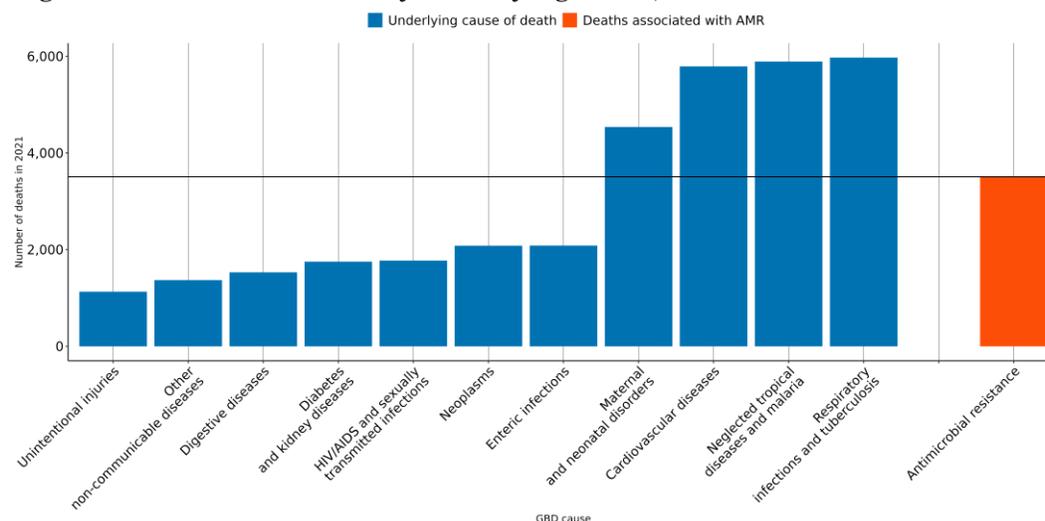


The burden of antimicrobial resistance (AMR) in Liberia

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **1,000 lives** have been lost each year since 1990 in Liberia due to AMR.
- In 2021, there were an estimated **720 UI (458-981)** deaths attributable to AMR and **3,510 UI (2,350-4,670)** 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, *Klebsiella pneumoniae* resistant to beta lactam / beta-lactamase inhibitors and *Streptococcus pneumoniae* resistant to fluoroquinolones.

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



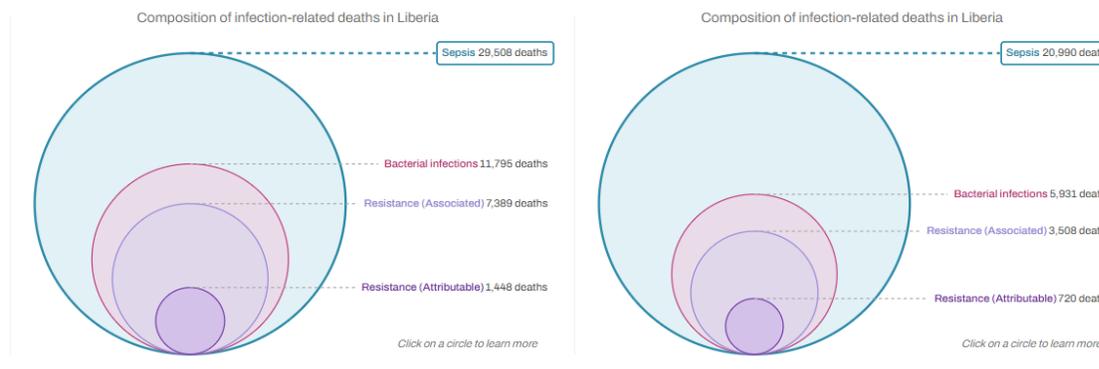
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Liberia, a 10% reduction means to decrease the number of deaths associated with AMR to **3,400**, but currently the trend for this country could reach up to **3,920 UI [2,510-5,950]** AMR-associated deaths in 2030.

AMR in Liberia

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 Liberia between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Liberia** in 2021, there were an estimated **720 UI (458-981)** deaths attributable to AMR and **3,510 UI (2,350-4,670)** 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, **Liberia has the 39th 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)

	Overall susceptible and resistant	Associated	Attributable
Burden rank	Mycobacterium tuberculosis 813 UI (326-1,300) ↓	Streptococcus pneumoniae 684 UI (459-909) ↓	Klebsiella pneumoniae 142 UI (97-188) ↓
	Streptococcus pneumoniae 768 UI (524-1,010) ↓	Escherichia coli 596 UI (370-822) ↓	Escherichia coli 118 UI (65-172) ↓
	Klebsiella pneumoniae 674 UI (478-870) ↓	Klebsiella pneumoniae 596 UI (420-771) ↓	Streptococcus pneumoniae 92 UI (53-132) ↓
	Escherichia coli 647 UI (405-889) ↓	Staphylococcus aureus 307 UI (180-435) ↓	Acinetobacter baumannii 90 UI (62-118) ↓
	Staphylococcus aureus 509 UI (365-653) ↑	Pseudomonas aeruginosa 274 UI (176-371) ↓	Staphylococcus aureus 66 UI (33-99) ↓
	Pseudomonas aeruginosa 467 UI (334-601) ↓	Acinetobacter baumannii 255 UI (163-347) ↓	Pseudomonas aeruginosa 65 UI (39-91) ↓
	Acinetobacter baumannii 397 UI (281-513) ↓	Serratia spp. 107 UI (73-140) ↓	Serratia spp. 31 UI (21-40) ↓
	Non-typhoidal Salmonella 338 UI (143-534) ↑	Shigella spp. 102 UI (7-198) ↓	Enterobacter spp. 28 UI (20-37) ↓
	Shigella spp. 224 UI (61-388) ↓	Group B Streptococcus 100 UI (64-136) ↓	Citrobacter spp. 14 UI (9-19) ↓
	Group B Streptococcus 206 UI (138-275) ↓	Enterobacter spp. 93 UI (66-119) ↓	Group B Streptococcus 12 UI (6-18) ↓

Annualized rate of change (1990-2021):
 <-3% (dark blue), -1.5% to 0% (light blue), 1.5% to 3% (medium blue), >5.0% (lightest blue)
 -3% to -1.5% (darker blue), 0% to 1.5% (orange), 3% to 5% (yellow)

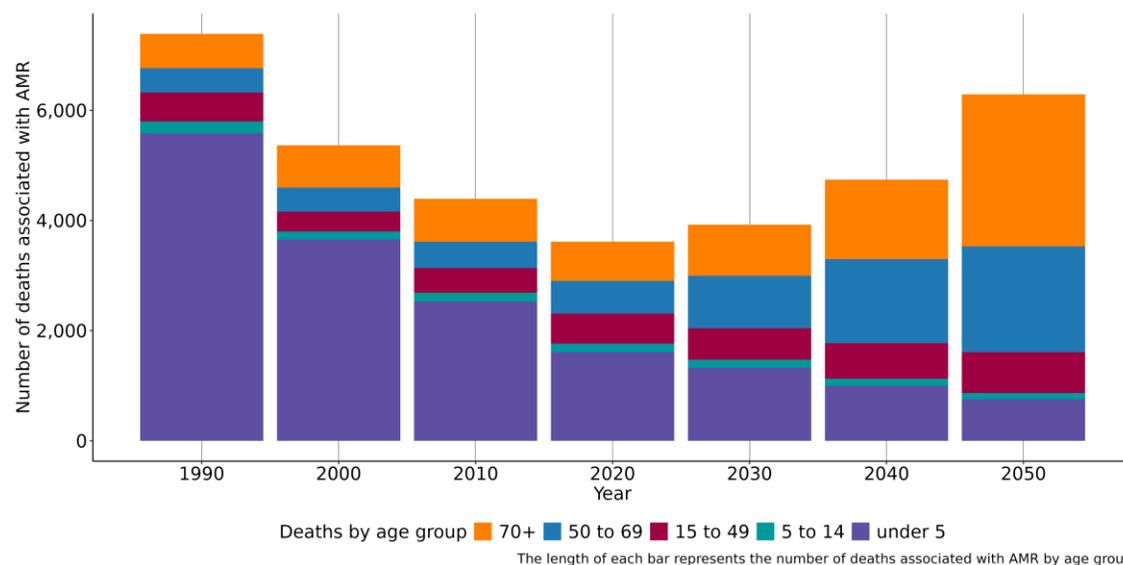
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

	Associated	Attributable
Burden Rank	Escherichia coli Aminopenicillin 585 UI (341-828) ↓	Staphylococcus aureus Methicillin 32 UI (9-56) ↓
	Streptococcus pneumoniae Macrolides 558 UI (369-748) ↓	Streptococcus pneumoniae Fluoroquinolones 29 UI (7-50) ↓
	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. 554 UI (385-724) ↓	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. 28 UI (10-47) ↓
	Streptococcus pneumoniae TMP-SMX 543 UI (339-746) ↓	Klebsiella pneumoniae Fluoroquinolones 26 UI (15-38) ↓
	Klebsiella pneumoniae TMP-SMX 525 UI (368-682) ↓	Klebsiella pneumoniae Aminoglycosides 26 UI (16-36) ↓
	Escherichia coli TMP-SMX 496 UI (313-680) ↓	Klebsiella pneumoniae TMP-SMX 22 UI (11-34) ↓
	Escherichia coli Beta-Lactam/Lactamase Inhib. 416 UI (255-577) ↓	Acinetobacter baumannii Fluoroquinolones 22 UI (16-29) ↓
	Klebsiella pneumoniae Aminoglycosides 402 UI (274-531) ↓	Klebsiella pneumoniae Carbapenems 22 UI (14-29) ↑
	Klebsiella pneumoniae Fluoroquinolones 374 UI (242-506) ↓	Escherichia coli Beta-Lactam/Lactamase Inhib. 22 UI (0-46) ↓
	Escherichia coli Fluoroquinolones 323 UI (113-533) ↓	Escherichia coli Fluoroquinolones 21 UI (8-35) ↓

Annualized rate of change (1990-2021):
 <-3% (dark blue), -1.5% to 0% (light blue), 1.5% to 3% (medium blue), >5.0% (lightest blue)
 -3% to -1.5% (darker blue), 0% to 1.5% (orange), 3% to 5% (yellow)

- 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 (3,000 UI (2,090-3,900)), lower respiratory infection (excl. COVID) (2,460 UI (1,710-3,200)), diarrhea (1,730 UI (863-2,590)), tuberculosis (813 UI (326-1,300)) and meningitis (478 UI (241-714)).

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



- In Liberia, 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 1,510 UI (930-2,080), whereas the mortality rate per 100,000 was 873 UI (655-1,090).

Data sources for Liberia

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 Liberia by source type

Source type	Years	Sample size	Sample size units
Antibiotic use	1990-2021	709	Study-year datapoints
Literature studies	1990-2009	236	Cases/isolates/susceptibility tests

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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- **LinkedIn:** <https://www.linkedin.com/company/institute-for-health-metrics-and-evaluation>