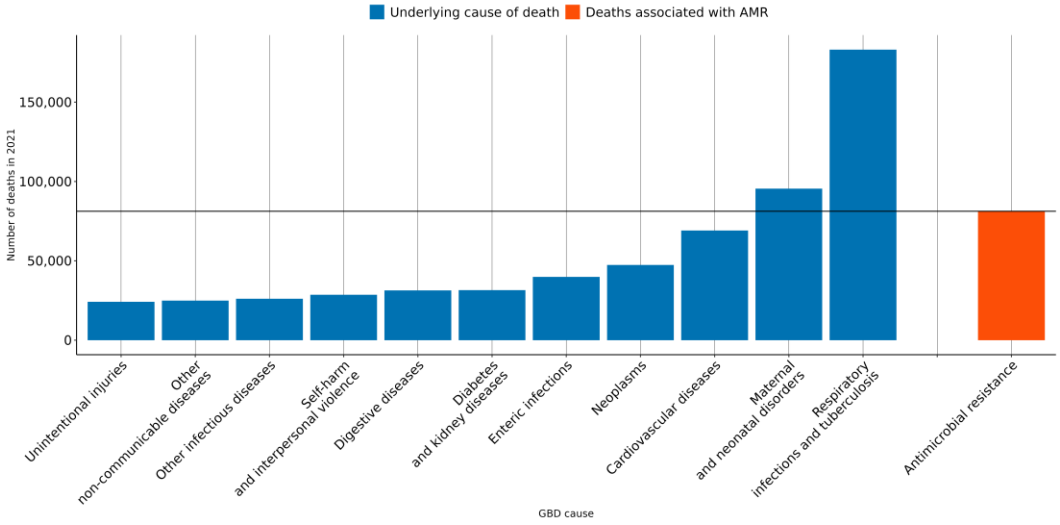
The burden of antimicrobial resistance (AMR) in Ethiopia

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **30,000 lives** have been lost each year since 1990 in Ethiopia due to AMR.
- In 2021, there were an estimated **19,200 UI (15,600-22,800)** deaths attributable to AMR and **81,200 UI (67,200-95,300)** 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 third-generation cephalosporins and *Streptococcus pneumoniae* resistant to carbapenems.

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



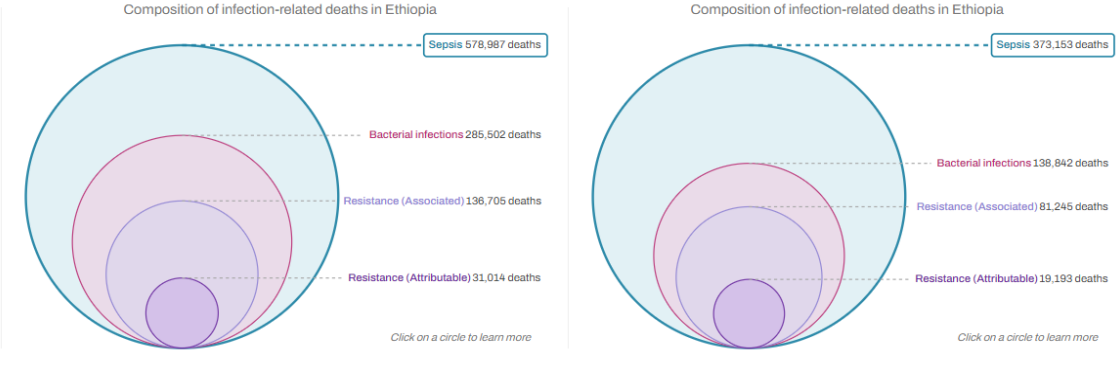
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Ethiopia, a 10% reduction means to decrease the number of deaths associated with AMR to **75,500**, but currently the trend for this country could reach up to **89,200 UI [70,100-114,000]** AMR-associated deaths in 2030.

AMR in Ethiopia

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 Ethiopia between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)]
- In **Ethiopia** in 2021, there were an estimated **19,200 UI (15,600-22,800)** deaths attributable to AMR and **81,200 UI (67,200-95,300)** 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, **Ethiopia has the 25th 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	Mycobacterium tuberculosis 30,200 UI (25,600-34,700) ↓	Klebsiella pneumoniae 15,300 UI (12,900-17,800) ↓	Klebsiella pneumoniae 3,820 UI (3,040-4,590) ↓
2	Streptococcus pneumoniae 18,900 UI (16,100-21,600) ↓	Streptococcus pneumoniae 13,400 UI (10,400-16,500) ↓	Escherichia coli 2,780 UI (2,140-3,410) ↓
3	Klebsiella pneumoniae 16,000 UI (13,500-18,600) ↓	Escherichia coli 12,800 UI (10,500-15,200) ↓	Streptococcus pneumoniae 2,700 UI (1,740-3,670) ↓
4	Escherichia coli 13,800 UI (11,200-16,300) ↓	Pseudomonas aeruginosa 7,910 UI (6,430-9,380) ↓	Acinetobacter baumannii 2,390 UI (2,070-2,710) ↓
5	Pseudomonas aeruginosa 10,800 UI (9,250-12,400) ↓	Staphylococcus aureus 6,960 UI (5,150-8,760) ↓	Pseudomonas aeruginosa 2,100 UI (1,650-2,560) ↓
6	Staphylococcus aureus 10,800 UI (9,230-12,300) ↑	Acinetobacter baumannii 6,290 UI (5,380-7,200) ↓	Staphylococcus aureus 1,660 UI (1,160-2,150) ↑
7	Acinetobacter baumannii 6,480 UI (5,550-7,420) ↓	Group B Streptococcus 3,200 UI (2,340-4,060) ↓	Serratia spp. 687 UI (525-849) ↓
8	Group B Streptococcus 5,170 UI (3,940-6,400) ↓	Serratia spp. 2,460 UI (1,890-3,030) ↓	Mycobacterium tuberculosis 657 UI (0-2,080) ↑
9	Shigella spp. 5,000 UI (2,780-7,230) ↓	Mycobacterium tuberculosis 2,130 UI (438-5,770) ↑	Enterobacter spp. 564 UI (467-662) ↓
10	Serratia spp. 3,160 UI (2,450-3,860) ↓	Enterobacter spp. 2,020 UI (1,680-2,360) ↓	Group B Streptococcus 409 UI (233-585) ↑

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%

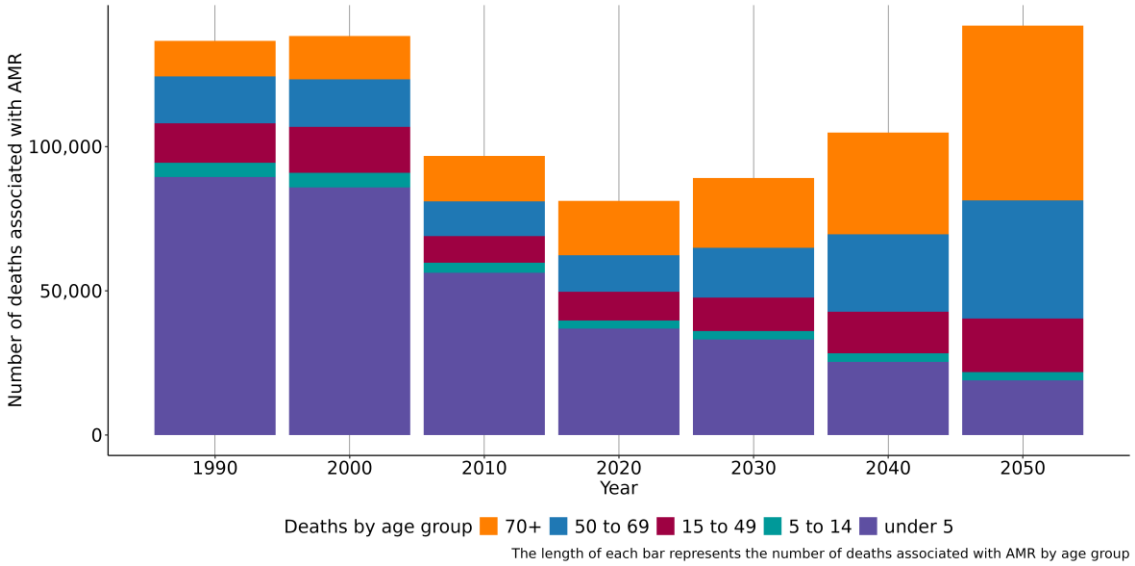
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
1	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib.	15,000 UI (12,500-17,400) ↓	Streptococcus pneumoniae Carbapenems	1,590 UI (879-2,310) ↓
2	Klebsiella pneumoniae TMP-SMX	14,300 UI (12,000-16,600) ↓	Staphylococcus aureus Methicillin	914 UI (574-1,250) ↑
3	Escherichia coli Aminopenicillin	12,900 UI (10,500-15,300) ↓	Klebsiella pneumoniae 3GC	799 UI (493-1,100) ↓
4	Klebsiella pneumoniae 3GC	10,600 UI (8,690-12,500) ↓	Acinetobacter baumannii Carbapenems	746 UI (491-1,000) ↑
5	Escherichia coli Beta-Lactam/Lactamase Inhib.	10,100 UI (8,190-12,100) ↓	Klebsiella pneumoniae TMP-SMX	651 UI (325-977) ↓
6	Escherichia coli TMP-SMX	9,850 UI (7,940-11,800) ↓	Mycobacterium tuberculosis MDR excluding XDR	646 UI (0-2,050) ↑
7	Streptococcus pneumoniae TMP-SMX	9,660 UI (6,390-12,900) ↓	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib.	636 UI (283-988) ↓
8	Klebsiella pneumoniae Aminoglycosides	9,150 UI (7,190-11,100) ↓	Klebsiella pneumoniae Aminoglycosides	632 UI (452-812) ↓
9	Streptococcus pneumoniae Macrolides	8,560 UI (6,710-10,400) ↓	Escherichia coli 3GC	616 UI (372-860) ↑
10	Escherichia coli Fluoroquinolones	8,100 UI (5,660-10,500) ↑	Klebsiella pneumoniae Carbapenems	615 UI (453-777) ↑

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 (65,100 UI (50,200-80,000)), lower respiratory infection (excl. COVID) (53,000 UI (45,900-60,100)), diarrhea (37,700 UI (25,700-49,700)), tuberculosis (30,200 UI (25,600-34,700)) and meningitis (12,900 UI (10,900-14,900)).

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



- In Ethiopia, 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 35,800 UI (25,500-46,000), whereas the mortality rate per 100,000 was 954 UI (799-1,110).

Data sources for Ethiopia

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 Ethiopia by source type

Source type	Years	Sample size	Sample size units
Mortality surveillance (Minimally invasive tissue sampling [MITS])	2010-2021	146	Deaths
Antibiotic use	1990-2021	1,515	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	32,694	Isolates
Literature studies	1990-2021	21,482	Cases/isolates/susceptibility tests
Single drug resistance profile data	2010-2021	4,319	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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