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Laboratory surveillance of *Enterococcus* spp. bacteraemia in England, Wales and Northern Ireland: 2018

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These analyses are based on data relating to reports of *Enterococcus* spp. bacteraemia between 2009 and 2018 in England, Wales and Northern Ireland. The data were extracted on 16 August 2019 from Public Health England's (PHE) voluntary surveillance database, Second Generation Surveillance System (SGSS). Data for Wales and Northern Ireland were extracted separately (DataStore on 30 April 2019 and CoSurv on 26 June 2019, respectively).

Rates of laboratory reported bacteraemia were calculated using mid-year resident population estimates for the respective year and geography [1]. 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 PHE Centres (PHECs), formed from the administrative local authority boundaries [2].

The following report includes analyses of the incidence trends, age and sex distribution and geographical distribution of *Enterococcus* spp. bacteraemia. Antimicrobial susceptibility three-year trends are reported for England and Northern Ireland based on SGSS AMR and CoSurv data, respectively. [A web appendix is available](#) featuring additional findings including data submitted to SGSS from laboratories in England.

Data presented here for earlier years may differ from those in previous publications due to the inclusion of late reports.

Key points

- the overall incidence of *Enterococcus* spp. bacteraemia in England, Northern Ireland and Wales was 13.3 per 100,000 population in 2018
- in 2018, the rates of *Enterococcus* spp. bacteraemia in England, Northern Ireland and Wales were 13.1, 15.4 and 15.9 per 100,000 population, respectively
- within England, all PHECs reported an increase in rates of *Enterococcus* spp. bacteraemia from 2014 to 2018
- the highest rate of *Enterococcus* spp. bacteraemia in 2018 was in the South West PHEC (16.1/100,000 population), and the lowest was in the London PHEC (11.2/100,000 population)
- in 2018, 89% of *Enterococcus* spp. bacteraemia reports were identified to species level
- the most frequently reported species in 2018 were *Enterococcus faecalis* (45%) and *Enterococcus faecium* (39%)
- the rates of *Enterococcus* spp. bacteraemia were higher in the elderly (75 years and older) and infants (under the age of one)
- rates were also higher in males (16.7/100,000 population) compared to females (9.9/100,000 population)
- resistance to glycopeptides was higher in *E. faecium* than in *E. faecalis*

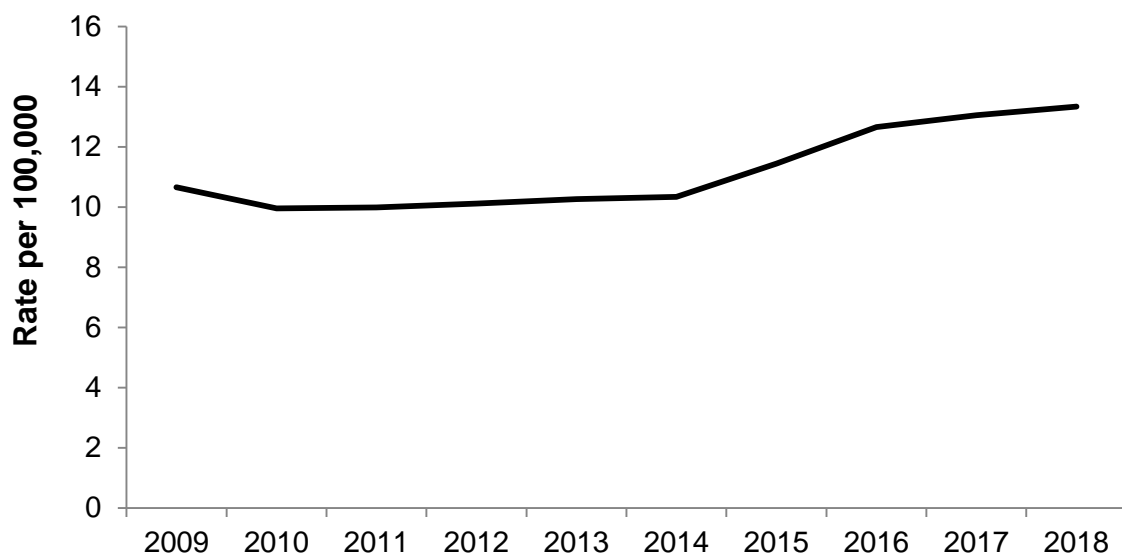
Trends

In England, Wales and Northern Ireland the rate of bacteraemia caused by *Enterococcus* spp. increased in 2018 (to 13.3 per 100,000 population) compared to 2017. This is also the highest rate that has been observed over the ten-year period since 2009 (Figure 1).

The rate of *Enterococcus* spp. bacteraemia was relatively stable between 2010 and 2014 (around 10.0 per 100,000 population) with the most pronounced increase between 2014 to 2016. This shift in the observed trend may be partly due to improvement in PHE's voluntary surveillance system following laboratories switching from LabBase2 to SGSS in 2014.

Enterococcus faecalis accounted for 1.9% of monomicrobial bacteraemias/fungaemias in 2017, making it the seventh most commonly identified organism reported. For polymicrobial bacteraemias/fungaemias, *E. faecalis* (4.3%) and *E. faecium* (2.8%) were the sixth and seventh most common organisms [3].

Figure 1. *Enterococcus* spp. bacteraemia rate per 100,000 population (England, Wales and Northern Ireland): 2009 to 2018



Geographic distribution

In 2018, the combined rate of reported *Enterococcus* spp. bacteraemia for England, Wales and Northern Ireland was 13.3 per 100,000 population, an increase of 2% from 2017.

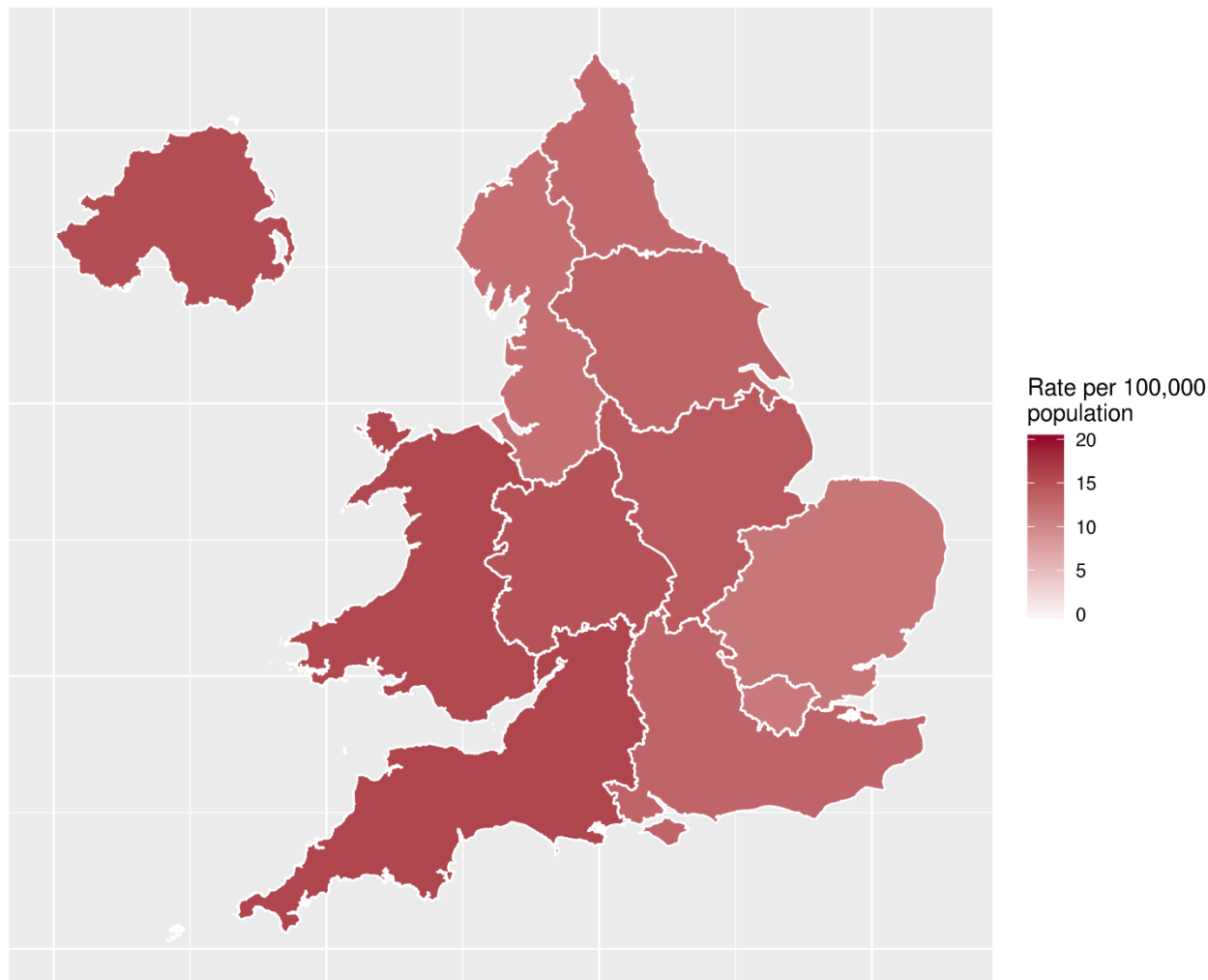
Individually, all countries have had an observed increase of reported *Enterococcus* spp. bacteraemia between 2014 and 2018; England by 32% (10.0 to 13.1/100,000 population), Northern Ireland by 17% (13.1 to 15.4/100,000 population) and Wales by 5% (15.1 to 15.9/100,000).

Within England, there was variation among the nine PHECs. All PHECs had higher rates of *Enterococcus* spp. bacteraemia in 2018 compared to 2014. In 2018, the relative increase from 2017 was greatest for Yorkshire and Humber (9.6 to 13.4/100,000 population). The highest rate of *Enterococcus* spp. bacteraemia in 2018 was in the South West (16.1/100,000 population). In contrast, London had the lowest rate of bacteraemia (11.2/100,000 population) (Table 1).

Table 1. *Enterococcus* spp. bacteraemia per 100,000 population by region (England, Wales and Northern Ireland): 2014 to 2018

Region	PHE Centre	Rate per 100,000				
		2014	2015	2016	2017	2018
North of England	North East	8.0	8.8	11.9	11.4	12.8
	North West	11.7	12.1	13.9	13.0	12.2
	Yorkshire and Humber	6.8	9.5	9.2	9.6	13.4
Midlands and East of England	East Midlands	9.2	12.1	13.4	13.6	14.2
	East of England	10.1	10.5	12.4	13.1	11.5
	West Midlands	12.4	12.4	13.2	14.6	14.9
London	London	10.4	10.2	11.4	11.9	11.2
South of England	South East	8.7	10.1	12.1	12.8	13.3
	South West	11.1	14.0	15.0	15.0	16.1
England		10.0	11.1	12.5	12.8	13.1
Northern Ireland		13.1	13.5	14.0	15.8	15.4
Wales		15.1	16.2	15.2	15.9	15.9
England, Northern Ireland and Wales		10.3	11.5	12.7	13.1	13.3

Figure 2. Geographical distribution of *Enterococcus* spp. bacteraemia rates per 100,000 population (England, Wales and Northern Ireland): 2018



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It is important to note differences in the way data are collected between the three countries. In England and Northern Ireland, microbiology laboratories electronically report clinically significant isolates to SGSS or CoSurv, respectively. In Wales, data are collected by extraction from a single laboratory information system used by all the microbiology laboratories. The system extracts all positive blood cultures, including those not thought to be clinically significant.

Species distribution

In 2018, 89% of *Enterococcus* spp. bacteraemia reports were identified to species level in England, Wales and Northern Ireland, an increase from 84% in 2014 (Table 2). There was variation of reports identified to species level by country (England 88%, Wales 95% and Northern Ireland 98%).

The most frequently identified *Enterococcus* spp. in 2018 within England, Wales and Northern Ireland was *E. faecalis* (45%) and has consistently been the most frequently identified species across the five-year time-period. *E. faecium* was the second most frequently reported species (39%). The proportion of *Enterococcus* spp. bacteraemia caused by *E. faecalis* and *E. faecium* has remained constant over the last five years. Other notable species in 2018 were: *E. gallinarum* (2% of *Enterococcus*) and *E. casseliflavus* (1%).

Table 2. Reports of *Enterococcus* spp. bacteraemia by species (England, Wales and Northern Ireland): 2014-2018

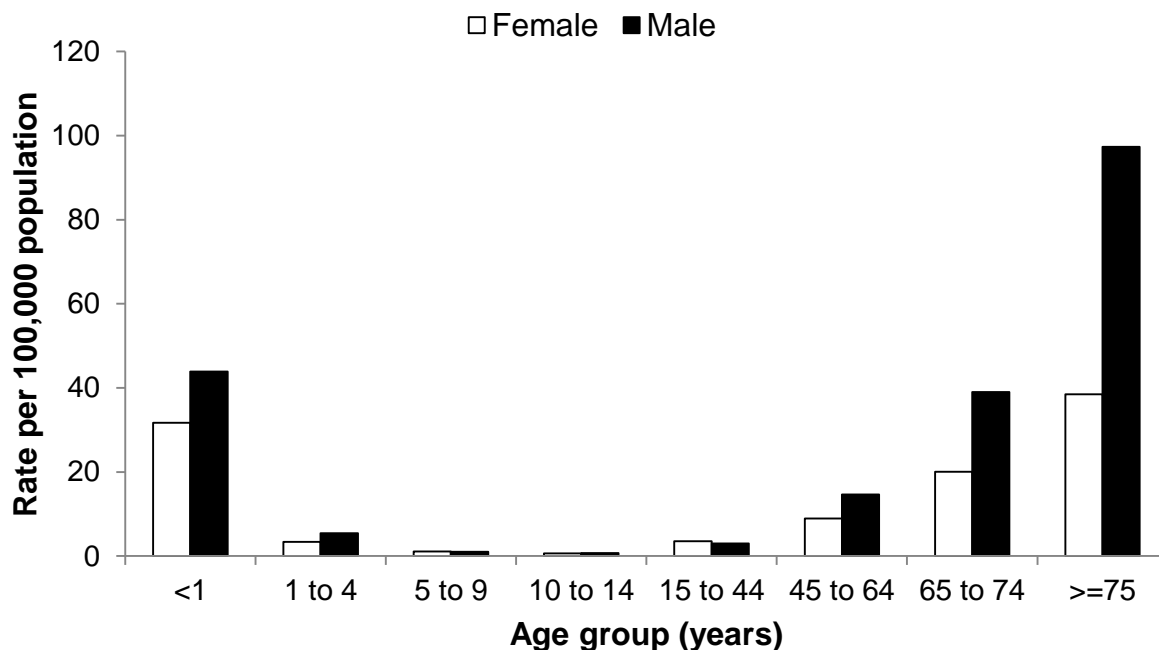
	2014		2015		2016		2017		2018	
	No.	%	No.	%	No.	%	No.	%	No.	%
<i>Enterococcus</i> spp.	6,126	100	6,841	100	7,625	100	7,916	100	8,136	100
<i>E. avium</i>	55	1	65	1	54	1	67	1	79	1
<i>E. casseliflavus</i>	59	1	55	1	72	1	67	1	82	1
<i>E. cecorum</i>	0	0	0	0	0	0	1	<1	1	<1
<i>E. columbae</i>	0	0	0	0	0	0	1	<1	1	<1
<i>E. durans</i>	20	<1	21	<1	19	<1	29	<1	15	<1
<i>E. faecalis</i>	2,549	42	2,851	42	3,276	43	3,521	44	3,621	45
<i>E. faecium</i>	2,295	37	2,565	37	2,927	38	2,986	38	3,207	39
<i>E. gallinarum</i>	86	1	88	1	100	1	94	1	123	2
<i>E. gilvus</i>	0	0	0	0	1	<1	1	<1	1	<1
<i>E. hirae</i>	6	<1	5	<1	6	<1	16	<1	13	<1
<i>E. italicus</i>	0	0	0	0	0	0	0	0	1	<1
<i>E. malodoratus</i>	0	0	0	0	1	<1	0	0	2	<1
<i>E. mundtii</i>	0	0	0	0	1	<1	0	0	0	0
<i>E. raffinosus</i>	36	1	54	1	48	1	70	1	62	1
<i>Enterococcus</i> spp., other named	54	1	36	1	31	<1	36	<1	31	<1
<i>Enterococcus</i> spp., sp. not recorded	966	16	1,100	16	1,088	14	1,027	13	897	11

Age and sex distribution

As in previous years, the *Enterococcus* spp. bacteraemia rates were highest for those aged 75 years and older (63.3/100,000 population) and infants under the age of one (40.1/100,000 population) [4].

Variation in *Enterococcus* spp. bacteraemia rates were also observed by gender, with higher rates noted in men (16.7/100,000 population) than women (9.9/100,000 population). The difference was most pronounced in those aged 75 years and over (males: 97.3/100,000; females: 38.5/100,000) (Figure 3).

Figure 3. *Enterococcus* spp. bacteraemia rates by age and sex (England, Wales and Northern Ireland): 2018



Antimicrobial resistance: England and Northern Ireland

Resistance of *Enterococcus* spp. to glycopeptides (vancomycin or teicoplanin) is monitored in the English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR) annual report [5], as it is one of the key drug/bug combinations identified by the Department of Health Advisory Committee for Antimicrobial Prescribing, Resistance and Healthcare Associated Infections (APRHAI) [6].

In 2018, antimicrobial resistance in *E. faecalis* bacteraemia remained rare, at around 2% resistant to each antimicrobial agent: ampicillin/amoxicillin, vancomycin, teicoplanin and linezolid, and has remained largely unchanged (Table 3a).

The proportion of resistant *E. faecium* isolates was higher for all antibiotics compared to *E. faecalis*, with the exception of linezolid (1% resistant in 2018). In 2018, the highest proportion of *E. faecium* resistance was to ampicillin/amoxicillin (91%). This is followed by teicoplanin resistance at 23%, which is classed as an exceptional phenotype by EUCAST [7], and vancomycin resistance at 22%. The proportion of *E. faecium* isolates resistant to each of the antibiotics has remained stable since 2016 (Table 3b).

Table 3a. Antimicrobial susceptibility* for *E. faecalis* bacteraemia (England and Northern Ireland): 2015 to 2018

Antimicrobial agent	2015			2016			2017			2018		
	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)
Ampicillin/Amoxicillin	98	0	2	98	<1	2	98	<1	2	98	<1	1
Vancomycin	99	<1	1	99	0	1	99	0	1	98	0	2
Teicoplanin	98	<1	2	98	0	2	98	0	2	98	0	2
Linezolid	100	0	<1	100	0	<1	100	<1	<1	99	<1	1

*S = susceptible; I = intermediate (reduced susceptibility); R = resistant

Table 3b. Antimicrobial susceptibility* for *E. faecium* bacteraemia (England and Northern Ireland): 2015 to 2018

Antimicrobial agent	2015			2016			2017			2018		
	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)
Ampicillin/Amoxicillin	9	<1	91	9	<1	91	9	<1	91	9	<1	91
Vancomycin	75	0	25	77	0	23	79	0	21	78	0	22
Teicoplanin	75	0	25	76	0	24	77	0	23	77	0	23
Linezolid	99	0	1	99	0	1	99	0	<1	99	0	1

*S = susceptible; I = intermediate (reduced susceptibility); R = resistant

Microbiology services

Identification of enterococcal bacteraemia to the species level is important due to concerns for potentially transferable resistant genes between organisms.

For advice on treatment of antibiotic-resistant infections caused by these opportunistic pathogens or for reference services including species identification and confirmation of sensitivity testing results, laboratories should contact the Medical Microbiologists at PHE's Bacteriology Reference Department (Colindale) on colindalemedmicro@phe.gov.uk and PHE's Antimicrobial Resistance and Healthcare Associated Infections (AMRHAI) Reference Unit (Colindale), respectively [8].

Acknowledgements

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