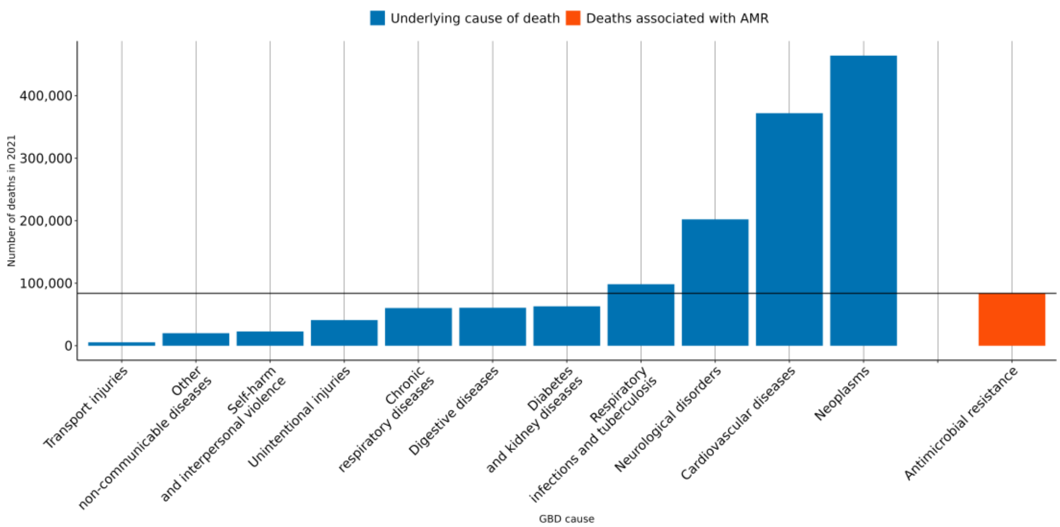
The burden of antimicrobial resistance (AMR) in Japan

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **20,000 lives** have been lost each year since 1990 in Japan due to AMR.
- In 2021, there were an estimated **17,400 UI (14,600-20,200)** deaths attributable to AMR and **83,900 UI (70,300-97,400)** 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 fluoroquinolones, *Staphylococcus aureus* resistant to methicillin and *Streptococcus pneumoniae* resistant to carbapenems.

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



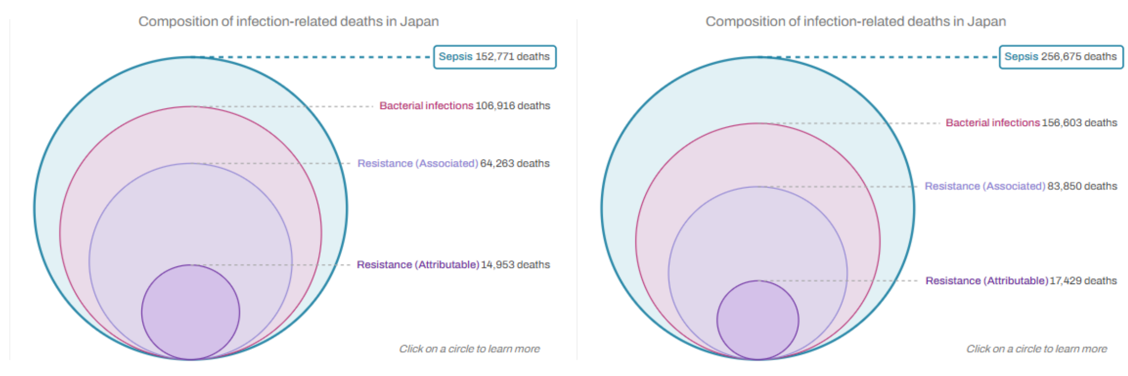
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Japan, a 10% reduction means to decrease the number of deaths associated with AMR to **78,500**, but currently the trend for this country could reach up to **93,900 UI [67,500-117,000]** AMR-associated deaths in 2030.

AMR in Japan

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 Japan between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)]
- In **Japan** in 2021, there were an estimated **17,400 UI (14,600-20,200)** deaths attributable to AMR and **83,900 UI (70,300-97,400)** 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, **Japan has the 15th 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 45,000 UI (37,700-52,300) ↑	Staphylococcus aureus 29,200 UI (24,500-34,000) ↑	Staphylococcus aureus 7,380 UI (6,130-8,630) ↑
2	Escherichia coli 23,600 UI (19,600-27,700) ↑	Escherichia coli 15,500 UI (12,800-18,300) ↑	Escherichia coli 2,900 UI (2,250-3,550) ↑
3	Streptococcus pneumoniae 18,600 UI (15,700-21,600) ↓	Streptococcus pneumoniae 14,000 UI (11,800-16,200) ↓	Streptococcus pneumoniae 2,070 UI (1,670-2,470) ↓
4	Pseudomonas aeruginosa 15,200 UI (12,800-17,600) ↑	Pseudomonas aeruginosa 6,240 UI (5,110-7,380) ↑	Pseudomonas aeruginosa 1,630 UI (1,240-2,020) ↑
5	Klebsiella pneumoniae 11,600 UI (9,690-13,500) ↑	Enterococcus faecium 3,860 UI (3,210-4,500) ↑	Klebsiella pneumoniae 737 UI (583-891) ↓
6	Acinetobacter baumannii 4,770 UI (4,050-5,490) ↓	Klebsiella pneumoniae 3,360 UI (2,740-3,980) ↓	Enterococcus faecium 485 UI (288-682) ↑
7	Enterococcus faecalis 4,520 UI (3,780-5,250) ↑	Proteus spp. 2,050 UI (1,670-2,440) ↑	Acinetobacter baumannii 466 UI (333-599) ↓
8	Group A Streptococcus 4,330 UI (3,590-5,070) ↑	Haemophilus influenzae 1,780 UI (1,500-2,070) ↑	Enterobacter spp. 356 UI (293-419) ↓
9	Enterococcus faecium 4,250 UI (3,530-4,960) ↑	Enterobacter spp. 1,370 UI (1,150-1,600) ↓	Proteus spp. 307 UI (234-379) ↑
10	Proteus spp. 4,190 UI (3,450-4,930) ↑	Acinetobacter baumannii 1,340 UI (890-1,790) ↓	Haemophilus influenzae 251 UI (194-308) ↑

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%

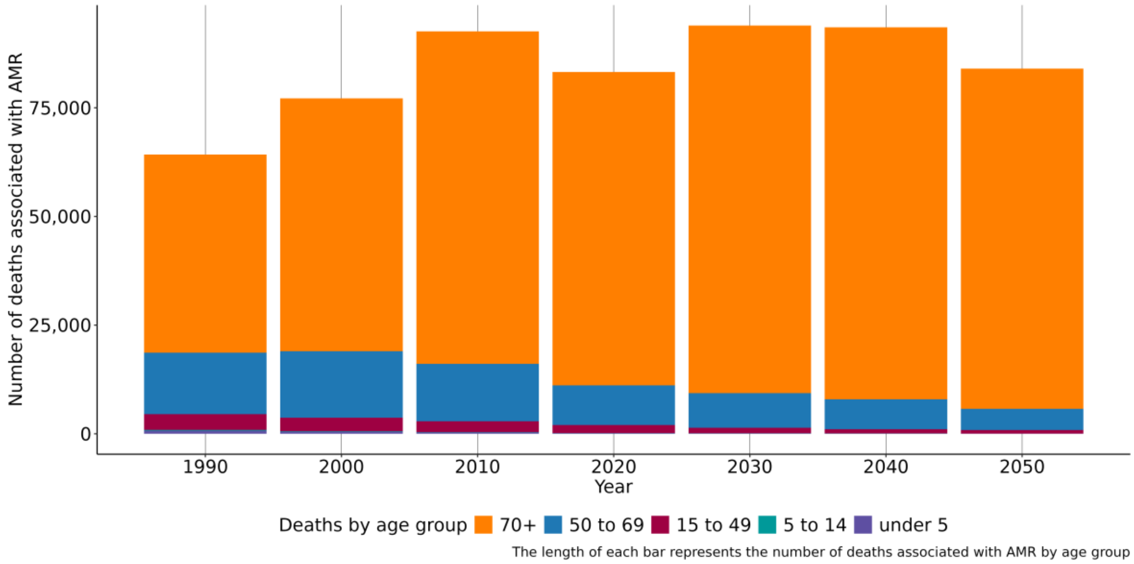
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
1	Staphylococcus aureus Methicillin	21,300 UI (17,200-25,300) ↑	Staphylococcus aureus Methicillin	5,080 UI (4,020-6,150) ↑
2	Staphylococcus aureus Fluoroquinolones	20,400 UI (16,600-24,200) ↑	Staphylococcus aureus Fluoroquinolones	1,360 UI (537-2,180) ↑
3	Staphylococcus aureus Macrolides	19,500 UI (15,900-23,000) ↑	Streptococcus pneumoniae Carbapenems	1,150 UI (828-1,480) ↓
4	Streptococcus pneumoniae Macrolides	13,300 UI (11,100-15,400) ↓	Escherichia coli Fluoroquinolones	996 UI (595-1,400) ↑
5	Escherichia coli Aminopenicillin	12,000 UI (9,620-14,400) ↑	Pseudomonas aeruginosa Carbapenems	858 UI (568-1,150) ↑
6	Escherichia coli Fluoroquinolones	11,100 UI (8,980-13,200) ↑	Staphylococcus aureus Macrolides	767 UI (491-1,040) ↑
7	Escherichia coli Beta-Lactam/Lactamase Inhib.	6,560 UI (5,250-7,860) ↑	Streptococcus pneumoniae Macrolides	586 UI (344-829) ↓
8	Streptococcus pneumoniae TMP-SMX	5,730 UI (3,540-7,920) ↓	Escherichia coli 3GC	570 UI (338-802) ↑
9	Escherichia coli TMP-SMX	5,720 UI (4,690-6,750) ↑	Enterococcus faecium Fluoroquinolones	435 UI (238-633) ↑
10	Escherichia coli 3GC	5,000 UI (3,990-6,010) ↑	Escherichia coli Aminopenicillin	424 UI (270-577) ↑

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) (107,000 UI (89,400-124,000)), bloodstream infections (62,600 UI (52,800-72,500)), peritoneal and intra-abdominal infections (28,200 UI (23,300-33,200)), urinary tract infections and pyelonephritis (16,100 UI (12,800-19,500)) and endocarditis (6,090 UI (4,830-7,340)).

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



- In Japan, 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 73,200 UI (60,000-86,400), whereas the mortality rate per 100,000 was 253 UI (208-299).

Data sources for Japan

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 Japan by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	2010-2021	386,559	Isolates
Microbial or laboratory data with outcome	2010-2021	1,273	Isolates
Literature studies	1990-2021	25,697	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	120,978,298	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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