

Antimicrobial resistance prevalence varies by age and sex in bloodstream infections in European hospitals: Study

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New research presented at this year's [European Congress of Clinical Microbiology and Infectious Diseases](#) (ESCMID 2024, Barcelona 27-30 April) shows that levels of resistance to antimicrobials (AMR) varies with age and sex, with age in particular showing substantial variation both between and within countries. The study by Gwen Knight, Associate Professor at the London School of Hygiene and Tropical Medicine and co-Director of the LSHTM AMR Centre, London, UK, and colleagues, is published in *PLOS Medicine*.

Remarkably little is known about how [antimicrobial resistance](#) (AMR) prevalence in infection varies with age and sex for different bacterial species and resistance phenotypes and how these associations vary spatially. Understanding such associations has the potential to shed new light on AMR epidemiology, inform forecasts, and support intervention targeting. Using data from 29 European countries, the researchers aimed to characterize this burden for bloodstream infections.

They analyzed routine surveillance data from bloodstream infections collected by the European Antimicrobial Resistance Surveillance Network (EARS-Net). They included 6,862,577 susceptibility results from isolates from 2015-2019 with age, sex and [spatial information](#) used to characterize resistance trends by age and sex. Computer modeling was used to estimate any potential resistance variance by sex and age between the young (1 year old) and the very old (100 years old)

They found substantial variation in AMR prevalence by age subnationally and between countries, with four main association forms: (i) u-shaped with monotonic increase with age after infancy, (ii) constant, (iii) n-shaped with resistance peaking at intermediate ages and (iv) monotonic decline with age. Sex was less often associated with resistance, apart from in *E. coli*, *K. pneumoniae* and at younger ages for

Acinetobacter sp., in which men were more likely to have a resistant infection.

Trends at the European level varied more within an antibiotic family than within a bacterial species. For methicillin-resistant Staphylococcus aureus (MRSA), a clear increase in resistance prevalence by age was seen (72% of countries seeing an increased resistance between younger and older males), while resistance to several antibiotics within Pseudomonas aeruginosa peaked at around 30 years of age

Age trends for aminopenicillin resistance in Escherichia coli were mostly negative (93% of countries show decreased resistance between younger and older males) with a smaller change in resistance in females.

Commenting on the findings, Dr. Knight says, "Most experts assume that resistance prevalence would increase with age due to cumulative antibiotic exposure effects and contact with health care settings, but it was not the case with all pathogens. I am also surprised by the fact that women, despite having more [risk factors](#)—such as childbirth and higher urinary tract infection incidence, and hence antibiotic exposures—had a lower prevalence of resistant bloodstream infections."

The authors conclude, "AMR prevalence in bloodstream infection varies by age and sex, with diverse patterns of association that vary widely with bacterial species and resistance phenotype. These unexpected findings, which may have important implications for intervention targeting, reveal important gaps in our understanding of AMR drivers in Europe. There is also much variation in antibiotic use guidelines between and within countries, that could be related to some of these observed trends."

More information: Naomi R. Waterlow et al, Antimicrobial resistance prevalence in bloodstream infection in 29 European countries by age and sex: An observational study, *PLOS Medicine* (2024). [DOI:](#)

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