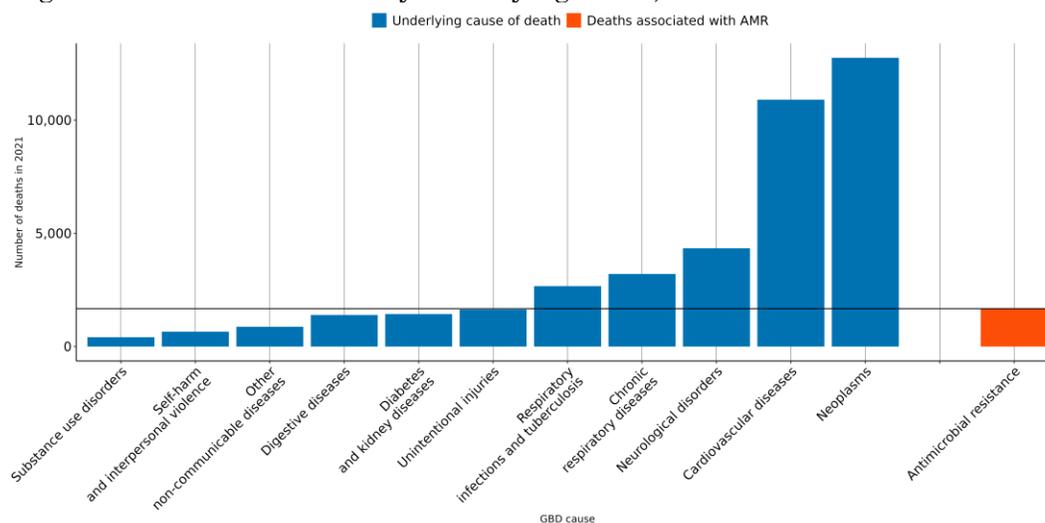


The burden of antimicrobial resistance (AMR) in Norway

Executive summary

- Antimicrobial Resistance (AMR) is a major global health threat, over **400 lives** have been lost each year since 1990 in Norway due to AMR.
- In 2021, there were an estimated **303 UI (208-399)** deaths attributable to AMR and **1,670 UI (1,220-2,120)** 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 *Escherichia coli* resistant to aminopenicillin, *Escherichia coli* resistant to beta lactam / beta-lactamase inhibitors and *Klebsiella pneumoniae* resistant to aminoglycosides.

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



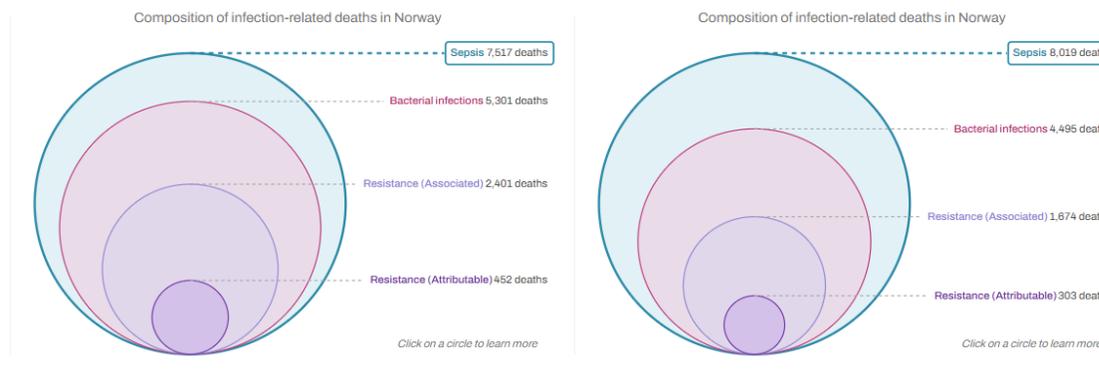
- In 2021, the number of deaths associated with AMR (orange bar in *figure 2*) were high compared to the most relevant underlying causes of death (depicted in blue) in the country. AMR associated deaths occur within multiple Global Burden of Disease (GBD) causes of death and AMR is not an underlying 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 Norway, a 10% reduction means to decrease the number of deaths associated with AMR to **1,520**, but currently the trend for this country could reach up to **2,110 UI [1,540-2,780]** AMR-associated deaths in 2030.

AMR in Norway

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 Norway between 1990 and 2019.



- To look at these and more visualization interactively visit [Measuring Infectious Causes and Resistance Outcomes for Burden Estimation \(MICROBE\)](#)
- In **Norway** in 2021, there were an estimated **303 UI (208-399)** deaths attributable to AMR and **1,670 UI (1,220-2,120)** 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, **Norway has the 6th 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	
	Bacteria (UI)	Change	Bacteria (UI)	Change	Bacteria (UI)	Change
	Staphylococcus aureus 1,280 UI (1,130-1,440)	↑	Escherichia coli 463 UI (327-600)	↑	Escherichia coli 81 UI (52-109)	↑
	Escherichia coli 883 UI (774-992)	↑	Staphylococcus aureus 320 UI (200-440)	↓	Staphylococcus aureus 49 UI (22-76)	↓
	Pseudomonas aeruginosa 418 UI (367-469)	↓	Pseudomonas aeruginosa 159 UI (117-202)	↓	Pseudomonas aeruginosa 40 UI (27-54)	↓
	Streptococcus pneumoniae 331 UI (289-373)	↓	Klebsiella pneumoniae 153 UI (117-189)	↓	Klebsiella pneumoniae 32 UI (24-40)	↓
	Klebsiella pneumoniae 319 UI (279-360)	↓	Streptococcus pneumoniae 118 UI (72-164)	↓	Acinetobacter baumannii 22 UI (17-26)	↓
	Group A Streptococcus 224 UI (192-255)	↑	Enterococcus faecium 99 UI (84-113)	↑	Streptococcus pneumoniae 16 UI (9-23)	↓
	Enterococcus faecalis 144 UI (127-161)	↓	Proteus spp. 88 UI (61-114)	↑	Enterococcus faecium 15 UI (10-20)	↑
	Proteus spp. 142 UI (123-160)	↑	Acinetobacter baumannii 63 UI (49-77)	↓	Enterobacter spp. 12 UI (10-14)	↓
	Enterococcus faecium 127 UI (112-143)	↑	Enterobacter spp. 47 UI (37-58)	↓	Proteus spp. 11 UI (7-16)	↑
	Enterobacter spp. 114 UI (100-128)	↓	Enterococcus faecalis 32 UI (24-41)	↓	Enterococcus faecalis 6 UI (3-9)	↓

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)

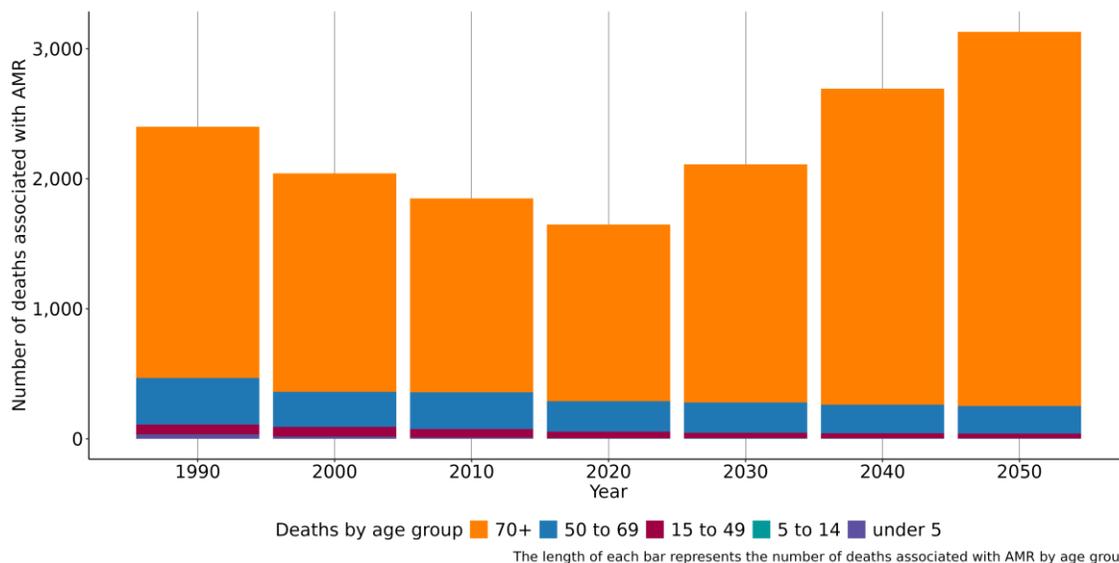
Table 2. Combinations which cause most deaths in 2021 (Number of deaths in parenthesis)

Burden Rank	Associated		Attributable	
	Bacteria (UI)	Change	Bacteria (UI)	Change
	Escherichia coli Aminopenicillin 399 UI (218-580)	↑	Escherichia coli Aminopenicillin 19 UI (6-32)	↑
	Staphylococcus aureus Macrolides 245 UI (167-324)	↑	Escherichia coli Beta-Lactam/Lactamase Inhib. 18 UI (6-31)	↑
	Escherichia coli TMP-SMX 226 UI (175-276)	↑	Klebsiella pneumoniae Aminoglycosides 18 UI (13-23)	↑
	Escherichia coli Beta-Lactam/Lactamase Inhib. 216 UI (163-268)	↑	Pseudomonas aeruginosa Carbapenems 18 UI (10-26)	↓
	Escherichia coli Fluoroquinolones 155 UI (105-205)	↑	Staphylococcus aureus Methicillin 17 UI (4-30)	↓
	Klebsiella pneumoniae Aminoglycosides 147 UI (112-183)	↓	Escherichia coli TMP-SMX 13 UI (7-18)	↑
	Staphylococcus aureus Fluoroquinolones 128 UI (82-174)	↓	Staphylococcus aureus Macrolides 12 UI (8-17)	↑
	Enterococcus faecium Fluoroquinolones 113 UI (98-127)	↑	Enterococcus faecium Fluoroquinolones 11 UI (6-16)	↑
	Escherichia coli Aminoglycosides 111 UI (56-166)	↑	Pseudomonas aeruginosa Fluoroquinolones 11 UI (7-15)	↓
	Pseudomonas aeruginosa Fluoroquinolones 97 UI (72-121)	↓	Escherichia coli Fluoroquinolones 10 UI (5-15)	↑

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) (2,480 UI (2,120-2,830)), bloodstream infections (2,010 UI (1,790-2,240)), peritoneal and intra-abdominal infections (731 UI (639-824)), urinary tract infections and pyelonephritis (619 UI (525-713)) and diarrhea (417 UI (353-482)).

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



- In Norway, 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 1,390 UI (1,000-1,780), whereas the mortality rate per 100,000 was 201 UI (145-257).

Data sources for Norway

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 Norway by source type

Source type	Years	Sample size	Sample size units
Microbial or laboratory data without outcome	1990-2021	22,246	Isolates
Literature studies	1990-2021	502	Cases/isolates/susceptibility tests
Single drug resistance profile data	2010-2021	185,109	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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