

# Quarterly laboratory surveillance of acquired carbapenemase-producing Gram-negative bacteria in England: October 2020 to March 2022

Health Protection Report Volume 16 Number 5

First published: 24 May 2022 Version 2 published: August 2022

# **Contents**

Background	3
Microbiology services	
First 18 months of notification data (October 2020 to March 2022)	7
Quarterly trends	8
Geographic distribution	9
Regional differences in carbapenemase family	12
Distribution of species and carbapenemase family	16
Age and sex distribution	18
Quarterly Mandatory Laboratory Return (QMLR) Reporting (October 2021 to March 2022)	19
Reference	20
Appendices	21
Acknowledgements	26

### **Background**

From 1 October 2020, all diagnostic laboratories in England have a duty to notify the following via UKHSA's Second Generation Surveillance System (SGSS):

- acquired carbapenemase-producing Gram-negative bacteria identified in human samples
- the results of any antimicrobial susceptibility test and any resistance mechanism for any of the causative agents listed in <u>Schedule 2 of the Health Protection</u> (Notifications) Regulations 2010

This requirement was launched in conjunction with the national <u>Framework of actions to contain</u> <u>carbapenemase-producing Enterobacterales (CPE)</u>, which sets out a range of measures, that if implemented well, will help health and social care providers minimise the impact of CPE.

These analyses are based on data relating to notifications of confirmed acquired carbapenemase-producing Gram-negative bacteria between October 2020 and March 2022 in England. The data was extracted on 28 April 2022 from both UKHSA's voluntary surveillance database, SGSS, and the <a href="Antimicrobial Resistance and Healthcare-Associated Infections">Antimicrobial Resistance and Healthcare-Associated Infections</a> (AMRHAI) Reference Unit database.

Rates of acquired carbapenemase-producing Gram-negative bacteria were calculated using mid-year resident population estimates for the respective year and geography. Geographical analyses were based on the patient's residential postcode. Where this information was unknown, the postcode of the patient's General Practitioner was used. Failing that, the postcode of the reporting laboratory was used. Cases in England were further assigned to one of nine local areas, formed from the administrative local authority boundaries.

As patients may have more than one positive specimen taken, specimens taken from the same patient that yielded growth of the same pathogen and carbapenemase within a 52-week period from the initial positive sterile site specimen, screening site specimen or other specimen type (grouped together), were regarded as comprising the same episode and were de-duplicated. Carbapenemase-producing Gram-negative bacteria 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.

This method differs slightly from the <u>weekly causative agent notification data</u>, where data is not de-duplicated incorporating specimen type. In addition, the data presented in the weekly notification reports is utilising SGSS reports only.

The following report summarises trends and geographical distribution of carbapenemase mechanisms identified from Gram-negative bacteria in human samples. Species, mechanism,

sample type, and age and sex of patients are also described. For the purposes of this report, quarters are calendar quarters, as such January to March is referred to as 'Q1', April to June is referred to as 'Q2', July to September is referred to as 'Q3' and October to December is referred to as 'Q4', alongside relevant years.

# Microbiology services

For reference services, including species identification and confirmation of susceptibility testing results, laboratories should contact UKHSA's <u>Antimicrobial Resistance and Healthcare</u> <u>Associated Infections (AMRHAI) Reference Unit in Colindale, London.</u>

Table 1 summarises the carbapenemase gene families that are targeted using the routine PCR applied to referred Enterobacterales, *Pseudomonas* spp. and *Acinetobacter* spp. that are suspected of harbouring an acquired carbapenemase gene. UKHSA strongly recommends that all diagnostic laboratories should be able to detect the 4 carbapenemase families in bold (the 'big 4') using either PCR or immunochromatographic methods. Table 1 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*.

Where an 'exceptional' carbapenemase and species combination result (cells without a ¥ symbol in Table 1) has been identified, or where an unusual organism has been identified with an acquired carbapenemase (that is, any bacterial genera other than a member of the Enterobacterales, *Pseudomonas* spp. or *Acinetobacter* spp.), isolates should be sent to the <u>AMRHAI Reference Unit</u> for confirmation.

Table 1. Distribution of carbapenemase genes covered by AMRHAI Reference Unit molecular assay (based on AMRHAI data)

Carbapenemase	Associat	ed with common 'host	d' organism
family	Enterobacterales	Pseudomonas spp.	Acinetobacter spp.
KPC	¥	<10	<10
OXA-48-like	¥	<10	0
NDM	¥	¥	¥
VIM	¥	¥	<10
IMP	¥	¥	¥
IMI/NMC-A	Β¥	0	0
GES	¥	¥	0
FRI	<10	0	0
SME	<10 <sup>C</sup> ¥	0	0
DIM	0	<10	0
GIM	<10	0	0
SIM	0	<10	0

Carbapenemase	Associat	ted with common 'host	' organism
family	Enterobacterales	Pseudomonas spp.	Acinetobacter spp.
SPM	0	<10	0
OXA-23-like	<10	0	¥
OXA-40-like	0	0	¥
OXA-51-like <sup>A</sup>	0	0	¥
OXA-58-like	0	0	¥

### Recent developments

The AMRHAI Reference Unit screens all Enterobacterales sent for investigation of carbapenem resistance with a multiplex PCR that includes the *bla*<sub>OXA-23-like</sub>, *bla*<sub>OXA-40-like</sub> and *bla*<sub>OXA-58-like</sub> acquired carbapenemase genes consistently associated with resistance in *Acinetobacter* spp. since 2020.

In 2021, AMRHAI detected the first known instance of an Enterobacterales isolate (*Proteus mirabilis*) harbouring a gene encoding for OXA-23 carbapenemase amongst referrals; a second isolate with no known links to the first was identified in early 2022. Similar isolates of *P. mirabilis* have been reported in the literature as associated with human and animal sources in France and Belgium since 1996 (1). As previously reported, both isolates were susceptible to most antibiotics but with meropenem above the EUCAST meropenem screening cut-off for CPE and observed resistance to imipenem (although reduced susceptibility to imipenem is expected in *Proteus* spp.), therefore their clinical significance is uncertain.

# First 18 months of notification data (October 2020 to March 2022)

Between October 2020 and March 2022, there were 3,268 acquired carbapenemase-producing Gram-negative bacteria episodes. The majority were identified in screening samples, accounting for 68.9% of carbapenemase notifications, with only 5.8% reported in sterile site specimens (Table 2).

Table 2. Number and percentage of acquired carbapenemase-producing Gramnegative reports by specimen type (England): October 2020 to March 2022

Specimen type	All re	ports	From AMRHAI [note 1]					
oposimon typo	Number	%	Number	%				
Sterile site samples	190	5.8	89	11.7				
Screening samples	2,252	68.9	357	47.1				
Other samples [note 2]	826	25.3	312	41.2				
All samples	3,268	100.0	758	100.0				

#### Notes to Table 2

Note 1. Samples that do not fall into either 'sterile site' or 'screening' samples, for example, urine and lower respiratory tract specimens.

Note 2. The AMRHAI Reference Unit actively encourages submission of sterile site isolates for carbapenemase confirmation; the distribution of specimen type will reflect this.

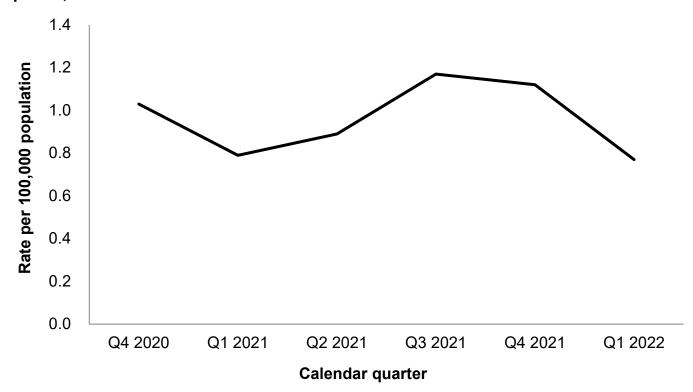
The remaining data summaries in this report consider all samples grouped together.

### **Quarterly trends**

The quarterly rate of acquired carbapenemase-producing Gram-negative bacteria reports between October 2020 and March 2022 is shown in Figure 1, for which the overall rate of reporting was 0.96 per 100,000 population.

Comparing the quarterly rates of reports across 2021, higher rates were seen in the second half of the calendar year (1.18 and 1.12 per 100,000 population in Q3 2021 and Q4 2021 respectively, compared to 0.79 and 0.89 per 100,000 population in Q1 and Q2 2021 respectively). Similarly, a higher rate was observed in Q4 2020 (1.04 per 100,000 population) and a lower rate was observed in Q1 2022 (0.77 per 100,000 population). However, as there is only 18 months of notification data, it is too early to conclude that there may be any seasonality, particularly in light of the coronavirus (COVID-19) pandemic, where quarterly changes may be affected by COVID-19 'waves' seen during this period or associated with local carbapenemase-producing Gram-negative bacteria outbreaks.

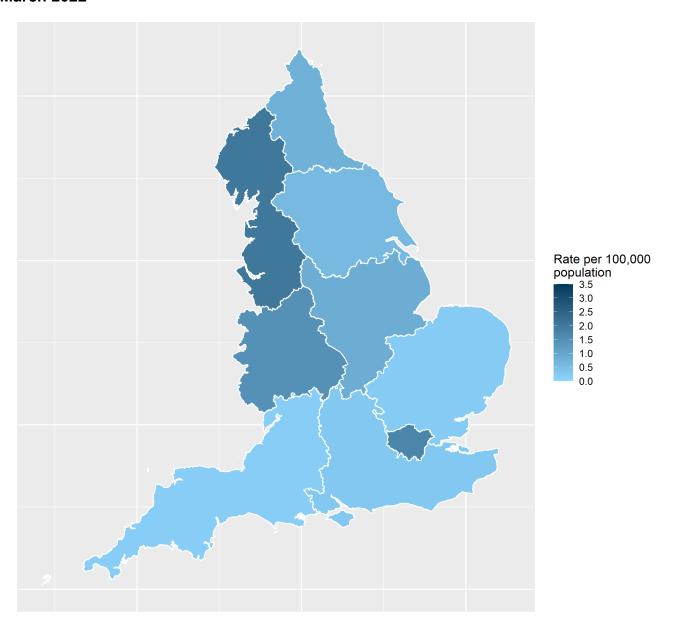
Figure 1. Rate of acquired carbapenemase-producing Gram-negative bacteria reports by quarter, October 2020 to March 2022



# **Geographic distribution**

The rate of acquired carbapenemase-producing Gram-negative bacteria reports varied by region (Figure 2), with the highest overall rate for all 6 quarters combined reported in the North West (2.04 per 100,000 population), followed by the London region (1.74 per 100,000 population). The lowest incidence across the time period was reported in the East of England and South West regions (0.24 and 0.20 reports per 100,000 population, respectively).

Figure 2. Geographical distribution of acquired carbapenemase-producing Gramnegative bacteria incidence rates per 100,000 population (England): October 2020 to March 2022



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Comparing the regional case numbers and rates across all quarters (Table 3, Figure 4a), all regions noted a decrease between Q4 2020 and Q1 2021, with the exception of the North East region and Yorkshire and Humber region, where the rate per 100,000 population increased from 0.34 to 0.75 (9 to 20 reports) and from 0.42 to 0.49 (23 to 27 reports), respectively.

Between Q1 and Q2 2021, all regions noted an increase, with the exception of the East of England and West Midlands regions, where the rate per 100,000 population decreased from 0.27 to 0.18 (18 to 12 reports) and from 1.34 to 1.07 (80 to 64 reports), respectively.

Between Q2 and Q3 of 2021, case numbers and rates increased in the majority of regions; increasing especially in the West Midlands where the number of reports more than doubled (from 64 to 137). This observed increase was likely due to an increase in screening due to an ongoing investigation and may not actually represent an increase in prevalence. In the North West and London the rate per 100,000 population increased from 1.97 to 2.47 (145 to 182 reports) and from 1.61 to 2.05 (145 to 185 reports), respectively.

Between Q3 and Q4 2021, the number of reports slightly increased or remained fairly stable in most regions, however, there was a large observed reduction in the rate of reporting in the North West and London regions. The number of reports from the West Midlands remained elevated (143 reports; 2.40 per 100,000 population); this observed increase in the second half of 2021 remained higher due to ongoing investigation.

Between Q4 2021 and Q1 2022, the overall rate of reports dropped and this was mirrored in the majority of regions. For example, in the West Midlands, North East and East Midlands regions, the rate per 100,000 population decreased from 2.40 to 0.42 (143 to 25 reports), from 1.16 to 0.56 (31 to 15 reports) and from 1.03 to 0.53 (50 to 26 reports), respectively.

Comparing Q1 between 2021 and Q1 2022, the rate of acquired carbapenemase-producing Gram-negative reports increased in the North West (1.59 to 2.02 per 100,000 population), Yorkshire and Humber (0.49 to 0.54 per 100,000 population), and London (1.41 to 1.68 per 100,000 population), as shown in Table 3. Comparatively, the rate decreased in the North East, East Midlands and East of England, whereas the South East and South West remained stable.

While the London region recorded the highest number of acquired carbapenemase-producing Gram-negative bacteria in all quarters, the North West had the highest rate of reports in Q4 2020, Q1, Q2, Q3 2021 and Q1 2022. In Q4 2021, the highest rate of reports came from the West Midlands (2.40 per 100,000 population).

Table 3. Rate per 100,000 population of acquired carbapenemase-producing Gram-negative reports by region (England): October 2020 to March 2022 [note 1]

Region	Local Area	Q4	2020	Q1 2	2021	Q2 :	2021	Q3 2	2021	Q4 2	2021	Q1 :	2022	Trend
region	Region	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	line¥
	North East	9	0.34	20	0.75	26	0.97	26	0.97	31	1.16	15	0.56	
North of	North West	165	2.24	117	1.59	145	1.97	182	2.47	144	1.95	149	2.02	<u></u>
England	Yorkshire and Humber	23	0.42	27	0.49	35	0.63	34	0.62	34	0.62	30	0.54	
N A: -III -	East Midlands	47	0.97	32	0.66	41	0.84	56	1.15	50	1.03	26	0.53	$\overline{}$
Midlands and East	East of England	23	0.34	18	0.27	12	0.18	5	0.07	27	0.40	10	0.15	$\searrow$
of England	West Midlands	87	1.46	80	1.34	64	1.07	137	2.30	143	2.40	25	0.42	$\sim$
London	London	183	2.03	127	1.41	145	1.61	185	2.05	151	1.68	151	1.68	
South of	South East	32	0.36	18	0.20	19	0.21	28	0.31	47	0.53	21	0.23	$\sim$
England	South West	16	0.29	7	0.13	16	0.29	10	0.18	9	0.16	8	0.15	<b>\</b>
England o	verall	585	1.03	446	0.79	503	0.89	663	1.17	636	1.12	435	0.77	

#### Notes to Table 3

Note 1. Trend line vertical axes are set to zero for each region

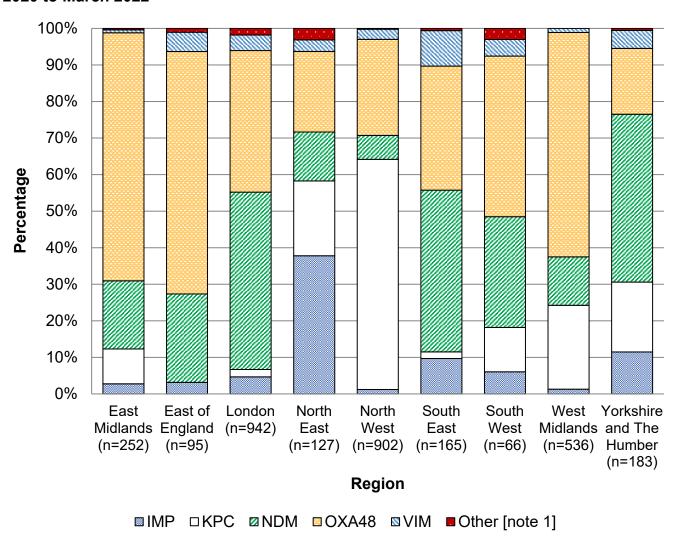
# Regional differences in carbapenemase family

For the entire period between October 2020 and March 2022, the most common carbapenemase families reported across all regions were OXA-48-like (40.1%), NDM (26.0%), and KPC (24.6%). However, similarly to the incidence of reports, the distribution of carbapenemase families identified also varied regionally (Figure 3, Figure 4a and 4b).

In the North West, which had the highest incidence rate for the first 18 months of mandatory reporting, the most common carbapenemase families identified were KPC (63.0%) and OXA-48-like (26.3%). KPC was not as common in any of the other regions, only accounting for between 0% and 22.9% of notifications in each region. For example, in London, which also had a high overall incidence rate, KPC accounted for 2.0% with NDM and OXA-48-like carbapenemases dominating the reports (48.5% and 38.7%, respectively). Another regional difference was observed in the North East, where IMP was the most commonly identified carbapenemase family (37.8%), only accounting for a small percentage of reports in other regions (up to 11.5%). However, given the small number of carbapenemases reported in some regions, the diversity of carbapenemases reported is likely to be strongly impacted by individual outbreaks. In the 2 regions that had the lowest incidence rates, the most common carbapenemase family was OXA-48-like (43.9% in the South West and 66.3% in the East of England, respectively).

The distribution of carbapenemase families within each region also varied by quarter (Figure 4b). In the North East, the percentage of reports of IMP carbapenemases has increased in the most recent quarter (Q1 2022: 73.3%). In the West Midlands, OXA-48-like carbapenemases were the dominant carbapenemase family reported between Q4 2020 and Q4 2021 (between 59.4% and 66.3%); however, this quarter, the percentage of OXA-48-like carbapenemases fell (to 32.0%) and KPC and NDM carbapenemases now dominate, with the percentage of NDM carbapenemases increasing dramatically compared to previous quarters (previously between 9.4% and 20.7%, now accounting for 40.0%).

Figure 3. Regional distribution of reports by carbapenemase family (England): October 2020 to March 2022



Notes to Figure 3

Note 1. Other carbapenemase families include GES and IMI.

Figure 4a. Acquired carbapenemase-producing Gram-negative bacteria reports by carbapenemase family and region (England): October 2020 to March 2022

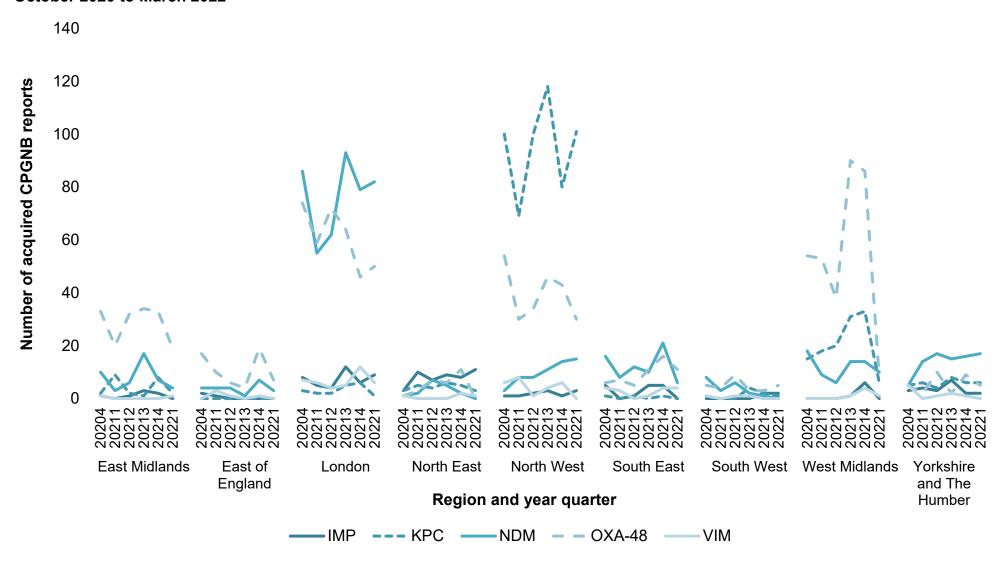
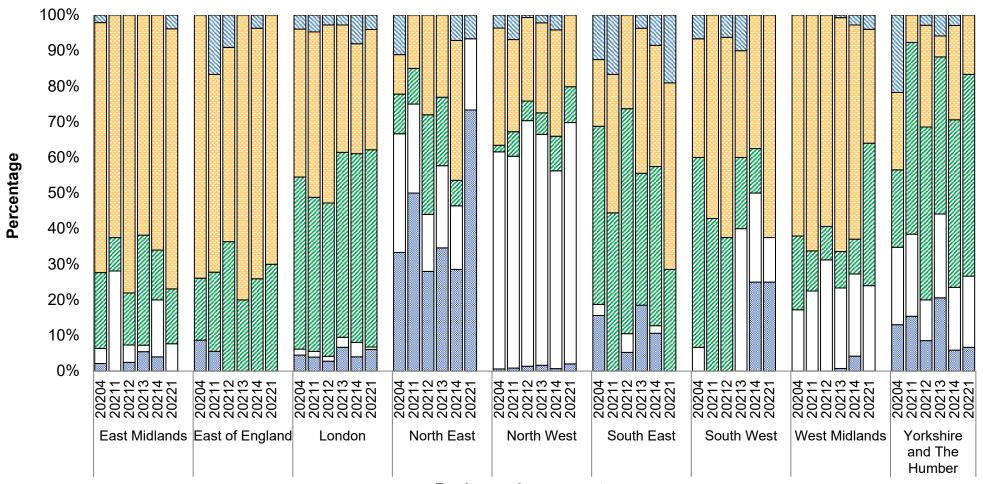


Figure 4b. Distribution of carbapenemase family (England) by region and calendar quarter: October 2020 to March 2022



Region and year quarter

■IMP □KPC ØNDM ■OXA-48 ■VIM

# Distribution of species and carbapenemase family

Across the entire 18 months of reporting, the most frequently isolated Gram-negative bacterial species with a confirmed acquired carbapenemase was *Klebsiella pneumoniae*, accounting for 1,102 (33.7%) of all specimens. This was followed by *Escherichia coli* and *Enterobacter* spp., which accounted for 26.1% and 20.3% of all specimens, respectively (Table 4).

Across these 3 species, the carbapenemase family most frequently identified was OXA-48-like (44.3%, 34.7% and 44.3% in *K. pneumoniae*, *Enterobacter* spp. and *E. coli*, respectively). In *K. pneumoniae* and *Enterobacter* spp. isolates, this was followed by KPC and NDM carbapenemase families (27.5% and 25.2% in *K. pneumoniae* and 30.2% and 22.5% in *Enterobacter* spp.), and in *E. coli* this was followed by NDM (31.5%) and KPC (21.0%) carbapenemase families.

Aside from the 'big 5' carbapenemase families (KPC, OXA-48-like, NDM, VIM and IMP), the AMRHAI Reference Unit also screens for rarer carbapenemase families, and it is recommended that all isolates suspected to produce a carbapenemase but is negative for the big 5 carbapenemases are referred to the AMRHAI Reference Unit for identification and/or confirmation. Between October 2020 and March 2022, both GES and IMI carbapenemases were identified in small numbers (29 in total), none being identified from invasive specimens. No IMI carbapenemases have been identified since Q3 2021, and all (12 in total) were identified in *Enterobacter* spp. isolates. The majority of GES carbapenemases (82.4%) were identified among *Pseudomonas aeruginosa* isolates.

Table 4. Reports of acquired carbapenemase-producing Gram-negative bacteria by species and carbapenemase family (England): October 2020 to March 2022

Carbapenemase family	IN	ИP	KF	C	NI	OM	OXA-	48-like	٧	'IM	Ot	her	To	tal
Species	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Acinetobacter spp.[note 1]	3	10.7	0	0.0	22	78.6	2	7.1	0	0.0	1	3.6	28	100.0
Citrobacter spp.	8	4.1	49	24.9	41	20.8	89	45.2	9	4.6	1	0.5	197	100.0
Enterobacter spp.	64	9.7	200	30.2	149	22.5	230	34.7	7	1.1	12	1.8	662	100.0
Escherichia coli	18	2.1	179	21.0	268	31.5	378	44.4	8	0.9	1	0.1	852	100.0
Other <i>Escherichia</i> spp.	0	0.0	0	0.0	0	0.0	2	100.0	0	0.0	0	0.0	2	100.0
Klebsiella oxytoca	6	5.9	40	39.6	8	7.9	43	42.6	4	4.0	0	0.0	101	100.0
Klebsiella pneumoniae	23	2.1	303	27.5	278	25.2	488	44.3	10	0.9	0	0.0	1,102	100.0
Other Klebsiella spp.	8	9.1	15	17.0	30	34.1	30	34.1	5	5.7	0	0.0	88	100.0
Morganella spp.	0	0.0	0	0.0	5	29.4	12	70.6	0	0.0	0	0.0	17	100.0
Pseudomonas aeruginosa [note 1]	26	19.3	4	3.0	32	23.7	6	4.4	53	39.3	14	10.4	135	100.0
Other Pseudomonas spp. [note 1]	4	12.9	4	12.9	7	22.6	2	6.5	14	45.2	0	0.0	31	100.0
Serratia spp.	0	0.0	0	0.0	4	36.4	7	63.6	0	0.0	0	0.0	11	100.0
Other Gram-negative bacteria [note 2]	1	2.4	12	28.6	7	16.7	22	52.4	0	0.0	0	0.0	42	100.0
Total	1	61	80	)6	8	51	1,	311	1	10	2	.9	3,268	

#### Notes to Table 4

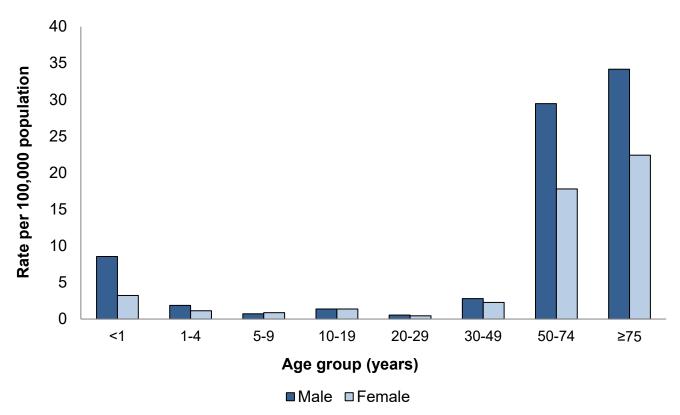
Note 1. KPC and OXA-48-like in *Pseudomonas* spp. and OXA-48-like in *Acinetobacter* spp. are extremely rare, and results should be interpreted with caution. The numbers reported here have not been confirmed by the reference laboratory

Note 2. Includes Aeromonas hydrophila, Bacteroides fragilis, coliform, other Escherichia spp., Hafnia spp., Kluyvera spp., Leclercia adecarboxylata, Pantoea spp., Phytobacter ursingii, Pluralibacter gergoviae, Proteus mirabilis, Providencia spp., and Raoultella spp.

# Age and sex distribution

The rate of acquired carbapenemase-producing Gram-negative bacteria reports was highest among the oldest and youngest members of the population. A similar age pattern was noted for both sexes, although overall the rate was higher in males compared to females (overall rates of 6.5 and 4.9 reports per 100,000 population, respectively: Figure 5). This aligns with the age group and sex distribution noted in <u>previously published reports</u> on Gram-negative bacteraemia such as *E. coli*, *Klebsiella* spp., *P. aeruginosa* and <u>Enterobacter spp.</u> and has been consistent across all quarters of mandatory CPGNB reporting.

Figure 5. Rates [note 1] of acquired carbapenemase-producing Gram-negative bacteria reports per 100,000 population by age and sex [note 2] (England): October 2020 to March 2022



#### Notes to Figure 5

Note 1. Rates have been calculated using cumulative reports across all 6 quarters of reporting, and as such cannot be compared to previous quarters.

Note 2. Information about patient sex is only recorded in 97% of cases.

Figure 5 shows the acquired carbapenemase-producing Gram-negative bacterial incidence rates by age group, with the highest rate reported in those aged 75 years and over (27.9 per 100,000 population) followed by the those aged between 50 to 74 years old (24.1 per 100,000 population). The overall rate of confirmed carbapenemases was 6.3 per 100,000 population in infants less than one year old.

# Quarterly Mandatory Laboratory Return (QMLR) Reporting (October 2021 to March 2022)

Table 5. QMLR returns for the total number of rectal swabs and faecal screening specimens taken for CPE screening by acute Trust type (England): October to March 2022

	Q4 2	020	Q1 2	021	Q2 2	021	Q3 2	021	Q4 2	021	Q1 2	022
Trust type [note 1]	Reported screens	Total screens										
	(%)	No.										
Small	22 (78.6)	3,826	20 (71.4)	3,682	19 (67.9)	6,213	14 (50.0)	2,976	13 (46.4)	1,562	7 (25.0)	1,005
Medium	22 (84.6)	6,943	21 (80.8)	7,725	22 (84.6)	9,853	21 (80.8)	9,992	20 (76.9)	8,207	14 (53.8)	6,627
Large	26 (92.9)	10,483	24 (85.7)	10,301	23 (82.1)	10,763	22 (78.6)	11,759	21 (75.0)	12,030	15 (53.6)	7,443
Multiservice	3 (75.0)	480	3 (75.0)	406	3 (75.0)	581	3 (75.0)	536	3 (75.0)	576	3 (75.0)	533
Specialist	13 (81.3)	5,412	14 (87.5)	5,547	13 (81.3)	4,717	13 (81.3)	5,472	13 (81.3)	5,393	10 (62.5)	4,178
Teaching	31 (86.1)	74,281	31 (86.1)	65,181	27 (75.0)	50,692	26 (72.2)	37,777	26 (72.2)	38,219	18 (50.0)	25,443
Total	117	101,425	114	92,842	107	82,819	99	68,512	96	65,987	67	45,229
	(84.8)		(82.6)		(77.5)		(71.7)		(69.6)		(48.6)	

#### Notes to Table 5

Note 1. Trust type obtained through NHS Digital Estate Return Information Collection (ERIC).

Reporting of quarterly totals of rectal swabs and faecal specimens taken for CPE screening was added to the mandatory quarterly laboratory returns (QMLR) section of the HCAI Data Capture System in October 2019, and reporting became mandatory in October 2020. Across all 6 quarters, there were 460,998 screens reported by 117 NHS Trusts leading to an overall Trust reporting rate of 73.5% (Table 5). This means that across all 6 quarters, there were 228 instances where an NHS Trust did not submit a return and 16 instances where an NHS Trust did not submit a return for any of the quarters. Of the acute Trusts that reported screening data, 2.8% reported that they conducted 0 screens (by quarter from Q4 2020 to Q1 2022 there were 7, 4, 3, 4, 3, and 2 reports of 0 screens). Between each consecutive quarter, both the number of Trusts that reported screens and the total number of screens fell (117 Trusts reporting 101,425 screens in Q4 2020 compared to 67 Trusts reporting 45,229 screens in Q1 2022).

Screening was more predominant in the acute Teaching trusts, accounting for 64.7% of screening swabs taken during this time period. By reporting acute Trust, the total screens reported for the quarter ranged from 0 to 18,859. The full list of reporting, including those that did not submit a return, is available in the data appendix by individual NHS acute Trust.

### Reference

Bonnin R and others. '<u>A single Proteus mirabilis lineage from human and animal sources: a hidden reservoir of OXA-23 or OXA-58 carbapenemases in Enterobacterales</u>.' Scientific Reports 2020: volume 10, issue 1, page 9,160

# **Appendices**

Appendix Table 1. QMLR returns for the total number of rectal swabs and faecal screening specimens taken for CPE screening by acute Trust (England): January to March 2022

T	T		202	20		2021				
Trust name	Trust type	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Airedale NHS Foundation Trust	Small	41	9	17	4	11	22			
Alder Hey Children's NHS Foundation Trust	Specialist				1,216	890	261	1,151	1,344	1,231
Ashford And St Peter's Hospitals NHS Foundation Trust	Medium			255	271	267	253	283	337	245
Barking, Havering And Redbridge University Hospitals NHS Trust	Large		576	1,024	1,108	1,353				
Barnsley Hospital NHS Foundation Trust	Small	101			38					
Barts Health NHS Trust	Teaching	1,533	1,112	1,727	1,555	1,321	2,128	2,737	1,733	1,775
Bedfordshire Hospitals NHS Foundation Trust	Medium	83	29	191		154	155	158	134	148
Birmingham Women's and Children's NHS Foundation Trust	Specialist									
Blackpool Teaching Hospitals NHS Foundation Trust	Teaching	760	591	958	689	719	980	796	792	801
Bolton NHS Foundation Trust	Medium	502	286	469	362	389	409	403	425	344
Bradford Teaching Hospitals NHS Foundation Trust	Teaching	541	545	697	629		288			
Buckinghamshire Healthcare NHS Trust	Multi-service			526	405	389	546	501	503	444
Calderdale And Huddersfield NHS Foundation Trust	Large	151	46	44	37		62	101	39	40
Cambridge University Hospitals NHS Foundation Trust	Teaching	1,587	959	1,273	1,332	992	1,257	1,340	1,407	
Chelsea And Westminster Hospital NHS Foundation Trust	Teaching									
Chesterfield Royal Hospital NHS Foundation Trust	Small									
Countess of Chester Hospital NHS Foundation Trust	Small									
County Durham And Darlington NHS Foundation Trust	Multi-service		10		68	12	30	28	63	82
Croydon Health Services NHS Trust	Medium			0	358	288	449	503	500	
Dartford And Gravesham NHS Trust	Small		0						0	
Doncaster And Bassetlaw Teaching Hospitals NHS Foundation Trust	Teaching			75		55		85	78	122
Dorset County Hospital NHS Foundation Trust	Small	31	17	32	14	26	57			
East and North Hertfordshire NHS Trust	Large			1,304	1,206	982	1,314	1,308	1,274	1,166
East Cheshire NHS Trust	Small	83	7	35	10	33	19	29		
East Kent Hospitals University NHS Foundation Trust	Teaching	421	225	339	338	249	395	383	400	378
East Lancashire Hospitals NHS Trust	Large	933	464	619	453	489	538	751	697	
East Suffolk And North Essex NHS Foundation Trust	Medium									
East Sussex Healthcare NHS Trust	Large	520	306	339	373	264	396	411	370	289
Epsom And St Helier University Hospitals NHS Trust	Large			0	368	313	292	312	270	

Truct name	Truct time			2022						
Trust name	Trust type	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Essex Partnership University NHS Foundation Trust	Multi-service									
Frimley Health NHS Foundation Trust	Medium				679	659	691	568	705	741
Gateshead Health NHS Foundation Trust	Small	8	2	5	3	17	18	15	22	
George Eliot Hospital NHS Trust	Small	52	18	77	74	47				
Gloucestershire Hospitals NHS Foundation Trust	Large			119	98	57	56	73	77	
Great Ormond Street Hospital for Children NHS Foundation Trust	Specialist	1,345	1,158	1,207	1,200	1,223	1,324	1,353	1,420	1,445
Great Western Hospitals NHS Foundation Trust	Medium	45	52	88	125	186	139	135	118	147
Guy's and St Thomas' NHS Foundation Trust	Teaching	4,205	3,245	3,635	3,537	693				
Hampshire Hospitals NHS Foundation Trust	Large	29	28	124	218	266	250	273	290	235
Harrogate And District NHS Foundation Trust	Small	182	100	87	141					
Homerton University Hospital NHS Foundation Trust	Medium				938	1,080	1,164	1,170	882	757
Hull University Teaching Hospitals NHS Trust	Teaching									
Imperial College Healthcare NHS Trust	Teaching	24,039	12,546	19,790	18,859	15,952				
Isle of Wight NHS Trust	Multi-service		5	0	7	5	5	7	10	7
James Paget University Hospitals NHS Foundation Trust	Small	31	13	30	15	7	10	10	10	50
Kettering General Hospital NHS Foundation Trust	Small	169	148	232	223	165	223			
King's College Hospital NHS Foundation Trust	Teaching			0	11,008	9,471	10,547			
Kingston Hospital NHS Foundation Trust	Small		0	0	122	95	96	88	86	
Lancashire Teaching Hospitals NHS Foundation Trust	Teaching				134	119	0	185	140	102
Leeds Teaching Hospitals NHS Trust	Teaching			0	1,488	1,319	1,188	2,214	2,360	
Lewisham And Greenwich NHS Trust	Large	1020	639	926	686	1684	929	1,045	2,102	
Liverpool Heart and Chest Hospital NHS Foundation Trust	Specialist			357	327	381	367	413	364	
Liverpool University Hospitals NHS Foundation Trust	Teaching			2,904	2,744	2,970	2,940	2,707	3,166	
Liverpool Women's NHS Foundation Trust	Specialist			76	55	68	63	94	70	
London North West University Healthcare NHS Trust	Large			788	766	888	765	776		
Maidstone And Tunbridge Wells NHS Trust	Large	683	363	451	392	341	478	310	332	
Manchester University NHS Foundation Trust	Teaching									
Medway NHS Foundation Trust	Medium									
Mid and South Essex NHS Foundation Trust	Medium									
Mid Cheshire Hospitals NHS Foundation Trust	Small	185	42	114	22	120	98	86		
Mid Yorkshire Hospitals NHS Trust	Large	81	22	28	15	99	200	191	192	149
Milton Keynes University Hospital NHS Foundation Trust	Small	24								

Tweet wares	Turnet true		202	20		2021 2022					
Trust name	Trust type	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	
Moorfields Eye Hospital NHS Foundation Trust	Specialist	0		0	0	0	0	0	0	0	
Norfolk And Norwich University Hospitals NHS Foundation Trust	Teaching	136	74	88	85	86	48	120	239		
North Bristol NHS Trust	Large		99	145	62	164	37				
North Cumbria Integrated Care NHS Foundation Trust	Small	393	90	89	63	67	2,637	1,722	271	194	
North Middlesex University Hospital NHS Trust	Small	2,108	1,567	2,119	2,362	2,396	2,099				
North Tees and Hartlepool NHS Foundation Trust	Medium	395	268	292	290	245	199	356			
North West Anglia NHS Foundation Trust	Large	229	115	200	158	86	142	172	174	147	
Northampton General Hospital NHS Trust	Medium		46		181	762	1,062	858			
Northern Devon Healthcare NHS Trust	Small	84	78	60	67	77	79	68	66		
Northern Lincolnshire And Goole NHS Foundation Trust	Large	84	48	41	13		7	15	20	13	
Northumbria Healthcare NHS Foundation Trust	Large	55	7	23	14	49					
Nottingham University Hospitals NHS Trust	Teaching				204	956	1,537	1,810	1,666	1,897	
Oxford University Hospitals NHS Foundation Trust	Teaching	561	373	566	585	489	618	713	776	684	
Pennine Acute Hospitals NHS Trust	Large	784	489	581	495	510	691	679	731	740	
Portsmouth Hospitals University National Health Service Trust	Large			310	280	295	356	332	244	326	
Queen Victoria Hospital NHS Foundation Trust	Specialist			0	0	2		0	1	1	
Royal Berkshire NHS Foundation Trust	Large	477	316	324	696	394	551	524	525	407	
Royal Cornwall Hospitals NHS Trust	Large	105	54	50	53	59	58	148	427		
Royal Devon And Exeter NHS Foundation Trust	Large	133	130	221	89	127	138	235	228	194	
Royal Free London NHS Foundation Trust	Teaching	8,219	4,611	7,669	8,354	6,194	7,400				
Royal National Orthopaedic Hospital NHS Trust	Specialist	255	309	204	234	473	316		238	239	
Royal Papworth Hospital NHS Foundation Trust	Specialist	89	114	75	85	125	66	64	47	51	
Royal Surrey County Hospital NHS Foundation Trust	Medium	385	223	454	692	725	1,135	1,159	1,183	1,186	
Royal United Hospitals Bath NHS Foundation Trust	Medium		21	20	0	244	334	229	173		
Salford Royal NHS Foundation Trust	Teaching	434	258	339	286	275	275	296	242	219	
Salisbury NHS Foundation Trust	Small	113	72	81	81	68	86				
Sandwell And West Birmingham Hospitals NHS Trust	Large		0	0	0	0					
Sheffield Children's NHS Foundation Trust	Specialist	0		0	0	0	2	0	3	1	
Sheffield Teaching Hospitals NHS Foundation Trust	Teaching	332	173	315	353	259	463	496	644	560	
Sherwood Forest Hospitals NHS Foundation Trust	Medium	0			0						
South Tees Hospitals NHS Foundation Trust	Teaching	134	27	26	46	16	88	143	304	412	
South Tyneside And Sunderland NHS Foundation Trust	Large										

Tweet name	Truct type		2020					2021				
Trust name	Trust type	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1		
South Warwickshire NHS Foundation Trust	Small				0	0	0	0	0	0		
Southport And Ormskirk Hospital NHS Trust	Small			203	172	180	224	270	241			
St George's University Hospitals NHS Foundation Trust	Teaching			0	84	906	979	961	1,268	1,332		
St Helens And Knowsley Teaching Hospitals NHS Trust	Medium	1,807	1,131	1,613	1,541	1,222	1,546	1,688	1,557	1,334		
Stockport NHS Foundation Trust	Medium				161	126	241	269	203	258		
Surrey and Sussex Healthcare NHS Trust	Medium	169	81		146	117	167	156	146			
Tameside And Glossop Integrated Care NHS Foundation Trust	Small	277	228	228	170	164	196	209	192			
The Christie NHS Foundation Trust	Specialist	330	297	246	322	297	358	467	619			
The Clatterbridge Cancer Centre NHS Foundation Trust	Specialist											
The Dudley Group NHS Foundation Trust	Medium	15	3	6	14	9	16	46	30			
The Hillingdon Hospitals NHS Foundation Trust	Small											
The Newcastle Upon Tyne Hospitals NHS Foundation Trust	Teaching	817	459	680	591	842	740	749	673	595		
The Princess Alexandra Hospital NHS Trust	Small	35	8	15	21	12	28	93	217	236		
The Queen Elizabeth Hospital, King's Lynn, NHS Foundation Trust	Small	21	7	2	3	2	4	5	94	126		
The Robert Jones And Agnes Hunt Orthopaedic Hospital NHS Foundation Trust	Specialist	71	103	135	104	87	98	82	90	51		
The Rotherham NHS Foundation Trust	Medium	1	69		68	94	520	548	452	14		
The Royal Marsden NHS Foundation Trust	Specialist	1,265	1,045	1,126	1,200	1,175	1,200	1,148	1,159	1,101		
The Royal Orthopaedic Hospital NHS Foundation Trust	Specialist	19	22			25	56	31	38	58		
The Royal Wolverhampton NHS Trust	Large	2,201	938	1,315	1,161	949	1,220	1,031	1,047	893		
The Shrewsbury And Telford Hospital NHS Trust	Large	102	50	143	134	124	125	143	135	91		
The Walton Centre NHS Foundation Trust	Specialist	662	495	487	669	801	606	669				
Torbay And South Devon NHS Foundation Trust	Medium	7	4	1	9	12	2		9	5		
United Lincolnshire Hospitals NHS Trust	Large	282	93				303	394	512	421		
University College London Hospitals NHS Foundation Trust	Teaching	312	312	369	419	537	601	793	912			
University Hospital Southampton NHS Foundation Trust	Teaching			236	282	1,390	224	254	386	328		
University Hospitals Birmingham NHS Foundation Trust	Teaching											
University Hospitals Bristol And Weston NHS Foundation Trust	Teaching	19	4	10	1,302	1,322						
University Hospitals Coventry And Warwickshire NHS Trust	Teaching	562	202	388	433	448	547	809	978	811		
University Hospitals of Derby and Burton NHS Foundation Trust	Teaching	174	101	64	100	48	94	93	97	83		
University Hospitals of Leicester NHS Trust	Teaching	4,215	2,957	5,413	6,818	5,870	7,325	6,919	6,834	6,348		
University Hospitals of Morecambe Bay NHS Foundation Trust	Medium	71	65	131	89	72	112	130	106			
University Hospitals of North Midlands NHS Trust	Teaching				8,487	8,213	9,446	9,593	9,975	8,965		

Trust namo	T		2020					2021				
Trust name	Trust type	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1		
University Hospitals Plymouth NHS Trust	Teaching			175	132	167	146	416	628			
University Hospitals Sussex NHS Foundation Trust	Large	141	63	116	162	88						
Walsall Healthcare NHS Trust	Medium				44	184	182	231	302	558		
Warrington And Halton Teaching Hospitals NHS Foundation Trust	Teaching	650	320	436	390	376	392	288	296			
West Hertfordshire Hospitals NHS Trust	Medium		214	477	668	549	780	857	662	713		
West Suffolk NHS Foundation Trust	Small											
Whittington Health NHS Trust	Medium	79	42	86	211	58	69	41	54			
Wirral University Teaching Hospital NHS Foundation Trust	Teaching	5,986	2,815	2,748	2,925	2,900		2,844	2,147			
Worcestershire Acute Hospitals NHS Trust	Large	2,202	694	1,534	1,446	720	1,855	2,535	2,344	2,332		
Wrightington, Wigan And Leigh NHS Foundation Trust	Medium				96	283	228	204	229	177		
Wye Valley NHS Trust	Small	323	164	206	178	167	273	329	304	246		
Yeovil District Hospital NHS Foundation Trust	Small	0	0	29	43	28	44	52	59	153		
York And Scarborough Teaching Hospitals NHS Foundation Trust	Teaching	81	40	30	92	27	46	33	78	31		

# **Acknowledgements**

These reports would not be possible without the weekly contributions from microbiology colleagues in laboratories across England, without whom there would be no surveillance data. The support from colleagues within the UK Health Security Agency, and the AMRHAI Reference Unit in particular, is valued in the preparation of the report. Feedback and specific queries about this report are welcome via hcai.amrdepartment@phe.gov.uk.

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First published: 24 May 2022 Version 2 published: August 2022

Publishing reference: GOV-12309



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