# The burden of antimicrobial resistance (AMR) in Nigeria

## Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **60,000 lives** have been lost each year since 1990 in Nigeria due to AMR.

- In 2021, there were an estimated **50,500 UI (36,900-64,100)** deaths attributable to AMR and **227,000 UI (167,000-286,000)** deaths associated with AMR in this location.

- The largest number of deaths associated with AMR in 2021 occurred among those aged **under 5** 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 third-generation cephalosporins.

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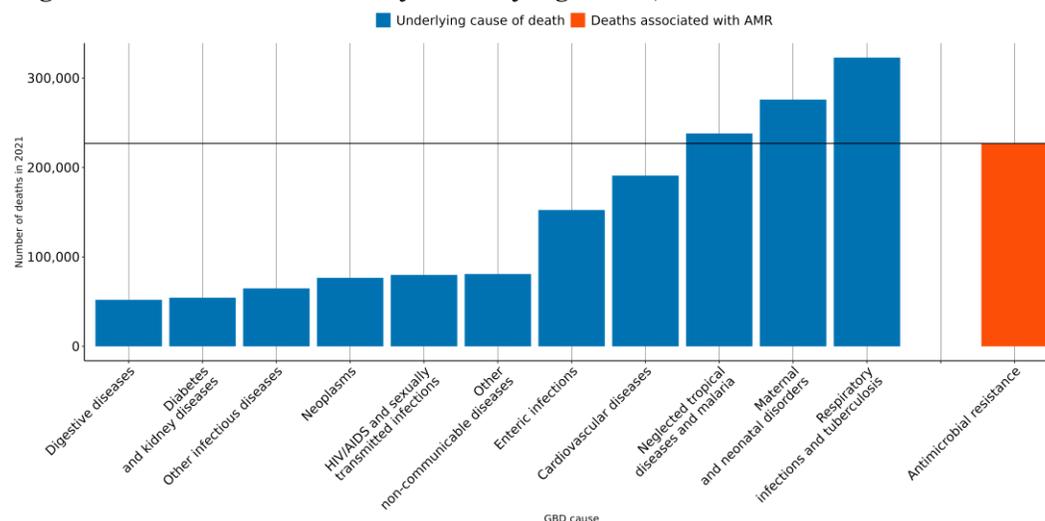


- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Nigeria, a 10% reduction means to decrease the number of deaths associated with AMR to **231,000**, but currently the trend for this country could reach up to **249,000 UI [171,000-351,000]** AMR-associated deaths in 2030.

# AMR in Nigeria

## 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 Nigeria between 1990 and 2019.
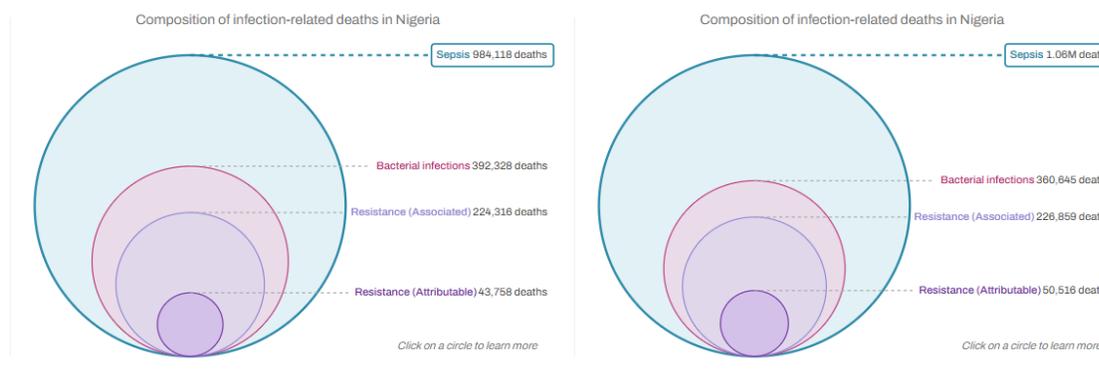


- To look at these and more visualization interactively visit Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)

- In **Nigeria** in 2021, there were an estimated **50,500 UI (36,900-64,100)** deaths attributable to AMR and **227,000 UI (167,000-286,000)** 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, **Nigeria has the 30th 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 | Streptococcus pneumoniae 59,600 UI (41,200-77,900) | ↓ | Streptococcus pneumoniae 51,000 UI (34,000-68,000) | ↓ | Streptococcus pneumoniae 9,910 UI (6,220-13,600) | ↓ |
| 2 | Mycobacterium tuberculosis 48,200 UI (35,300-61,100) | ↓ | Escherichia coli 36,300 UI (25,900-46,700) | ↓ | Klebsiella pneumoniae 8,620 UI (6,590-10,600) | ↑ |
| 3 | Escherichia coli 39,200 UI (28,100-50,300) | ↓ | Klebsiella pneumoniae 35,500 UI (28,000-43,000) | ↑ | Escherichia coli 7,300 UI (4,790-9,810) | ↓ |
| 4 | Klebsiella pneumoniae 38,300 UI (30,400-46,200) | ↑ | Acinetobacter baumannii 17,100 UI (13,300-20,900) | ↑ | Acinetobacter baumannii 6,470 UI (5,160-7,780) | ↑ |
| 5 | Pseudomonas aeruginosa 24,600 UI (19,500-29,600) | ↑ | Pseudomonas aeruginosa 16,900 UI (12,700-21,200) | ↑ | Staphylococcus aureus 4,600 UI (3,370-5,840) | ↑ |
| 6 | Non-typhoidal Salmonella 24,500 UI (11,000-37,900) | ↑ | Staphylococcus aureus 16,800 UI (12,300-21,300) | ↑ | Pseudomonas aeruginosa 4,280 UI (3,010-5,550) | ↑ |
| 7 | Staphylococcus aureus 22,700 UI (18,300-27,100) | ↑ | Shigella spp. 11,200 UI (4,340-18,100) | ↑ | Enterobacter spp. 1,380 UI (1,090-1,660) | ↑ |
| 8 | Shigella spp. 21,500 UI (11,400-31,600) | ↓ | Non-typhoidal Salmonella 6,040 UI (2,440-9,650) | ↑ | Mycobacterium tuberculosis 1,340 UI (0-4,060) | ↑ |
| 9 | Acinetobacter baumannii 21,000 UI (16,900-25,100) | ↑ | Group B Streptococcus 5,950 UI (4,100-7,800) | ↑ | Shigella spp. 1,180 UI (58-2,310) | ↑ |
| 10 | Group B Streptococcus 13,000 UI (9,960-16,100) | ↑ | Enterobacter spp. 5,040 UI (4,020-6,060) | ↑ | Serratia spp. 1,090 UI (768-1,400) | ↓ |

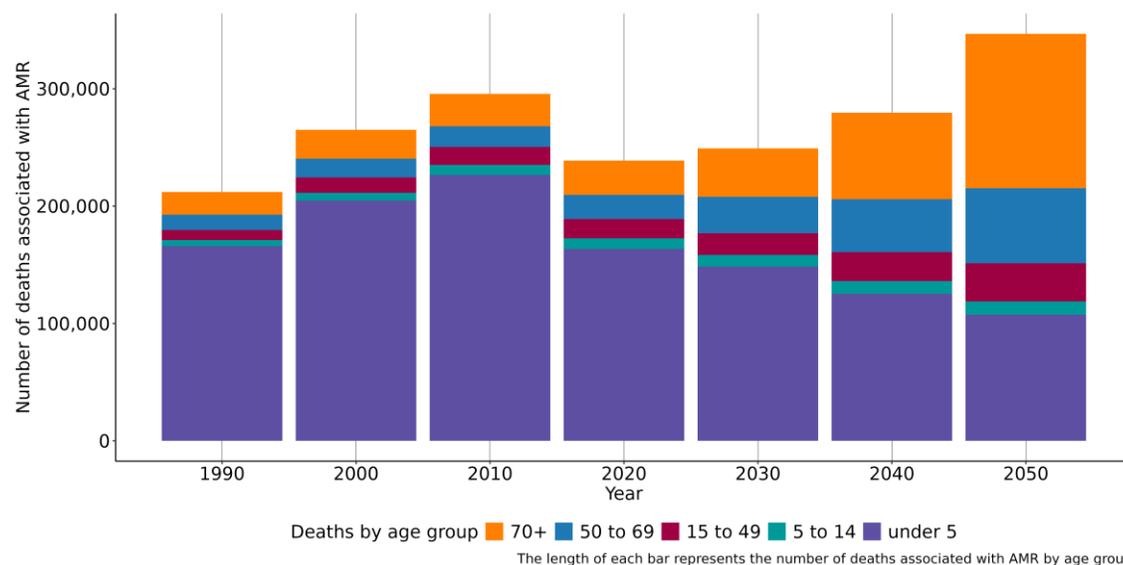Annualized rate of change (1990-2021): <-3% | -3% to -1.5% | -1.5% to 0% | 0% to 1.5% | 1.5% to 3% | 3% to 5% | >5.0%

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

| Burden Rank | Associated | | | Attributable | | |
|---|---|---|---|---|---|---|
| 1 | Streptococcus pneumoniae TMP-SMX | 45,500 UI (29,700-61,400) | ↓ | Streptococcus pneumoniae 3GC | 3,290 UI (1,870-4,720) | ↑ |
| 2 | Klebsiella pneumoniae TMP-SMX | 34,700 UI (27,400-42,000) | ↑ | Staphylococcus aureus Methicillin | 2,970 UI (2,050-3,890) | ↑ |
| 3 | Escherichia coli TMP-SMX | 32,400 UI (23,300-41,500) | ↓ | Acinetobacter baumannii Carbapenems | 2,260 UI (1,480-3,040) | ↑ |
| 4 | Streptococcus pneumoniae Penicillin | 32,000 UI (18,000-45,900) | ↑ | Klebsiella pneumoniae Fluoroquinolones | 2,140 UI (1,330-2,940) | ↑ |
| 5 | Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. | 31,500 UI (24,200-38,900) | ↑ | Streptococcus pneumoniae Penicillin | 2,010 UI (1,150-2,870) | ↑ |
| 6 | Escherichia coli Aminopenicillin | 30,400 UI (18,500-42,200) | ↓ | Streptococcus pneumoniae Fluoroquinolones | 1,930 UI (678-3,190) | ↓ |
| 7 | Klebsiella pneumoniae Fluoroquinolones | 27,600 UI (21,100-34,000) | ↑ | Acinetobacter baumannii Fluoroquinolones | 1,860 UI (1,450-2,270) | ↑ |
| 8 | Klebsiella pneumoniae 3GC | 27,300 UI (21,200-33,400) | ↑ | Klebsiella pneumoniae 3GC | 1,820 UI (986-2,660) | ↑ |
| 9 | Escherichia coli Fluoroquinolones | 26,800 UI (18,600-35,000) | ↑ | Escherichia coli Fluoroquinolones | 1,720 UI (943-2,500) | ↑ |
| 10 | Klebsiella pneumoniae Aminoglycosides | 22,900 UI (17,100-28,700) | ↑ | Escherichia coli 3GC | 1,700 UI (457-2,950) | ↑ |

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) (161,000 UI (117,000-205,000)), bloodstream infections (157,000 UI (123,000-190,000)), diarrhea (135,000 UI (95,700-174,000)), tuberculosis (48,200 UI (35,300-61,100)) and meningitis (36,500 UI (19,400-53,600)).

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 Nigeria, people aged under 5 saw the largest number of deaths associated with AMR both in 1990 and 2021, which indicates that under 5 continues to be particularly vulnerable to infections which are resistant to antibiotics. In 2021, the number of deaths associated with AMR among the under 5 was 152,000 UI (105,000-199,000), whereas the mortality rate per 100,000 was 763 UI (631-896).

**Data sources for Nigeria**

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 Nigeria by source type

| Source type | Years | Sample size | Sample size units |
|---|---|---|---|
| Antibiotic use | 1990-2021 | 8,495 | Study-year datapoints |
| Microbial or laboratory data without outcome | 2010-2021 | 129,977 | Isolates |
| Literature studies | 1990-2021 | 134,503 | Cases/isolates/susceptibility tests |
| Single drug resistance profile data | 2010-2021 | 2,158 | 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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