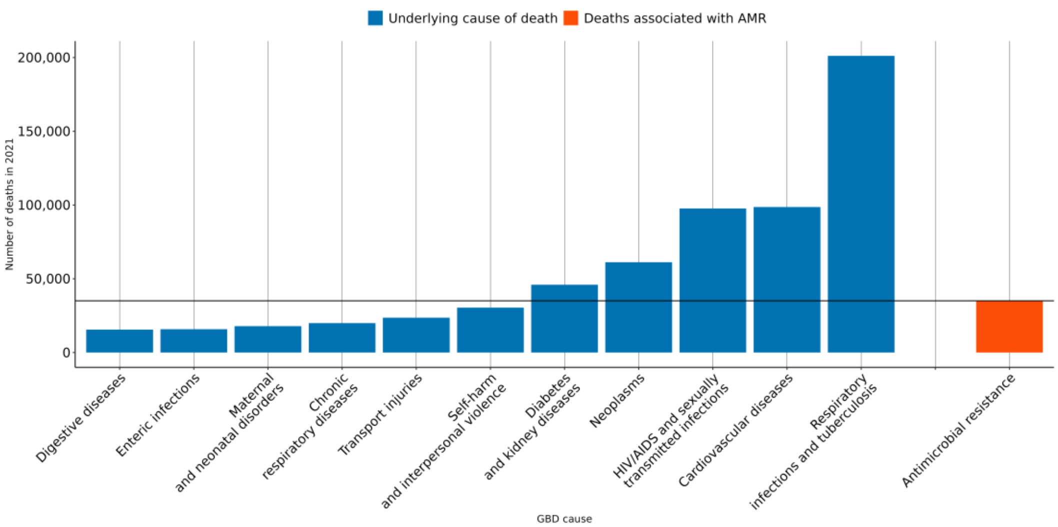
The burden of antimicrobial resistance (AMR) in South Africa

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **10,000 lives** have been lost each year since 1990 in South Africa due to AMR.
- In 2021, there were an estimated **8,490 UI (7,240-9,730)** deaths attributable to AMR and **35,100 UI (30,600-39,500)** 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



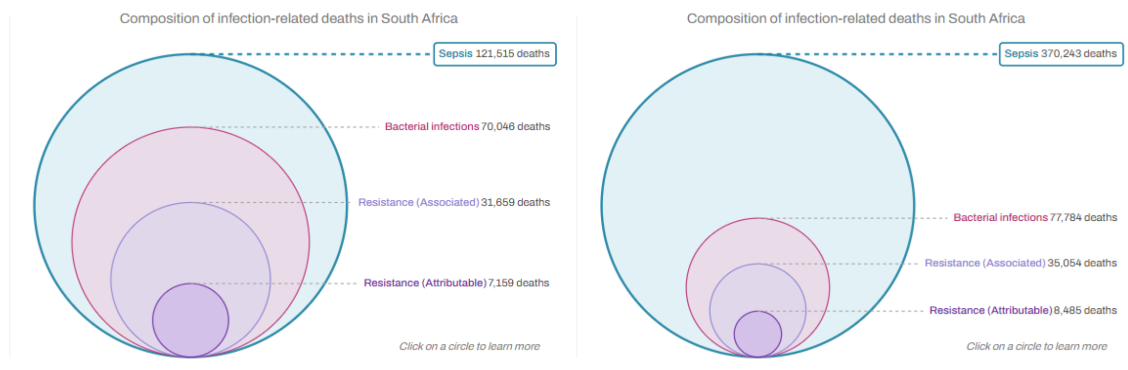
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 S. Africa, a 10% reduction means to decrease the number of deaths associated with AMR to **34,400**, but currently the trend for this country could reach up to **38,700 UI [32,000-46,700]** AMR-associated deaths in 2030.

AMR in South Africa

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 South Africa between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation (MICROBE)]
- In **South Africa** in 2021, there were an estimated **8,490 UI (7,240-9,730)** deaths attributable to AMR and **35,100 UI (30,600-39,500)** 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, **South Africa has the 67th 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)

Overall susceptible and resistant	Associated	Attributable
Mycobacterium tuberculosis 23,200 UI (20,300-26,000) ↑	Escherichia coli 5,900 UI (5,240-6,570) ↑	Klebsiella pneumoniae 1,580 UI (1,370-1,790) ↑
Staphylococcus aureus 8,150 UI (7,570-8,740) ↑	Klebsiella pneumoniae 5,890 UI (5,300-6,490) ↑	Streptococcus pneumoniae 1,280 UI (1,010-1,550) ↓
Streptococcus pneumoniae 7,680 UI (7,090-8,270) ↓	Streptococcus pneumoniae 5,400 UI (4,600-6,210) ↓	Staphylococcus aureus 1,240 UI (1,090-1,400) ↑
Klebsiella pneumoniae 7,460 UI (6,930-8,000) ↑	Staphylococcus aureus 5,270 UI (4,390-6,140) ↑	Acinetobacter baumannii 1,160 UI (1,040-1,280) ↑
Escherichia coli 7,390 UI (6,780-7,990) ↑	Pseudomonas aeruginosa 3,440 UI (3,010-3,870) ↑	Escherichia coli 1,080 UI (895-1,260) ↑
Pseudomonas aeruginosa 6,220 UI (5,790-6,640) ↑	Acinetobacter baumannii 2,850 UI (2,620-3,080) ↑	Pseudomonas aeruginosa 912 UI (720-1,100) ↑
Acinetobacter baumannii 3,030 UI (2,810-3,260) ↑	Mycobacterium tuberculosis 1,400 UI (390-3,220) ↑	Mycobacterium tuberculosis 450 UI (0-1,320) ↑
Group B Streptococcus 1,710 UI (1,500-1,920) ↑	Enterococcus faecium 871 UI (802-941) ↑	Serratia spp. 143 UI (112-174) ↑
Group A Streptococcus 1,610 UI (1,460-1,760) ↑	Group B Streptococcus 630 UI (529-730) ↑	Enterobacter spp. 143 UI (123-162) ↓
Serratia spp. 1,510 UI (1,380-1,640) ↑	Serratia spp. 600 UI (462-739) ↓	Enterococcus faecium 111 UI (66-157) ↑

Burden rank

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)

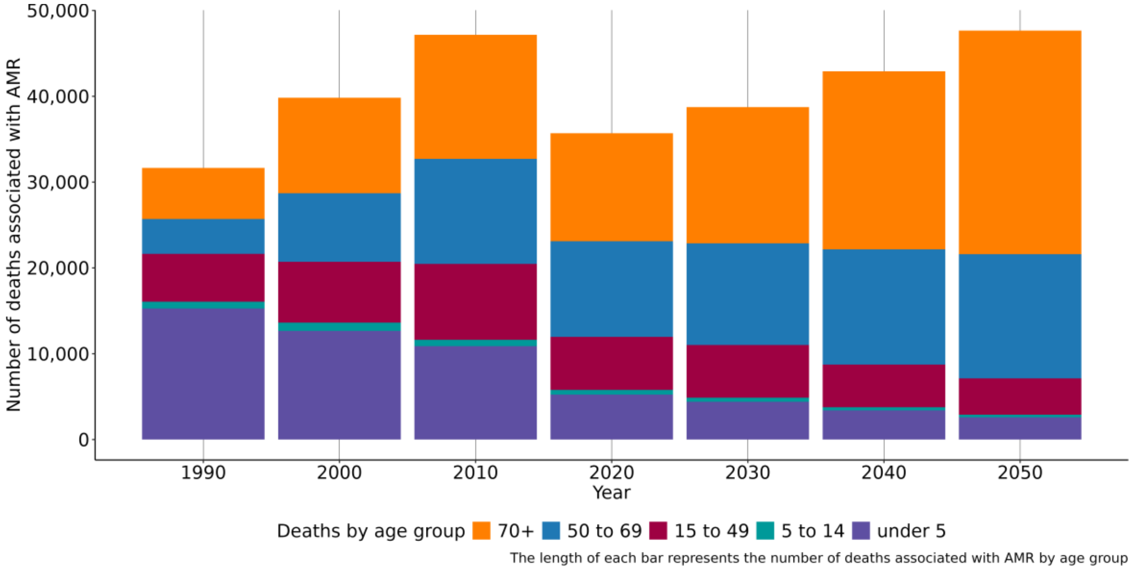
Associated		Attributable	
Escherichia coli Aminopenicillin	5,580 UI (4,450-6,710) ↑	Streptococcus pneumoniae Carbapenems	910 UI (659-1,160) ↓
Klebsiella pneumoniae TMP-SMX	5,290 UI (4,680-5,900) ↑	Staphylococcus aureus Methicillin	714 UI (473-955) ↑
Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib.	4,340 UI (3,580-5,100) ↑	Acinetobacter baumannii Carbapenems	674 UI (559-789) ↑
Klebsiella pneumoniae 3GC	4,180 UI (3,710-4,650) ↓	Pseudomonas aeruginosa Carbapenems	517 UI (342-692) ↑
Escherichia coli TMP-SMX	3,980 UI (3,260-4,700) ↑	Klebsiella pneumoniae Carbapenems	447 UI (351-544) ↑
Klebsiella pneumoniae Aminoglycosides	3,870 UI (3,150-4,590) ↑	Mycobacterium tuberculosis MDR excluding XDR	443 UI (0-1,300) ↑
Klebsiella pneumoniae Fluoroquinolones	3,840 UI (3,320-4,360) ↑	Acinetobacter baumannii Fluoroquinolones	305 UI (249-360) ↑
Streptococcus pneumoniae TMP-SMX	3,730 UI (2,710-4,740) ↓	Klebsiella pneumoniae Fluoroquinolones	301 UI (208-394) ↑
Staphylococcus aureus Methicillin	3,190 UI (2,370-4,020) ↑	Klebsiella pneumoniae Aminoglycosides	285 UI (201-370) ↑
Streptococcus pneumoniae Carbapenems	3,180 UI (2,500-3,870) ↓	Klebsiella pneumoniae TMP-SMX	253 UI (129-376) ↑

Burden Rank

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) lower respiratory infection (excl. COVID) (37,000 UI (33,900-40,000)), bloodstream infections (30,200 UI (27,500-32,900)), tuberculosis (23,200 UI (20,300-26,000)), diarrhea (15,700 UI (10,500-20,900)) and peritoneal and intra-abdominal infections (4,810 UI (4,320-5,290)).

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



- In South Africa, 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 12,100 UI (10,500-13,700), whereas the mortality rate per 100,000 was 545 UI (472-617).

Data sources for South Africa

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 South Africa by source type

Source type	Years	Sample size	Sample size units
Mortality surveillance (Minimally invasive tissue sampling [MITS])	2010-2021	926	Deaths
Antibiotic use	2010-2021	353	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	551,940	Isolates
Literature studies	1990-2021	646,778	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	410,146	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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