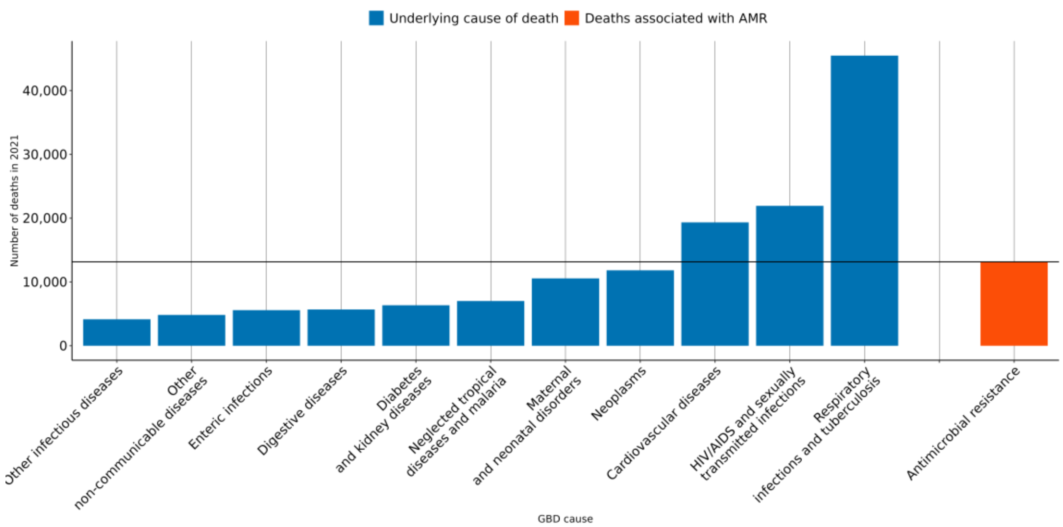
The burden of antimicrobial resistance (AMR) in Zambia

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **4,000 lives** have been lost each year since 1990 in Zambia due to AMR.
- In 2021, there were an estimated **2,990 UI (2,120-3,870)** deaths attributable to AMR and **13,100 UI (9,520-16,800)** 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 *Klebsiella pneumoniae* resistant to third-generation cephalosporins, *Acinetobacter baumannii* resistant to carbapenems and *Streptococcus pneumoniae* resistant to carbapenems.

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



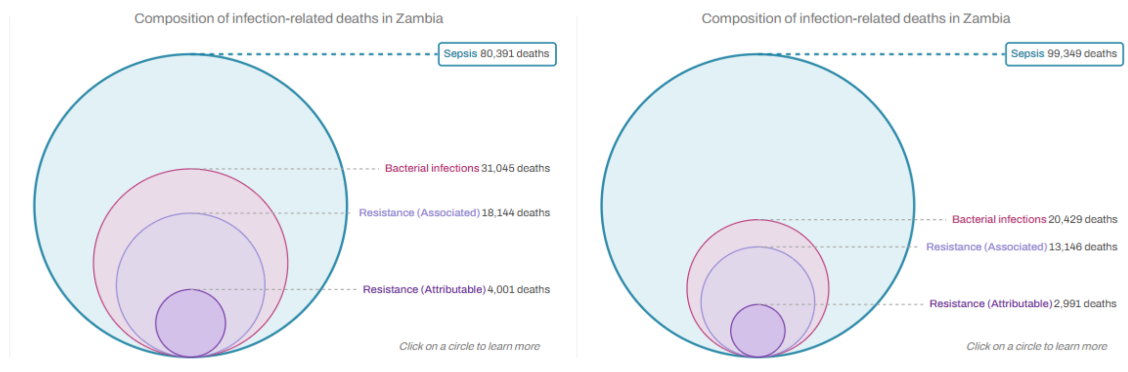
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Zambia, a 10% reduction means to decrease the number of deaths associated with AMR to **13,100**, but currently the trend for this country could reach up to **15,000 UI [10,200-21,700]** AMR-associated deaths in 2030.

AMR in Zambia

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 Zambia between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)]
- In **Zambia** in 2021, there were an estimated **2,990 UI (2,120-3,870)** deaths attributable to AMR and **13,100 UI (9,520-16,800)** 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, **Zambia has the 16th 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	
	Mycobacterium tuberculosis 2,980 UI (1,660-4,300)	↓	Klebsiella pneumoniae 2,550 UI (1,890-3,220)	↓	Klebsiella pneumoniae 602 UI (430-773)	↓
	Klebsiella pneumoniae 2,700 UI (2,010-3,400)	↓	Escherichia coli 2,280 UI (1,640-2,920)	↓	Streptococcus pneumoniae 485 UI (300-671)	↓
	Streptococcus pneumoniae 2,680 UI (2,010-3,350)	↓	Streptococcus pneumoniae 2,210 UI (1,580-2,830)	↓	Escherichia coli 460 UI (302-619)	↓
	Escherichia coli 2,380 UI (1,720-3,040)	↓	Staphylococcus aureus 1,650 UI (1,170-2,130)	↑	Acinetobacter baumannii 386 UI (297-475)	↓
	Staphylococcus aureus 1,910 UI (1,430-2,390)	↑	Acinetobacter baumannii 963 UI (704-1,220)	↓	Staphylococcus aureus 372 UI (256-487)	↑
	Pseudomonas aeruginosa 1,850 UI (1,380-2,310)	↑	Pseudomonas aeruginosa 943 UI (613-1,270)	↓	Pseudomonas aeruginosa 228 UI (137-320)	↓
	Acinetobacter baumannii 1,060 UI (777-1,340)	↓	Group B Streptococcus 318 UI (216-421)	↑	Serratia spp. 90 UI (64-117)	↓
	Group B Streptococcus 807 UI (564-1,050)	↑	Serratia spp. 317 UI (223-410)	↓	Mycobacterium tuberculosis 73 UI (0-253)	↑
	Shigella spp. 495 UI (252-737)	↓	Enterobacter spp. 278 UI (202-353)	↑	Enterobacter spp. 68 UI (49-88)	↑
	Serratia spp. 489 UI (348-629)	↑	Salmonella Typhi 232 UI (47-418)	↑	Haemophilus influenzae 38 UI (15-62)	↓

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%

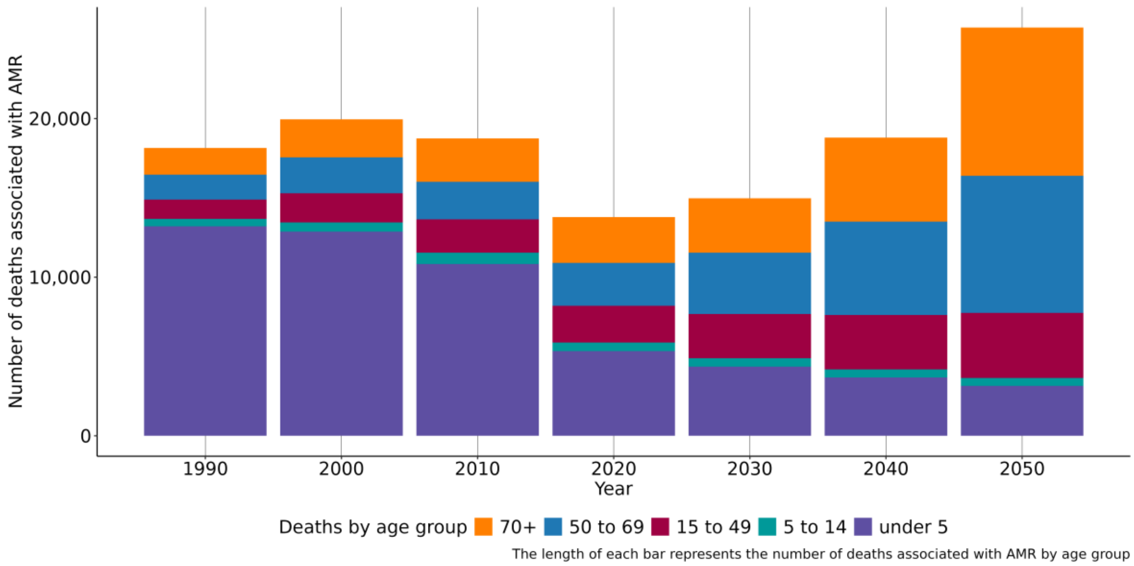
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated			Attributable		
	Klebsiella pneumoniae TMP-SMX	2,530 UI (1,880-3,180)	↓	Streptococcus pneumoniae Carbapenems	295 UI (169-420)	↓
	Klebsiella pneumoniae 3GC	2,320 UI (1,710-2,920)	↑	Klebsiella pneumoniae 3GC	219 UI (115-324)	↑
	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib.	2,220 UI (1,600-2,840)	↑	Acinetobacter baumannii Carbapenems	217 UI (156-279)	↑
	Escherichia coli Aminopenicillin	2,190 UI (1,520-2,870)	↓	Staphylococcus aureus Methicillin	185 UI (105-266)	↑
	Escherichia coli TMP-SMX	2,080 UI (1,500-2,650)	↓	Klebsiella pneumoniae Fluoroquinolones	132 UI (79-184)	↑
	Streptococcus pneumoniae TMP-SMX	2,060 UI (1,450-2,680)	↓	Escherichia coli 3GC	120 UI (53-187)	↑
	Klebsiella pneumoniae Fluoroquinolones	1,790 UI (1,270-2,310)	↑	Klebsiella pneumoniae TMP-SMX	114 UI (55-173)	↓
	Escherichia coli Fluoroquinolones	1,610 UI (1,010-2,200)	↑	Staphylococcus aureus TMP-SMX	113 UI (66-160)	↑
	Escherichia coli Beta-Lactam/Lactamase Inhib.	1,580 UI (1,120-2,030)	↓	Escherichia coli TMP-SMX	102 UI (67-137)	↓
	Escherichia coli 3GC	1,410 UI (888-1,940)	↑	Escherichia coli Fluoroquinolones	98 UI (49-146)	↑

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) (9,810 UI (7,480-12,100)), bloodstream infections (9,450 UI (6,640-12,300)), diarrhea (5,130 UI (3,300-6,970)), tuberculosis (2,980 UI (1,660-4,300)) and meningitis (2,170 UI (1,440-2,900)).

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



- In Zambia, 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 4,820 UI (3,310-6,340), whereas the mortality rate per 100,000 was 1,020 UI (815-1,230).

Data sources for Zambia

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 Zambia by source type

Source type	Years	Sample size	Sample size units
Antibiotic use	1990-2021	1,802	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	3,752	Isolates
Literature studies	1990-2021	428	Cases/isolates/susceptibility tests
Single drug resistance profile data	2010-2021	4,872	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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