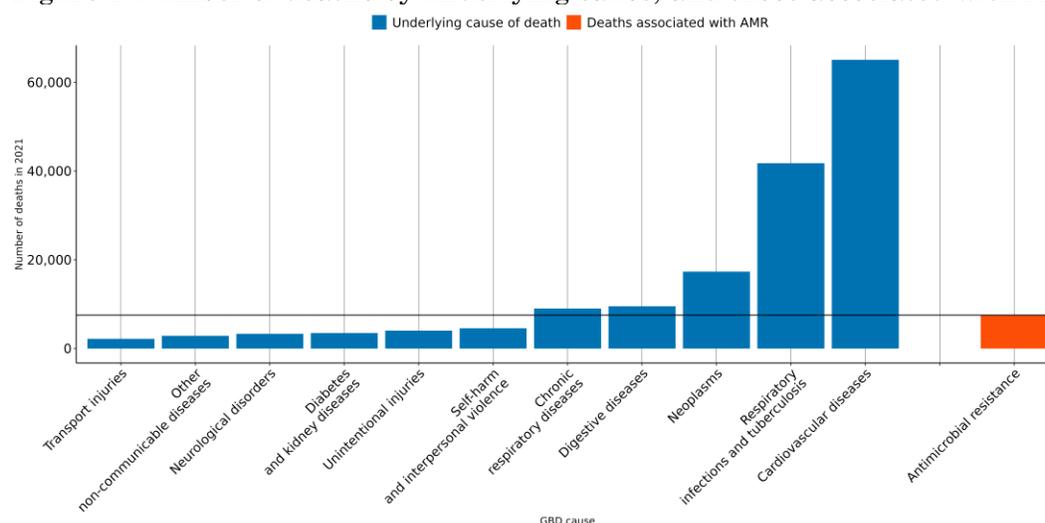


The burden of antimicrobial resistance (AMR) in Kazakhstan

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **2,000 lives** have been lost each year since 1990 in Kazakhstan due to AMR.
- In 2021, there were an estimated **1,790 UI (1,330-2,240)** deaths attributable to AMR and **7,530 UI (5,870-9,190)** 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



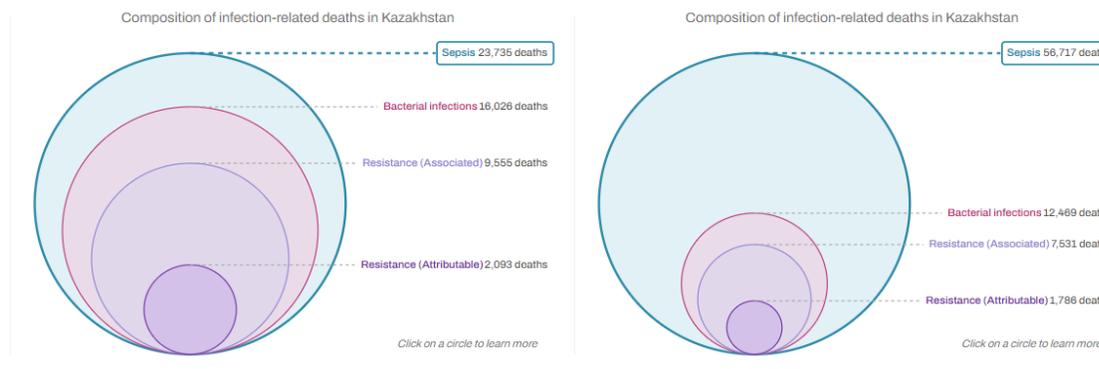
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Kazakhstan, a 10% reduction means to decrease the number of deaths associated with AMR to **7,300**, but currently the trend for this country could reach up to **8,810 UI [6,720-11,100]** AMR-associated deaths in 2030.

AMR in Kazakhstan

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 Kazakhstan between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Kazakhstan** in 2021, there were an estimated **1,790 UI (1,330-2,240)** deaths attributable to AMR and **7,530 UI (5,870-9,190)** 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, **Kazakhstan has the 76th 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)

	Overall susceptible and resistant	Associated	Attributable
Burden rank	Staphylococcus aureus 2,610 UI (2,360-2,850) ↑	Escherichia coli 1,410 UI (1,080-1,740) ↓	Staphylococcus aureus 316 UI (141-491) ↑
	Escherichia coli 1,720 UI (1,550-1,900) ↓	Staphylococcus aureus 1,140 UI (582-1,690) ↑	Escherichia coli 272 UI (198-346) ↓
	Streptococcus pneumoniae 1,390 UI (1,250-1,520) ↓	Klebsiella pneumoniae 1,030 UI (876-1,190) ↓	Klebsiella pneumoniae 240 UI (194-285) ↓
	Klebsiella pneumoniae 1,380 UI (1,240-1,510) ↓	Pseudomonas aeruginosa 916 UI (770-1,060) ↓	Pseudomonas aeruginosa 233 UI (181-285) ↓
	Pseudomonas aeruginosa 1,360 UI (1,220-1,490) ↑	Streptococcus pneumoniae 865 UI (623-1,110) ↓	Acinetobacter baumannii 193 UI (169-216) ↓
	Mycobacterium tuberculosis 600 UI (527-673) ↓	Acinetobacter baumannii 484 UI (432-535) ↓	Streptococcus pneumoniae 161 UI (97-224) ↓
	Acinetobacter baumannii 492 UI (440-545) ↓	Enterococcus faecalis 277 UI (241-314) ↓	Mycobacterium tuberculosis 106 UI (0-252) ↑
	Enterococcus faecalis 422 UI (376-469) ↓	Mycobacterium tuberculosis 252 UI (95-409) ↑	Enterococcus faecalis 50 UI (30-70) ↓
	Enterobacter spp. 371 UI (334-409) ↓	Enterococcus faecium 229 UI (198-260) ↑	Enterococcus faecium 49 UI (38-61) ↑
	Serratia spp. 315 UI (285-345) ↓	Proteus spp. 212 UI (165-259) ↑	Serratia spp. 42 UI (36-48) ↓

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

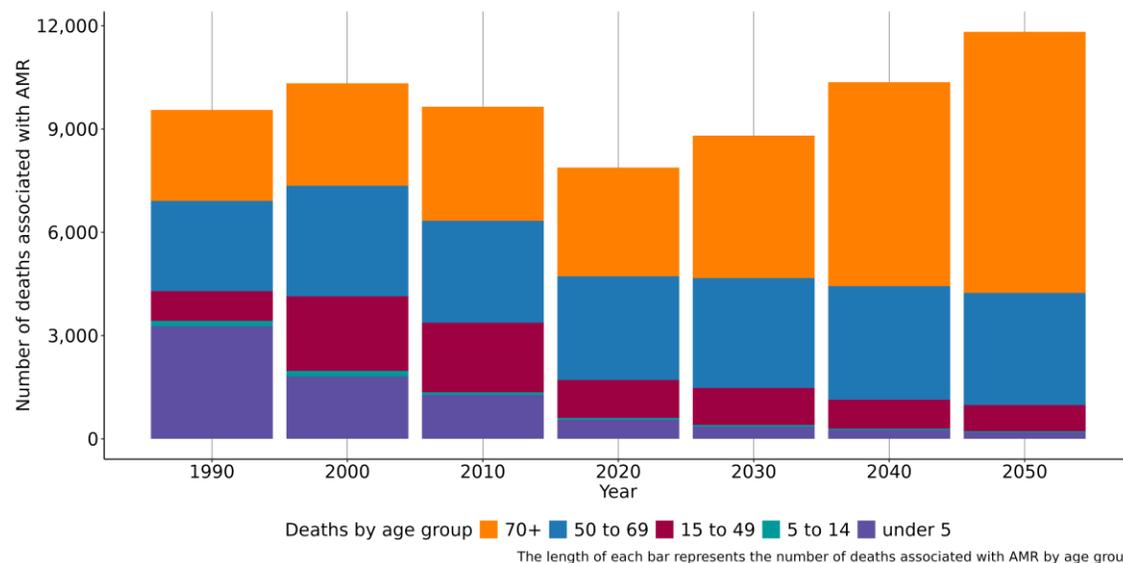
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

	Associated	Attributable
Burden Rank	Escherichia coli Aminopenicillin 1,280 UI (702-1,870) ↓	Staphylococcus aureus Methicillin 240 UI (88-393) ↑
	Escherichia coli TMP-SMX 927 UI (689-1,170) ↓	Acinetobacter baumannii Carbapenems 92 UI (71-112) ↓
	Staphylococcus aureus Methicillin 923 UI (295-1,550) ↑	Pseudomonas aeruginosa Carbapenems 90 UI (56-123) ↓
	Klebsiella pneumoniae TMP-SMX 851 UI (686-1,020) ↓	Streptococcus pneumoniae Carbapenems 86 UI (44-129) ↓
	Escherichia coli Fluoroquinolones 830 UI (538-1,120) ↑	Mycobacterium tuberculosis MDR excluding XDR 72 UI (0-182) ↑
	Klebsiella pneumoniae Aminoglycosides 817 UI (677-957) ↓	Escherichia coli 3GC 71 UI (46-96) ↑
	Streptococcus pneumoniae TMP-SMX 751 UI (496-1,010) ↓	Klebsiella pneumoniae Aminoglycosides 64 UI (48-81) ↓
	Klebsiella pneumoniae Beta-Lactam/Lactamase Inhib. 665 UI (457-874) ↓	Pseudomonas aeruginosa Fluoroquinolones 60 UI (41-78) ↓
	Klebsiella pneumoniae Fluoroquinolones 663 UI (522-803) ↓	Acinetobacter baumannii Fluoroquinolones 56 UI (45-66) ↓
	Pseudomonas aeruginosa Fluoroquinolones 649 UI (548-749) ↓	Escherichia coli Fluoroquinolones 56 UI (25-86) ↑

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

- 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 (7,470 UI (6,750-8,180)), lower respiratory infection (excl. COVID) (6,070 UI (5,380-6,770)), peritoneal and intra-abdominal infections (1,570 UI (1,350-1,780)), urinary tract infections and pyelonephritis (993 UI (795-1,190)) and tuberculosis (600 UI (527-673)).

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



- In Kazakhstan, 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 2,980 UI (2,300-3,660), whereas the mortality rate per 100,000 was 367 UI (283-451).

Data sources for Kazakhstan

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 Kazakhstan by source type

Source type	Years	Sample size	Sample size units
Antibiotic use	2010-2021	145	Study-year datapoints
Literature studies	1990-2021	591	Cases/isolates/susceptibility tests
Single drug resistance profile data	2010-2021	24,591	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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