# The burden of antimicrobial resistance (AMR) in Côte d'Ivoire

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **5,000 lives** have been lost each year since 1990 in Côte d'Ivoire due to AMR.

- In 2021, there were an estimated **4,280 UI (2,950-5,600)** deaths attributable to AMR and **19,600 UI (14,100-25,100)** 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 fluoroquinolones, *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
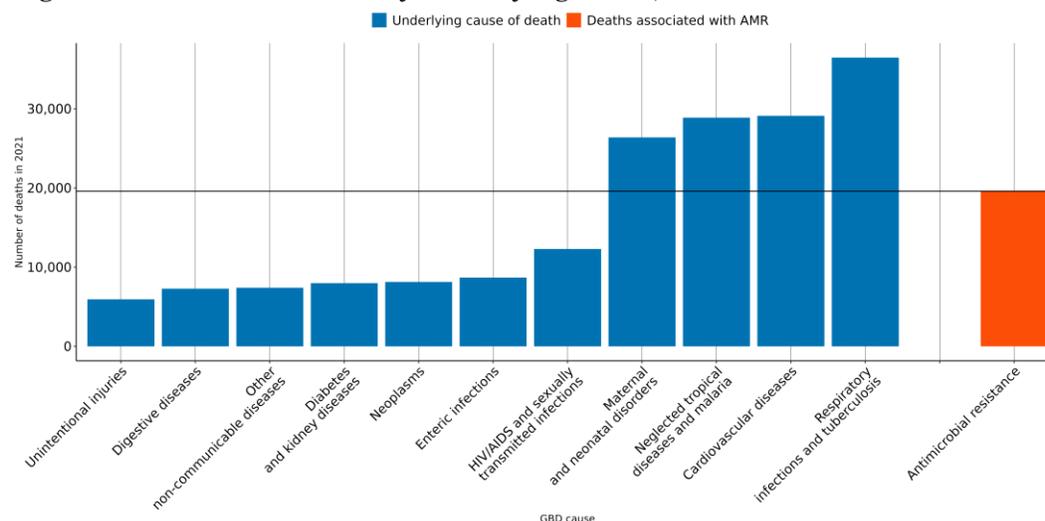
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Cote d'Ivoire, a 10% reduction means to decrease the number of deaths associated with AMR to **20,100**, but currently the trend for this country could reach up to **21,200 UI [14,400-30,300]** AMR-associated deaths in 2030.

AMR in Côte d'Ivoire

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 Côte d'Ivoire between 1990 and 2019.
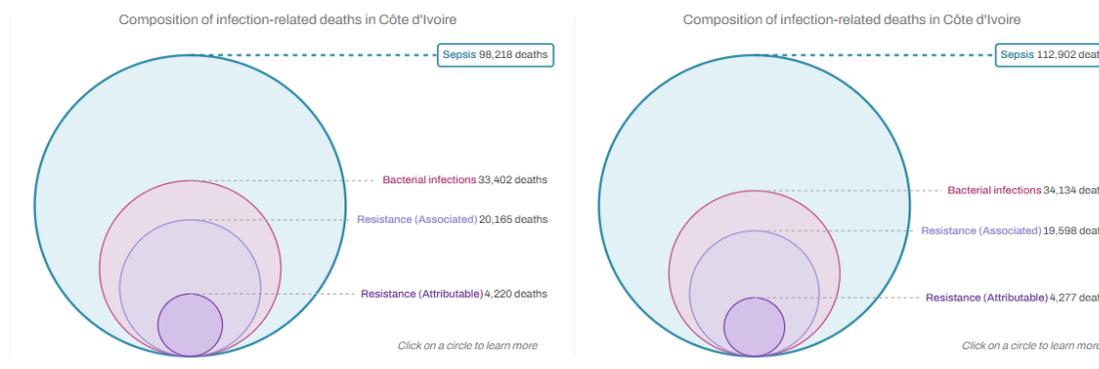
- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)](link)

- In **Côte d'Ivoire** in 2021, there were an estimated **4,280 UI (2,950-5,600)** deaths attributable to AMR and **19,600 UI (14,100-25,100)** 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, **Côte d'Ivoire has the 42nd 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 4,940 UI (3,600-6,290)	↓	Streptococcus pneumoniae 3,890 UI (2,590-5,190)	↓	Klebsiella pneumoniae 853 UI (619-1,090)	↑
2	Mycobacterium tuberculosis 4,790 UI (2,890-6,690)	↓	Klebsiella pneumoniae 3,730 UI (2,900-4,570)	↑	Streptococcus pneumoniae 717 UI (430-1,000)	↓
3	Klebsiella pneumoniae 4,060 UI (3,190-4,940)	↑	Escherichia coli 3,070 UI (2,190-3,940)	↓	Acinetobacter baumannii 663 UI (510-816)	↑
4	Escherichia coli 3,320 UI (2,440-4,200)	↓	Acinetobacter baumannii 1,770 UI (1,320-2,230)	↑	Escherichia coli 596 UI (380-813)	↑
5	Staphylococcus aureus 2,760 UI (2,160-3,350)	↑	Pseudomonas aeruginosa 1,640 UI (1,150-2,130)	↑	Pseudomonas aeruginosa 388 UI (254-522)	↑
6	Pseudomonas aeruginosa 2,680 UI (2,110-3,250)	↑	Staphylococcus aureus 1,540 UI (1,040-2,050)	↑	Staphylococcus aureus 308 UI (161-455)	↑
7	Non-typhoidal Salmonella 2,380 UI (1,120-3,630)	↑	Serratia spp. 574 UI (419-728)	↑	Serratia spp. 161 UI (116-206)	↑
8	Acinetobacter baumannii 2,180 UI (1,710-2,650)	↑	Enterobacter spp. 531 UI (408-654)	↑	Enterobacter spp. 131 UI (101-162)	↑
9	Group B Streptococcus 1,290 UI (958-1,620)	↑	Group B Streptococcus 500 UI (332-669)	↑	Mycobacterium tuberculosis 99 UI (0-337)	↑
10	Serratia spp. 805 UI (606-1,000)	↑	Non-typhoidal Salmonella 390 UI (165-615)	↑	Citrobacter spp. 84 UI (57-112)	↑

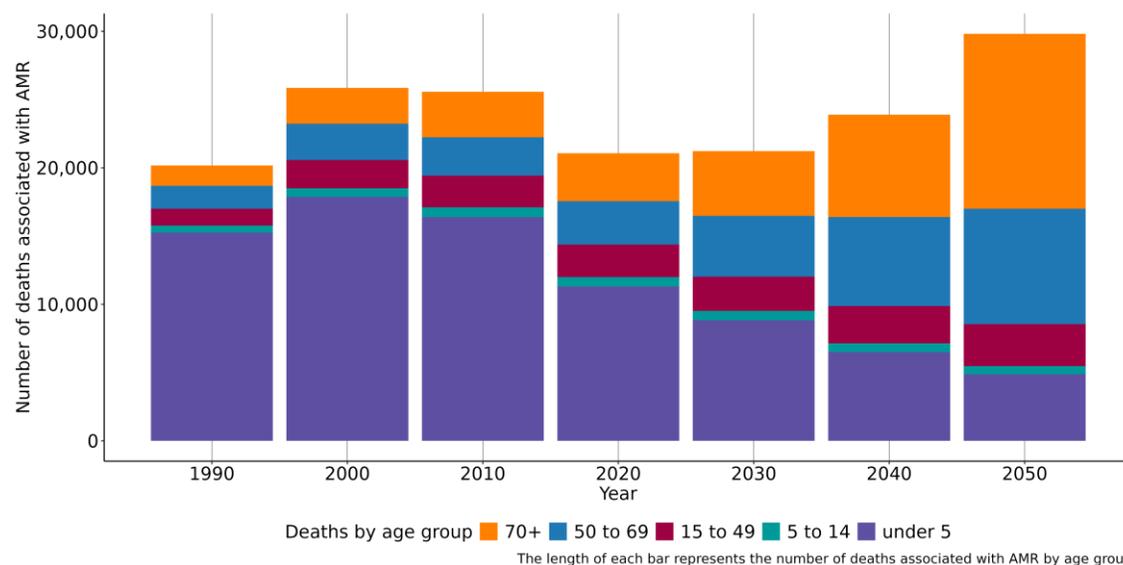Annualized rate of change (1990-2021): <-3% | -3% to -1.5% | -1.5% to 0% | 0% to 1.5% | 1.5% to 3% | 3% to 5% | >5.0%

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

Burden Rank	Associated			Attributable		
1	Klebsiella pneumoniae TMP-SMX	3,630 UI (2,820-4,440)	↑	Streptococcus pneumoniae 3GC	230 UI (135-324)	↑
2	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib.	3,260 UI (2,420-4,090)	↑	Klebsiella pneumoniae Fluoroquinolones	203 UI (122-283)	↑
3	Streptococcus pneumoniae TMP-SMX	3,240 UI (1,980-4,490)	↓	Acinetobacter baumannii Carbapenems	198 UI (112-285)	↑
4	Escherichia coli Aminopenicillin	2,950 UI (1,970-3,930)	↓	Klebsiella pneumoniae TMP-SMX	166 UI (82-250)	↑
5	Klebsiella pneumoniae Fluoroquinolones	2,700 UI (1,950-3,450)	↑	Acinetobacter baumannii Fluoroquinolones	163 UI (123-203)	↑
6	Escherichia coli TMP-SMX	2,570 UI (1,860-3,280)	↓	Staphylococcus aureus Methicillin	144 UI (50-239)	↑
7	Klebsiella pneumoniae Aminoglycosides	2,040 UI (1,440-2,640)	↑	Klebsiella pneumoniae 3GC	138 UI (71-204)	↑
8	Klebsiella pneumoniae 3GC	2,030 UI (1,480-2,580)	↑	Escherichia coli TMP-SMX	134 UI (89-178)	↓
9	Streptococcus pneumoniae Penicillin	1,970 UI (963-2,980)	↓	Streptococcus pneumoniae Penicillin	130 UI (70-191)	↓
10	Streptococcus pneumoniae Macrolides	1,880 UI (1,080-2,690)	↑	Klebsiella pneumoniae Aminoglycosides	127 UI (80-174)	↑

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 (16,700 UI (12,800-20,700)), lower respiratory infection (excl. COVID) (16,500 UI (12,200-20,900)), diarrhea (6,070 UI (3,440-8,700)), tuberculosis (4,790 UI (2,890-6,690)) and typhoid fever, paratyphoid fever, and invasive non-typhoidal salmonella (2,670 UI (1,410-3,930)).

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 Côte d'Ivoire, 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 10,200 UI (6,990-13,400), whereas the mortality rate per 100,000 was 798 UI (616-979).

Data sources for Côte d'Ivoire

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 Côte d'Ivoire by source type

Source type	Years	Sample size	Sample size units
Antibiotic use	1990-2021	2,016	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	6,172	Isolates
Literature studies	1990-2021	8,683	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:

- 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