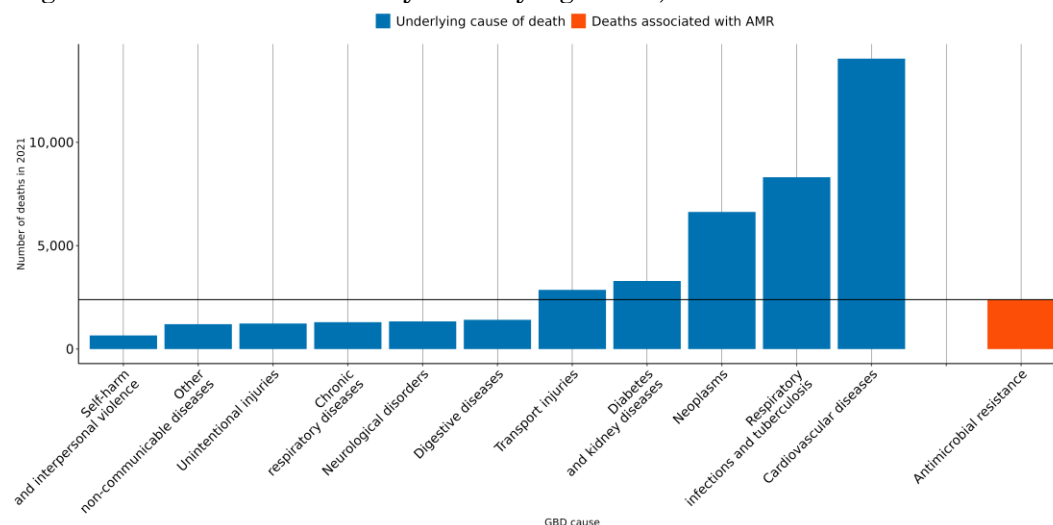


The burden of antimicrobial resistance (AMR) in Libya

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **500 lives** have been lost each year since 1990 in Libya due to AMR.
- In 2021, there were an estimated **639 UI (463-816)** deaths attributable to AMR and **2,390 UI (1,770-3,010)** 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 *Staphylococcus aureus* resistant to methicillin, *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



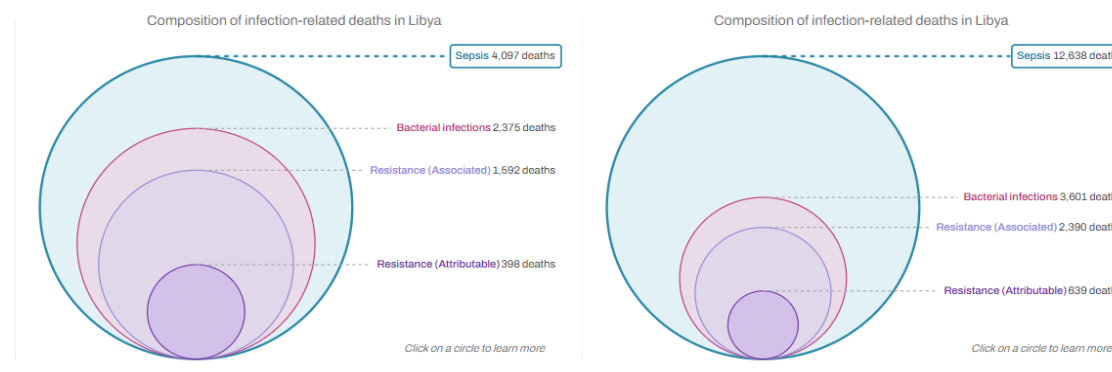
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Libya, a 10% reduction means to decrease the number of deaths associated with AMR to **2,400**, but currently the trend for this country could reach up to **3,180 UI [2,150-4,400]** AMR-associated deaths in 2030.

AMR in Libya

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 Libya between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Libya** in 2021, there were an estimated **639 UI (463-816)** deaths attributable to AMR and **2,390 UI (1,770-3,010)** 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, **Libya has the 93rd lowest** 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	
	Staphylococcus aureus 696 UI (539-854)	↑	Staphylococcus aureus 415 UI (263-568)	↑	Staphylococcus aureus 115 UI (68-162)	↑
	Escherichia coli 464 UI (362-565)	↑	Escherichia coli 411 UI (314-508)	↑	Acinetobacter baumannii 108 UI (87-129)	↑
	Klebsiella pneumoniae 386 UI (300-473)	↑	Klebsiella pneumoniae 329 UI (253-406)	↑	Escherichia coli 105 UI (74-137)	↑
	Streptococcus pneumoniae 383 UI (298-468)	↓	Streptococcus pneumoniae 285 UI (203-367)	↓	Klebsiella pneumoniae 94 UI (72-115)	↑
	Pseudomonas aeruginosa 380 UI (295-465)	↑	Acinetobacter baumannii 264 UI (203-326)	↑	Streptococcus pneumoniae 70 UI (45-94)	↓
	Acinetobacter baumannii 264 UI (203-326)	↑	Pseudomonas aeruginosa 219 UI (152-286)	↑	Pseudomonas aeruginosa 56 UI (36-76)	↑
	Mycobacterium tuberculosis 172 UI (111-233)	↑	Enterococcus faecalis 84 UI (63-104)	↑	Enterobacter spp. 23 UI (16-30)	↑
	Enterococcus faecalis 119 UI (90-147)	↑	Enterobacter spp. 81 UI (62-100)	↑	Enterococcus faecalis 14 UI (8-19)	↑
	Enterobacter spp. 108 UI (83-133)	↑	Enterococcus faecium 61 UI (46-77)	↑	Serratia spp. 12 UI (9-16)	↓
	Group A Streptococcus 103 UI (80-125)	↑	Proteus spp. 58 UI (41-75)	↑	Enterococcus faecium 12 UI (8-16)	↑

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%

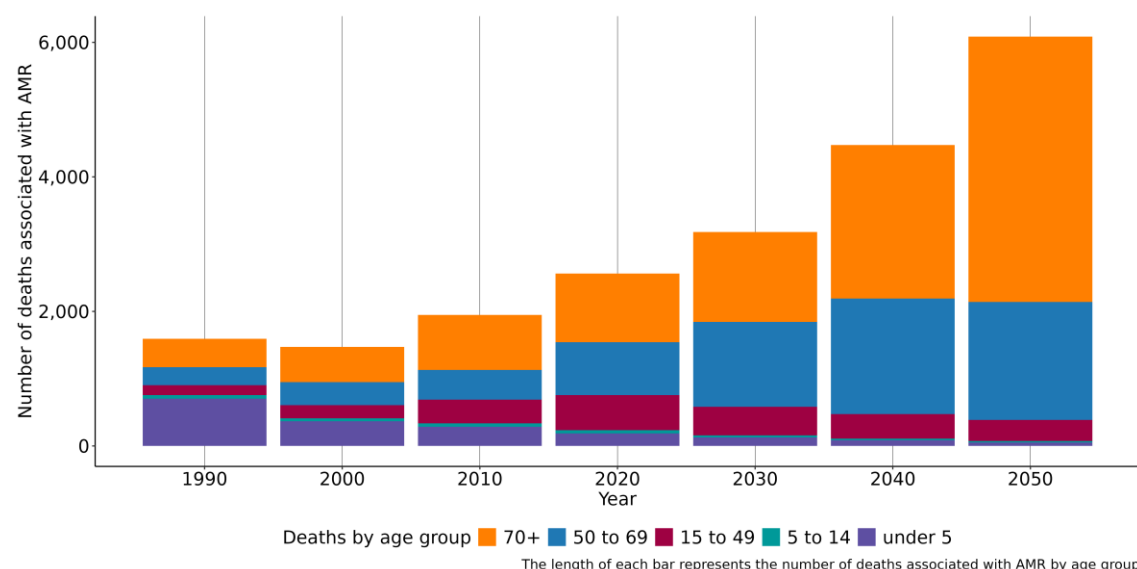
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated			Attributable		
	Escherichia coli Aminopenicillin	351 UI (216-486)	↑	Staphylococcus aureus Methicillin	84 UI (46-123)	↑
	Escherichia coli Beta-Lactam/Lactamase Inhib.	348 UI (268-428)	↑	Acinetobacter baumannii Carbapenems	63 UI (47-78)	↑
	Staphylococcus aureus Methicillin	339 UI (171-506)	↑	Streptococcus pneumoniae Carbapenems	50 UI (30-69)	↓
	Klebsiella pneumoniae Aminoglycosides	311 UI (238-383)	↑	Escherichia coli Carbapenems	43 UI (20-66)	↑
	Klebsiella pneumoniae Fluoroquinolones	274 UI (204-344)	↑	Acinetobacter baumannii Fluoroquinolones	30 UI (23-36)	↑
	Acinetobacter baumannii Carbapenems	264 UI (203-326)	↑	Klebsiella pneumoniae Carbapenems	27 UI (19-34)	↑
	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib.	263 UI (186-340)	↑	Klebsiella pneumoniae Aminoglycosides	24 UI (17-31)	↑
	Acinetobacter baumannii 4GC	263 UI (202-323)	↑	Pseudomonas aeruginosa Carbapenems	22 UI (12-32)	↑
	Acinetobacter baumannii 3GC	258 UI (199-318)	↑	Klebsiella pneumoniae Fluoroquinolones	22 UI (14-29)	↑
	Staphylococcus aureus Macrolides	249 UI (170-327)	↑	Escherichia coli 3GC	16 UI (9-23)	↑

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 (2,300 UI (1,770-2,820)), lower respiratory infection (excl. COVID) (1,530 UI (1,170-1,880)), peritoneal and intra-abdominal infections (440 UI (325-555)), infections of the skin and subcutaneous systems (207 UI (154-259)) and urinary tract infections and pyelonephritis (182 UI (138-226)).

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



- In Libya, 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 1,000 UI (737-1,260), whereas the mortality rate per 100,000 was 456 UI (336-577).

Data sources for Libya

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 Libya by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2009	3	Isolates
Literature studies	1990-2021	7,414	Cases/isolates/susceptibility tests
Single drug resistance profile data	2010-2021	1,869	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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