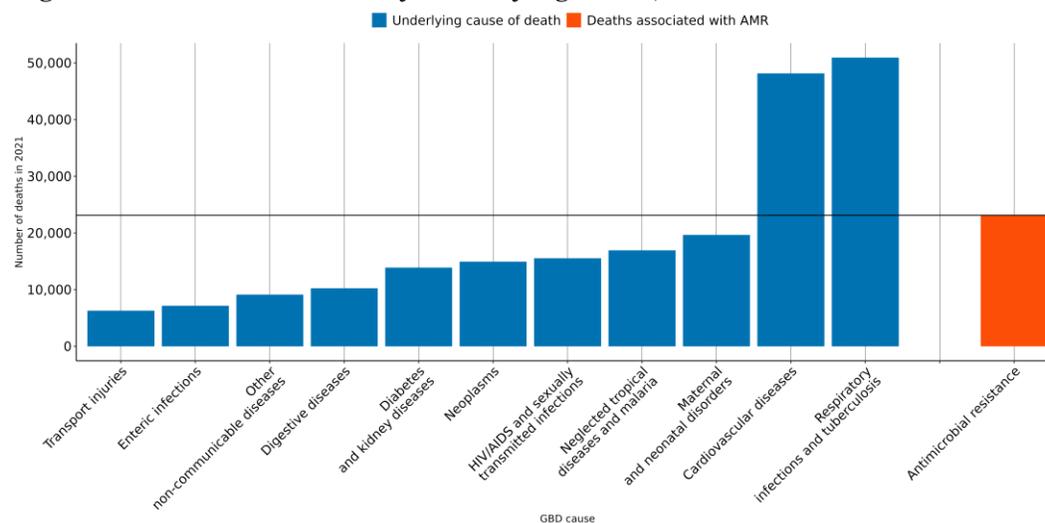


The burden of antimicrobial resistance (AMR) in Ghana

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **5,000 lives** have been lost each year since 1990 in Ghana due to AMR.
- In 2021, there were an estimated **4,910 UI (3,600-6,230)** deaths attributable to AMR and **23,100 UI (17,700-28,500)** 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, *Escherichia coli* resistant to third-generation cephalosporins and *Klebsiella pneumoniae* resistant to third-generation cephalosporins.

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



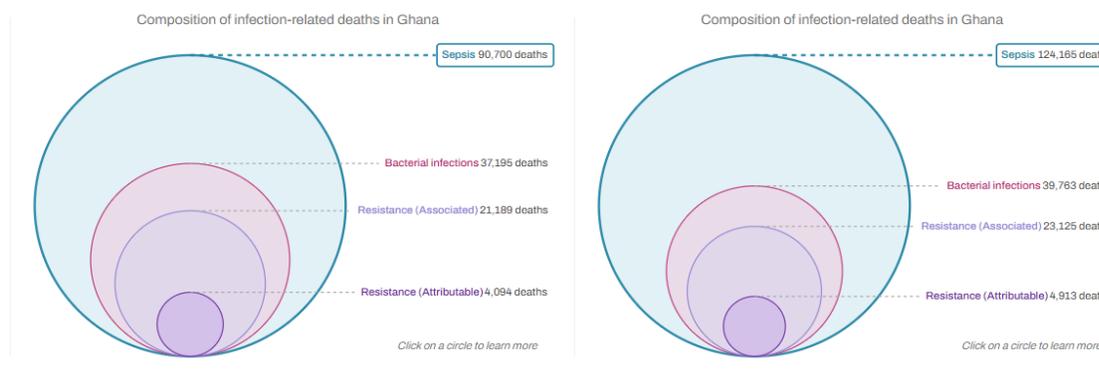
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Ghana, a 10% reduction means to decrease the number of deaths associated with AMR to **23,000**, but currently the trend for this country could reach up to **27,600 UI [19,500-37,000]** AMR-associated deaths in 2030.

AMR in Ghana

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 Ghana between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Ghana** in 2021, there were an estimated **4,910 UI (3,600-6,230)** deaths attributable to AMR and **23,100 UI (17,700-28,500)** 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, **Ghana has the 35th 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	
	Bacteria	Annualized rate of change (1990-2021)	Bacteria	Annualized rate of change (1990-2021)	Bacteria	Annualized rate of change (1990-2021)
	Mycobacterium tuberculosis 8,230 UI (5,660-10,800)	↑	Klebsiella pneumoniae 4,160 UI (3,270-5,050)	↑	Klebsiella pneumoniae 962 UI (712-1,210)	↑
	Klebsiella pneumoniae 4,600 UI (3,630-5,570)	↑	Streptococcus pneumoniae 3,770 UI (2,910-4,630)	↓	Acinetobacter baumannii 702 UI (547-857)	↑
	Streptococcus pneumoniae 4,100 UI (3,190-5,000)	↓	Escherichia coli 3,340 UI (2,650-4,040)	↑	Escherichia coli 695 UI (510-879)	↑
	Staphylococcus aureus 3,840 UI (3,040-4,640)	↑	Staphylococcus aureus 2,220 UI (1,550-2,890)	↑	Streptococcus pneumoniae 521 UI (336-706)	↓
	Escherichia coli 3,540 UI (2,810-4,280)	↑	Pseudomonas aeruginosa 1,960 UI (1,410-2,500)	↑	Staphylococcus aureus 478 UI (315-640)	↑
	Pseudomonas aeruginosa 3,320 UI (2,630-4,010)	↑	Acinetobacter baumannii 1,910 UI (1,430-2,390)	↑	Pseudomonas aeruginosa 440 UI (290-589)	↑
	Acinetobacter baumannii 2,470 UI (1,940-2,990)	↓	Serratia spp. 849 UI (639-1,060)	↑	Serratia spp. 232 UI (171-294)	↑
	Group B Streptococcus 1,500 UI (1,120-1,890)	↑	Group B Streptococcus 710 UI (485-935)	↑	Enterobacter spp. 164 UI (126-201)	↑
	Serratia spp. 978 UI (752-1,200)	↑	Enterobacter spp. 621 UI (483-760)	↑	Mycobacterium tuberculosis 140 UI (0-511)	↑
	Salmonella Typhi 879 UI (280-1,480)	↓	Mycobacterium tuberculosis 474 UI (86-1,300)	↑	Citrobacter spp. 112 UI (83-141)	↑

Annualized rate of change (1990-2021): <-3% (dark blue), -3% to -1.5% (medium blue), -1.5% to 0% (light blue), 0% to 1.5% (pink), 1.5% to 3% (red), 3% to 5% (dark red), >5.0% (black)

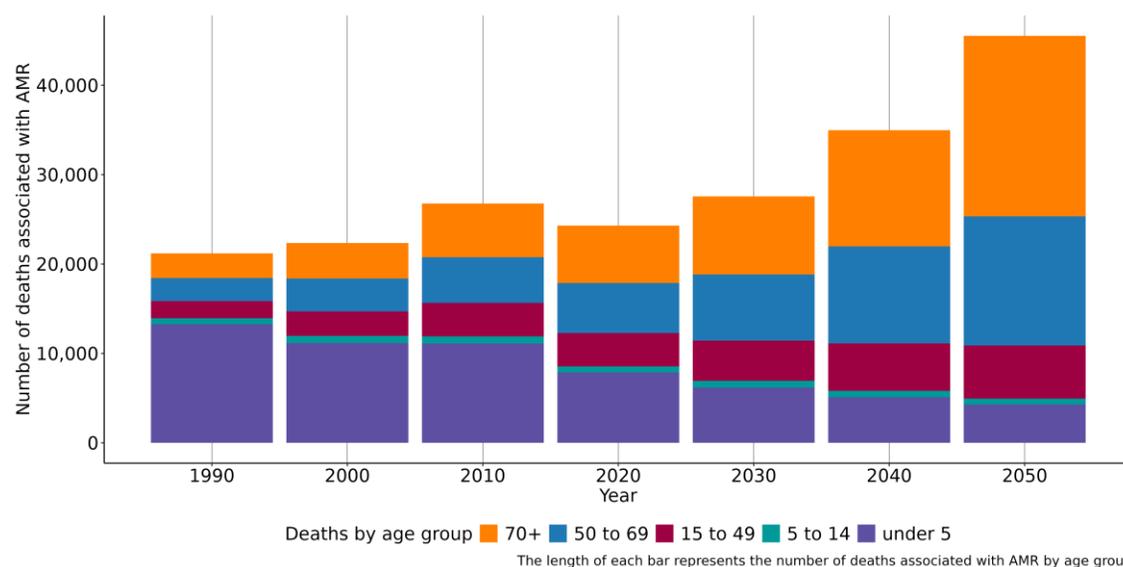
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
	Combination	Annualized rate of change (1990-2021)	Combination	Annualized rate of change (1990-2021)
	Klebsiella pneumoniae TMP-SMX 3,780 UI (2,950-4,600)	↑	Klebsiella pneumoniae 3GC 355 UI (202-507)	↑
	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. 3,740 UI (2,910-4,570)	↑	Staphylococcus aureus Methicillin 227 UI (121-333)	↑
	Streptococcus pneumoniae TMP-SMX 3,720 UI (2,860-4,570)	↓	Escherichia coli 3GC 227 UI (120-334)	↑
	Klebsiella pneumoniae 3GC 3,670 UI (2,870-4,470)	↑	Acinetobacter baumannii Carbapenems 207 UI (134-281)	↑
	Escherichia coli Aminopenicillin 3,140 UI (2,420-3,860)	↑	Klebsiella pneumoniae Fluoroquinolones 192 UI (117-267)	↑
	Escherichia coli TMP-SMX 2,880 UI (2,280-3,490)	↑	Klebsiella pneumoniae TMP-SMX 162 UI (79-245)	↑
	Klebsiella pneumoniae Fluoroquinolones 2,740 UI (2,030-3,450)	↑	Klebsiella pneumoniae Aminoglycosides 151 UI (94-208)	↓
	Escherichia coli Beta-Lactam/Lactamase Inhib. 2,550 UI (1,990-3,110)	↑	Escherichia coli TMP-SMX 148 UI (90-206)	↓
	Klebsiella pneumoniae Aminoglycosides 2,420 UI (1,760-3,080)	↓	Mycobacterium tuberculosis MDR excluding XDR 138 UI (0-503)	↑
	Escherichia coli 3GC 2,220 UI (1,610-2,820)	↑	Acinetobacter baumannii Fluoroquinolones 137 UI (103-171)	↑

Annualized rate of change (1990-2021): <-3% (dark blue), -3% to -1.5% (medium blue), -1.5% to 0% (light blue), 0% to 1.5% (pink), 1.5% to 3% (red), 3% to 5% (dark red), >5.0% (black)

- 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 (19,500 UI (15,000-23,900)), lower respiratory infection (excl. COVID) (17,600 UI (13,800-21,400)), tuberculosis (8,230 UI (5,660-10,800)), diarrhea (5,840 UI (3,510-8,160)) and meningitis (3,440 UI (2,340-4,530)).

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



- In Ghana, 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 7,170 UI (4,820-9,530), whereas the mortality rate per 100,000 was 894 UI (698-1,090).

Data sources for Ghana

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 Ghana by source type

Source type	Years	Sample size	Sample size units
Antibiotic use	1990-2021	2,007	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	124,196	Isolates
Microbial or laboratory data with outcome	1990-2021	14,078	Isolates
Literature studies	1990-2021	10,446	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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