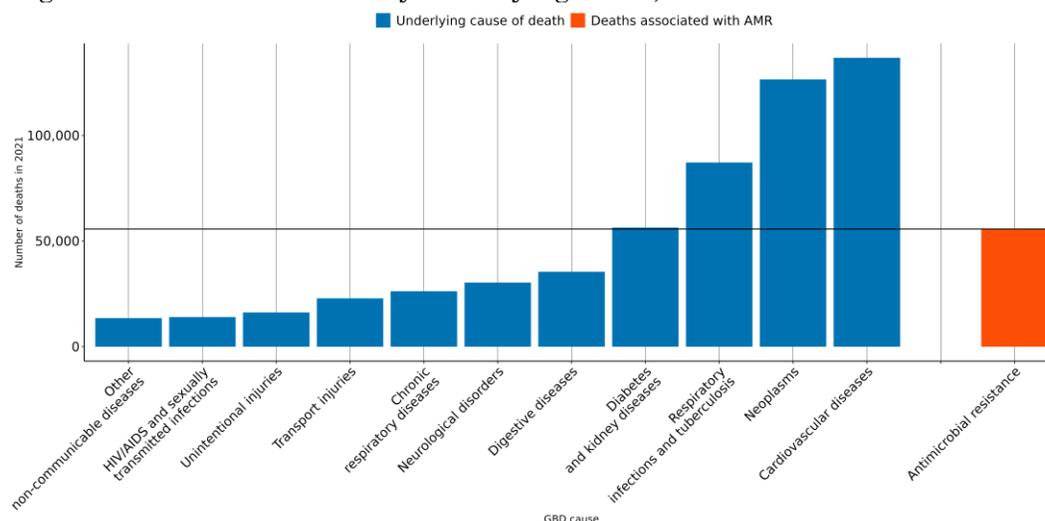


# The burden of antimicrobial resistance (AMR) in Thailand

## Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **10,000 lives** have been lost each year since 1990 in Thailand due to AMR.
- In 2021, there were an estimated **13,900 UI (10,400-17,400)** deaths attributable to AMR and **55,700 UI (41,600-69,800)** 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



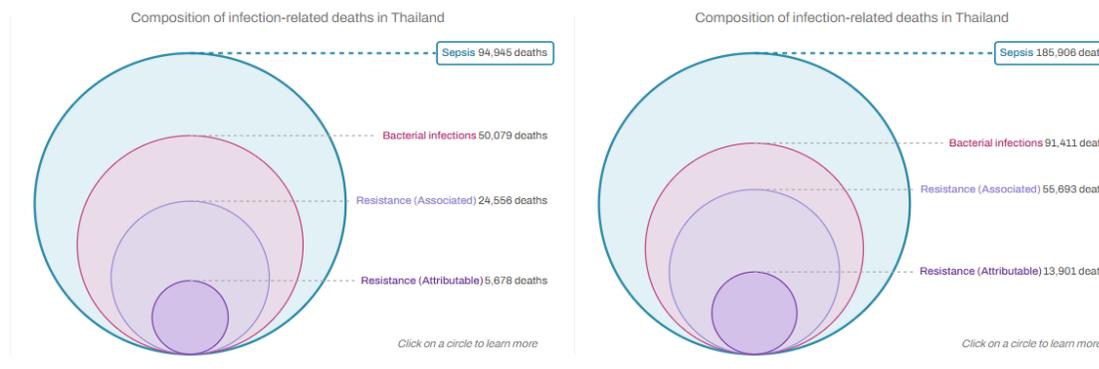
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Thailand, a 10% reduction means to decrease the number of deaths associated with AMR to **48,400**, but currently the trend for this country could reach up to **71,200 UI [50,400-95,700]** AMR-associated deaths in 2030.

## AMR in Thailand

### 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 Thailand between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Thailand** in 2021, there were an estimated **13,900 UI (10,400-17,400)** deaths attributable to AMR and **55,700 UI (41,600-69,800)** 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, **Thailand has the 99th 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	
	Number of deaths (UI)	Change (1990-2021)	Number of deaths (UI)	Change (1990-2021)	Number of deaths (UI)	Change (1990-2021)
	Streptococcus pneumoniae 17,700 UI (13,300-22,000)	↑	Streptococcus pneumoniae 12,600 UI (9,180-16,100)	↑	Acinetobacter baumannii 3,110 UI (2,490-3,730)	↑
	Staphylococcus aureus 14,000 UI (10,700-17,400)	↑	Staphylococcus aureus 8,540 UI (6,250-10,800)	↑	Streptococcus pneumoniae 2,730 UI (1,860-3,590)	↑
	Escherichia coli 9,640 UI (7,130-12,100)	↑	Escherichia coli 8,530 UI (6,320-10,700)	↑	Staphylococcus aureus 2,130 UI (1,480-2,780)	↑
	Mycobacterium tuberculosis 9,450 UI (7,110-11,800)	↓	Acinetobacter baumannii 7,760 UI (5,940-9,580)	↑	Escherichia coli 1,770 UI (1,270-2,260)	↑
	Acinetobacter baumannii 8,270 UI (6,310-10,200)	↑	Klebsiella pneumoniae 5,110 UI (3,790-6,430)	↑	Klebsiella pneumoniae 1,410 UI (1,060-1,760)	↑
	Pseudomonas aeruginosa 7,740 UI (5,880-9,610)	↑	Pseudomonas aeruginosa 4,540 UI (3,390-5,700)	↑	Pseudomonas aeruginosa 1,200 UI (830-1,580)	↑
	Klebsiella pneumoniae 7,410 UI (5,580-9,240)	↑	Enterococcus faecium 1,560 UI (1,170-1,940)	↑	Enterobacter spp. 316 UI (240-392)	↑
	Enterococcus faecalis 2,470 UI (1,850-3,080)	↑	Enterobacter spp. 1,300 UI (958-1,630)	↑	Enterococcus faecium 248 UI (161-334)	↑
	Group A Streptococcus 2,460 UI (1,850-3,080)	↑	Proteus spp. 1,270 UI (906-1,630)	↑	Enterococcus faecalis 214 UI (136-292)	↑
	Enterobacter spp. 2,180 UI (1,650-2,710)	↑	Enterococcus faecalis 1,090 UI (788-1,400)	↑	Proteus spp. 180 UI (121-239)	↑

Annualized rate of change (1990-2021): <-3% (light blue), -1.5% to 0% (medium blue), 0% to 1.5% (light red), 1.5% to 3% (medium red), 3% to 5% (dark red), >5.0% (darkest red)

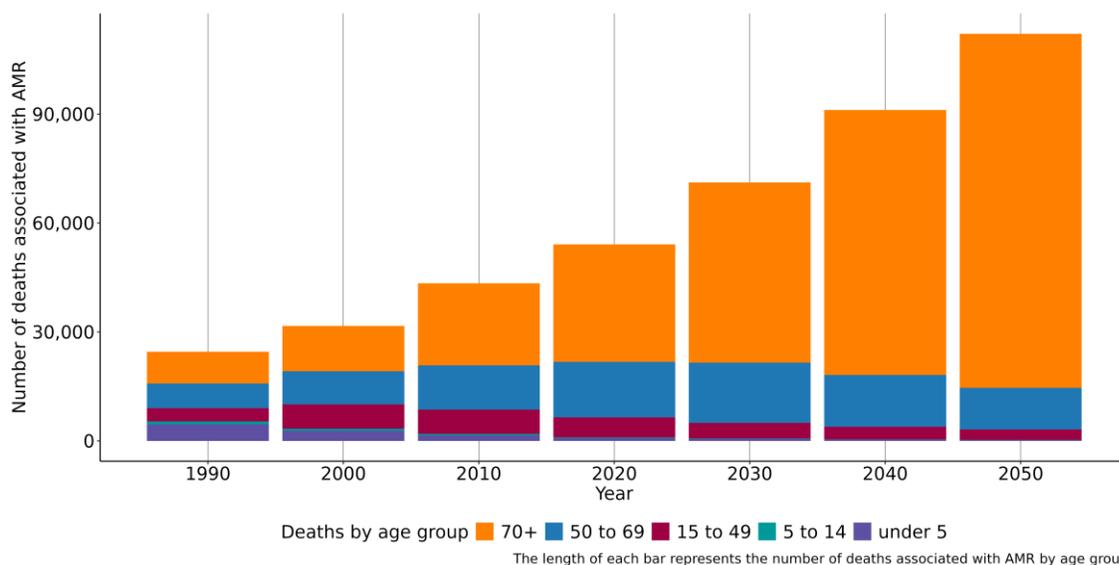
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
	Number of deaths (UI)	Change (1990-2021)	Number of deaths (UI)	Change (1990-2021)
	Streptococcus pneumoniae TMP-SMX 9,100 UI (5,970-12,200)	↑	Streptococcus pneumoniae Carbapenems 1,820 UI (1,180-2,460)	↑
	Escherichia coli Aminopenicillin 8,020 UI (5,890-10,100)	↑	Acinetobacter baumannii Carbapenems 1,620 UI (1,200-2,050)	↑
	Streptococcus pneumoniae Macrolides 7,760 UI (5,600-9,910)	↑	Staphylococcus aureus Methicillin 1,410 UI (909-1,920)	↑
	Acinetobacter baumannii Carbapenems 7,230 UI (5,540-8,930)	↑	Acinetobacter baumannii Fluoroquinolones 859 UI (678-1,040)	↑
	Acinetobacter baumannii Anti-pseudomonal 6,980 UI (5,340-8,620)	↑	Pseudomonas aeruginosa Carbapenems 658 UI (400-916)	↑
	Acinetobacter baumannii 3GC 6,910 UI (5,280-8,540)	↑	Klebsiella pneumoniae Carbapenems 438 UI (315-561)	↑
	Acinetobacter baumannii 4GC 6,900 UI (5,230-8,570)	↑	Acinetobacter baumannii Aminoglycosides 415 UI (283-546)	↑
	Acinetobacter baumannii Beta-Lactam/Lactamase Inhib. 6,870 UI (5,240-8,510)	↑	Escherichia coli Fluoroquinolones 412 UI (212-613)	↑
	Acinetobacter baumannii Fluoroquinolones 6,870 UI (5,270-8,470)	↑	Klebsiella pneumoniae Fluoroquinolones 384 UI (250-518)	↑
	Streptococcus pneumoniae Carbapenems 6,510 UI (4,470-8,560)	↑	Escherichia coli 3GC 365 UI (182-547)	↑

Annualized rate of change (1990-2021): <-3% (light blue), -3% to -1.5% (medium blue), -1.5% to 0% (light red), 0% to 1.5% (medium red), 1.5% to 3% (dark red), 3% to 5% (darkest red), >5.0% (darkest red)

- 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) (50,800 UI (38,000-63,600)), bloodstream infections (28,900 UI (22,300-35,500)), urinary tract infections and pyelonephritis (10,300 UI (7,020-13,600)), tuberculosis (9,450 UI (7,110-11,800)) and peritoneal and intra-abdominal infections (8,980 UI (6,570-11,400)).

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



- In Thailand, people aged 70+ saw the largest number of deaths associated with AMR both in 1990 and 2021, which indicates that 70+ continues to be particularly vulnerable to infections which are resistant to antibiotics. In 2021, the number of deaths associated with AMR among the 70+ was 33,900 UI (25,100-42,700), whereas the mortality rate per 100,000 was 544 UI (403-686).

### Data sources for Thailand

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 Thailand by source type

Source type	Years	Sample size	Sample size units
Antibiotic use	1990-2021	2,210	Study-year datapoints
Microbial or laboratory data without outcome	1990-2021	502,689	Isolates
Microbial or laboratory data with outcome	2010-2021	89,091	Isolates
Literature studies	1990-2021	74,472	Cases/isolates/susceptibility tests
Single drug resistance profile data	1990-2021	301,499	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:*

- For inquiries about the analysis and questions from government officials, health departments, or research institutions: [engage@healthdata.org](mailto:engage@healthdata.org)
- For media-related inquiries: [media@healthdata.org](mailto:media@healthdata.org)
- **Bluesky:** @ihmeuw.bsky.social
- **Twitter:** @IHME\_UW
- **Facebook:** <https://www.facebook.com/IHMEUW>
- **LinkedIn:** <https://www.linkedin.com/company/institute-for-health-metrics-and-evaluation>