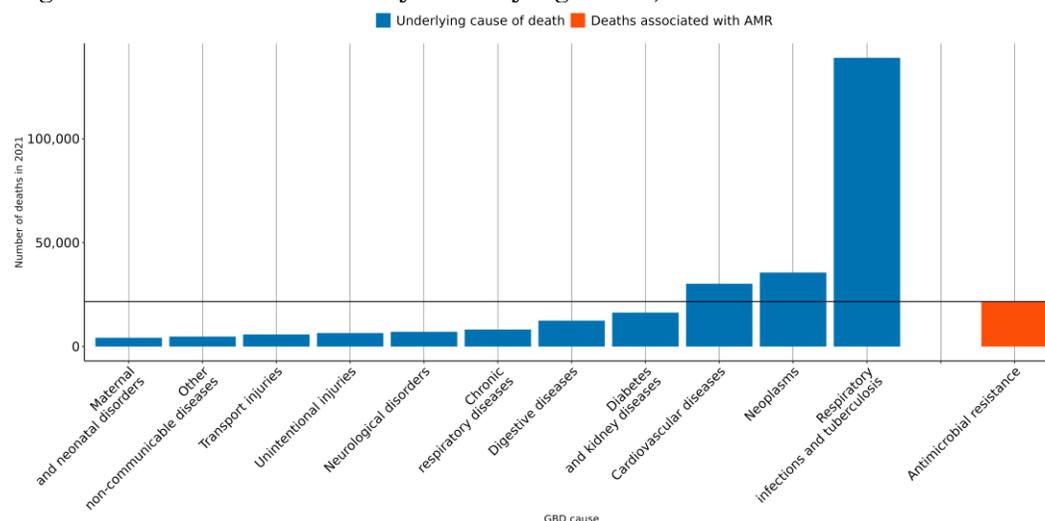


# The burden of antimicrobial resistance (AMR) in Peru

## Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **5,000 lives** have been lost each year since 1990 in Peru due to AMR.
- In 2021, there were an estimated **4,930 UI (3,860-6,000)** deaths attributable to AMR and **21,600 UI (17,000-26,200)** 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, *Pseudomonas aeruginosa* resistant to carbapenems and *Acinetobacter baumannii* resistant to carbapenems.

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



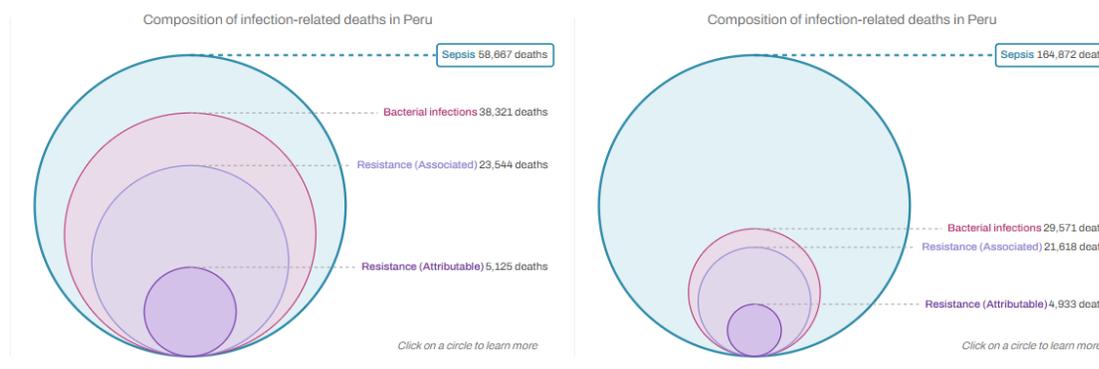
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Peru, a 10% reduction means to decrease the number of deaths associated with AMR to **23,000**, but currently the trend for this country could reach up to **27,000 UI [19,800-35,500]** AMR-associated deaths in 2030.

## AMR in Peru

### 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 Peru between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Peru** in 2021, there were an estimated **4,930 UI (3,860-6,000)** deaths attributable to AMR and **21,600 UI (17,000-26,200)** 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, **Peru has the 91st 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
Burden rank	Staphylococcus aureus 5,740 UI (4,510-6,960) ↑	Staphylococcus aureus 4,890 UI (3,830-5,950) ↑	Staphylococcus aureus 1,330 UI (1,000-1,660) ↑
	Streptococcus pneumoniae 4,660 UI (3,650-5,660) ↓	Streptococcus pneumoniae 4,100 UI (3,200-5,000) ↓	Pseudomonas aeruginosa 649 UI (476-822) ↑
	Escherichia coli 3,380 UI (2,630-4,120) ↑	Escherichia coli 3,070 UI (2,360-3,780) ↑	Klebsiella pneumoniae 641 UI (484-799) ↓
	Klebsiella pneumoniae 3,250 UI (2,550-3,950) ↓	Klebsiella pneumoniae 2,690 UI (2,080-3,290) ↓	Escherichia coli 595 UI (417-774) ↑
	Pseudomonas aeruginosa 3,180 UI (2,490-3,870) ↑	Pseudomonas aeruginosa 2,500 UI (1,950-3,050) ↑	Streptococcus pneumoniae 569 UI (394-744) ↓
	Mycobacterium tuberculosis 2,410 UI (1,700-3,110) ↓	Acinetobacter baumannii 1,140 UI (892-1,400) ↓	Acinetobacter baumannii 459 UI (371-547) ↓
	Acinetobacter baumannii 1,240 UI (974-1,510) ↓	Enterobacter spp. 481 UI (373-589) ↓	Mycobacterium tuberculosis 141 UI (0-389) ↑
	Enterobacter spp. 674 UI (526-822) ↑	Proteus spp. 467 UI (331-603) ↑	Enterobacter spp. 113 UI (88-139) ↓
	Haemophilus influenzae 660 UI (519-801) ↓	Mycobacterium tuberculosis 427 UI (157-861) ↑	Enterococcus faecium 104 UI (77-131) ↑
	Group B Streptococcus 660 UI (520-800) ↓	Enterococcus faecium 389 UI (295-482) ↑	Proteus spp. 73 UI (48-99) ↑

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% (orange)

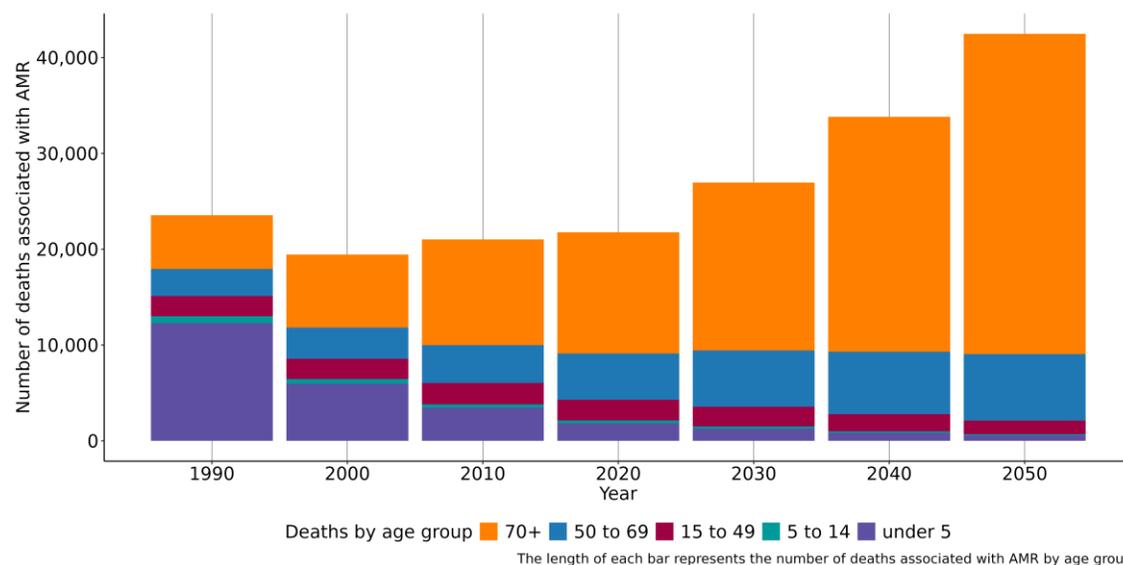
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

	Associated	Attributable
Burden Rank	Staphylococcus aureus Macrolides 4,300 UI (3,360-5,250) ↑	Staphylococcus aureus Methicillin 914 UI (614-1,210) ↑
	Staphylococcus aureus Methicillin 3,960 UI (2,700-5,210) ↑	Acinetobacter baumannii Carbapenems 271 UI (206-336) ↑
	Streptococcus pneumoniae TMP-SMX 3,670 UI (2,810-4,540) ↓	Pseudomonas aeruginosa Carbapenems 262 UI (153-370) ↑
	Streptococcus pneumoniae Macrolides 3,100 UI (2,380-3,820) ↑	Pseudomonas aeruginosa Fluoroquinolones 188 UI (123-253) ↓
	Staphylococcus aureus Fluoroquinolones 3,080 UI (2,320-3,850) ↑	Klebsiella pneumoniae Aminoglycosides 178 UI (120-237) ↓
	Escherichia coli Aminopenicillin 2,830 UI (1,920-3,750) ↑	Klebsiella pneumoniae Fluoroquinolones 175 UI (116-235) ↑
	Klebsiella pneumoniae Aminoglycosides 2,440 UI (1,880-3,000) ↓	Staphylococcus aureus Fluoroquinolones 175 UI (71-279) ↑
	Escherichia coli Fluoroquinolones 2,280 UI (1,490-3,080) ↑	Staphylococcus aureus Macrolides 158 UI (97-219) ↑
	Klebsiella pneumoniae Fluoroquinolones 2,280 UI (1,730-2,830) ↑	Escherichia coli Fluoroquinolones 146 UI (66-227) ↑
	Escherichia coli TMP-SMX 2,260 UI (1,680-2,840) ↑	Escherichia coli 3GC 140 UI (62-218) ↑

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% (orange)

- 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) (25,000 UI (19,400-30,700)), bloodstream infections (10,500 UI (8,190-12,800)), peritoneal and intra-abdominal infections (2,840 UI (2,140-3,530)), urinary tract infections and pyelonephritis (2,670 UI (1,900-3,450)) and tuberculosis (2,410 UI (1,700-3,110)).

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



- In Peru, 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 12,500 UI (9,800-15,200), whereas the mortality rate per 100,000 was 663 UI (521-805).

### Data sources for Peru

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 Peru by source type

Source type	Years	Sample size	Sample size units
Antibiotic use	1990-2021	23,569	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	148,181	Isolates
Microbial or laboratory data with outcome	1990-2021	2,050	Isolates
Literature studies	1990-2021	7,896	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	36,102	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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