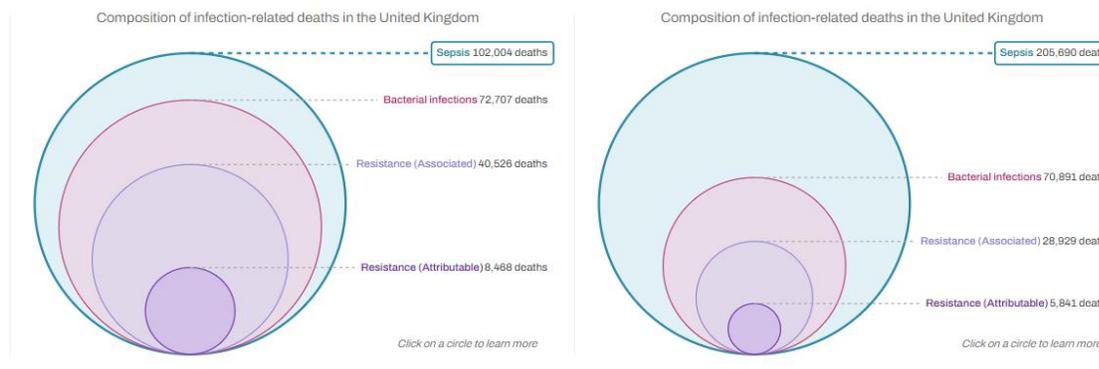
- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)](#)

- In **the United Kingdom** in 2021, there were an estimated **5,840 UI (5,060-6,620)** deaths attributable to AMR and **28,900 UI (25,600-32,300)** 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, **the United Kingdom has the 21st 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	
Staphylococcus aureus 20,200 UI (18,100-22,300)	↑	Staphylococcus aureus 7,460 UI (6,560-8,350)	↓	Staphylococcus aureus 1,580 UI (1,250-1,910)	↓
Escherichia coli 11,500 UI (10,300-12,700)	↑	Escherichia coli 6,990 UI (6,220-7,760)	↑	Escherichia coli 1,210 UI (896-1,530)	↑
Pseudomonas aeruginosa 7,270 UI (6,550-8,000)	↑	Klebsiella pneumoniae 2,700 UI (2,280-3,130)	↓	Pseudomonas aeruginosa 645 UI (509-782)	↓
Streptococcus pneumoniae 6,820 UI (6,100-7,530)	↓	Pseudomonas aeruginosa 2,440 UI (2,090-2,780)	↓	Klebsiella pneumoniae 572 UI (443-701)	↑
Klebsiella pneumoniae 5,810 UI (5,200-6,420)	↓	Streptococcus pneumoniae 1,860 UI (1,480-2,240)	↓	Acinetobacter baumannii 434 UI (352-515)	↓
Group A Streptococcus 2,650 UI (2,340-2,970)	↑	Enterococcus faecium 1,860 UI (1,660-2,060)	↑	Enterococcus faecium 388 UI (316-460)	↑
Proteus spp. 2,190 UI (1,950-2,440)	↑	Acinetobacter baumannii 1,200 UI (957-1,450)	↓	Streptococcus pneumoniae 252 UI (186-319)	↓
Enterococcus faecalis 2,160 UI (1,940-2,380)	↓	Proteus spp. 1,110 UI (906-1,310)	↑	Enterobacter spp. 177 UI (150-205)	↓
Enterococcus faecium 2,080 UI (1,870-2,290)	↑	Enterobacter spp. 714 UI (605-823)	↓	Proteus spp. 141 UI (106-177)	↑
Enterobacter spp. 1,930 UI (1,740-2,130)	↓	Enterococcus faecalis 564 UI (487-642)	↓	Enterococcus faecalis 108 UI (82-135)	↓

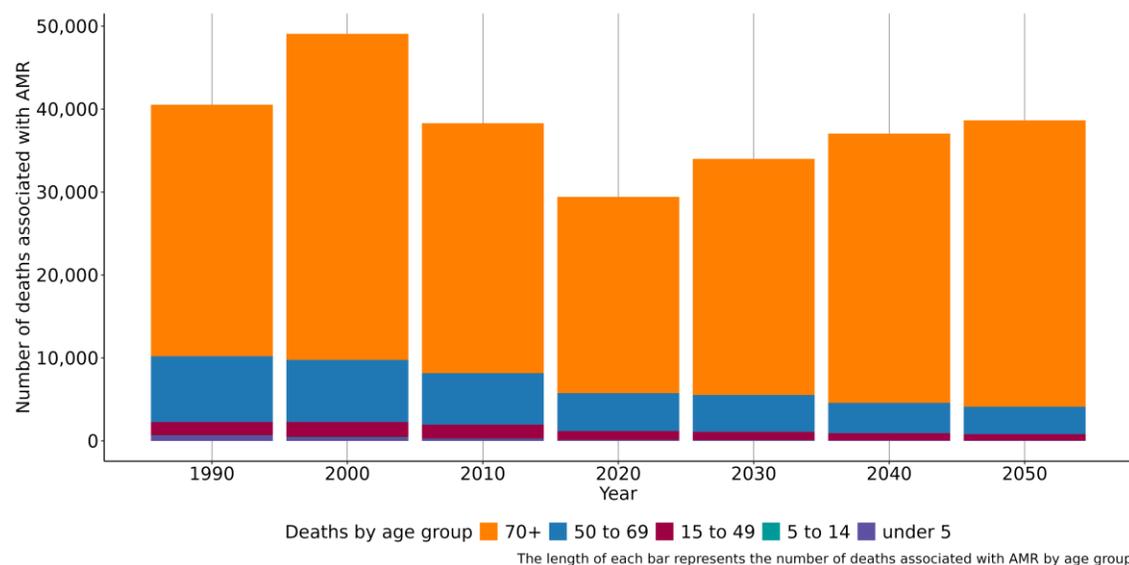Annualized rate of change (1990-2021): <-3% | -3% to -1.5% | -1.5% to 0% | 0% to 1.5% | 1.5% to 3% | 3% to 5% | >5.0%

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

Associated		Attributable	
Staphylococcus aureus Macrolides — 4,930 UI (4,100-5,760)	↑	Staphylococcus aureus Methicillin — 880 UI (520-1,240)	↓
Escherichia coli Aminopenicillin — 4,850 UI (4,250-5,460)	↑	Escherichia coli Beta-Lactam/Lactamase Inhib. — 427 UI (161-692)	↑
Escherichia coli Beta-Lactam/Lactamase Inhib. — 4,840 UI (4,180-5,500)	↑	Pseudomonas aeruginosa Carbapenems — 379 UI (269-490)	↓
Escherichia coli TMP-SMX — 3,870 UI (3,300-4,440)	↑	Escherichia coli TMP-SMX — 237 UI (135-338)	↓
Staphylococcus aureus Methicillin — 3,670 UI (2,290-5,040)	↓	Staphylococcus aureus Macrolides — 229 UI (150-307)	↑
Staphylococcus aureus Fluoroquinolones — 2,710 UI (2,000-3,430)	↓	Enterococcus faecium Vancomycin — 207 UI (172-243)	↑
Escherichia coli Fluoroquinolones — 2,440 UI (2,070-2,800)	↑	Enterococcus faecium Fluoroquinolones — 181 UI (105-256)	↑
Enterococcus faecium Fluoroquinolones — 1,930 UI (1,730-2,130)	↑	Staphylococcus aureus Fluoroquinolones — 180 UI (45-316)	↓
Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. — 1,920 UI (1,520-2,320)	↑	Escherichia coli 3GC — 170 UI (109-232)	↑
Klebsiella pneumoniae TMP-SMX — 1,810 UI (1,520-2,100)	↓	Escherichia coli Fluoroquinolones — 162 UI (93-231)	↑

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) (43,600 UI (38,400-48,700)), bloodstream infections (30,200 UI (27,300-33,100)), peritoneal and intra-abdominal infections (13,100 UI (11,600-14,500)), urinary tract infections and pyelonephritis (9,280 UI (8,070-10,500)) and infections of the skin and subcutaneous systems (4,400 UI (3,810-4,990)).

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

Deaths by age group ■ 70+ ■ 50 to 69 ■ 15 to 49 ■ 5 to 14 ■ under 5
The length of each bar represents the number of deaths associated with AMR by age group

- In the United Kingdom, 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 23,000 UI (19,900-26,100), whereas the mortality rate per 100,000 was 252 UI (218-286).

Data sources for the United Kingdom

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 the United Kingdom by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2021	2,899,227	Isolates
Microbial or laboratory data with outcome	1990-2021	1,081,253	Isolates
Literature studies	1990-2021	111,169	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	10,090,772	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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