Surveillance of antimicrobial resistance in Europe, 2025 data

Executive summary

WHO European Region

This executive summary presents results derived from 2025 antimicrobial resistance (AMR) data, sourced from invasive isolates reported to both the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR) network and the European Antimicrobial Resistance Surveillance Network (EARS-Net).

EARS-Net collected data from 30 countries, encompassing the whole of the European Union/European Economic Area (EU/EEA) while CAESAR received reports from 17 countries from the rest of the WHO European Region. EARS-Net and CAESAR use compatible methodologies for data-gathering and analysis. However, given that each national surveillance system is shaped by country-specific protocols and practices, it is important to exercise caution when comparing AMR patterns between countries.

Epidemiology

Nine (53%) of the 17 countries that submitted data to CAESAR reported that their participating laboratories had an estimated population coverage of over two thirds of the population, including seven countries that reported having an estimated population coverage of 90% or more. However, four countries reported an estimated population coverage of less than half of their population and three did not report data on population coverage.

Of the 17 countries that reported data to CAESAR, one (6%) indicated that the reported data had a 'high' representativeness, in terms of three metrics: geographical representativeness, hospital representativeness and isolate representativeness. A further nine countries reported that the representativeness was 'high' for two of the three metrics, one country reported the representativeness as 'high' for one of the three metrics, and four countries reported the representativeness as 'low' for all three metrics. A 'low' score was more frequently reported for isolate representativeness than for the other two metrics.

The blood culture rate in hospitals served by laboratories reporting data to CAESAR in 2025 was reported by 14 countries. The reported blood culture rates, measured as blood culture sets per 1 000 patient-days, varied widely among countries. These varying estimates should be interpreted with caution, as the definitions of a 'blood culture set' and a 'patient-day' may differ between and within countries.

In 2025, 14 countries reported isolate data for all eight bacterial species reported to CAESAR. One country did not report isolate data for *Enterococcus faecium*, one country did not report isolate data for *Acinetobacter* spp., and one country did not report isolate data for *E. faecium*, *Enterococcus faecalis*, and *Streptococcus pneumoniae*. According to the data submitted to CAESAR for 2025 by

17 countries, the majority of isolates (109 371 of 150 850 isolates; 72%) were *Escherichia coli* (58 648 isolates; 39%), *Staphylococcus aureus* (26 343 isolates; 17%) and *Klebsiella pneumoniae* (24 380 isolates; 16%). This ranking was also observed in 2024.

In 2025, 17 countries reported data to CAESAR, including Tajikistan, which reported for the first time. Sixteen of these countries had also reported data for 2024. Among those 16 countries reporting in both years, the total number of laboratories reporting data increased from 519 in 2024 to 541 in 2025.

Among the 16 countries that provided data to CAESAR for both 2024 and 2025, the total number of reported invasive isolates increased by 5%, from 143 775 in 2024 to 150 739 in 2025.

Looking at the 16 countries that provided data to CAESAR for 2024 and 2025, the largest increases in the total number of reported isolates were for *E. faecium* (+8.5%), followed by *E. faecalis* (+7.3%), *K. pneumoniae* (+6.7%), and *Pseudomonas aeruginosa* (+6.3%).

The AMR situation in bacterial species reported to CAESAR and EARS-Net in 2025 varied widely depending on species, antimicrobial group and geographical region. Within the WHO European Region, pronounced disparities are evident, echoing trends highlighted in past reports. A notable increasing resistance gradient emerges, with a clear pattern from north-to-south and west-to-east, i.e. the northern and western regions predominantly show lower resistance percentages, while the eastern and southern regions tend to report higher ones.

In terms of bacterial species-specific results from 2025, a resistance percentage to fluoroquinolones in *E. coli* below 25% was observed in 21 (49%) of 43 countries that reported data on this microorganism-antimicrobial group combination. This percentage was generally lowest in the northern parts of the WHO European Region and highest in the south. A resistance percentage of 25% or above was reported in 22 (51%) countries. A resistance percentage of 50% or above was observed in five (12%) countries. For third-generation cephalosporin resistance in *E. coli*, five (12%) of 43 countries reported percentages below 10%, whereas resistance percentages equal to or above 50% were observed in five countries (12%). For carbapenem resistance in *E. coli*, nine (21%) of 42 countries reported percentages of 1% or above.

In 2025, percentages for third-generation cephalosporin resistance in *K. pneumoniae* below 10% were observed in two (5%) of 43 countries in the Region reporting data on this microorganism-antimicrobial group combination, while 21 (49%), particularly in the southern and eastern parts of the Region, reported resistance percentages of 50% or above. This geographic trend has been consistent since 2019. For carbapenem resistance in *K. pneumoniae*, eight (19%) of 43 countries reported resistance percentages below 1%, whereas 10 (23%) countries reported resistance percentages equal to or above 50%.

Large differences were observed in the percentages of carbapenem-resistant *P. aeruginosa* in the WHO European Region. In 2025, resistance percentages of below 5% were observed in five (13%) of the 40 countries reporting data on this microorganism-antimicrobial group combination, whereas five (13%) countries reported percentages equal to or above 50%.

The percentages of carbapenem-resistant *Acinetobacter* spp. varied widely within the Region in 2025, from below 5% in 11 (29%) of the 38 countries that reported data on this microorganism-antimicrobial group combination, to equal to or above 50% in 21 (55%) countries, mostly in southern and eastern parts of the WHO European Region.

In 2025, 12 (28%) of 43 countries reporting data on *S. aureus* reported meticillin-resistant *S. aureus* (MRSA) percentages below 5%. An MRSA percentage equal to or above 50% was reported in one (2%) of 43 countries. Most countries were at either end of the range: only six reported percentages between 5% and 50%.

The percentages of penicillin non-wild-type *S. pneumoniae* varied markedly across the Region. Of the 37 countries reporting data on this microorganism-antimicrobial group combination, 13 (35%) registered percentages below 10%, while four (11%) recorded percentages of 25% or higher.

Resistance to vancomycin in *E. faecium* varied substantially among countries in the Region. In 2025, resistance percentages of below 1% were reported by five (12%) of 41 countries providing data on this microorganism-antimicrobial agent combination, while percentages equal to or above 50% were seen in seven (17%) countries.

Interactive resistance maps, trends and country-specific information for each bacterial species, including information on patient age group and sex, are available on the WHO Regional Office for Europe AMR Dashboard *(1)*.

Discussion

Although assessing the exact magnitude of AMR is challenging and the results should be interpreted with caution, the results from CAESAR and EARS-Net clearly show the presence of specific AMR patterns across clinical settings in the WHO European Region.

High percentages of resistance to third-generation cephalosporins and carbapenems in *K. pneumoniae* and of carbapenem-resistant *Acinetobacter* spp. in close to half of the countries are of serious concern. They are consistent with the dissemination in healthcare settings of clones that carry resistance genes *(2)* and indicate that many countries have serious limitations in treatment options for patients with infections caused by these pathogens, and that infection prevention and control (IPC) measures should be strengthened.

While the north-to-south and west-to-east gradients in AMR percentages are more evident for gram-negative bacteria (*E. coli*, *K. pneumoniae*, *P. aeruginosa* and *Acinetobacter* spp.), they are less pronounced for

gram-positive bacteria (*S. aureus*, *S. pneumoniae* and *E. faecium*), as shown in the interactive maps on the AMR Dashboard *(1)*. The reasons for these differences are likely to vary between pathogens and countries and warrant further investigation.

Overall, laboratories have increasingly been reporting data to CAESAR and EARS-Net since both networks were initiated, which is an encouraging development. Two thirds of countries (34 of 51) now have a standardised national AMR surveillance system with a coordinating centre, including 10 that also link it with antimicrobial consumption or use data. However, surveillance across the WHO European Region remains uneven: 31% (16 out of 51) of countries still collect AMR data without a standardised approach and national coordination. This underlines the continuing need to strengthen and harmonise surveillance systems and methodologies as networks expand and mature *(3)*.

With a response rate of 98% for the WHO European Region in the global Tracking Antimicrobial Resistance Country Self-Assessment Survey, 94% of countries reported having a National Action Plan (NAP) on AMR or being in the process of revising it. However, only 40% reported implementing it with the necessary financing in place, supported by regular evaluation and feedback mechanisms *(3)*.

Efforts to strengthen surveillance and implement NAPs now sit within a stronger global framework. In 2024, the United Nations General Assembly adopted a political declaration on AMR committing countries, by 2030, to report high-quality AMR surveillance data to the Global Antimicrobial Resistance and Use Surveillance System (GLASS), to ensure that at least 80% of countries can test all priority bacterial and fungal pathogens for resistance, and to reduce deaths associated with bacterial AMR by 10% *(4)*. In May 2026, the World Health Assembly adopted the updated Global action plan on AMR 2026–2036, which supports countries in developing, implementing and financing their NAPs, and strengthens accountability and monitoring *(5)*. The findings in this summary show the distance still to cover: nearly one third of countries in the Region still collect AMR data without a standardised national system, and only 40% are implementing their NAPs with financing and evaluation.

To help countries see where they stand, the WHO Regional Office for Europe, together with the London School of Economics and with support from the Novo Nordisk Foundation, is finalising the AMR Accountability Index *(6)*. Built on the Roadmap on AMR for the WHO European Region 2023–2030 *(7)* and piloted in six countries in 2026, it shows each country where its NAP is moving forward and where more action is needed.

WHO Regional Office for Europe is also working more closely with countries on antimicrobial stewardship, at regional, national and hospital level. This year, with funding from the EU's EU4Health programme, it is reviewing stewardship and IPC practices in hospitals in six countries, with coaching and implementation support to follow in 2027 *(8)*. Combined with stronger diagnostics and IPC, stewardship helps ensure that antibiotics are used appropriately in everyday hospital care.

Public health implications

In about half of the countries in the Region, half or more of the *K. pneumoniae* and *Acinetobacter* spp. bacteria causing bloodstream and other invasive infections are resistant to key antibiotics: third-generation cephalosporins for *K. pneumoniae* and carbapenems for *Acinetobacter* spp. As resistance to third-generation cephalosporins rises, physicians increasingly turn to carbapenems, although some carbapenem-sparing alternatives are available. When bacteria are also resistant to carbapenems, what remains are mostly Reserve antibiotics, which are often expensive and not always marketed in all countries *(4)*. WHO classifies these as last-resort antibiotics, to be reserved for confirmed or suspected infections caused by multidrug-resistant bacteria *(9)*. For patients, the stakes are high: those whose first antibiotic is not active against the bacteria causing their infection are more likely to die in hospital *(10)*. For health systems, intensive care, transplantation, cancer chemotherapy and neonatal care become riskier when effective antibiotics are lacking. Infections with carbapenem-resistant bacteria are also associated with longer hospital stays and higher costs *(2)*.

At the same time, many countries cannot see the problem clearly. Where few blood cultures are taken, physicians must treat without knowing which antibiotic will work, and surveillance data mostly come from the most severe cases *(4)*. Furthermore, because routine surveillance data usually show resistance but not the mechanism behind it, they cannot guide the choice of last-resort antibiotic, which depends on that mechanism *(2)*.

Moreover, AMR does not stop at national borders. Resistant bacteria travel with patients: since 2022, several EU/EEA countries have detected them in patients transferred from Ukraine, and resistant strains circulate widely across eastern Europe *(2, 11)*.

Stronger diagnostics, including the capacity of national reference laboratories to detect carbapenemases, would help patients and surveillance at the same time. Together with consistent IPC, prudent antibiotic use, and access to Reserve antibiotics where they are needed *(4)*, they are the most direct way to protect patients across the Region.

EU/EEA countries

In 2026, all EU Member States and EEA countries reported data for 2025 to EARS-Net. Twenty-one (70%) of these 30 countries reported that their participating laboratories had a population coverage of over two thirds of the national population, including 13 countries that reported having a coverage of 90% or more. However, six countries reported data with a coverage of less than half of the population.

Twenty-four (80%) of the 30 participating countries indicated that their reported data had a high national representativeness based on three metrics: geographical areas covered; acute care hospitals included; and

microorganisms that caused invasive infections in these hospitals. A further country reported that the representativeness was 'high' for two of the three metrics, and one country reported representativeness as 'low' for all three metrics.

The blood culture rate in hospitals served by the laboratories that reported data to EARS-Net for 2025 was reported by 25 countries. The blood culture rates, measured as blood culture sets per 1 000 patient-days, varied widely among the countries. However, these estimates should be interpreted with caution since the definitions of a 'blood culture set' and a 'patient-day' can differ between and within countries.

In 2025, all but one country reported isolate data for all eight bacterial species under surveillance by EARS-Net (*E. coli*, *K. pneumoniae*, *P. aeruginosa*, *Acinetobacter* spp., *S. pneumoniae*, *S. aureus*, *E. faecalis* and *E. faecium*). Liechtenstein reported isolate data for *E. coli*, *K. pneumoniae*, *P. aeruginosa*, *S. pneumoniae*, *S. aureus* and *E. faecalis*.

Based on the laboratory identifiers provided by the countries, the number of laboratories participating in EARS-Net has increased since 2021, indicating that national AMR surveillance systems may have been strengthened in the EU/EEA. For 2025, data were reported from 2 191 laboratories. Moreover, 807 laboratories were identified as having reported data for each year during the period 2021–2025.

As part of the reporting of Antimicrobial Susceptibility Testing (AST) data for novel antimicrobials, at most 10 (34.5%) of the 29 countries that reported carbapenem-resistant gram-negative bacteria for 2025 reported data on susceptibility to a specific novel antimicrobial that could be included in an analysis. Due to the amount of missing data, these data were analysed at country level, but not at EU/EEA level.

Epidemiology

Progress towards the EU targets on antimicrobial resistance

In 2023, the Council of the European Union recommendation on stepping up EU actions on antimicrobial resistance in a One Health approach established EU targets on AMR to reduce the total EU incidence of MRSA, third-generation cephalosporin-resistant *E. coli*, and carbapenem-resistant *K. pneumoniae* bloodstream infections by 15%, 10% and 5% by 2030 against the baseline year 2019, respectively *(1)*.

In the data for 2025, the estimated total EU incidence of MRSA bloodstream infections was 4.56 per 100 000 population (EU country range 0.58–12.07). This was 19% lower than in 2019 (baseline year) and 0.23 per 100 000 population lower than the 2030 target of 4.79 per 100 000 population. For the EU overall, a statistically significant decreasing trend was detected between 2019 (baseline year) and 2025, although in the last two years the estimated incidence has been increasing. At country level, 14 countries (Austria, Bulgaria, Czechia, Denmark, France, Germany, Ireland, Italy, Latvia, Luxembourg, Malta, Portugal, Romania, and Slovakia)[1] had reached their respective target in 2025. However, seven EU countries had seen a statistically significant increasing trend in the estimated incidence since 2019.

The estimated total EU incidence of third-generation cephalosporin-resistant *E. coli* bloodstream infections was 12.13 per 100 000 population (EU country range 3.40–24.61) in 2025. This was 16.4% higher than in 2019 (baseline year) and 2.75 per 100 000 population higher than the 2030 target of 9.38 per 100 000 population. For the EU overall, no statistically significant trend was detected between 2019 (baseline year) and 2025, although in the last two years the estimated incidence has been higher than in 2019. At country level, three countries (Bulgaria, Finland and France)[2] had reached their respective targets in 2025. Meanwhile, there was a statistically significant increasing trend in the estimated incidence in 14 EU countries since 2019.

The estimated total EU incidence of carbapenem-resistant *K. pneumoniae* bloodstream infections was 3.75 per 100 000 population (EU country range 0.00–21.29) in 2025. This was 72% higher than in 2019 (baseline year) and 1.68 per 100 000 population higher than the 2030 target of 2.07 per 100 000 population. For the EU overall, a statistically significant increasing trend was detected between 2019 (baseline year) and 2025. At country level, five countries had reached their respective target (Austria, France, Ireland, Luxembourg and Malta)[3]. However, since 2019 a statistically significant increasing trend in the estimated incidence has been noted in 18 EU countries.

Epidemiological summary

Compared to 2021, the total number of reported invasive isolates for the EU/EEA increased from 370 544 to 517 966 in 2025. For bacteria, the highest estimated EU/EEA incidence of invasive isolates from all reporting laboratories in 2025 was *E. coli* (76.4 per 100 000 population), followed by *S. aureus* (39.3 per 100 000 population), *K. pneumoniae* (26.1 per 100 000 population), *E. faecalis* (14.7 per 100 000 population), *P. aeruginosa* (11.2 per 100 000 population), *E. faecium* (11.1 per 100 000 population), *S. pneumoniae* (9 per 100 000 population) and *Acinetobacter* spp. (4.1 per 100 000 population). This ranking did not differ from the ranking for 2024. Compared to 2021, all the estimated incidences of invasive isolates under EARS-Net surveillance in the EU/EEA had increased, except for *Acinetobacter* spp. which decreased with 25.5%. The largest increase in estimated incidence occurred for *S. pneumoniae* (+150%; from 3.6 to 9 per 100 000) followed by *K. pneumoniae* (+35.2%; from 19.3 to 26.1). Since 2021, *S. pneumoniae* has increased on an annual basis. Annual increases for *E. coli*, *K. pneumoniae*, *P. aeruginosa* and *S. aureus* have also been observed since 2021.

1 The results for Bulgaria, Denmark and France should be interpreted with caution.

2 The results for Bulgaria and France should be interpreted with caution.

3 The result for France should be interpreted with caution.

For AMR, the situation reported by EU/EEA countries to EARS-Net for 2025 varied widely, depending on the bacterial species, antimicrobial group and geographical region, as demonstrated by varying AMR percentages and often also the estimated incidence of bloodstream infections with AMR.

Overall, in 2025 more than 85% (23/27) of the estimated EU/EEA incidences of bloodstream infections with AMR under EARS-Net surveillance exceeded one per 100 000 population. Moreover, the results showed increases from 2021 to 2025 for two thirds of the combinations (66.7%), ranging from +1.2% to +141.5%. In particular, there was a statistically significant increasing trend in all AMR combinations for *E. coli*, *K. pneumoniae* and *S. pneumoniae*.

Overall, in 2025, the population-weighted EU/EEA mean AMR percentages exceeded 10% in (23/27) 85% of the combinations under regular surveillance. From 2021 to 2025, the results showed increases for one third of the combinations (33.3%), ranging from +0.1% to +3%. The AMR percentage for most of the bacterial species–antimicrobial combinations showed either a significantly decreasing or no significant trend. However, there were seven combinations for which a significantly increasing trend was observed: aminopenicillin resistance, third-generation cephalosporin resistance, carbapenem resistance, aminoglycoside resistance and combined resistance in *E. coli*, carbapenem resistance in *K. pneumoniae*, and combined penicillin non-wild-type and macrolide resistance in *S. pneumoniae*.

For some of the pathogens, the trend between 2021 and 2025 in the population-weighted EU/EEA mean AMR percentages differed from the corresponding trend in the estimated EU/EEA incidence of bloodstream infections with AMR. The differences can mainly be seen in *K. pneumoniae* and *S. aureus*. The estimated AMR incidence and AMR percentage may move in different directions, as the AMR percentage also depends on the incidence of infections by susceptible bacteria.

In 2025, the bacterial species with the highest estimated EU/EEA incidence of invasive infections and the highest estimated EU/EEA incidences of bloodstream infections with AMR was *E. coli*. Resistance to carbapenems was rare in *E. coli*, but all the estimated EU/EEA incidences of *E. coli* bloodstream infections with AMR under EARS-Net surveillance (aminopenicillins, fluoroquinolones, third-generation cephalosporins, aminoglycosides and carbapenems) increased compared to 2021, with significantly increasing trends for all combinations under surveillance. The trend pattern was similar for the respective EU/EEA population-weighted mean percentages, with one exception: no significant trend in the EU/EEA population-weighted mean percentage for fluoroquinolone resistance. Resistance to multiple antimicrobial groups was common. During the period 2021–2025, the estimated EU/EEA incidence of bloodstream infections with combined AMR showed a statistically significant increasing trend, as did the equivalent EU/EEA population-weighted mean. Except for carbapenem resistance, which remained low in almost all countries, with Cyprus showing the highest estimated incidence and resistance proportion, larger inter-country variations were noted for all the other antimicrobial groups under surveillance. Overall, the highest estimated national incidences of bloodstream infections with AMR *E. coli* were noted in countries in southern Europe. Otherwise, the geographical pattern was quite mixed. The national AMR percentages for aminoglycoside, fluoroquinolone, third-generation cephalosporin resistance and combined resistance were highest in southern, central and eastern Europe but otherwise the geographical pattern was mixed.

During the period 2021–2025, all the estimated EU/EEA incidences of *K. pneumoniae* bloodstream infections with AMR under EARS-Net surveillance (fluoroquinolones, third-generation cephalosporins, aminoglycosides and carbapenems) increased and showed significantly increasing trends. With the EU/EEA population-weighted mean percentage, this trend was only seen for carbapenem resistance. For the other antimicrobial groups, the EU/EEA population-weighted mean percentage showed statistically significant decreasing trends. Resistance to multiple antimicrobial groups was common. The estimated EU/EEA incidence of combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides in *K. pneumoniae* bloodstream infections showed a statistically significant increasing trend during the period 2021–2025, whereas the equivalent EU/EEA population-weighted mean percentage showed a statistically significant decreasing trend during the same period. Large inter-country variations were noted for all the antimicrobial groups under surveillance. Overall, the higher estimated national incidences of bloodstream infections with AMR *K. pneumoniae* were noted in countries in southern, central and eastern Europe. The same pattern was noted for the national AMR percentages.

Between 2021 and 2025, the estimated EU/EEA incidence of *P. aeruginosa* bloodstream infections with resistance to piperacillin-tazobactam, ceftazidime, and carbapenem increased, whereas resistance to fluoroquinolones and aminoglycosides decreased. Only fluoroquinolone resistance showed a significant decreasing trend. For aminoglycosides and combined resistance, these results should be interpreted with caution due to limited AST in many of the EU/EEA countries. For 2021–2025, the EU/EEA population-weighted mean AMR percentage decreased for all combinations and showed significantly decreasing trends for all the percentages. In 2025, all countries except one (Greece) showed estimated incidences of *P. aeruginosa* bloodstream infections with resistance to carbapenem of less than 2 per 100 000 population, and 19 countries reported more than 10% carbapenem resistance, seven of which reported more than 20% carbapenem resistance. Resistance to two or more antimicrobial groups was frequent. During the period 2021–2025, the estimated EU/EEA incidence of combined resistance, defined as resistance to at least three of the antimicrobial groups under surveillance, showed no statistically significant trend in *P. aeruginosa* bloodstream infections, whereas the equivalent EU/EEA population-weighted mean percentage showed a statistically significant decreasing trend. Large inter-country variations were noted in all antimicrobial

groups for the AMR percentages, but less so for the estimated incidences of AMR bloodstream infections. Overall, the higher estimated national incidences of bloodstream infections with AMR *P. aeruginosa*, as well as the national AMR percentages, were noted in countries in southern, central and eastern Europe.

Between 2021 and 2025, all the estimated EU/EEA incidences of *Acinetobacter* spp. bloodstream infections with resistance under EARS-Net surveillance showed a statistically significant decreasing trend. Moreover, all the estimated EU/EEA resistance incidences had almost halved compared to the high incidences seen in 2021. The EU/EEA population-weighted mean AMR percentage also showed statistically significant decreasing trends for all the antimicrobial groups under surveillance in the EU/EEA between 2021 and 2025. However, compared to 2024 there were increases or only a minor decrease in the EU/EEA population-weighted mean AMR percentages. Moreover, two countries showed estimated incidence of *Acinetobacter* spp. bloodstream infections with resistance to carbapenem above 10 per 100 000 (Greece and Romania). Resistance to multiple antimicrobial groups was common. However, the estimated EU/EEA incidence of combined resistance to carbapenems, fluoroquinolones and aminoglycosides in bloodstream infections decreased between 2021 and 2025 with a statistically significant decreasing trend. The EU/EEA population-weighted mean percentage of combined resistance showed a similar pattern. Large inter-country variations were noted for all antimicrobial groups. Overall, the higher estimated national incidences of bloodstream infections with AMR *Acinetobacter* spp. were noted in countries in southern, central and eastern Europe. The national AMR percentages showed a similar geographical pattern.

The estimated EU/EEA incidence of MRSA bloodstream infections showed a statistically significant increasing trend for the period 2021–2025, with three countries reporting national estimated incidences above 10 per 100 000 (Cyprus, Italy and Romania). On the other hand, the EU/EEA population-weighted mean MRSA percentage exhibited a significantly decreasing trend. Moreover, the MRSA percentage either showed a statistically significant decreasing trend or no statistically significant trend (i.e. neither decreasing nor increasing) in most EU/EEA countries. With MRSA, combined resistance to another antimicrobial group was quite common. Large inter-country variations were noted for MRSA. Overall, both the higher estimated national incidences of bloodstream infections with MRSA as well as the higher national MRSA percentages were noted in countries in southern, central and eastern Europe.

Compared to 2021, the 2025 estimated EU/EEA incidences of bloodstream infections with resistant *S. pneumoniae* more than doubled and there was a statistically significant increasing trend for the EU/EEA for all incidences between 2021 and 2025. Increases were also seen in the equivalent EU/EEA population-weighted mean percentages, but with no statistically significant trend. Combined resistance to another antimicrobial group was quite common, although rarely for three or four antimicrobial groups. The estimated EU/EEA incidence of combined AMR (i.e. macrolide resistance and penicillin non-wild-type) in *S. pneumoniae* bloodstream infections had also more than doubled compared to 2021 and showed a statistically significant increasing trend during the period 2021–2025. The EU/EEA population-weighted mean percentage for combined resistance also showed a significantly increasing trend. At country level, 18 EU/EEA countries showed this trend in the estimated incidence of penicillin non-wild-type *S. pneumoniae* bloodstream infections for 2021–2025, and 18 EU/EEA countries showed an equivalent trend in the estimated incidence of macrolide-resistant *S. pneumoniae* bloodstream infections for 2021–2025. Large inter-country variations in AMR percentages were noted for all antimicrobial groups, although there was less inter-country variation in the estimated incidences. Overall, there was a mixed geographical pattern of the estimated national incidences of bloodstream infections with AMR *S. pneumoniae*, as well as the national AMR percentages, across the EU/EEA.

During the period 2021–2025, the estimated EU/EEA incidence of high-level gentamicin-resistant *E. faecalis* bloodstream infections decreased from 2021 to 2024, before a slight increase in 2025, with a statistically significant decreasing trend. However, it should be noted that for each year more than one third of the countries reported that susceptibility to gentamicin was tested for less than 90% of isolates. The EU/EEA population-weighted mean percentage has been decreasing since 2021 and showed a significantly decreasing trend for the period 2021–2025. However, at country level seven countries reported an estimated incidence of high-level gentamicin resistance above three per 100 000 population. Large inter-country variations in AMR percentages were noted although there was less variation in the estimated incidence. Overall, higher estimated national incidences of bloodstream infections with high-level gentamicin resistance, as well as national AMR percentages, were noted in countries in southern, central and eastern Europe.

Although the estimated EU/EEA incidence of vancomycin-resistant *E. faecium* bloodstream infections decreased somewhat between 2021 and 2025, it increased in 2025 compared to 2024 and did not show a statistically significant trend. At country level eight countries showed a statistically significant increasing trend. The EU/EEA population-weighted mean percentage of vancomycin-resistant *E. faecium* was higher than that for 2021, but there was no statistically significant trend. AMR to two or more antimicrobial groups was common. For the estimated incidence of vancomycin-resistant *E. faecium* bloodstream infections, 15 countries reported an incidence below 0.50 per 100 000 population and three countries reported an incidence above 5 per 100 000 population. Eight countries reported vancomycin-resistant *E. faecium* percentages below 5% and 10 countries reported percentages above 25%, resulting in large inter-country variations in AMR percentages and less variation in the estimated incidence. Overall, the higher estimated national incidences of bloodstream infections with vancomycin resistant

E. faecium were noted in countries in southern, central and eastern Europe. The pattern of the national AMR percentages was similar except for one country (Ireland).

In addition to this summary, published jointly by the European Centre for Disease Prevention and Control (ECDC) and the WHO Regional Office for Europe, an Annual Epidemiological Report (AER) on Antimicrobial Resistance in the EU/EEA (EARS-Net) using 2025 data has been published by ECDC *(12)*. In country summaries that are published as an annex to the report there is country-specific information available, for each bacterial species, on: the estimated incidence of antimicrobial-resistant bloodstream infections (including the recommended EU targets on AMR); the percentage of invasive isolates with AMR; data availability, and the percentage of intensive care unit patients. Results by age group and sex are available in ECDC's Surveillance Atlas of Infectious Diseases *(13)*. The country summaries also include information on susceptibility to novel antimicrobials among gram-negative carbapenem-resistant isolates.

Discussion

In 2026, all EU/EEA countries reported data for 2025 to EARS-Net. Representativeness, as reported by the countries, was high at 80%. This indicates that although all EU/EEA countries actively participate in EARS-Net, some countries can still improve surveillance representativeness.

The EARS-Net data showed an overall increase in the EU/EEA estimated incidences of invasive infections between 2021 and 2025, except for *Acinetobacter* spp., the incidence of which considerably decreased. The former could potentially reflect changes in the EU/EEA population, such as an increase in the number of people vulnerable to developing these severe infections over time, due to factors such as aging, invasive medical treatments and immunosuppression. The latter may reflect successful control efforts after a large increase was noted for 2020–2021 *(14)*, which was a time of COVID-19 interventions and pandemic-associated pressures on healthcare. The effects of COVID-19 and the related interventions during this period should also be kept in mind when interpreting the other results in this summary.

The results for the EU targets continued to show a combination of an achieved target for MRSA and concerning developments for the other two EU targets. The estimated EU incidence of third-generation cephalosporin-resistant *E. coli* bloodstream infections with a 10% reduction target increased by more than 15% compared to 2019 (baseline year). Meanwhile, the estimated EU incidence of carbapenem-resistant *K. pneumoniae* bloodstream infections increased by over 70% compared to 2019 (baseline year), which is in stark contrast to the target of a 5% reduction by 2030. This indicates the continued need to rapidly strengthen prevention and control, as well as antimicrobial stewardship, including accessibility to relevant antimicrobials in the EU, as highlighted in the Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach *(15)*.

Overall, AMR levels remained high in the EU/EEA in 2025, as in previous years, with wide variability among EU/EEA countries, depending on the bacterial species, antimicrobial group and geographical region. In general, higher AMR percentages and estimated incidences of bloodstream infections with AMR continued to be reported by countries in southern, central and eastern Europe *(16)*. By providing an overview of the wide variability across EU/EEA countries in 2025, the summary suggests that there are further opportunities for significant AMR reduction through interventions to improve IPC and antimicrobial stewardship practices. For example, for carbapenem-resistant *K. pneumoniae* and other carbapenem-resistant Enterobacterales (CRE), the updated ECDC rapid risk assessment on CRE noted that the spread could be reduced by consistently applied IPC and antimicrobial stewardship, including access to relevant antimicrobials, and the impact mitigated by measures such as timely laboratory detection and infection management *(17)*.

At the EU/EEA level, increases in the estimated incidences of bloodstream infections with resistant bacteria were observed not only for two of the above-mentioned AMR-pathogen combinations with an EU target, but also for many other bacteria and antimicrobial groups under surveillance. These increases in the estimated incidences are a cause for concern.

Among the most worrying developments are:

- The increasing carbapenem resistance in *K. pneumoniae* together with ECDC's assessment that the probability of further spread in the EU/EEA can be considered high *(17)*, especially in combination with the presence of genetic markers of increased virulence *(18)*;
- The increasing estimated AMR incidences (including for carbapenems) and population-weighted mean AMR percentages for *E. coli*, indicating that the EU/EEA is not progressing in the right direction for *E. coli*, a bacterial species that is one of the most common causes of bloodstream infections in Europe. Moreover, already in 2016–2020, the largest EU/EEA AMR burden of disease was caused by infections with third-generation cephalosporin-resistant *E. coli*, both in terms of the number of cases and the number of attributable deaths *(19)*;
- The more than doubled estimated AMR incidences for *S. pneumoniae* since 2021, with increasing trends in most EU/EEA countries, although there were smaller increases in the corresponding EU/EEA population-weighted mean percentages. The observed increases possibly reflect the lifting of non-pharmaceutical interventions for SARS-CoV-2, in parallel with factors that could influence AST, such as laboratories switching from gradient test, which underestimates resistance, and for macrolides also a change of the European Committee on Antimicrobial Susceptibility Testing (EUCAST) breakpoint for R as of 2023 *(20)*. However, these aspects should not detract from the noted increases in AMR;
- The increasing estimated incidence of MRSA bloodstream infections, indicating that the one EU

target that is currently met may be in jeopardy, while also considering that MRSA is one of the most common causes of bloodstream infections, with a high burden in terms of morbidity and mortality *(19,21)*. In addition, the decreasing trend in EU/EEA population-weighted mean MRSA percentage and the increasing estimated incidence of invasive *S. aureus* infections suggest that it occurs concomitant with an increase in meticillin-susceptible bloodstream infections in the EU/EEA;

- The increase in the estimated EU/EEA incidence of vancomycin-resistant *E. faecium* bloodstream infections compared to 2024, with statistically significant increasing trends observed for eight countries, together with an increase in the EU/EEA population-weighted mean percentage and an increase in the estimated incidence of invasive *E. faecium* infections. An ECDC study estimated that there were 117 866 *E. faecalis* and *E. faecium* infections in the EU/EEA in 2020, with 3 414 deaths *(19)*. A rise in the estimated EU/EEA incidence of vancomycin-resistant *E. faecium* bloodstream infections compared to 2020 would contribute to a further increase in the health burden of vancomycin-resistant enterococci infections. At the same time, enterococci have intrinsic resistance to several antimicrobial classes and are easily disseminated in healthcare settings.

Concerns raised regarding CRE, specifically carbapenem-resistant *K. pneumoniae* and carbapenem-resistant *E. coli*, led to the adoption of a Health Security Committee (HSC) opinion on this topic in 2025 *(22)*. The HSC opinion noted that the deteriorating situation may have been influenced by the COVID-19 pandemic, as well as war casualties and patients transferred from Ukraine since 2022 *(23)*. The HSC opinion also stated that CRE pose a threat to EU preparedness in future pandemics or significant mass casualty events and emphasised the importance of reducing the spread. To counteract the deteriorating situation for CRE, the HSC opinion proposed measures for the EU/EEA, including support that can be provided by the European Reference Laboratory on AMR (EURL-PH-AMR), the EU guidelines on IPC in human health developed by the European Commission in collaboration with ECDC *(24)*, and the European Commission support of research and access to antimicrobials. At EU/EEA country level, the HSC opinion's proposed measures include CRE national management teams and management plans.

There are also encouraging developments at EU/EEA level. For example, the high levels of AMR among *Acinetobacter* spp. noted in 2021 have decreased substantially. Another example is the EU/EEA AMR percentages for *P. aeruginosa* for 2021–2025, which showed statistically significant decreasing trends. However, it should be noted that some of the corresponding estimated EU/EEA AMR incidences for *P. aeruginosa* increased and the *P. aeruginosa* results that include aminoglycosides should be interpreted with caution due to limited AST in many EU/EEA countries. Although there are a few signs that the AMR situation is improving at EU/EEA level for some of the EARS-Net pathogens, the situation at country level is still a cause for concern. For *Acinetobacter* spp., two countries showed estimated incidence of *Acinetobacter* spp. bloodstream infections with resistance to carbapenem above 10 per 100 000 population. In addition, *Acinetobacter* spp. continue to display high EU/EEA population-weighted mean AMR percentages. For *P. aeruginosa*, high AMR percentages were observed in several countries, and carbapenem resistance was frequent among the tested invasive isolates. As *P. aeruginosa* is intrinsically resistant to many antimicrobial agents, additional acquired resistance is further complicating the treatment of *P. aeruginosa* infections. Moreover, *P. aeruginosa* is one of the major causes of healthcare-associated infections in Europe *(25, 26)*.

When interpreting the EARS-Net data, it is important to be mindful of the structure of the surveillance system, including variations in national blood culture rates, as well as changes in the national surveillance systems and in EARS-Net over time. For example:

- The estimated incidence relies on the estimated national population coverage of the AMR data, as reported by each country. The estimated incidences should be interpreted with caution, especially when the national population coverage is estimated as less than 100%. The interpretation of AMR percentages can also be challenging, as they depend not only on the number of resistant isolates but also on the number of identified susceptible isolates included in the denominator. The AMR percentage could therefore for example decrease despite an unchanged number of resistant isolates if this coincides with an increase in the number of susceptible isolates. Both measures, estimated incidence and AMR percentage, should be considered for EARS-Net results and should be interpreted with some caution.
- Although ECDC published the report 'Operational public health considerations for the prevention and control of infectious diseases in the context of Russia's aggression towards Ukraine' *(27)*, which specifically raises the issue of multidrug-resistant organisms, data reported to EARS-Net cannot assess the magnitude of the impact of this war in terms of AMR occurrence in the EU/EEA.
- EARS-Net currently only covers eight pathogens. However, other relevant pathogens may be covered at country level, and several of the pathogens are covered by other disease networks coordinated by ECDC; for example, the European Antimicrobial Resistance Genes Surveillance Network (EURGen-Net) published an investigation into carbapenemase-producing *Providencia stuartii (28)*.
- EARS-Net focuses on specimens from blood and cerebrospinal fluid, which allows some pooling of EU/EEA data and comparison, although limited, of results across EU/EEA countries. However, this should not prevent countries from collecting data from other sample types to better inform national and/or local treatment guidelines.
- There are also limitations for specific bacterial species. For example, it should be noted that the data reported on *K. pneumoniae* may have been affected by changes over time in the identification and nomenclature of *K. pneumoniae*. Species previously but no longer

identified as *K. pneumoniae* sensu stricto are less often found to be resistant. As a result, the reported percentage of resistant *K. pneumoniae* in the EU/EEA may have increased over time. However, in many cases, laboratories will have difficulties in distinguishing species belonging to the *K. pneumoniae* complex (the main members being *K. pneumoniae* sensu stricto, *K. variicola*, and *K. quasipneumoniae*). The size of the impact, in terms of changes in identification and nomenclature, is unknown.

One previous limitation of EARS-Net was the lack of AST data on novel antimicrobials for treatment of carbapenem-resistant gram-negative bacteria. However, as of 2025 these data are collected and presented at country level, although currently EU/EEA level analysis is not undertaken due to the limited data reported to ECDC.

Another aspect that is important to consider when interpreting the results is the quality of the laboratory data that EARS-Net collects. To address this, EARS-Net conducts annual external quality assessment (EQA) exercises. Overall, the EARS-Net EQA results for 2025 were favourable. All 29 participating countries achieved either 'excellent' or 'very good' results *(29)*. The results also indicated that there was no systematic overestimation or underestimation of AMR in the EU/EEA. However, the results continued to show that AST for carbapenems for *E. coli* and *K. pneumoniae* (underestimation of resistance), for the macrolide azithromycin for *S. pneumoniae* (overestimation of resistance), and for the aminoglycoside gentamicin in *Acinetobacter* spp. (overestimation of resistance) pose a challenge to laboratories in EARS-Net *(29)*. In addition, more recently noted challenges include the novel antimicrobials (with e.g. both overestimation and underestimation of resistance to cefiderocol) and AST of the fluoroquinolone levofloxacin for *K. pneumoniae* (overestimation of resistance) *(29)*. Previous EARS-Net EQAs have also indicated that there may be an underestimation of ceftazidime resistance in *P. aeruginosa*, and overestimation of resistance to third-generation cephalosporins in *E. coli*, piperacillin-tazobactam in *P. aeruginosa*, and MRSA *(30, 31)*. The overall very good 2025 EARS-Net EQA results, as well as the noted challenges, should, as applicable, be considered when interpreting the results in this summary.

To address the various challenges posed by AMR, ECDC surveillance and monitoring are not restricted to EARS-Net. To complement the phenotypic-based surveillance data available from EARS-Net, and to further investigate the sources and routes of transmission for carbapenemase-producing Enterobacterales (CPE) (including *E. coli* and *K. pneumoniae*) and *Acinetobacter* spp. periodic surveys are conducted within EURGen-Net *(32, 33)*. The results from such a survey were recently published *(34)*. Moreover, ECDC is also able, to a limited extent, to provide Member States with access to whole-genome sequencing services, primarily for investigating potential multi-country outbreaks. The need for follow-up of antimicrobial consumption is met by the surveillance carried out by the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) *(35)*. The ESAC-Net AER has for example in 2026 shown that despite some recent progress, the EU remains unlikely to achieve the antimicrobial consumption targets of a 20% reduction in total consumption of antibacterials for systemic use between 2019 and 2030 and ensuring that at least 65% of antimicrobial consumption comprises WHO AWaRe[4] Access group antimicrobials by 2030 *(36)*. In addition, point prevalence surveys as well as indicator- and event-based surveillance of healthcare-associated infections are undertaken within the Healthcare-Associated Infections Surveillance Network (HAI-Net) *(37)*. Among the recent outputs from the network are the AER on healthcare-associated infections acquired in intensive care units *(25)* and on surgical site infections in healthcare-associated infections *(38)*, and the results from the point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2023–2024 *(39)*. To address the One Health aspect of AMR, a joint annual report is produced by ECDC and the European Food Safety Authority (EFSA) *(40)*, showing for example reduction in AMR in *E. coli* in food-producing animals, although with large variations across the participating countries, and occurrence of CPE, although at a low level *(40)*. A full One Health perspective is presented in a joint inter-agency report on the integrated analysis of consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals in the EU/EEA (JIACRA) which is produced by ECDC, EFSA, and the European Medicines Agency (EMA) approximately every three years *(41)*.

Moreover, ECDC has produced rapid risk assessments with options for response and recommendations to address several of the challenges highlighted in this summary, such as CRE *(17)*, emergence of hypervirulent *K. pneumoniae* sequence type 23 carrying carbapenemase genes *(18)*, and carbapenem-resistant *Acinetobacter baumannii* in healthcare settings *(42)*.

In recent years, ECDC has also conducted Public Health Emergency Preparedness Assessments (PHEPA) in EU/EEA countries. These assessments, which include the topic of AMR, result in country-specific recommendations *(43)* for which the countries should, as needed, produce an action plan.

In addition, data collected by ECDC contribute to providing a regional *(1)* and global *(44)* picture of AMR by being included in outputs produced by WHO. Moreover, ECDC and WHO Regional Office for Europe jointly produce this summary of AMR in Europe.

Furthermore, at EU level, the European Health Union was created in 2020 to better protect the health of EU citizens *(45)*. One of the main instruments for the European Health Union is a large budget available under the EU4Health programme (EUR 4.4 billion for the period 2021–2027), dedicated to wider policy areas, including action on AMR.

At a global level, the Political Declaration of the High-Level Meeting on AMR at the United Nations (UN) General

4 (Access, Watch, Reserve)

Assembly (September 2024) highlighted the public health threat posed by AMR *(46)*. The Declaration called for the establishment of an independent panel to collect evidence for action against AMR. The European Commission declared that it will be providing funds for the establishment of such a panel *(47)* and the plan is for the Independent Panel on Evidence for Action against AMR (IPEA) to be established in 2026 *(48)*. WHO has also published a list of priority bacteria as a guide for AMR research, investments and public health action *(49)*.

Public health implications

Estimates based on EARS-Net data from 2020 indicate that over 35 000 people die in the EU/EEA each year as a direct consequence of antimicrobial-resistant infections *(19)*. The overall poor progress towards the EU targets on AMR and the increases in the estimated EU/EEA incidences of bloodstream infections with resistant bacteria highlight the urgent need for intensified public health action against AMR to protect public health.

The 'Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach' (2023/C 220/01), not only encourages Member States to develop and implement NAPs against AMR, but also highlights the need for the countries to allocate appropriate human and financial resources for the effective implementation of these plans *(15)*. In addition, the PHEPA reports provide recommendations, specifically tailored to the respective country, on addressing AMR and healthcare-associated infections *(43)*.

Implementing public health interventions to tackle AMR would not only have a significant positive impact on population health but also future healthcare expenditure in the EU/EEA. A mixed intervention package has been estimated to potentially not only prevent nearly 613 000 resistant infections and avoid more than 10 000 deaths per year in the EU/EEA, but it would also lead to a reduction in health expenditure and gains in productivity, which together would be three times higher than the average cost of implementing the package *(50)*.

However, in the absence of stronger and swifter public health action, it is unlikely that the EU AMR targets will be reached by 2030. AMR will instead continue to increasingly jeopardise public health in the EU/EEA, including its preparedness. This will lead to an increased number of infections with antimicrobial-resistant bacteria that will be more difficult to treat, as well as greater challenges for patient safety and a rise in AMR-related deaths.

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