UK Health Security Agency

English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) report 2025 to 2026

Annexe

Contents

Chapter 2. Antimicrobial resistance 3
Methods and caveats annexe 3
Antifungal resistance 14
Antiviral resistance 15
Antiparasitic resistance 17
Additional data sources 17
Statistical analyses 18
AMR resources 18
Supplementary analyses 19
Chapter 3. Antimicrobial consumption 21
Antimicrobial consumption: data sources 21
Classification of prescribing data 22
Denominators 24
Other community settings categories 24
Details of the Pharmacy First Service 25
Statistical analyses 26
Secondary care data quality 28
Antiviral consumption 32
Antiparasitic consumption 32
Chapter 5. Antimicrobial stewardship 33
Chapter 6. NHS England: improvement and assurance schemes 33
Chapter 7. Professional and public education and training 34
TARGET and RCGP Webinar series 34
Vector-borne disease educational resource development 34
Antibiotic Guardian 35
Chapter 8. Research insights and knowledge mobilisation 37
List of publications 37
Chapter 9. ESPAUR oversight group members' activities and actions to tackle AMR – mapping to the National Action Plan 50
Chapter 10. Knowledge mobilisation of ESPAUR report: evaluation of feedback from report users 50
References 51
About the UK Health Security Agency 52

Chapter 2. Antimicrobial resistance

Methods and caveats annexe

Antibacterial resistance

Data on the antibiotic susceptibility of pathogens causing bacteraemia was obtained from SGSS (Second Generation Surveillance System), a national database maintained by UK Health Security Agency (UKHSA) that contains laboratory data supplied electronically by approximately 98% of hospital microbiology laboratories in England. SGSS comprises 2 modules, a communicable disease reporting (CDR, formerly CoSurv/LabBase2) module and an antimicrobial resistance (AMR, formerly AmSurv) module. The AMR module contains comprehensive antibiogram information as it includes results for all antibiotics tested (including results suppressed from clinical reports) for isolates from all clinical sources. For trends included within this report, resistance data between 1 January 2019 to 31 December 2025 is taken from the AMR module.

Hospital microbiology laboratories have reported antimicrobial susceptibility test results as ‘susceptible’, 'susceptible, increased exposure’ or ‘resistant’. These categories were defined as follows as per the European Committee on Antimicrobial Susceptibility Testing (EUCAST):

1. Susceptible, standard dosing regimen (S): a bacterial strain is said to be susceptible to a given antibiotic when there is a high likelihood of therapeutic success using a standard dosing regimen.
2. Susceptible, increased exposure (I): a bacterial strain is said to be susceptible, increased exposure’ when there is a high likelihood of therapeutic success because exposure to the agent is increased by adjusting the dosing regimen or by its concentration at the site of infection.
3. Resistant (R): a bacterial strain is said to be resistant to a given antibiotic when there is a high likelihood of therapeutic failure even when there is increased exposure.

For the whole time period, values are presented with only resistant episodes included in the numerator, as per the definition of susceptibility test results used by the European Committee on Antimicrobial Susceptibility Testing (EUCAST), updated in January 2019. Breakpoints can change over time, and this has implications for interpretation of resistance trends spanning breakpoint changes – see ESPAUR 2023/24 report box 2.3 for further explanation.

As patients may have more than one positive blood culture taken, blood cultures taken from the same patient that yielded growth of the same pathogen during a rolling 14-day period from the initial positive blood culture were regarded as comprising the same episode of infection and were de-duplicated, retaining the worst-case scenario susceptibility result for each antibiotic tested (resistant > intermediate > susceptible). Combining patient results into one infection episode is limited by the provision of key identifiers by reporting laboratories, so some episodes

may be counted more than once if these identifiers enabling grouping and de-duplication are not provided or are provided incorrectly.

Antibiotic groupings used in the bacteraemia antimicrobial susceptibility analyses within the report are shown in Annexe Table 2.1.

Annexe Table 2.1. Antibiotic class groupings

Antibiotic class groupings	Antibiotic
Third-generation cephalosporins	cefotaxime, ceftazidime, cefpodoxime or ceftriaxone, unless otherwise indicated
Carbapenems	meropenem or imipenem, except where neither were tested, in which cases results for ertapenem were used if available (the exception to this is for *Pseudomonas spp.* where ertapenem was not used)
Aminoglycosides	gentamicin or amikacin
Fluoroquinolones	ciprofloxacin, unless otherwise defined
Glycopeptides	vancomycin or teicoplanin
Macrolides	azithromycin, clarithromycin or erythromycin

Data on the incidence of *Escherichia coli* (*E. coli*) and *Staphylococcus aureus* (*S. aureus)* bacteraemia was extracted from the national mandatory surveillance schemes while data on the incidence of other pathogens was derived from cases reported to the AMR module of SGSS. As the latter data was provided on a voluntary basis, case ascertainment will be incomplete.

SGSS and the mandatory surveillance Data Capture System are live reporting databases, and therefore data is subject to change and may differ to other published outputs.

Data on additional bacterial pathogens causing hospital bacteraemia in England can be found in Chapter 2 data tables.

Incidence trends, age and sex distributions and antibiotic resistance trends are presented based on SGSS AMR module data. This data continues the series previously published in separate annual voluntary surveillance bacteraemia reports (published in the Health Protection Report series).

Limitations and caveats

In England, the mandatory surveillance scheme for *E. coli* bacteraemia does not include susceptibility testing data, which is collected through a parallel voluntary laboratory reporting system. Comparison of the incidence reported between the 2 systems indicated that the ascertainment achieved in the laboratory reporting system was 93% in 2025 (92% in 2024, Annexe Table 2.2) and varied by local geography across the country (ranging between 83% and

98%, Annexe Table 2.3). Ascertainment factors applied to estimate the total number of resistant bloodstream infections by Integrated Care Board (ICB) can be found in the accompanying data tables.

Annexe Table 2.2. Ascertainment factor applied to estimate total number of resistant bloodstream infections

Year	Mandatory *E. coli* bacteraemia reports	SGSS AMR *E. coli* bacteraemia reports	% ascertainment	Ascertainment factor
2019	43,746	38,152	87.2	1.147
2020	37,907	31,604	83.4	1.199
2021	37,865	32,987	87.1	1.148
2022	38,500	33,713	87.6	1.142
2023	41,228	37,248	90.3	1.107
2024	43,621	40,159	92.1	1.086
2025	44,812	41,863	93.4	1.070

Annexe Table 2.3. Regional ascertainment factor applied to estimate total number of resistant bloodstream infections 2025

Region	Mandatory *E. coli* bacteraemia reports	SGSS AMR *E. coli* bacteraemia reports	% ascertainment	Ascertainment factor
East Midlands	3,947	3,869	98.0	1.020
East of England	4,675	4,417	94.5	1.058
London	5,959	4,961	83.3	1.201
North East	2,812	2,363	84.0	1.190
North West	6,251	5,968	95.5	1.047
South East	6,890	6,643	96.4	1.037
South West	4,580	4,472	97.6	1.024
West Midlands	4,799	4,480	93.4	1.071
Yorkshire and Humber	4,899	4,505	92.0	1.087

Since April 2017 reporting of bacteraemia caused by *Klebsiella spp.* and *Pseudomonas aeruginosa* was also mandatory. Reviews of ascertainment between the mandatory and voluntary surveillance schemes for each pathogen were assessed for 2021 as 83% (*Klebsiella spp.*) and 85%, for *P. aeruginosa*.

Rapid molecular techniques are used to identify the mecA gene (meticillin-resistant *S. aureus* (MRSA) indicator) avoiding the requirement to undertake susceptibility testing for isoxazolyl-penicillins (such as oxacillin). This information is not captured in the SGSS data. Figure 2.1 and Figure 2.2 in the main report present the mandatory surveillance results for MRSA bacteraemia which represents a more accurate burden of MRSA in England. Whereas Figure 2.9 (resistance differences between MRSA and meticillin-susceptible *S. aureus* (MSSA)) is using SGSS AMR data, where MRSA is defined as *S. aureus* reported as resistant to meticillin, oxacillin, cefoxitin or flucloxacillin. The ascertainment factor for *S. aureus* reports in SGSS AMR was 1.078 in 2025.

EUCAST does not provide daptomycin clinical breakpoints for *E. faecium* and *E. faecalis*, but rather lists the breakpoint as 'Insufficient Evidence', in part due to the dosing regimes which far exceed licensed doses. Although daptomycin is increasingly used for enterococcal bacteraemia and endocarditis, especially in the context of vancomycin resistance, uncertainties remain particularly with the inability of even the highest published doses to achieve adequate exposure against all wild-type enterococcal isolates (1). Although minimum inhibitory concentration (MIC) distributions and epidemiological cut-off values are frequently used to predict likelihood of clinical success, as the local method of susceptibility testing cannot be verified, daptomycin MIC cannot be categorised and therefore caution should be used when interpretating the results.

Estimating the burden of antibiotic-resistant bloodstream infections

Data used to update the pathogen and antimicrobial summaries in the ESPAUR report was utilised to generate a metric of the estimated burden of resistant bacteraemia in England. The total number of resistant infections is generated by calculating the proportion of each pathogen that were reported as resistant to one or more specific antibiotics and ensuring that that infection report is not counted in any subsequent antibiotic combinations to avoid double counting. A full list of pathogen and antibiotic combinations is shown in Annexe Table 2.4. The pathogen and antibiotic combinations used for the ESPAUR AMR burden metric include all of those used to calculate the UK Government's 2024 to 2029 AMR National Action Plan AMR burden metric for human health target 1a, plus additional combinations – the differences between these metrics are detailed in Annexe Table 2.4.

For each year, the ascertainment of cases of *E. coli* bacteraemia reported on a voluntary basis to the AMR module of SGSS was estimated by comparison with mandatory surveillance reports (Annexe Table 2.2). This value was then applied to the other pathogens under surveillance to estimate the total number of bacteraemia for each pathogen each year (except for *S. aureus,* where the mandatory surveillance totals for both MRSA and MSSA were used). The same method with region-specific numbers was used to calculate the regional AMR burden (regional numbers and ascertainment factors are listed in the data tables accompanying the report.

For 2025, the AMR burden from bacteraemia was reported by ethnic group and by indices of multiple deprivation (IMD). As the mandatory surveillance scheme does not include ethnicity and deprivation information, incidence data of all pathogens was derived from cases reported to the AMR module of SGSS.

Annexe Table 2.4. Bacteria and antibiotic resistance categories included in the AMR burden analysis within the ESPAUR report: ESPAUR AMR bacteraemia burden combinations and National Action Plan (NAP) estimate combinations

Bacteria	Antibiotic resistance	ESPAUR AMR bacteraemia burden	NAP estimate AMR burden
Escherichia coli	Carbapenem-resistant	✓	✓
	Third-generation cephalosporin-resistant (excluding isolates also resistant to carbapenems)	✓	✓
	Aminoglycoside-resistant (excluding isolates also resistant to carbapenem and/or third-generation cephalosporin)	✓	
	Fluoroquinolone-resistant (excluding isolates also resistant to carbapenem and/or third-generation cephalosporin and/or aminoglycoside)	✓	
Klebsiella pneumoniae	Carbapenem-resistant	✓	✓
	Third-generation cephalosporin-resistant (excluding isolates also resistant to carbapenem)	✓	✓
	Aminoglycoside-resistant (excluding isolates also resistant to carbapenem and/or third-generation cephalosporin)	✓	
	Fluoroquinolone-resistant (excluding isolates also resistant to carbapenem and/or third-generation cephalosporin and/or aminoglycoside)	✓	
	Carbapenem-resistant	✓	

Bacteria	Antibiotic resistance	ESPAUR AMR bacteraemia burden	NAP estimate AMR burden
Klebsiella oxytoca	Third-generation cephalosporin-resistant (excluding isolates also resistant to carbapenem)	✓	
	Aminoglycoside-resistant (excluding isolates also resistant to carbapenem and/or third-generation cephalosporin)	✓	
	Fluoroquinolone-resistant (excluding isolates also resistant to carbapenem and/or third-generation cephalosporin and/or aminoglycoside)	✓	
Acinetobacter spp.	Carbapenem-resistant	✓	✓
	Aminoglycoside- and fluoroquinolone-resistant (excluding isolates also resistant to carbapenem)	✓	✓
Pseudomonas spp.	Carbapenem-resistant	✓	✓*
	Resistant to 3 or more antimicrobial groups (excluding isolates also resistant to carbapenem)	✓	✓*
Enterococcus spp.	Glycopeptide-resistant	✓	✓**
Staphylococcus aureus	Methicillin-resistant	✓	✓
Streptococcus pneumoniae	Penicillin- and macrolide-resistant (excluding isolates only resistant to penicillin)	✓	✓
	Penicillin-resistant (excluding isolates also resistant to macrolides)	✓	✓

* The NAP estimate AMR burden includes *Pseudomonas aeruginosa* only and not other *Pseudomonas* species.
** The NAP estimate AMR burden includes *E. faecalis and E. faecium* only and not other *Enterococcus* species.

Acquired carbapenemase-producing Gram-negative bacteria

Acquired carbapenemase-producing Gram-negative organisms (CPO) continue to pose a significant public health concern in terms of threat to global health and economic stability (2).

Carbapenems constitute some of the most effective and broadest-spectrum antibiotics available and are typically reserved for severe and multi-drug-resistant infections. Acquired carbapenemases are enzymes which inactivate carbapenems and most other -lactam antibiotics, including penicillins and cephalosporins, and can result in infections with severely limited treatment options. Many carbapenemase genes are found on mobile genetic elements and are thus easily transferable between species.

The prominent carbapenemase families, termed the ‘big 5’, and constituting >98% of carbapenemase mechanisms overall, are KPC, NDM, OXA-48-like, VIM and IMP, and are increasingly found in species such as *E. coli*, *K. pneumoniae* and *Enterobacter cloacae* complex. However, novel mechanisms of resistance are increasingly being detected.

Developing local laboratory capacity to detect the ‘big 5’ carbapenemase families has been a key part of the national response, and a change in referral criteria to the Antimicrobial Resistance and Healthcare Associated Infections (AMRHAI) Reference Unit with a focus on invasive isolates and mechanistic uncertainty in the context of certain resistant determinants, has seen a decrease in nationally referred isolates (presented later in the Chapter).

Data on confirmed CPOs was obtained from both the Antimicrobial Resistance and Healthcare-Associated Infections (AMRHAI) Reference Unit and from the Antimicrobial Resistance (AMR) module of SGSS (see the Antibacterial resistance methods section for details).

As patients may have more than one positive specimen taken, specimens taken from the same patient that yielded growth of the same pathogen and carbapenem resistance mechanism within a 52-week period from the initial positive specimen were regarded as comprising the same episode of infection and were de-duplicated. CPO positive referred isolates and local laboratory isolates were combined for this de-duplication process, with resistance mechanism results from the AMRHAI Reference Unit retained preferentially where patient specimen overlap occurred. A summary of the distribution of the carbapenemase families covered by the AMRHAI Reference Unit (including those outside the ‘big 5’ families) is presented in Annexe Table 2.5, below. The local laboratory data presented only includes results from the 'big 5' carbapenemase families.

UKHSA strongly recommends that all diagnostic laboratories should be able to detect the 4 carbapenemase families in bold (the ‘big 4’). The following table uses these symbols: ¥ = combinations of mechanism and species would not be considered as exceptional results. A = intrinsic to *A. baumannii* and only expressed when associated with an insertion element. B = almost exclusively reported in *Enterobacter spp.* with less than a handful of reports in other genera. C = reported only in *Serratia marcescens*. D = fewer than 10 in total ever confirmed by AMRHAI Reference Unit. E = fewer than 50 in total ever confirmed by AMRHAI Reference Unit.

Where an 'exceptional' carbapenemase and species combination result (cells without a ¥ symbol in Annexe Table 2.5) has been identified, isolates should be sent to AMRHAI Reference Unit for confirmation.

Annexe Table 2.5. Distribution of carbapenemase genes covered by AMRHAI Reference Unit molecular assay (based on AMRHAI data)

Carbapenemase family	Associated with common 'host' organism		
	Enterobacterales	***Pseudomonas spp.***	***Acinetobacter spp.***
KPC	¥	<10D	<10D
OXA-48-like	¥	<50E	0
NDM	¥	¥	¥
VIM	¥	¥	<10D
IMP	¥	¥	¥
IMI/NMC-A	¥ B	0	0
GES	¥	¥	<10D
FRI	<10D	0	0
SME	<50C,E	0	0
DIM	0	<50E	0
GIM	<10D	<10D	0
SIM	0	<10D	0
SPM	0	<10D	0
OXA-23-like	<50E	0	¥
OXA-40-like	0	0	¥
OXA-51-likeA	0	0	¥
OXA-58-like	0	0	¥

Notification data

Following the inclusion of carbapenemase screening in the notification schedule, a mechanism to combine reference laboratory referrals with local laboratory-confirmed carbapenemases was implemented. Data presented in the Antimicrobial resistance chapter in the main ESPAUR report includes analyses on counts of combined clinical infection and routine screening samples reported by laboratories using the recommended molecular or immunochromatographic methods to both SGSS and the AMRHAI Reference Unit. This differs slightly from the weekly case totals included within the causative agents of notified diseases reports which currently only include local laboratory reports.

For the purpose of the ESPAUR report and for the notification data, specimen reports of a positive CPO fall into 3 specimen type categories: sterile site, 'screening' and 'everything else'. A full list of the specimen types and how they are grouped is available in the data tables accompanying this report, but at a high level:

- sterile site group specimens include blood, CSF and bone and joint specimens
- screening group specimens include faecal, rectal swab, skin swab specimen
- the other specimens include urine, upper respiratory, catheter and lower genital tract specimens

Timeline of CPE activities

The Antimicrobial Resistance and Healthcare Associated Infections (AMRHAI) Reference Unit within UKHSA received and confirmed an increasing number of CPO year-on-year since 2006. Amongst Enterobacterales sent for referral in 2006, 4 were identified as carbapenemase producers compared to more than 4,000 identified in 2018. In response to the observed increase, UKHSA (then Public Health England (PHE)) established an incident control team in 2013 and implemented a number of initiatives aimed at preventing and controlling the spread of CPO.

The timeline of CPO activities included:

- October 2000 – AMRHAI Reference Unit published 'Carbapenemases: a problem in waiting?'
- 2003 – first VIM-producing Enterobacterales (*Klebsiella* sp.)
- 2003 – first IMP-producing Enterobacterales (*Klebsiella* sp.)
- December 2005 – resistance alert issued 'Carbapenem-resistant Enterobacteriaceae'
- November 2007 – first OXA-48-producing Enterobacterales (*K. pneumoniae*)
- January 2008 – first KPC-producing Enterobacterales (*K. pneumoniae*)
- October 2008 – first NDM-producing Enterobacterales (*K. pneumoniae*)
- January 2009 – resistance alert issued 'CPE in the UK: multi-faceted emergence'
- June 2009 – first KPC-producing *K. pneumoniae* identified in Manchester
- July 2009 – resistance alert issued 'CPE in the UK: NDM-β-lactamase: repeated importation from Indian subcontinent'
- mid-2009 – start of KPC outbreak in Manchester
- 2011 – the Health Protection Agency (HPA, forerunner to PHE) and the Advisory Committee on Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) publish guidance on detection, control and treatment of carbapenem resistant infections
- March 2013 – UK Standard for Microbiological Investigation (SMI) for detection of carbapenemases published
- November 2013 – PHE Level 3 Incident Control Team established

- December 2013 – acute trust toolkit for CPE published
- March 2014 – Patient Safety Alert addressing rising trends and outbreaks in CPE
- May 2015 – Electronic Reporting System (ERS) for the enhanced surveillance of carbapenemase-producing Gram-negative bacteria launched
- June 2015 – non-acute and community settings CPE toolkit published
- July 2016 – ERS upgraded to accept carbapenemase producers identified by diagnostic laboratories
- February 2017 – UK component of ECDC-funded 'European Survey on Carbapenemase-producing Enterobacteriaceae (EuSCAPE)' project published
- April 2018 – AMRHAI Reference Unit introduce charging for detection of KPC, NDM, OXA-48-like and VIM
- July 2018 – PHE conducts national survey on carbapenemase testing methods performed by diagnostic laboratories
- August 2018 – evaluation of the acute trust toolkit for CPE published
- January 2019 – AMRHAI requests diagnostic laboratories refer only locally-confirmed CPO from sterile sites
- January 2019 – evaluation of the ERS published
- 1 May 2019 – ESR closed
- 1 October 2020 – CPO was made notifiable
- April 2022 – CPE point prevalence survey in intensive care units (ICUs) in England
- September 2022 – update of CPE Framework guidance

Surveillance of antimicrobial resistance in *Neisseria gonorrhoeae*

Surveillance of antimicrobial resistance (AMR) in *Neisseria gonorrhoeae* is monitored through the Gonococcal Resistance to Antimicrobials Surveillance Programme (GRASP), which detects and monitors AMR in *N. gonorrhoeae* and records confirmed treatment failures. Trend data is derived from the national sentinel surveillance system, which collects gonococcal isolates from consecutive patients attending a network of 26 participating sexual health services (SHSs) (24 in England, 2 in Wales) over a 2-to-3-month period each year. Gonococcal isolates are referred to the UKHSA national STI reference laboratory (STIRL) for antimicrobial susceptibility testing and whole-genome sequencing, and the results are linked to patient demographic, clinical and behavioural data for analysis of antimicrobial susceptibility trends in patient sub-groups.

Surveillance of antibiotic resistance in *Mycoplasma genitalium*

Surveillance of antimicrobial resistance in *M. genitalium* in England is monitored through the *M. genitalium* Antimicrobial Resistance Surveillance (MARS) Programme. Pilot collections for this programme were conducted in 2019 (4) and 2020 (5), before MARS was launched as an annual programme in 2023 (6).

Full details of MARS methodology are available in the protocol: MARS protocol.

Tuberculosis

Data for AMR in tuberculosis data for 2011 to 2025 was extracted from the Enhanced Tuberculosis Surveillance system (ETS). More detail on the methods and data sources are described in the Tuberculosis in England annual report.

Critical antibiotic resistance in foodborne bacteria

Data was cleaned based on UKHSA internal WGS and AMR gene quality metrics. Genome and sequencing metrics are stringent to ensure quality data is reported and are as follows: yield >150mb, no mixture kmers detected and non-consensus bases above 15%.

Isolates were sequenced using Illumina technologies and antimicrobial resistance was profiled using a mapping-based approach using the in-house processor, GeneFinder. Specific genes that conferred resistance to tetracycline, carbapenems and colistin were investigated *in silico,* without phenotypic confirmation of expression of resistance.

Specific genes were investigated*, tet(X)* for tetracycline, *mcr* for colistin, and carbapenemases conferring genes.

Despite *in-silico* genomic AMR determinants being detected in the genomes, this does not always correlate to phenotypic resistance, and data presented here should be interpreted for surveillance, not clinical management.

It is worth noting that *in silico* profiling is constrained to the genes that are in the database. As such, genes not represented in the database will not be detected in strains and does not necessarily infer phenotypic sensitivity of those strains.

Total counts may differ slightly from UKHSA GI annual reports, as ESPAUR sequence data taken forward is subject to higher quality thresholds than those required to identify species and clonal complexes presented in the annual reports

Antifungal resistance

Routine surveillance

Data on the laboratory reports of yeast species from 2019 to 2025 was obtained from UKHSA's SGSS, as described in the Antibacterial resistance section of Chapter 2. The SGSS CDR module was used to obtain incidence trends of fungaemia (fungal bloodstream infections) and the species distribution of yeasts, the SGSS AMR module data was used for assessing the antifungal susceptibility.

As previously reported, several taxonomic revisions to species previously classified in *Candida* have been implemented in the period covered by this report. As a result, this report has expanded from *Candida* to include further yeast species causing fungaemia. This may mean

rates of fungaemia may not reflect what has been reported in previous reports. A full list of species causing fungaemia identified from SGSS can be found in the Chapter 2 data tables accompanying this report.

Recent taxonomic changes better reflect true lineages and is significant. For example, *Nakaseomyces glabratus,* unlike most *Candida* species, demonstrates reduced susceptibility to fluconazole. *P. kudriavzevii,* in common with other *Pichia species,* is innately resistant to fluconazole and *Clavispora lusitaniae* sometimes demonstrates the rare phenomenon amongst *Candida s*pecies of innate or emergent resistance to amphotericin B.

In previous ESPAUR reports, hospital microbiology laboratories antifungal susceptibility test results were grouped into 'reduced-susceptibility'. For the purpose of this report, antifungal susceptibility test results reported as ‘susceptible’, ‘intermediate’ or ‘resistant’, as determined locally, are presented alongside a proportion that are resistant.

The breakpoint criteria for categorising clinical isolates as susceptible, intermediate or resistant to individual antifungals have changed over time, the classification presented is the same as at the time of the specimen and has not subsequently been adjusted. Antifungal resistance for yeast species is focused on 3 antifungal drugs (amphotericin B, caspofungin and fluconazole). These drugs represent 3 different classes of antifungal drug and are the most frequently tested for and used.

As patients may have more than one positive blood culture taken, blood cultures taken from the same patient that yielded growth of the same pathogen during a rolling 14-day period from the initial positive blood culture were regarded as comprising the same episode of infection and were de-duplicated.

Antiviral resistance

Influenza virus

UKHSA screens influenza virus positive samples for mutations in the virus neuraminidase (NA) and the cap-dependent endonuclease (PA) genes, which are known to confer neuraminidase inhibitor or baloxavir resistance, respectively. The samples are primarily obtained for surveillance. However, diagnostic testing is also performed on patient samples with a suspected antiviral-resistant strain.

Influenza virus susceptibility to the neuraminidase inhibitor class of antivirals has been monitored routinely in the UK since 2005 using a combination of phenotypic and genotypic testing. The current influenza antiviral susceptibility surveillance strategy is a genotypic only approach. Phenotypic analysis to determine virus susceptibility to antiviral drugs by monitoring 50% inhibitory concentration (IC50) was not performed during the 2025 to 2026 influenza season.

Results are reported in the National flu and COVID-19 surveillance reports: 2025 to 2026 season during the active influenza season and summarised in the Influenza in the UK, annual epidemiological reports for each flu season.

UKHSA guidelines for treatment and prophylaxis of influenza virus are available.

Human immunodeficiency virus (HIV)

The detection of HIV resistance in drug-naïve people indicates the transmission of drug-resistant variants, an important occurrence which limits first-line regimen options. Tracking drug resistance in the treatment-experienced population provides an insight into the causes of treatment failure. HIV sequences are from the UK HIV Genomics Database, within which data up to 2019 can be considered nationally representative, and data from 2020 onwards is sourced from UKHSA Colindale, UKHSA Birmingham, Imperial, St Bart's, and Chelsea and Westminster.

Transmitted drug resistance (TDR) is from the analysis of HIV sequences of people with a Recent Infection Testing Algorithm result indicating recent acquisition, and a HIV sequence collected within 90 days of diagnosis. Implicitly this will also exclude those with any prior history of treatment. Individuals were included only once. Acquired drug resistance (ADR) is from the analysis of HIV sequences of people who could be linked to HARS (HIV and AIDS Reporting System), and whose sample date was at least 90 days after antiretroviral therapy initiation. Individuals were included for each year in which they were sampled, but only once per year.

Acquired and transmitted drug resistance, with resistance as defined by a local implementation of the algorithm used by the Stanford Calibrated Population Resistance (CPR) tool. The web tool applies the Surveillance Drug Resistance Mutations (SDRM) lists to submitted HIV genomic sequences and returns the proportion carrying SDRMs by drug class, after quality assessment for APOBEC3G/F-driven hypermutation, highly unusual amino acid mutations and complex nucleotide mixtures.

Hepatitis C virus (HCV)

Recommended first line Direct Acting Antiviral (DAA) combinations in the UK usually contain an NS5A inhibitor with either an NS5B polymerase inhibitor or NS3 protease inhibitor. Two antiviral combinations are available with activity against almost all viral strains common in the UK, sofosbuvir-velpatasvir and glecaprevir-pibrentasvir. The success of DAA drug roll-out underpins the UK's commitment to WHO HCV elimination targets.

Testing for HCV drug resistance is not universally recommended prior to initiating DAA therapy, as there is no or minimal impact of resistance on cure rates in DAA-naïve individuals in many scenarios. The European Association for the Study of the Liver (EASL) and the American Association for the Study of Liver Diseases (AASLD) have produced guidelines on particular scenarios when resistance testing may be considered or recommended. There is currently no role for phenotypic resistance testing in clinical management, as this is costly, laborious and available only within research contexts.

There is no national database of HCV resistance in the UK. However, the UKHSA Antiviral Unit provides a HCV genotyping and resistance testing service for the NHS. Since 2019, resistance testing has been carried out by whole genome sequencing, which identifies the viral genotype and subtype, as well as the resistance profile of the NS3, NS5A and NS5B genes, in a single test. UKHSA also coordinates the English HCV Treatment Registry which contains information on treatment status that is whether DAA-naïve or previously exposed to DAAs, and can be linked to HCV sequence data.

Antiparasitic resistance

As part of the surveillance and resistance monitoring functions of the UKHSA Malaria Reference Laboratory (MRL) suspected treatment failure in cases of imported malaria is investigated by molecular genotyping of parasite genes implicated in reduced antimalarial susceptibility. Additional *in vitro* drug susceptibility testing of a subset of imported parasite infections is provided by colleagues in the malaria research laboratories at the London School of Hygiene and Tropical Medicine. Artemisinin combination therapy (ACT) consists of a member of the rapid-acting artemisinin family of compounds plus a partner drug from a different chemical class with a longer-half-life.

Additional data sources

Population data used in the chapter was taken from the Office for National Statistics annual mid-year population estimates published data for the corresponding geographic region and year. Geographies were assigned to infection episodes based on patient postcode where available, where not available the reporting laboratory postcode was used. The postcodes were then assigned to regions or Integrated Care Boards and presented at this level.

A SPINE trace was performed on records of patient episodes to identify those with reported 30-day all-cause mortality. Case fatality rates were calculated at 30 days in line with the 30 day all-cause mortality following MRSA, MSSA and Gram-negative bacteraemia and C. difficile infections, 2022 to 2023 report protocol. Gram-negative bacteraemia case fatality rates includes *K. pneumoniae* only and not other *Klebsiella* species.

The index of multiple deprivation (IMD) is a way of summarising how deprived a particular geographical area is based on a set of factors that includes levels of income, employment, education and levels of crime within that area. Episodes were linked to IMD using patient postcode (or GP or laboratory postcode where patient postcode was unavailable) and the IMD quintile score was identified by the lower super output area in which the patient resided.
The Office for Health Improvements and Disparities developed a method for assigning ethnic group based on hospital admissions data. As different ethnicities may be recorded in different treatment episodes, the method selected a single ethnic group from a patient's HES records. Episodes were linked to ethnic group using patient NHS number and date of birth.

Statistical analyses

P-values were calculated to assess the change in resistance over time, these were generated using an unadjusted binomial regression model for each drug and bug combination. A significant change is defined by a p-value less than 0.05 ($p<0.05$).

Trends in incidence and resistance are shown at national, regional and IMD quintile level for England. Incidence rates are calculated per 100,000 population per year using the Office for National Statistics mid-year population estimates. At the time of writing, 2025 estimates were not yet available and therefore 2024 was used as a proxy for 2025.

Binomial confidence intervals were calculated to 95% for the percentage resistance for the ethnic group analysis.

Analyses were completed using Stata v15/v17 (StataCorp) and RStudio (R version 4.4.0).

AMR resources

This will group together the locations and names of other AMR-relevant publications that UKHSA and others produce to help people know that there is more information available, including:

- carbapenemase-producing Gram-negative bacteria laboratory surveillance quarterly reports
- weekly carbapenemase Notifications of Infectious Diseases (NOIDs) reports
- annual epidemiological commentary: Gram-negative, MRSA, MSSA bacteraemia and *C. difficile* infections
- pyogenic and non-pyogenic Streptococcal bacteraemia annual data from voluntary surveillance
- Group A streptococcal infections seasonal activity reports
- Fingertips: AMR local indicators
- UK One Health report: Joint report on antibiotic use, antibiotic sales and antibiotic resistance
- Tuberculosis in England: national quarterly reports
- Gonococcal resistance to antimicrobials surveillance programme GRASP
- Quarterly report on diagnoses of syphilis, gonorrhoea and ceftriaxone-resistant gonorrhoea in England: provisional data, March 2026
- Monitoring and evaluation plan of doxycycline post-exposure prophylaxis (doxyPEP)
- Quality and methodology information for the sexually transmitted infections and National Chlamydia Screening Programme data release for England
- Mycoplasma genitalium antimicrobial resistance surveillance (MARS)

- Mycoplasma pneumoniae surveillance in England and Wales, October 2020 to September 2025
- Enteric fever (typhoid and paratyphoid) England, Wales and Northern Ireland
- Laboratory surveillance of paediatric bacterial bloodstream infections and antimicrobial resistance in England
- Laboratory surveillance of Enterococcus spp. bacteraemia (England)
- UKHSA data dashboard: the UKHSA data dashboard shares public health data in a simple, inclusive and accessible way
- UK 2024 to 2029 AMR National Action Plan: Confronting antimicrobial resistance 2024 to 2029
- Notifications of infectious diseases (NOIDs)
- *Escherichia coli* (*E. coli*): guidance, data and analysis
- *Pseudomonas aeruginosa*: guidance, data and analysis
- *Klebsiella* species: guidance, data and analysis
- *Clostridium difficile*: guidance, data and analysis
- *Staphylococcus aureus*: guidance, data and analysis
- MRSA, MSSA, Gram-negative and CDI quarterly report (official statistics)
- MRSA, MSSA, Gram-negative bacteraemia and CDI; independent sector (annual official statistics)
- Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals 2016 to 2017
- Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR) data
- GLASS (Global Antimicrobial Resistance and Use Surveillance System) AMR routine data surveillance
- podcast: Infection Control Matters on Apple Podcasts
- the European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2021 to 2022
- TB diagnosis, microbiology and drug resistance in England
- National flu and COVID-19 surveillance reports: 2025 to 2026 season

Supplementary analyses

Antifungal resistance

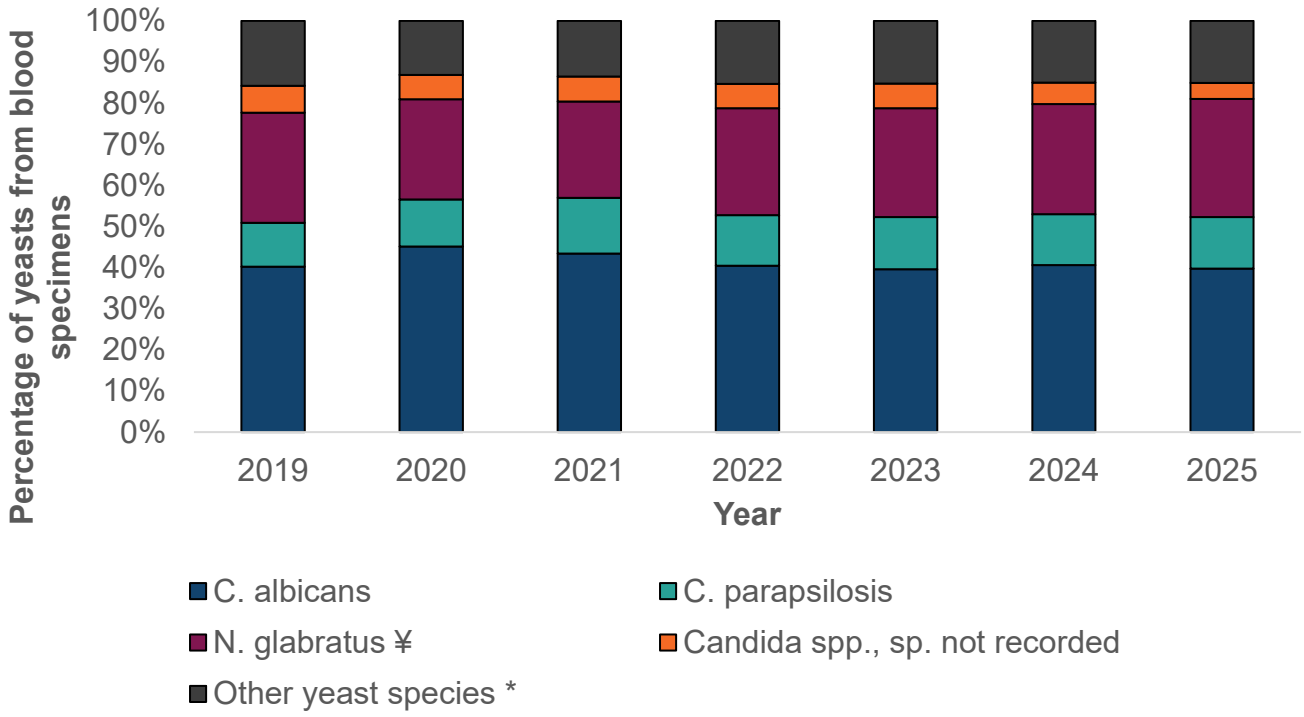
Incidence of fungaemia by region, and species frequency

Annexe Figure 2.1, below, shows *Candida albicans* was the most frequently isolated yeast species across the 7-year period, accounting for 40% of fungaemia in 2025 (957 out of 2,408). In common with many other surveillance studies the second most frequently reported species was *Nakaseomyces glabratus* (formerly *Candida glabrata*), which was identified in 29% (692) of fungaemia episodes in 2025.

Regionally, variation in incidence of fungaemia can be seen. The region with the highest rate of fungaemia in 2025 was the North West (4.8 per 100,000 population). The lowest recorded rate

was the South East (3.4 per 100,000 population). Further regional data for incidence by genus can be found in the 'Laboratory surveillance of fungaemia due to yeasts in England: 2025' Health Protection Report.

Annexe Figure 2.1. Reports of yeasts from blood isolates by species, 2019 to 2025



¥ *Nakaseomyces glabratus* (formerly *Candida glabrata*)
* for all other yeast species and genera please see the Chapter 2 data tables accompanying this report

Chapter 3. Antimicrobial consumption

All data presented in this chapter in tables can be accessed in the ‘Chapter 3 data tables’ and all figures can be accessed via the downloadable slide set, both available from the ESPAUR report web page.

Antimicrobial consumption: data sources

Primary care

Information on prescribing of antimicrobials in the community was obtained from the UKHSA Antibiotic Prescribing Data Warehouse, a project initiated by the ESPAUR Oversight Group. Data is sourced from the NHS Digital database and are extracted each month as a snapshot in time from the GP Payments system.

Age group data for primary care was obtained from ePACT2 from NHS BSA.

Primary care prescribing data includes antimicrobials prescribed from general practice and other community settings such as out-of-hours services and walk-in centres. The full list of primary care prescribing settings is provided in Annex table 3.1.

Data on ethnicity was collected from the NHSBSA Medicines Dispensed in Primary Care (MDPC) and through linkage from NHS Digital – Hospital Episode Statistics (HES) dataset.

Data on Index of Multiple Deprivation was obtained through best-fit linkage with patients' postcode from linkage with HES, supplemented with patients lower-layer super output area (LSOA) from the MDPC dataset if available.

Secondary care

Information on the use of antimicrobials in secondary care was obtained from Rx-Info Define. Define receives medicines usage data from NHS hospital pharmacy systems across England and is used by NHS organisations to monitor and benchmark medicines use. Data reflect medicines issued or supplied by hospital pharmacies and are assigned to the ward or department from which the medicines were dispensed.

Data from all NHS acute trusts in England were included. Trusts may make retrospective amendments to submitted pharmacy data and therefore data for recent years should be considered provisional and subject to revision.

Rx-Info data are derived from hospital pharmacy stock control systems and reflect medicines supplied rather than medicines prescribed to, or consumed by, individual patients. Consequently, interpretation of trends should take account of local dispensing and stock management practices.

Dental care
Information on the use of antibiotics prescribed in NHS dental surgeries was obtained from NHS BSA through a data request.

Private care

Information on the use of antimicrobials in the private sector obtained from IQVIA. The data held by IQVIA comprises the following settings:

Sales into Private Hospitals and Private Pharmacies from IQVIA Supply Chain Manager (SCM)

This dataset captures the flow of medicines from manufacturers through wholesalers to outlet locations. The data specifically includes sales into private hospitals and private pharmacies only. It excludes products supplied directly by some manufacturers or distributed via Third Party Logistics (3PL) providers. The sales into private pharmacies data includes sales into those pharmacies that dispense purely private medications and do not have a contract to dispense NHS prescriptions.

Private Prescriptions Dispensed in Community Pharmacy from IQVIA Prescription Based Services (PBS)

This dataset reflects medicines dispensed to patients in community pharmacies based on private prescriptions, as recorded in Patient Medical Record (PMR) systems. It excludes medicines dispensed under NHS-reimbursed FP10 prescriptions. The Private Prescriptions Dispensed in Community Pharmacy includes pharmacies that have a contract to dispense NHS prescriptions but also from time to time may dispense private prescriptions. This includes small, medium and large chains as well as independent pharmacies.

Private Usage within NHS Hospitals from IQVIA Hospital Pharmacy Audit (HPA)

This dataset provides information on medicines dispensed in NHS hospital settings, based on data from hospital pharmacy stock control systems. The data is limited to medicines issued by private wards within NHS hospitals and is dependent on accurate recording by hospital pharmacy teams.

As above, all IQVIA data used retains IQVIA Limited and its affiliates Copyright. All rights reserved. Use of IQVIA data for sales. marketing or any other commercial purposes is not permitted without IQVIA Limited's approval, expressed by IQVIA’s Terms of Use.

Classification of prescribing data

The classification of antimicrobials for this report is based on the Anatomical Therapeutic Chemical / Daily Defined Dose (ATC/DDD) index 2023 managed by the World Health Organization (WHO) at Collaborating Centre for Drug Statistics Methodology.

Data for antibiotics covered all agents in the ATC group ‘J01’, (antibiotics for systemic use) and 4 additional oral agents outside the ‘J01’ group used to treat *Clostridioides difficile* infections,

fidaxomicin (A07AA12), metronidazole (P01AB01), tinidazole (P01AB02) and vancomycin (A07AA09).

Data for antifungals covered all agents in the ATC group ‘J02’, (antimycotics for systemic use) and one additional systemic antifungal outside the 'J02' group, terbinafine (D01BA02).

Third level pharmacological sub-grouping within ATC group ‘J01’

Penicillins (‘beta-lactam antibacterials, penicillins’) include extended-spectrum penicillins, beta-lactamase sensitive and resistant penicillins, and beta-lactamase inhibitors either alone or in combination with penicillins.

‘Other beta-lactam antibacterials’ includes cephalosporins, carbapenems, and monobactams. Anti-*Clostridioides difficile* (formerly *Clostridium difficile*) agents include: oral vancomycin (ATC code: A07AA09) and fidaxomicin (ATC code: A07AA12). Oral metronidazole (ATC code: P01AB01) has been separated from this group, as opposed to previous years, following feedback from stakeholders.

‘Other antimicrobials’ (ATC 3rd level pharmacological subgroup ‘J01X’) includes glycopeptides, polymyxins, steroid antibacterials, imidazole derivatives, nitrofuran derivatives, and other antimicrobials: fosfomycin, linezolid, daptomycin and tedizolid. Methenamine, an anti-infective classified within J01X, although continues to be monitored, has been removed from antibiotic prescribing trends and the AWaRe classification (from April 2026 in England).

The broad-spectrum antibiotics includes Co-amoxiclav J01CR02, Cefaclor J01DC04, Cefadroxil J01DB05, Cefalexin J01DB01, Cefixime J01DD08, Cefotaxime J01DD01, Cefoxitin J01DC01, Cefpodoxime J01DD13, Cefradine J01DB09, Ceftazidime J01DD02, Ceftriaxone J01DD04, Cefuroxime J01DC02, Cefazolin J01DB04, Cefotaxime J01DD01, Ceftazidime/avibactam J01DD52, Cefepime J01DE01, Ceftaroline fosamil J01DI02, Ceftobiprole medocaril J01DI01, Ceftolozane/tazobactam J01DI54, Ofloxacin J01MA01, Ciprofloxacin J01MA02, Norfloxacin J01MA06, Levofloxacin J01MA12, Moxifloxacin J01MA14

ATC and DDD methodology

The ATC system aims to identify the active therapeutic ingredient of all human medicines and assigns drugs a measure of use known as the DDD, which is the assumed average maintenance dose per day for a drug used for its main indication in adults. It is important to note however that while the DDD is used as a unit of measurement of drug use, it does not necessarily reflect the recommended or prescribed daily doses used in practice as therapeutic doses for individual patients may vary depending on characteristics such as age, weight, ethnic differences, type and severity of disease and pharmacokinetic considerations.

Access Watch and Reserve (AWaRe) classification

The AWaRe classification was first introduced by the World Health Organization (WHO) in 2017 with updates made every 2 years (latest revision in 2023) (1). It categorises antibiotics into 3 groups: Access, Watch, and Reserve. The 'Access' group comprises narrow-spectrum antibiotics with fewer side effects, lower costs, and lower resistance potential. The 'Watch' group comprises broader-spectrum antibiotics with a higher resistance potential. The 'Reserve' group comprises new and 'last-resort' antibiotics, where use should be limited to highly selected patients (with infections due to multi-drug resistant bacteria). The use of 'Reserve' antibiotics is closely monitored.

A nationally adapted AWaRe classification has been used in England since 2019 (2 to 4). Following the 2023 WHO classification update, the 4 nations of the UK collaborated to re-adapt the AWaRe classification, ensuring it remained relevant to current national context (5) Compared with the WHO classification, the UK re-adaptation makes achieving the Access target more challenging, as widely used antibiotics such as co-amoxiclav are placed in the Watch group rather than Access. This reduces the proportion of prescribing that contributes to the Access category.

Denominators

Mid-year populations (inhabitants) for each year were extracted from the Office National Statistics (ONS). Hospital admission data for each year was extracted from Hospital Episode Statistics (HES) from NHS Digital. Note that population estimates for 2024 were used as a proxy for the 2025 data, as data at the time of extraction was available only for 2024. Similarly, HES 2023 admissions were used as a proxy for 2025.

Denominator data for ethnicity was derived from the ONS 2021 census (latest available dataset).

Other community settings categories

Annexe Table 3.1. Mapping of community settings to the setting categories used within the report

Other community settings	Setting category
Walk-in centre	Walk-in centre
Out-of-hours	Out-of-hours
WIC and OOH practice	Out-of-hours
Public health service	PH service
Community health service	Community service
Hospital service	Hospital

Other community settings	Setting category
Optometry service	Other
Urgent and emergency care	Urgent care
Hospice	Hospice
Care home or nursing home	Nursing home
Border Force	No data reported
Young offender institution	Custody
Secure training centre	No data reported
Secure children's home	Custody
Immigration removal centre	Custody
Court	No data reported
Police custody	No data reported
Sexual assault referral centre	Other
Other: justice estate	No data reported
Prison	Custody
Secure Training Centre	Other
Other	Other

Details of the Pharmacy First Service

Under the Government's NHS Primary Care Recovery Plan, NHS England (NHSE) commissioned the Pharmacy First service in 2023. From 31 January 2024, pharmacies participating in the Pharmacy First service were able to supply prescription-only medicines (including antimicrobials) for 7 common conditions: earache, uncomplicated UTIs in women, sore throat, sinusitis, impetigo, shingles, and infected insect bites, after consultation with a community pharmacist (antimicrobial-pathway combinations are described in Table X.X).

Pharmacy First data caveats

The Pharmacy First service follows established clinical protocols based on NICE guidance and diagnostic pathways developed by the UKHSA, supporting appropriate prescribing. While the introduction and rise in antibiotic use through the Pharmacy First service was intended to relieve pressure on general practice, it likely also reflects shifts in patient pathways from other healthcare settings, such as independent sector clinics, emergency departments, and some walk-in or urgent treatment centres, rather than a simple increase in antibiotic demand. Although dispensing data is available for walk-in centres, supplies made under Patient Group Directions may not be fully captured, particularly where stock is sourced directly from hospitals, wholesalers, or over-labelling providers. Given these surveillance limitations, alongside

seasonal and year-to-year variation in infection rates, it is important to present data from Pharmacy First alongside appropriate context and caveats.

Statistical analyses

A Poisson regression with IMD quintile and year interaction term (adjusted for population), was used to test whether the difference in antibiotic consumption between the most and least deprived quintiles changed significantly between 2021 and 2025, which was then expressed as p-values.

Annexe Table 3.2. Pharmacy First clinical pathways with their associated populations and antimicrobial recommendations

Clinical pathway	Population covered	Recommended antimicrobial									
		Nitrofurantoin	Aciclovir	Valaciclovir	Fusidic acid	Flucloxacillin	Clarithromycin	Erythromycin	Phenoxymethyl-penicillin	Amoxicillin	Doxycycline
Urinary tract infection	Women (16 to 64 years)	✓*									
Shingles	Adults (≥18 years)		✓*	✓							
Impetigo	Children (1 to 17 years) and adults (≥18 years)				✓*	✓*	✓	✓			
Infected insect bites	Children 1 to 17 years) and adults (≥18 years)					✓*	✓	✓			
Acute sore throat	Children (5 to 17 years) and adults (≥18 years)						✓	✓	✓*		
Acute sinusitis	Children (12 to 17 years) and adults (≥18 years)						✓	✓	✓*		✓
Acute otitis media	Children (1 to 17 years)						✓	✓		✓*	

* First-line treatment if no penicillin allergy, ineffective treatment, or other inclusion or exclusion criteria met

Note: although not shown in the table, antibiotics are not recommended as the first-line management in some Pharmacy First pathways, including acute otitis media (AOM), impetigo, and acute sinusitis. For example, in children aged one to 17 years with AOM, analgesic or anaesthetic ear drops are recommended instead of antibiotics.

Secondary care data quality

Secondary care antimicrobial consumption analyses are derived from Rx-Info Define pharmacy supply data and Hospital Episode Statistics (HES) admissions data. As with previous years, data quality and completeness issues were identified in both datasets and should be considered when interpreting trends presented in this report.

Data quality issues may arise from changes in local information systems, migration to new electronic patient record systems, amendments to coding and reporting practices, and variations in the completeness of data submissions. These issues can affect both antimicrobial consumption and hospital activity metrics and may impact comparability over time and between organisations.

Readers should therefore exercise caution when interpreting trends, particularly where substantial year-on-year changes are observed for individual organisations, specialties or peer groups.

Dispensing data completeness and accuracy

Hospital admissions data

Interpretation of admission-based metrics should take account of changes in the recording of Same Day Emergency Care (SDEC) activity within HES. Following changes to national reporting arrangements, some trusts have moved SDEC activity from Admitted Patient Care (APC) datasets to the Emergency Care Data Set (ECDS), while implementation has varied between organisations.

As a result, some trusts have experienced substantial reductions in reported admissions despite no corresponding reduction in healthcare activity. This can artificially increase antimicrobial consumption rates expressed per 1,000 admissions and may affect comparability both over time and between trusts.

The impact of these changes is currently being assessed and should be considered when interpreting trends in admission-based secondary care antimicrobial consumption metrics.

Department speciality

Annexe Table 3.3. Department speciality to department group look-up table for antibiotic consumption

Department speciality	Department group
Mixed outpatient clinics	AE / Non-specific out-patient department
Aseptic unit	AE / Non-specific out-patient department
A&E	AE / Non-specific out-patient department
Psychogeriatric	Geriatrics

Department speciality	Department group
Geriatrics	Geriatrics
Intensive care	Intensive care unit
Dermatology	General medicine
Respiratory, chest or asthma clinic	General medicine
Cardiology	General medicine
Gastroenterology	General medicine
Coronary care	General medicine
Rheumatology	General medicine
Thoracic or chest medicine	General medicine
General medicine	General medicine
Endocrinology	General medicine
Obstetrics and gynaecology	Obstetrics and gynaecology
Fertility and genetics	Obstetrics and gynaecology
Orthopaedics	Orthopaedics
Trauma and Orthopaedics	Orthopaedics
Pain clinic	Other
Radiology	Other
Radiology and Imaging	Other
Physiotherapy	Other
Physically disabled	Other
Rehabilitation or long stay unit	Other
Pathology lab	Other
Mental handicap	Other
Occupational health	Other
Learning disabilities	Other
Child adolescent psychiatry	Other
Other wards or units	Other
Psychiatry and mental illness	Other
Psychiatric day Hospital	Other
Paediatric ICU	Paediatrics
Neonatal unit	Paediatrics
Paediatric or paediatric surgery	Paediatrics

Department speciality	Department group
Acute internal medicine	Specialist medicine
Medical oncology	Specialist medicine
Clinical oncology (Radiotherapy)	Specialist medicine
AIDS unit	Specialist medicine
Infectious disease or Isolation	Specialist medicine
Renal medicine	Specialist medicine
Liver or Pancreatic unit	Specialist medicine
Neurology	Specialist medicine
G.U.M	Specialist medicine
GU Medicine or HIV	Specialist medicine
G.U./ V.D./ S.T.D./ A.I.D.S.	Specialist medicine
Haematology	Specialist medicine
GUM medicine	Specialist medicine
Liver (failure) unit	Specialist medicine
Transplantation unit	Specialist surgery
ENT	Specialist surgery
Cardio-thoracic surgery	Specialist surgery
Plastic surgery	Specialist surgery
Burn and Plastic surgery	Specialist surgery
Oral surgery	Specialist surgery
Vascular surgery	Specialist surgery
Ophthalmology	Specialist surgery
Urology	Specialist surgery
Neurosurgery	Specialist surgery
General surgery	General surgery
Breast treatment and care	General surgery
Day case theatres	General surgery
Theatre and anaesthetics	General surgery

Recently licensed antibiotics used within the NHS, including those in the Antimicrobial Product Subscription Model

Annexe Table 3.4. England regional consumption, DDDs per 1,000 population

Region	Cefiderocol	Ceftazidime with avibactam	Ceftolozane with tazobactam	Eravacycline	Aztreonam with avibactam	Ceftobiprole medocaril	Imipenem/ cilastatin/relebactam
East Midlands	0.07591	0.18355	0.16406	0.00564	0.03111	0	0.01116
East of England	0.16856	0.22558	0.36285	0	0.00152	0	0.04265
London	0.34554	0.47751	0.30884	0.00063	0.01980	0	0.03900
North East	0.25670	0.50579	0.09068	0	0.06085	0.00241	0.22694
North West	0.11403	0.24384	0.19628	0.00369	0.03542	0	0.02694
South East	0.08743	0.21431	0.05593	0.04793	0.00910	0	0.00075
South West	0.06656	0.19537	0.13770	0	0.01036	0	0
West Midlands	0.16962	0.27541	0.06206	0	0.05358	0.00835	0.00230
Yorkshire and Humber	0.08972	0.19431	0.10541	0	0.02239	0.00118	0.00247

Antiviral consumption

Data sources

COVID-19 therapeutics usage data for primary care was obtained from ePACT2, while secondary care data was obtained from Rx-Info. Further details on Rx-Info data are provided in the secondary care section of this annexe. As data on the number of patients eligible to receive COVID-19 therapeutics was not available to UKHSA, confirmed COVID-19 case counts from the UKHSA COVID-19 dashboard were used as the denominator.

Data analysis

Total DDDs from 1 January 2020 to 31 December 2025 by therapy were included for Molnupiravir (Lagevrio®), Nirmatrelvir plus ritonavir (Paxlovid®), Remdesivir (Veklury®) and Sotrovimab (Xevudy®). Rates of DDDs were estimated by dividing the number of DDDs by the COVID-19 case numbers (per 1,000) over the specified time period.

Rates by region were estimated by dividing the COVID-19 case numbers (per 1,000) which were extracted from the UKHSA COVID-19 dashboard by each region over the specified time period.

STATA 18 and R was used in all medicines supply data analysis.

Antiparasitic consumption

Data sources

Antiparasitic usage data for the primary care was obtained from ePACT2, and for the secondary care was sourced from by Rx-Info (Define). Private care antiparasitic usage data was included in the report for the first time this year.

Data analysis

Total rates of antiparasitic consumption were calculated using the ONS Mid-year population (inhabitants) denominator, as above.

Chapter 5. Antimicrobial stewardship

None

Chapter 6. NHS England: improvement and assurance schemes

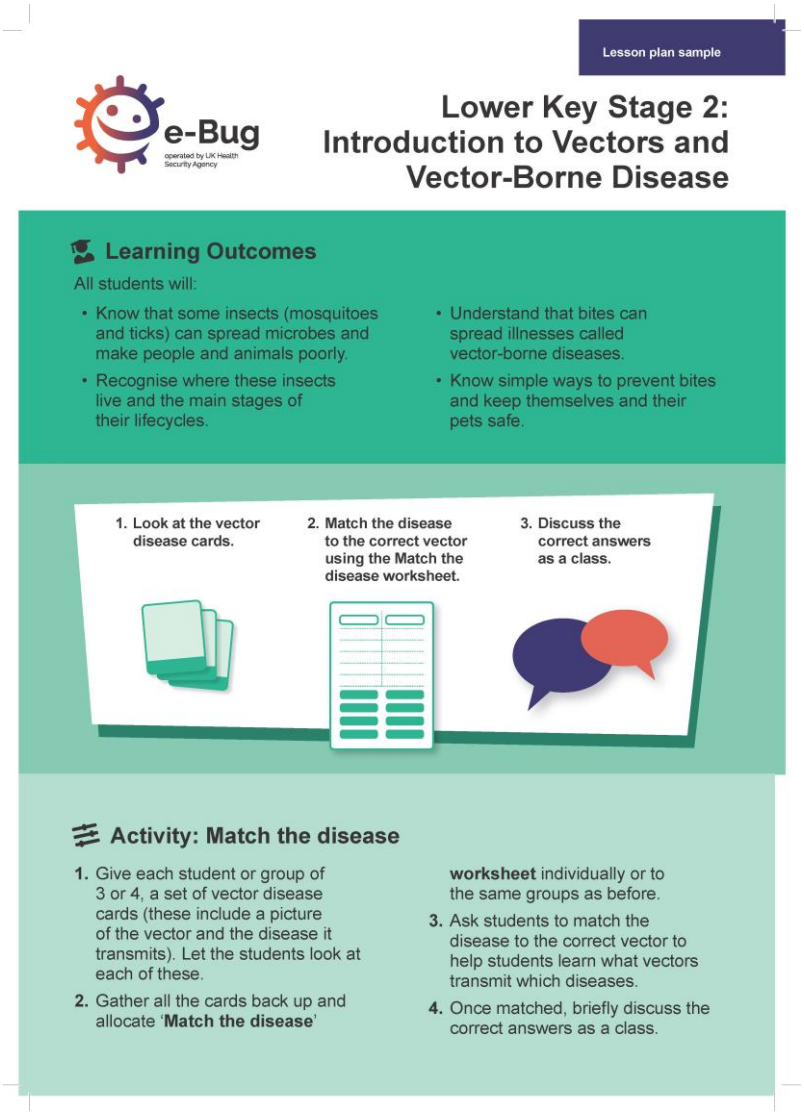
None

Chapter 7. Professional and public education and training

TARGET and RCGP Webinar series

Net promoter score is a measure of how likely someone is to recommend a service. Respondents are grouped as Promoters (9 to 10), Passives (7 to 8), or Detractors (0 to 6). The score is calculated by subtracting the percentage of Detractors from the percentage of Promoters, resulting in a score between −100 and 100.

Vector-borne disease educational resource development



Antibiotic Guardian

Annexe Table 7.1. A summary of Antibiotic Guardian pledges made on the main pledge page by pharmacy teams each year, from 2014 to 2025, with breakdown of the sub-category of pledger

Year	Pharmacy teams pledges	Pharmacy team pledge sub-category						
		Academic pharmacist	Community pharmacist	Pharmacy assistant	Pharmacy technician	Primary care pharmacist	Secondary care pharmacist	Unknown
2014	1,300	N/A	N/A	N/A	N/A	N/A	N/A	0
2015	1,338	30	0	85	270	398	551	0
2016	2,111	75	0	145	409	654	756	0
2017	3,021	81	0	357	544	861	901	0
2018	1,627	30	245	163	317	350	496	0
2019	2,410	42	807	242	403	299	574	0
2020	28,701	125	10,145	13,214	3,166	1,359	394	0
2021	27,684	47	8,856	13,900	2,885	1,223	392	0
2022	9,747	43	3,059	4,755	965	547	378	0
2023	14,896	84	4,063	8,010	1,454	717	325	243
2024	8,628	43	2,451	4,492	964	436	242	0
2025	1,176	13	271	245	285	189	173	0

These sub-categories were not available in 2014 and the ‘Community pharmacist’ sub-category was introduced in 2018.

Annexe Table 7.2. Summary of the organisational AMS pledge activity from January to December 2025, broken down by the type of organisation, from across UK

Organisation type	Number of registrations in 2025
GP practice	36
Hospital (secondary care)	4
NHS primary care	1
Private healthcare	4
Community pharmacy company	3
NHS trust or health and social care trust (NI)	5
Other	1
Community pharmacy premises	2
National NHS organisation	2
Regional NHS organisation (for example health boards, ICBs, local commissioning group)	5
University	2
Government (Local)	3
Charity	1
Total	73

Raising awareness of AMS and AMR among pharmacy technicians

Seven AMR knowledge questions

Source: AMR Knowledge Questions: Narratives – UKHSA WAAW Sept 2025

The following questions were used to assess the health target on the public and healthcare professionals' knowledge of AMR:

1. “Antibiotics are effective against viruses”
2. “Antibiotics are effective against cold and flu”
3. “Unnecessary use of antibiotics makes them become ineffective”
4. “Taking antibiotics has associated side effects or risks, such as diarrhoea, colitis, allergies”
5. “Every person treated with antibiotics is at an increased risk of antibiotic resistant infection”
6. “Antibiotic resistant bacteria can spread from person to person”
7. “Healthy people can carry antibiotic resistant bacteria”

Chapter 8. Research insights and knowledge mobilisation

List of publications

A list of peer-reviewed publications from April 2025 to March 2026:

Abani, O., A. Abbas, F. Abbas, J. Abbas, K. Abbas, M. Abbas, S. Abbasi, H. Abbass, A. Abbott and N. Abdallah (2025). 'Molnupiravir or nirmatrelvir–ritonavir plus usual care versus usual care alone in patients admitted to hospital with COVID-19 (RECOVERY): a randomised, controlled, open-label, platform trial.' The Lancet Infectious Diseases 25(9): 1000-1010.

Agnew, E., J. Bacon and J. V. Robotham (2026). 'Research Insights and Knowledge Mobilisation on Antimicrobial Utilisation and Resistance in England: ESPAUR Report 2024-25.' JAC-Antimicrobial Resistance 8(Suppl 2): dlaf243. 006.

Ahlers, F. M., D. J. Litt, M. J. Jansen van Rensburg, J. E. Bray, K. A. Jolley, C. Sheppard, S. Eletu, J. Coelho, B. Pichon and O. B. Harrison (2025). 'Utilizing large and diverse bacterial genome datasets to improve the detection and identification of Streptococcus pneumoniae via PCR-based diagnostics.' Microbial Genomics 11(6): 001418.

Allen, M., R. Reynolds, S. Mushtaq, O. Nsonwu, R. Hope, C. Horner, C. Longshaw, B. J. Parcell and D. M. Livermore (2025). 'The British Society for Antimicrobial Chemotherapy Resistance Surveillance Project: methods and limitations.' Journal of Antimicrobial Chemotherapy 80(Supplement_4): iv7-iv21.

Aluzaite, K., M. M. Dione, D. Belay, J. Robotham, J. Guitian, D. Chan, E. Emes, Y. Endalew, P. White and F. Ramponi (2025). 'One Health criteria to support decision-making on antimicrobial resistance interventions.' Scientific and Technical Review 44(1/27).

Aluzaite, K., M. O. Soares, C. Hewitt, W. Hope, J. Robotham and B. Woods (2025). 'Antimicrobial Resistance (AMR) Development Map: A Conceptual Map and a Tool to Support Economic Evaluation of AMR Interventions: K. Aluzaite et al.' Applied Health Economics and Health Policy 23(5): 767-777.

Ashiru-Oredope, D. (2025). 'What do recent reviews of research literature tell us about the evolving role of pharmacy and pharmaceutical sciences?' Pharmaceutical Journal 314(7996).

Ashiru-Oredope, D., E. Tang, R. Hope, C. Brown and R. Pebody (2026). 'The English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR) Report 2024-25.' JAC-Antimicrobial Resistance 8(Supplement_2): dlaf243. fm001.

Baird, R., T. Dewé, A. Glennie, A. Kirby, E. Light, K. Healey, C. Brown, F. Martelli, A. Papadopoulou and E. Haynes (2025). One Health antimicrobial resistance surveillance roundtable, Microbiology Society. 74: 002099.

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Chapter 9. ESPAUR oversight group members' activities and actions to tackle AMR – mapping to the National Action Plan

None.

Chapter 10. Knowledge mobilisation of ESPAUR report: evaluation of feedback from report users

None.

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339

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