# The burden of antimicrobial resistance (AMR) in Bangladesh

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **30,000 lives** have been lost each year since 1990 in Bangladesh due to AMR.

- In 2021, there were an estimated **23,500 UI (17,900-29,000)** deaths attributable to AMR and **96,900 UI (76,500-117,000)** 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, *Klebsiella pneumoniae* resistant to carbapenems and *Acinetobacter baumannii* resistant to carbapenems.

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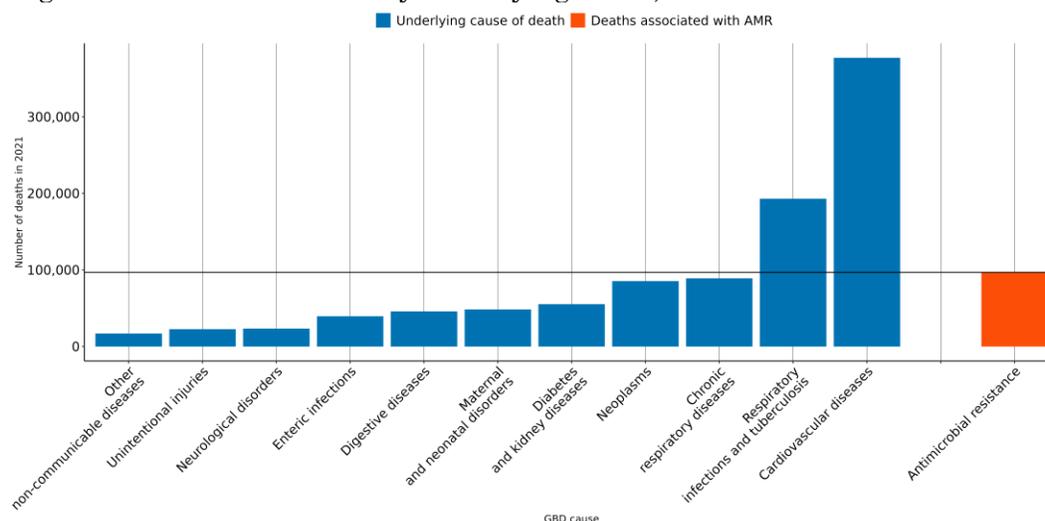

- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Bangladesh, a 10% reduction means to decrease the number of deaths associated with AMR to **92,100**, but currently the trend for this country could reach up to **110,000 UI [81,700-143,000]** AMR-associated deaths in 2030.

AMR in Bangladesh

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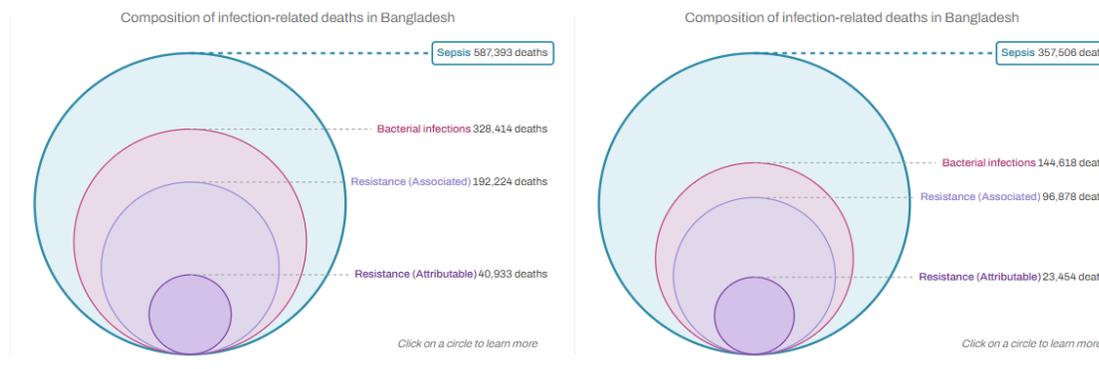
- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)](#)

- In **Bangladesh** in 2021, there were an estimated **23,500 UI (17,900-29,000)** deaths attributable to AMR and **96,900 UI (76,500-117,000)** 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, **Bangladesh has the 77th highest** 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	Mycobacterium tuberculosis 29,800 UI (22,000-37,700) ↓	Escherichia coli 15,300 UI (12,000-18,600) ↓	Escherichia coli 4,080 UI (3,180-4,990) ↑
2	Staphylococcus aureus 16,200 UI (13,000-19,500) ↑	Staphylococcus aureus 14,500 UI (11,300-17,800) ↑	Klebsiella pneumoniae 3,880 UI (3,010-4,760) ↓
3	Escherichia coli 16,100 UI (12,600-19,500) ↓	Klebsiella pneumoniae 12,300 UI (9,710-14,900) ↓	Staphylococcus aureus 3,440 UI (2,490-4,390) ↑
4	Klebsiella pneumoniae 14,000 UI (11,200-16,900) ↓	Streptococcus pneumoniae 10,900 UI (8,340-13,400) ↓	Acinetobacter baumannii 3,370 UI (2,700-4,050) ↓
5	Streptococcus pneumoniae 13,000 UI (10,500-15,500) ↓	Acinetobacter baumannii 8,620 UI (6,810-10,400) ↓	Streptococcus pneumoniae 1,970 UI (1,200-2,730) ↓
6	Pseudomonas aeruginosa 11,600 UI (9,300-14,000) ↓	Salmonella Typhi 7,700 UI (3,310-12,100) ↓	Pseudomonas aeruginosa 1,770 UI (1,110-2,430) ↓
7	Acinetobacter baumannii 8,890 UI (7,050-10,700) ↓	Pseudomonas aeruginosa 7,120 UI (4,970-9,280) ↓	Salmonella Typhi 811 UI (155-1,470) ↓
8	Salmonella Typhi 8,000 UI (3,470-12,500) ↓	Mycobacterium tuberculosis 2,580 UI (728-5,800) ↑	Enterobacter spp. 789 UI (603-974) ↓
9	Group B Streptococcus 3,210 UI (2,400-4,020) ↓	Enterobacter spp. 2,490 UI (1,940-3,040) ↓	Mycobacterium tuberculosis 784 UI (0-2,230) ↑
10	Enterobacter spp. 3,040 UI (2,400-3,670) ↓	Serratia spp. 2,110 UI (1,530-2,690) ↓	Serratia spp. 480 UI (332-629) ↓

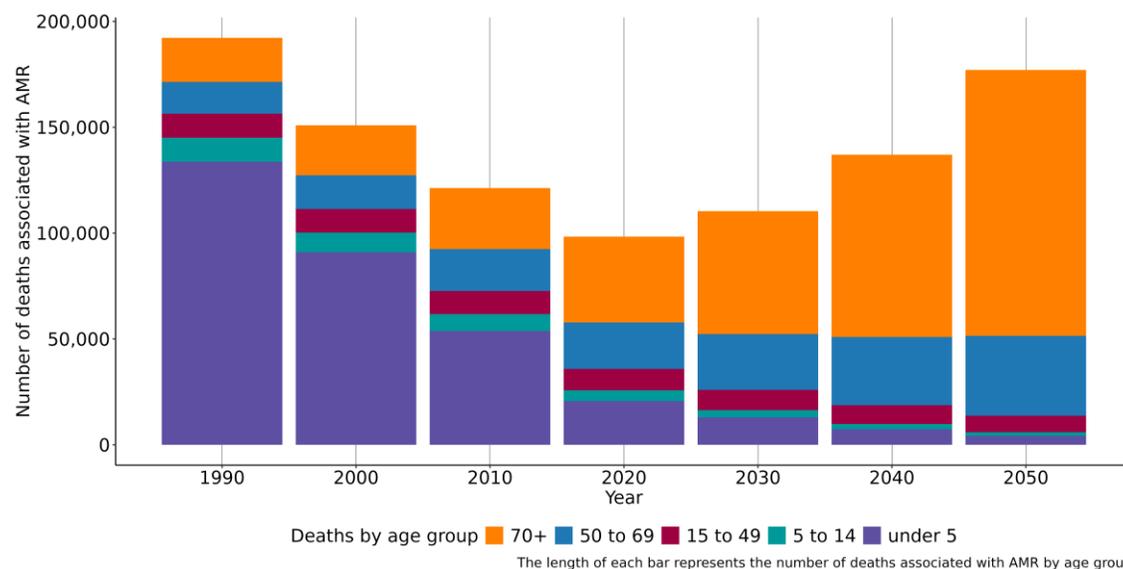Annualized rate of change (1990-2021): <-3% | -3% to -1.5% | -1.5% to 0% | 0% to 1.5% | 1.5% to 3% | 3% to 5% | >5.0%

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

Burden Rank	Associated	Attributable
1	Escherichia coli Aminopenicillin 14,300 UI (11,100-17,500) ↓	Staphylococcus aureus Methicillin 1,950 UI (1,220-2,670) ↑
2	Escherichia coli Fluoroquinolones 12,300 UI (9,390-15,100) ↓	Klebsiella pneumoniae Carbapenems 1,510 UI (1,060-1,960) ↓
3	Escherichia coli 3GC 11,900 UI (9,070-14,800) ↑	Acinetobacter baumannii Carbapenems 1,420 UI (973-1,880) ↓
4	Staphylococcus aureus Macrolides 11,900 UI (9,220-14,600) ↑	Escherichia coli Carbapenems 1,360 UI (914-1,800) ↑
5	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. 11,700 UI (9,030-14,400) ↓	Streptococcus pneumoniae Carbapenems 1,040 UI (535-1,550) ↓
6	Klebsiella pneumoniae 3GC 10,700 UI (8,410-13,000) ↓	Acinetobacter baumannii Fluoroquinolones 812 UI (635-989) ↓
7	Escherichia coli TMP-SMX 10,700 UI (8,110-13,200) ↓	Escherichia coli Fluoroquinolones 809 UI (528-1,090) ↑
8	Streptococcus pneumoniae TMP-SMX 10,000 UI (7,440-12,600) ↓	Escherichia coli 3GC 785 UI (452-1,120) ↑
9	Klebsiella pneumoniae Aminoglycosides 9,780 UI (7,490-12,100) ↓	Klebsiella pneumoniae Fluoroquinolones 766 UI (517-1,010) ↓
10	Klebsiella pneumoniae Fluoroquinolones 9,690 UI (7,440-11,900) ↓	Mycobacterium tuberculosis MDR excluding XDR 740 UI (0-2,130) ↑

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) bloodstream infections (60,100 UI (47,100-73,100)), lower respiratory infection (excl. COVID) (56,400 UI (45,000-67,900)), diarrhea (30,600 UI (4,340-56,900)), tuberculosis (29,800 UI (22,000-37,700)) and typhoid fever, paratyphoid fever, and invasive non-typhoidal salmonella (9,070 UI (4,500-13,600)).

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 Bangladesh, 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 41,100 UI (32,900-49,400), whereas the mortality rate per 100,000 was 558 UI (446-670).

Data sources for Bangladesh

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 Bangladesh by source type

Source type	Years	Sample size	Sample size units
Mortality surveillance (Minimally invasive tissue sampling [MITS])	2010-2021	80	Deaths
Antibiotic use	1990-2021	6,040	Study-year datapoints
Microbial or laboratory data without outcome	2010-2021	4,974	Isolates
Microbial or laboratory data with outcome	2010-2021	27,832	Isolates
Literature studies	1990-2021	63,550	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	6,449	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