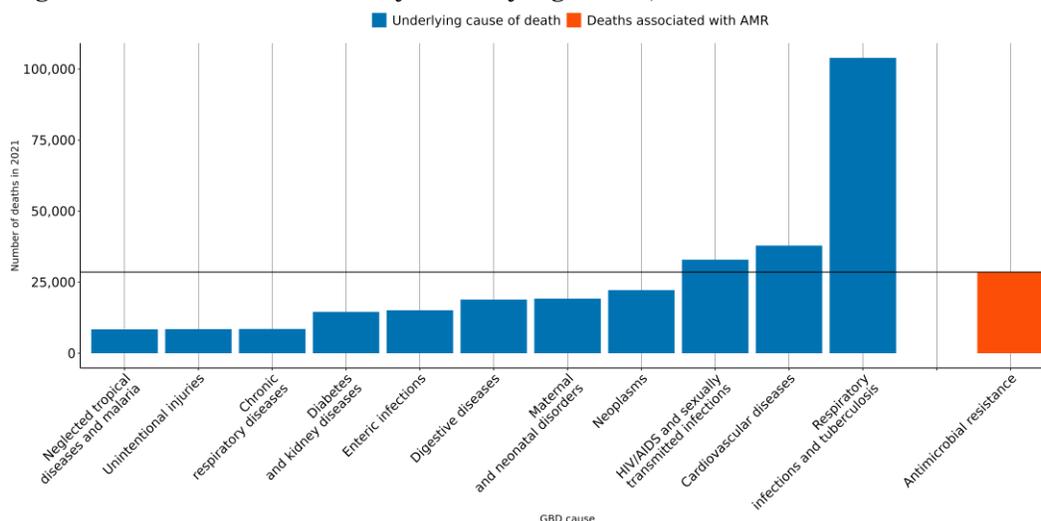


The burden of antimicrobial resistance (AMR) in Kenya

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **8,000 lives** have been lost each year since 1990 in Kenya due to AMR.
- In 2021, there were an estimated **6,670 UI (5,280-8,060)** deaths attributable to AMR and **28,500 UI (23,800-33,300)** deaths associated with AMR in this location.
- The largest number of deaths associated with AMR in 2021 occurred among those aged **70+** in the country.
- Among the most deadly pathogen-drug combinations in 2021 were multi-drug resistant *Mycobacterium tuberculosis* (excluding extensive drug-resistance), *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



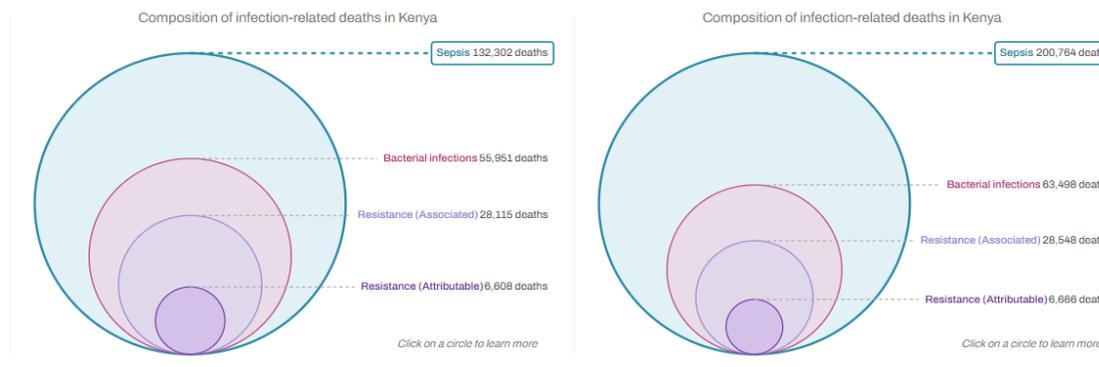
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Kenya, a 10% reduction means to decrease the number of deaths associated with AMR to **28,400**, but currently the trend for this country could reach up to **31,300 UI [25,000-38,600]** AMR-associated deaths in 2030.

AMR in Kenya

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 Kenya between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Kenya** in 2021, there were an estimated **6,670 UI (5,280-8,060)** deaths attributable to AMR and **28,500 UI (23,800-33,300)** 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, **Kenya has the 40th 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	Rate of change	Bacteria	Rate of change	Bacteria	Rate of change
	Mycobacterium tuberculosis 23,500 UI (15,300-31,700)	↑	Klebsiella pneumoniae 5,220 UI (4,410-6,030)	↑	Klebsiella pneumoniae 1,260 UI (1,000-1,510)	↑
	Klebsiella pneumoniae 5,920 UI (5,040-6,790)	↑	Streptococcus pneumoniae 5,050 UI (4,210-5,890)	↓	Streptococcus pneumoniae 1,200 UI (890-1,520)	↓
	Streptococcus pneumoniae 5,570 UI (4,690-6,450)	↓	Escherichia coli 4,670 UI (3,830-5,510)	↓	Escherichia coli 973 UI (747-1,200)	↑
	Escherichia coli 5,100 UI (4,220-5,980)	↓	Staphylococcus aureus 2,700 UI (2,120-3,270)	↑	Acinetobacter baumannii 846 UI (719-973)	↑
	Staphylococcus aureus 4,460 UI (3,800-5,120)	↑	Pseudomonas aeruginosa 2,690 UI (2,140-3,230)	↑	Pseudomonas aeruginosa 689 UI (517-861)	↑
	Pseudomonas aeruginosa 4,200 UI (3,580-4,820)	↑	Acinetobacter baumannii 2,100 UI (1,760-2,450)	↑	Staphylococcus aureus 567 UI (456-678)	↑
	Acinetobacter baumannii 2,220 UI (1,850-2,580)	↑	Mycobacterium tuberculosis 921 UI (228-2,180)	↑	Mycobacterium tuberculosis 328 UI (0-1,110)	↑
	Non-typhoidal Salmonella 1,760 UI (725-2,790)	↓	Salmonella Typhi 788 UI (341-1,240)	↑	Serratia spp. 148 UI (113-182)	↓
	Group B Streptococcus 1,610 UI (1,330-1,900)	↑	Enterobacter spp. 635 UI (509-761)	↑	Enterobacter spp. 127 UI (101-153)	↓
	Salmonella Typhi 1,610 UI (695-2,520)	↓	Group B Streptococcus 623 UI (497-749)	↑	Haemophilus influenzae 89 UI (28-151)	↑

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)

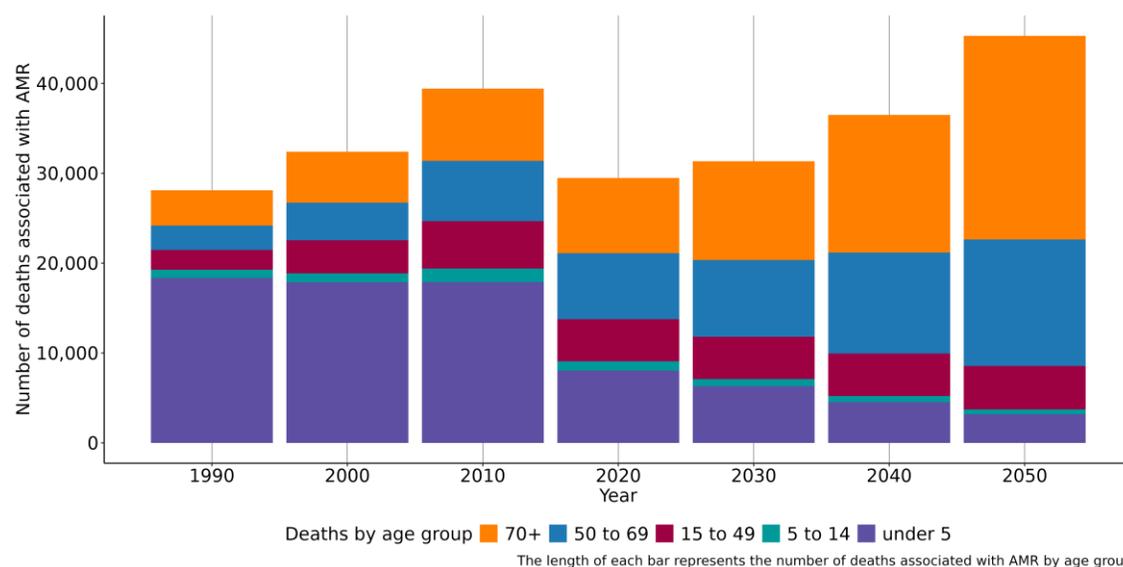
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
	Combination	Rate of change	Combination	Rate of change
	Streptococcus pneumoniae TMP-SMX 4,940 UI (4,080-5,800)	↓	Streptococcus pneumoniae Carbapenems 837 UI (577-1,100)	↓
	Klebsiella pneumoniae TMP-SMX 4,820 UI (4,040-5,600)	↑	Acinetobacter baumannii Carbapenems 447 UI (354-541)	↑
	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. 4,550 UI (3,700-5,400)	↑	Mycobacterium tuberculosis MDR excluding XDR 321 UI (0-1,090)	↑
	Escherichia coli Aminopenicillin 4,290 UI (3,270-5,310)	↓	Staphylococcus aureus Methicillin 287 UI (165-410)	↑
	Klebsiella pneumoniae Aminoglycosides 3,910 UI (3,220-4,590)	↑	Klebsiella pneumoniae Aminoglycosides 267 UI (191-343)	↑
	Escherichia coli TMP-SMX 3,780 UI (3,080-4,470)	↓	Pseudomonas aeruginosa Carbapenems 248 UI (152-344)	↑
	Klebsiella pneumoniae 3GC 3,620 UI (3,010-4,230)	↑	Klebsiella pneumoniae 3GC 237 UI (142-333)	↓
	Escherichia coli Beta-Lactam/Lactamase Inhib. 3,410 UI (2,780-4,040)	↓	Acinetobacter baumannii Fluoroquinolones 225 UI (178-273)	↑
	Klebsiella pneumoniae Fluoroquinolones 3,130 UI (2,440-3,820)	↑	Klebsiella pneumoniae Fluoroquinolones 220 UI (139-302)	↑
	Streptococcus pneumoniae Carbapenems 3,060 UI (2,270-3,860)	↓	Klebsiella pneumoniae TMP-SMX 214 UI (107-321)	↑

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) lower respiratory infection (excl. COVID) (24,400 UI (20,100-28,700)), tuberculosis (23,500 UI (15,300-31,700)), bloodstream infections (18,100 UI (14,900-21,400)), diarrhea (12,500 UI (8,120-16,800)) and meningitis (4,300 UI (3,230-5,380)).

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



- In Kenya, people aged under 5 experienced the largest number of deaths associated with AMR in 1990 but this changed by 2021 as the largest number of deaths occurred among the 70+. This indicates that prevention of infections among the under 5 has contributed to the reduction in the number of AMR associated deaths. In 2021, the number of deaths associated with AMR among the 70+ was 8,200 UI (6,610-9,780), whereas the mortality rate per 100,000 was 878 UI (708-1,050).

Data sources for Kenya

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 Kenya by source type

Source type	Years	Sample size	Sample size units
Mortality surveillance (Minimally invasive tissue sampling [MITS])	2010-2021	324	Deaths
Antibiotic use	1990-2021	6,371	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	42,156	Isolates
Microbial or laboratory data with outcome	1990-2021	3,040	Isolates
Literature studies	1990-2021	54,272	Cases/isolates/susceptibility tests
Single drug resistance profile data	2010-2021	40,049	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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