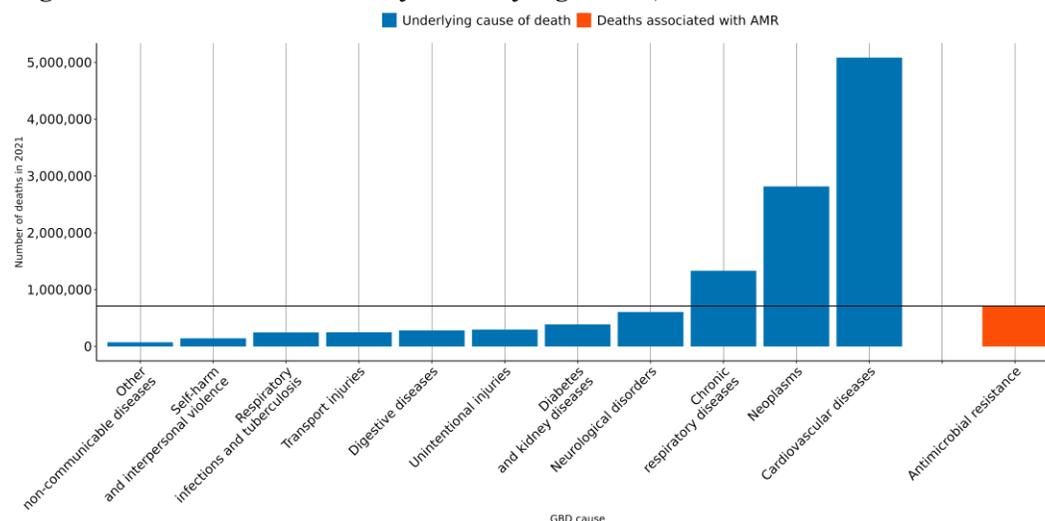


# The burden of antimicrobial resistance (AMR) in China

## Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **200,000 lives** have been lost each year since 1990 in China due to AMR.
- In 2021, there were an estimated **160,000 UI (132,000-188,000)** deaths attributable to AMR and **712,000 UI (586,000-837,000)** 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, *Acinetobacter baumannii* resistant to carbapenems and *Streptococcus pneumoniae* resistant to carbapenems.

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



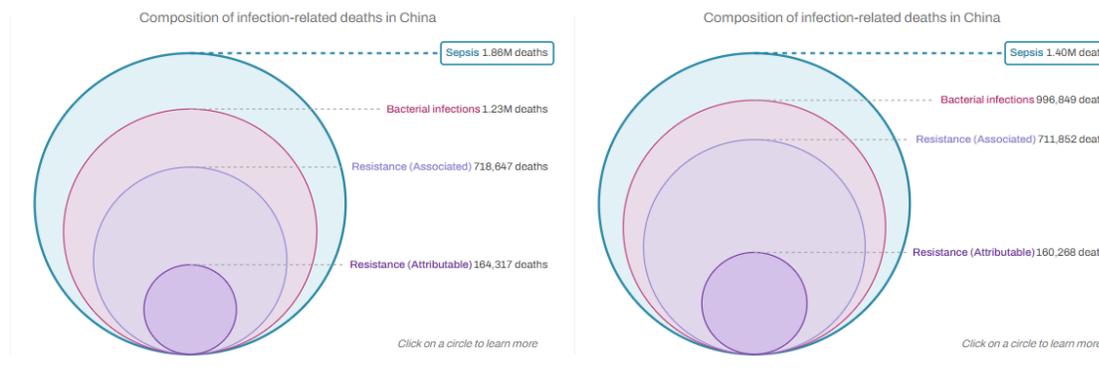
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 China, a 10% reduction means to decrease the number of deaths associated with AMR to **623,000**, but currently the trend for this country could reach up to **772,000 UI [616,000-951,000]** AMR-associated deaths in 2030.

## AMR in China

### 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 China between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **China** in 2021, there were an estimated **160,000 UI (132,000-188,000)** deaths attributable to AMR and **712,000 UI (586,000-837,000)** 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, **China has the 65th 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
	Staphylococcus aureus 225,000 UI (184,000-266,000) ↑	Staphylococcus aureus 169,000 UI (139,000-199,000) ↑	Staphylococcus aureus 39,600 UI (31,100-48,200) ↑
Streptococcus pneumoniae 177,000 UI (146,000-209,000) ↓	Streptococcus pneumoniae 159,000 UI (131,000-187,000) ↓	Streptococcus pneumoniae 29,300 UI (23,900-34,700) ↓	
Escherichia coli 106,000 UI (86,300-125,000) ↑	Escherichia coli 94,500 UI (76,800-112,000) ↑	Acinetobacter baumannii 23,200 UI (19,400-27,000) ↓	
Pseudomonas aeruginosa 97,600 UI (79,600-116,000) ↓	Acinetobacter baumannii 59,600 UI (49,000-70,200) ↓	Escherichia coli 19,400 UI (15,200-23,500) ↑	
Klebsiella pneumoniae 78,800 UI (64,300-93,300) ↓	Klebsiella pneumoniae 51,100 UI (41,300-60,900) ↓	Klebsiella pneumoniae 14,400 UI (11,600-17,200) ↓	
Acinetobacter baumannii 70,900 UI (57,900-83,900) ↓	Pseudomonas aeruginosa 50,500 UI (40,600-60,400) ↓	Pseudomonas aeruginosa 13,200 UI (9,830-16,600) ↓	
Mycobacterium tuberculosis 38,800 UI (28,700-48,900) ↓	Enterococcus faecium 21,200 UI (17,300-25,200) ↑	Enterobacter spp. 4,770 UI (3,880-5,650) ↓	
Enterococcus faecalis 36,400 UI (29,500-43,200) ↑	Group A Streptococcus 21,200 UI (16,800-25,600) ↑	Enterococcus faecium 2,860 UI (1,730-4,000) ↑	
Enterobacter spp. 30,600 UI (24,900-36,200) ↑	Enterobacter spp. 17,600 UI (14,500-20,800) ↓	Proteus spp. 2,250 UI (1,700-2,800) ↑	
Group A Streptococcus 24,500 UI (19,500-29,600) ↑	Proteus spp. 13,400 UI (10,800-16,100) ↑	Enterococcus faecalis 2,140 UI (1,370-2,910) ↑	

Annualized rate of change (1990-2021): <-3% (blue), -3% to -1.5% (light blue), -1.5% to 0% (light red), 0% to 1.5% (red), 1.5% to 3% (dark red), 3% to 5% (darkest red), >5.0% (black)

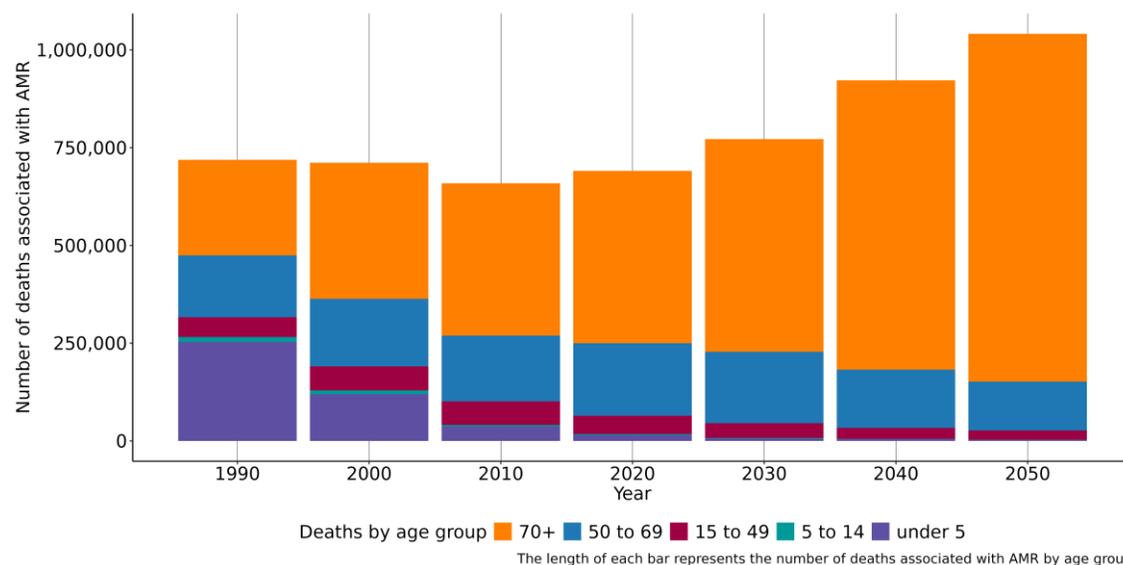
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated	Attributable
	Streptococcus pneumoniae Macrolides 150,000 UI (123,000-177,000) ↑	Staphylococcus aureus Methicillin 26,000 UI (17,600-34,500) ↑
Staphylococcus aureus Macrolides 150,000 UI (123,000-177,000) ↑	Streptococcus pneumoniae Carbapenems 11,200 UI (7,380-15,000) ↓	
Staphylococcus aureus Methicillin 111,000 UI (77,000-145,000) ↑	Acinetobacter baumannii Carbapenems 10,500 UI (7,860-13,200) ↑	
Streptococcus pneumoniae TMP-SMX 98,200 UI (78,500-118,000) ↑	Streptococcus pneumoniae 3GC 6,700 UI (4,180-9,220) ↑	
Escherichia coli Aminopenicillin 91,400 UI (72,900-110,000) ↑	Pseudomonas aeruginosa Carbapenems 6,640 UI (4,270-9,010) ↑	
Staphylococcus aureus Fluoroquinolones 77,700 UI (58,900-96,600) ↑	Staphylococcus aureus Macrolides 6,230 UI (4,070-8,400) ↑	
Streptococcus pneumoniae 3GC 68,700 UI (54,200-83,200) ↑	Streptococcus pneumoniae Macrolides 5,820 UI (3,420-8,230) ↑	
Escherichia coli Fluoroquinolones 66,300 UI (53,600-79,000) ↑	Acinetobacter baumannii Fluoroquinolones 5,710 UI (4,540-6,880) ↑	
Streptococcus pneumoniae Beta-Lactam/Lactamase Inhib. 56,600 UI (38,700-74,500) ↑	Klebsiella pneumoniae Carbapenems 4,840 UI (3,650-6,030) ↑	
Escherichia coli TMP-SMX 54,300 UI (43,500-65,100) ↑	Staphylococcus aureus Fluoroquinolones 4,590 UI (1,400-7,790) ↑	

Annualized rate of change (1990-2021): <-3% (blue), -3% to -1.5% (light blue), -1.5% to 0% (light red), 0% to 1.5% (red), 1.5% to 3% (dark red), 3% to 5% (darkest red), >5.0% (black)

- 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 (536,000 UI (438,000-634,000)), lower respiratory infection (excl. COVID) (517,000 UI (417,000-617,000)), peritoneal and intra-abdominal infections (98,600 UI (76,000-121,000)), infections of the skin and subcutaneous systems (49,500 UI (37,100-62,000)) and urinary tract infections and pyelonephritis (47,200 UI (35,500-58,800)).

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



- In China, people aged under 5 experienced the largest number of deaths associated with AMR in 1990 but this changed by 2021 as the largest number of deaths occurred among the 70+. This indicates that prevention of infections among the under 5 has contributed to the reduction in the number of AMR associated deaths. In 2021, the number of deaths associated with AMR among the 70+ was 462,000 UI (379,000-545,000), whereas the mortality rate per 100,000 was 387 UI (318-457).

### Data sources for China

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 China by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2021	961,486	Isolates
Microbial or laboratory data with outcome	2010-2021	2,889	Isolates
Literature studies	1990-2021	1,918,013	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	377,982	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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