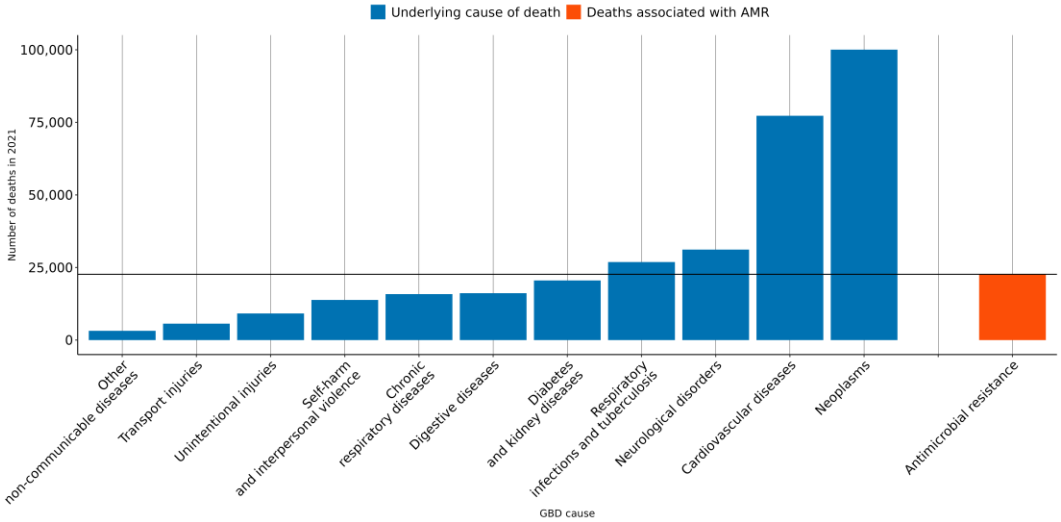
The burden of antimicrobial resistance (AMR) in the Republic of Korea

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **5,000 lives** have been lost each year since 1990 in the Republic of Korea due to AMR.
- In 2021, there were an estimated **5,820 UI (4,860-6,780)** deaths attributable to AMR and **22,700 UI (19,300-26,000)** 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 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



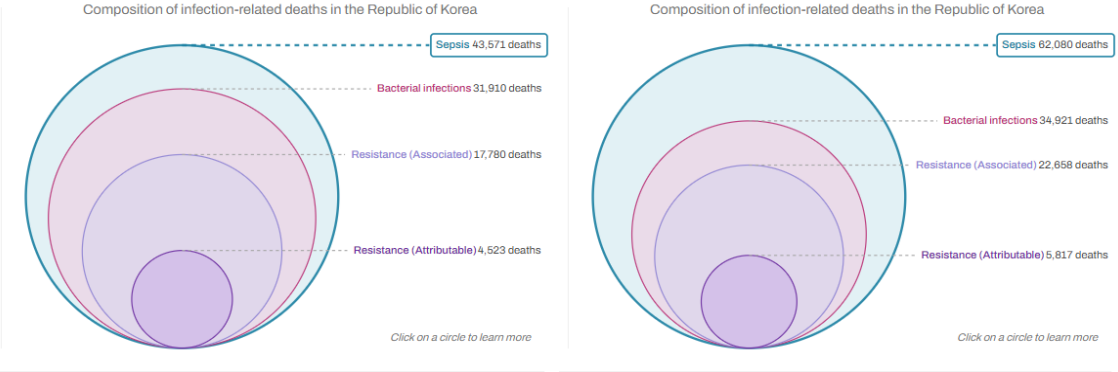
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 the S Korea, a 10% reduction means to decrease the number of deaths associated with AMR to **20,200**, but currently the trend for this country could reach up to **32,400 UI [24,600-38,800]** AMR-associated deaths in 2030.

AMR in the Republic of Korea

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 Republic of Korea 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 Republic of Korea** in 2021, there were an estimated **5,820 UI (4,860-6,780)** deaths attributable to AMR and **22,700 UI (19,300-26,000)** 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, **the Republic of Korea has the 30th 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 8,910 UI (7,730-10,100) ↑	Staphylococcus aureus 6,540 UI (5,450-7,620) ↑	Staphylococcus aureus 1,860 UI (1,470-2,240) ↑
2	Escherichia coli 5,090 UI (4,350-5,820) ↑	Escherichia coli 4,230 UI (3,620-4,840) ↑	Streptococcus pneumoniae 1,140 UI (913-1,360) ↓
3	Streptococcus pneumoniae 4,280 UI (3,630-4,940) ↓	Streptococcus pneumoniae 3,820 UI (3,210-4,420) ↓	Escherichia coli 821 UI (662-979) ↑
4	Pseudomonas aeruginosa 3,120 UI (2,720-3,530) ↑	Pseudomonas aeruginosa 1,920 UI (1,610-2,230) ↓	Pseudomonas aeruginosa 493 UI (387-599) ↓
5	Mycobacterium tuberculosis 2,660 UI (2,150-3,170) ↓	Klebsiella pneumoniae 1,320 UI (1,120-1,520) ↓	Acinetobacter baumannii 442 UI (385-499) ↓
6	Klebsiella pneumoniae 2,370 UI (2,030-2,710) ↓	Acinetobacter baumannii 1,090 UI (959-1,230) ↓	Klebsiella pneumoniae 329 UI (273-386) ↓
7	Acinetobacter baumannii 1,140 UI (999-1,280) ↓	Enterococcus faecium 882 UI (761-1,000) ↑	Enterococcus faecium 211 UI (170-253) ↑
8	Enterococcus faecalis 1,110 UI (964-1,260) ↑	Enterobacter spp. 510 UI (439-580) ↓	Enterobacter spp. 131 UI (110-152) ↓
9	Group A Streptococcus 1,010 UI (861-1,170) ↑	Proteus spp. 505 UI (377-633) ↑	Proteus spp. 72 UI (48-97) ↑
10	Enterococcus faecium 928 UI (801-1,050) ↑	Enterococcus faecalis 399 UI (334-464) ↑	Enterococcus faecalis 68 UI (44-91) ↓

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%

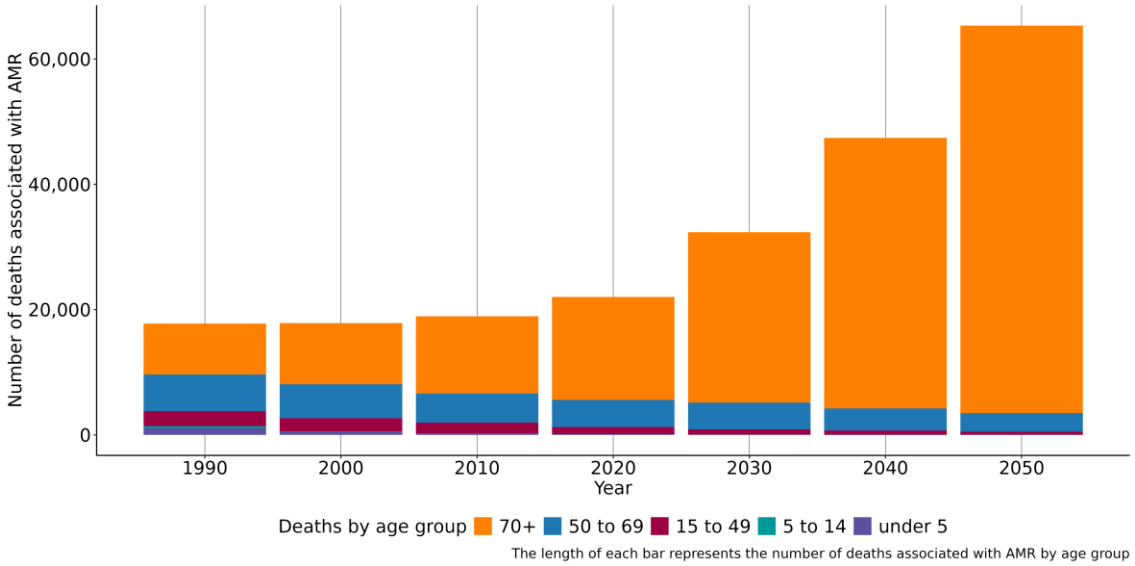
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
1	Staphylococcus aureus Methicillin	5,620 UI (4,210-7,030) ↑	Staphylococcus aureus Methicillin	1,380 UI (1,040-1,710) ↑
2	Staphylococcus aureus Macrolides	4,440 UI (3,710-5,180) ↑	Streptococcus pneumoniae Carbapenems	923 UI (717-1,130) ↑
3	Staphylococcus aureus Fluoroquinolones	4,250 UI (3,500-5,000) ↑	Staphylococcus aureus Fluoroquinolones	262 UI (116-409) ↑
4	Escherichia coli Aminopenicillin	3,880 UI (3,300-4,460) ↑	Acinetobacter baumannii Carbapenems	234 UI (185-283) ↑
5	Streptococcus pneumoniae Macrolides	3,290 UI (2,750-3,830) ↓	Pseudomonas aeruginosa Carbapenems	226 UI (154-298) ↑
6	Streptococcus pneumoniae Carbapenems	3,270 UI (2,700-3,850) ↑	Escherichia coli Fluoroquinolones	216 UI (124-308) ↑
7	Escherichia coli Fluoroquinolones	3,000 UI (2,500-3,500) ↑	Escherichia coli 3GC	168 UI (99-238) ↑
8	Escherichia coli TMP-SMX	2,160 UI (1,790-2,520) ↑	Staphylococcus aureus Macrolides	167 UI (110-223) ↑
9	Streptococcus pneumoniae TMP-SMX	2,030 UI (1,470-2,590) ↓	Pseudomonas aeruginosa Fluoroquinolones	141 UI (94-187) ↑
10	Escherichia coli Beta-Lactam/Lactamase Inhib.	1,830 UI (1,480-2,190) ↑	Enterococcus faecium Vancomycin	135 UI (107-162) ↑

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) (19,700 UI (16,300-23,100)), bloodstream infections (15,000 UI (13,200-16,700)), peritoneal and intra-abdominal infections (6,020 UI (5,100-6,930)), tuberculosis (2,660 UI (2,150-3,170)) and urinary tract infections and pyelonephritis (2,320 UI (1,390-3,250)).

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



- In the Republic of Korea, 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 16,900 UI (13,900-19,900), whereas the mortality rate per 100,000 was 305 UI (251-360).

Data sources for the Republic of Korea

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 Republic of Korea by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2021	666,406	Isolates
Literature studies	1990-2021	1,491,681	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	509,912	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:

- For inquiries about the analysis and questions from government officials, health departments, or research institutions: engage@healthdata.org
- For media-related inquiries: media@healthdata.org
- **Bluesky**: @ihmeuw.bsky.social
- **Twitter**: @IHME_UW
- **Facebook**: https://www.facebook.com/IHMEUW
- **LinkedIn**: https://www.linkedin.com/company/institute-for-health-metrics-and-evaluation