



Volume 10 Number 41 Published on: 25 November 2016*

Surveillance of pyogenic and non-pyogenic streptococcal bacteraemia in England, Wales and Northern Ireland: 2015

These analyses are based on data relating to diagnoses of pyogenic and non-pyogenic streptococcal bloodstream infections during 2008 – 2015 in England, Wales and Northern Ireland (EWNI). Data were extracted from Public Health England's (PHE) voluntary surveillance database Second Generation Surveillance System (SGSS; for cases within England), CoSurv (Northern Ireland) and Datastore (Wales). Data were extracted on 27 October 2016 for England and Northern Ireland and 24 October 2016 for Wales. Isolates of group A streptococcal (GAS) bacteraemia submitted to the PHE Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU, Colindale) are merged with routine laboratory reports (England only). Reports of group B streptococcal (GBS) bacteraemia in Northern Ireland are enhanced with data submitted through mandatory surveillance of infant disease to the Public Health Agency [1].

Data presented here will differ in some instances from those in earlier publications partly due to the inclusion of late reports.

Rates of bacteraemia laboratory reports were calculated using mid-year resident population estimates for the respective year and geography [2]. Rates of group GBS bacteraemia in infants were calculated using 2015 live birth denominators [3]. Geographical analyses were based on the residential postcode of the patient if known (otherwise the GP postcode or failing that the postcode of the laboratory) with cases in England being assigned to the catchment area formed from administrative local authority boundaries (formerly PHE Centres).

Data collection is based on voluntary reporting systems and as such it is important to note that regional and temporal incidence rates can be affected by completeness of and local variations in reporting.

Beta-haemolytic, pyogenic streptococci are classified according to type of major surface polysaccharide antigen into Lancefield group A (*Streptococcus pyogenes*), B (*Streptococcus agalactiae*), C (multiple zoonotic species plus the human species,

* A corrected version of table 4 in this report was substituted prior to republication on 28 November 2016.

Streptococcus dysgalactiae subsp. *equisimilis*) and G (human and animal species *Streptococcus dysgalactiae* subsp. *equisimilis* and *Streptococcus canis*).

The non-pyogenic streptococci are subdivided into the Mitis, Sanguinis, Anginosus, Salivarius, Mutans, and Bovis groups. Analyses on *Streptococcus pneumoniae* and group D streptococci (now classified as *Enterococcus* spp.) are not included within this report.

The report includes analyses on the trend, age and sex distribution, geographical distribution and the antimicrobial susceptibility of laboratory reported cases of pyogenic and non-pyogenic streptococcal bacteraemia.

Key points

- between 2014 and 2015 there was a 24% rise in the number streptococcal bacteraemia reports (11,056 and 13,755 respectively) in England, Wales and Northern Ireland
- the rate of reports for each of the pyogenic and non-pyogenic streptococcal groups increased over the period 2008 to 2015
- the overall rate of group A streptococcal (GAS) bacteraemia in 2015 was 3.2 per 100,000 population; the equivalent rates for the other pyogenic streptococci were 3.1/100,000 (group B streptococci, GBS), 1.7/100,000 (group C streptococci, GCS) and 1.9/100,000 (group G streptococci, GGS)
- in line with previous reports, rates of pyogenic streptococcal bacteraemia were highest in the elderly, with the notable exception of GBS where rates were highest in infants
- rates of infant GBS disease (disease in infants less than 90 days old) in EWNl decreased slightly between 2014 (0.67 per 1,000 live births) and 2015 (0.66/1,000) with highest rates in Wales (0.81) followed by England (0.67) and Northern Ireland (0.37)
- rates of both early (infants less than seven days old) and late onset (seven to 90 days old) disease dropped markedly in Northern Ireland between 2014 and 2015 in contrast to Wales where rates of both increased over the two years
- In England, early onset GBS disease increased between 2014 and 2015 from 0.41/1,000 live births to 0.44/1,000 whereas rates of late onset disease dropped over the same period (0.24 to 0.23/1,000)
- a rise in reports of resistance to clindamycin continued in 2015 for GBS, GCS and GGS bacteraemia, reaching 23%, 19% and 24% respectively
- between 1% and 30% of non-pyogenic streptococcal group bacteraemic isolates were reported as having reduced susceptibility or resistance to penicillin in 2015

Trends: England, Wales and Northern Ireland

Between 2011 and 2015 there was a 40% increase in the number of laboratory reports of streptococcal bacteraemia (9,781 to 13,755; table 1) in England, Wales and Northern Ireland; a 35% increase in pyogenic (4,373 to 5,914) and 48% increase in non-pyogenic streptococci (3,277 to 4,866). Pyogenic and non-pyogenic streptococci accounted for 5.0% and 7.8% of mono-microbial bloodstream infections respectively in 2014 making them the sixth and fourth most commonly reported mono-microbial bloodstream infections respectively [4].

In 2015, 81% of *Streptococcus* spp. isolates from blood (excluding *S. pneumoniae*) were reported to species level (11,682 reports), this is similar to what was reported in 2014 (81%; 9,349 reports).

In England, the rate at which blood cultures were performed, as reported through the mandatory surveillance, increased by 11% between 2011 and 2015, from 3,021.1 per 100,000 population to 3,343.9/100,000 [5]. The rate of increase of the pyogenic streptococci over the same period ranged between 12% and 121% (figure 1a), and 16% to 71% for the non-pyogenic streptococci (figure 1b); all groups increasing more than that of the rate of blood culture.

In 2014 the system of laboratory reporting to PHE changed, which may have led to a slight reduction in ascertainment for the year (81% to 78% 2013 to 2014), however an increase in ascertainment was reported for 2015 (82%), in line with earlier years [6]. This slight variation in ascertainment may partially explain the increase in streptococcal group bacteraemia reports in 2015.

Group A Streptococci

Of the pyogenic streptococci causing bacteraemia, group A *Streptococcus* (GAS) accounted for 32% of reports (1,889 reports; table 1) in 2015, an increase from 2014 where 28% of pyogenic streptococci were identified as GAS in England, Wales and Northern Ireland.

In 2015 the overall rate of GAS bacteraemia for England, Wales and Northern Ireland was 3.2 cases per 100,000 population (figure 1a). Wales reported the highest incidence rate (3.4/100,000), followed by England (3.2/100,000) and Northern Ireland (3.0/100,000; table 2). Each country reported an increase in incidence compared to 2014 [7].

There was wide variation in GAS bacteraemia reports within England in 2015, with rates ranging from 2.4 per 100,000 population in both London and the South Midlands & Hertfordshire regions to 4.5/100,000 in the North East region of England.

Rates of GAS bacteraemia in England were higher in males than females in the majority of age groups, the exceptions being the 10 to 14 and 15 to 44 years age groups (figure 2). The highest rates were in the elderly, aged 75 years and over (11.6/100,000 all; 13.6/100,000 males and

10.2/100,000 females), followed by those less than 1 year old (6.9/100,000 all; 8.5 males and 6.9 females).

Table 1. Reports of pyogenic and non-pyogenic streptococcal bacteraemia by species (England, Wales and Northern Ireland); 2011 to 2015

	2011		2012		2013		2014		2015	
	No.	%	No.	%	No.	%	No.	%	No.	%
Pyogenic streptococci	4,373	100	4,429	100	4,744	100	4,856	100	5,914	100
Group A	1,389	32	1,411	32	1,696	36	1,364	28.1	1,889	32
Group B	1,624	37	1,576	36	1,592	34	1,752	36	1,870	32
Group C	452	10	556	13	598	13	785	16	1,041	18
Group G	908	21	886	20	858	18	955	20	1,114	19
Non-pyogenic streptococci	3,277	100	3,448	100	3,724	100	3,991	100	4,866	100
Anginosus group	924	28	881	26	992	27	994	25	1,146	24
<i>S. anginosus</i>	309	9	353	10	411	11	427	11	508	10
<i>S. constellatus</i>	224	7	225	7	269	7	292	7	288	6
<i>S. intermedius</i>	97	3	111	3	115	3	130	3	168	3
<i>S. milleri</i> group	262	8	154	4	162	4	127	3	153	3
<i>Streptococcus</i> group F	32	1	38	1	35	1	18	0	29	1
Bovis group	318	10	315	9	333	9	362	9	386	8
<i>S. alactolyticus</i>	6	0	10	0	31	1	34	1	51	1
<i>S. bovis</i> biotype ii	19	1	20	1	18	0	17	0	98	2
<i>S. bovis</i> untyped	233	7	187	5	177	5	184	5	84	2
<i>S. equinus</i>	15	0	19	1	17	0	18	0	15	0
<i>S. gallolyticus</i>	35	1	56	2	66	2	69	2	84	2
<i>S. infantarius</i>	10	0	23	1	24	1	40	1	54	1
Mitis group	1,020	31	1,135	33	1,165	31	1,312	33	1,632	34
<i>S. mitis</i>	684	21	818	24	809	22	814	20	948	19
<i>S. oralis</i>	335	10	317	9	354	10	493	12	668	14
<i>S. cristatus</i>	1	0	0	0	2	0	5	0	15	0
Mutans group	64	2	58	2	81	2	75	2	94	2
<i>S. mutans</i>	61	2	57	2	79	2	73	2	91	2
<i>S. sobrinus</i>	3	0	1	0	2	0	2	0	3	0
Salivarius group	377	12	425	12	435	12	481	12	655	13
<i>S. salivarius</i>	346	11	387	11	397	11	436	11	610	13
<i>S. vestibularis</i>	31	1	38	1	38	1	45	1	43	1
Sanguinis group	574	18	634	18	718	19	767	19	953	20
<i>S. gordonii</i>	71	2	75	2	97	3	121	3	148	3
<i>S. parasanguinis</i>	171	5	233	7	278	7	310	8	442	9
<i>S. sanguinis</i>	332	10	326	9	343	9	336	8	363	7

Table 1 (continued). Closely related genera reports (England)

	2011		2012		2013		2014		2015	
	No.	%	No.	%	No.	%	No.	%	No.	%
Other streptococci	2,131	28	2,159	27	2,292	27	2,209	25	2,975	28
'Anaerobic streptococcus'	37	2	46	2	30	1	52	2	44	1
<i>S. acidominimus</i>	26	1	17	1	17	1	9	0	12	0
<i>S. suis</i>	0	0	2	0	1	0	6	0	5	0
<i>S. uberis</i>	7	0	5	0	3	0	4	0	3	0
Streptococci not fully identified	1,877	25	1,858	24	1,944	23	1,707	19	2,073	19
<i>Streptococcus</i> spp., other named‡	184	9	231	11	297	13	431	20	838	28
Genera closely related to streptococci*†	371	100	429	100	424	100	423	100	459	100
<i>Abiotrophia</i> spp.	16	4	22	5	18	4	22	5	28	6
<i>Aerococcus</i> spp.	119	32	144	34	146	34	167	39	194	42
<i>Gemella</i> spp.	86	23	87	20	95	22	105	25	109	24
<i>Globicatella sanguinis</i>	3	1	0	0	3	1	4	1	3	1
<i>Leuconostoc</i> spp.	33	9	39	9	40	9	23	5	33	7
<i>Pediococcus</i> spp.	2	1	3	1	3	1	10	2	8	2
<i>Peptostreptococcus</i> spp.	112	30	134	31	119	28	92	22	83	18

* England only

† total includes those recorded as 'nutritionally variant Streptococci' without further information

‡ including: *Streptococcus thermophilus*, *Streptococcus infantis*, *Streptococcus lutetiensis*, *Streptococcus pluranimalium*, *Streptococcus pasteurianus*, *Streptococcus ovis*, *Streptococcus peroris*

Figure 1a. Trend in pyogenic streptococcal bacteraemia reports, by group, per 100,000 population (England); 2008 to 2015

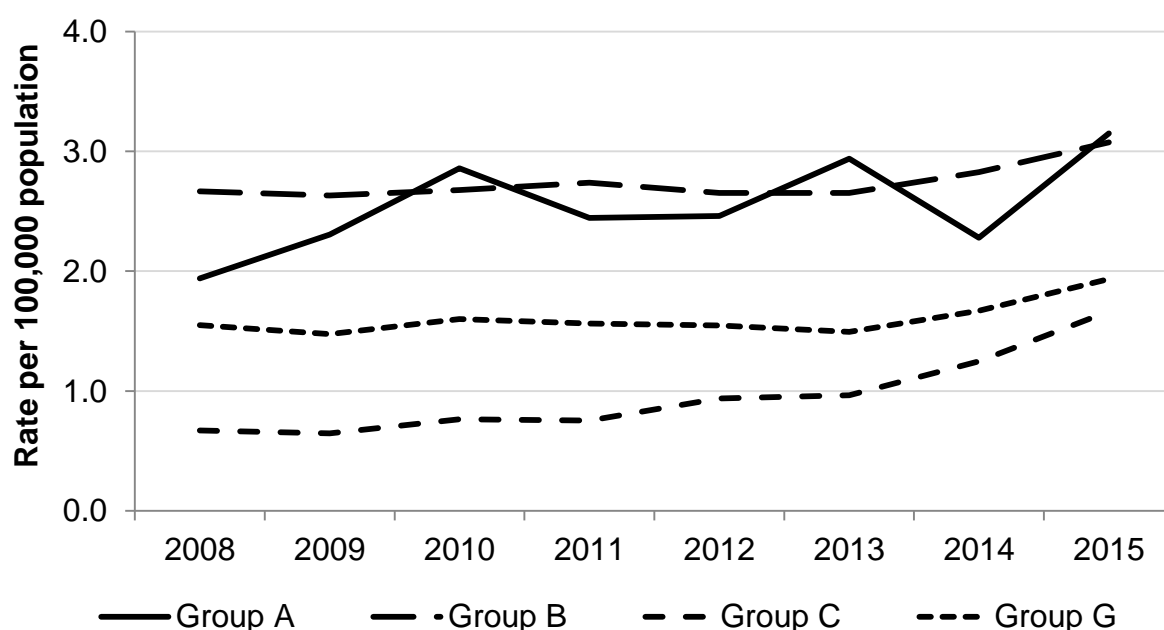


Figure 1b. Trend in non-pyogenic streptococcal bacteraemia reports per 100,000 population (England); 2008 to 2015

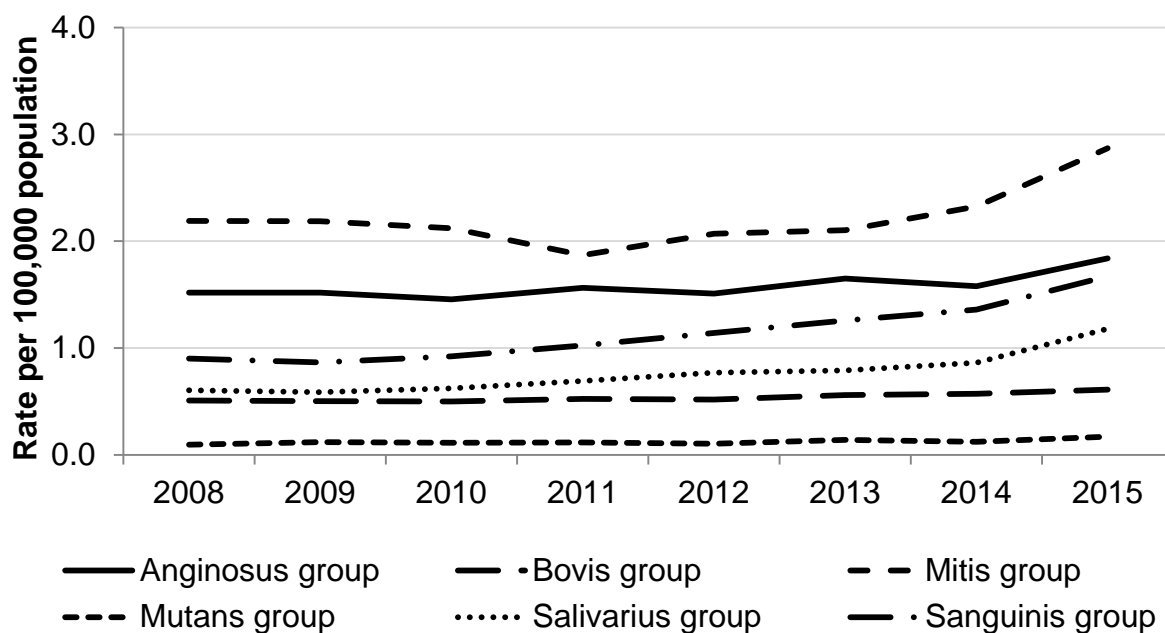
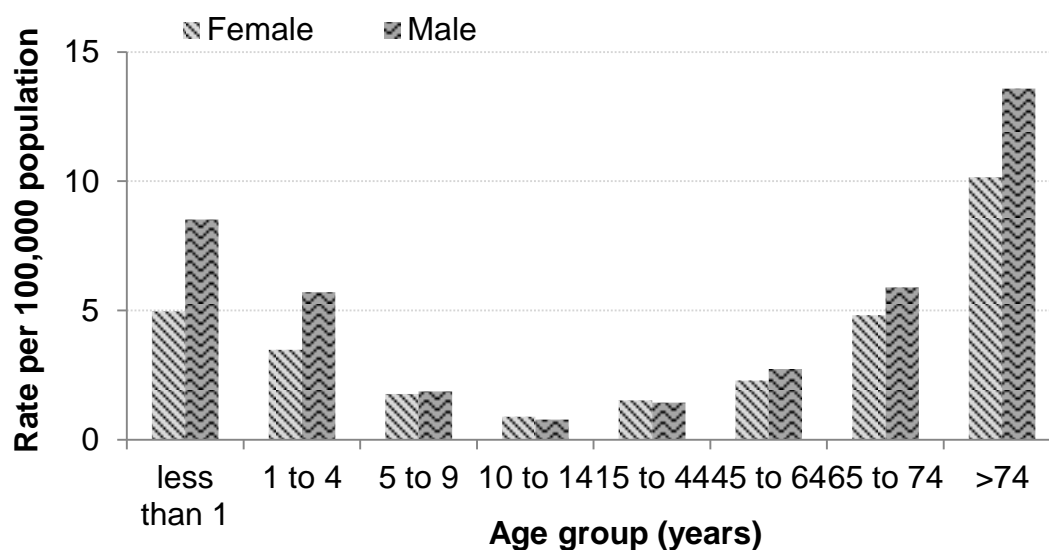


Table 2. Rate per 100,000 population of pyogenic streptococcal bacteraemia reports by Region and country (England, Wales and Northern Ireland); 2015

Region		Rate per 100,000 population			
		Group A	Group B	Group C	Group G
London	London	2.4	3.4	0.8	0.9
Midlands and East of England	South Midlands and Hertfordshire	2.4	2.8	1.4	1.5
	East Midlands	3.7	3.0	1.5	3.7
	Anglia and Essex	2.7	2.7	1.8	3.1
	West Midlands	3.5	3.2	2.4	2.7
North of England	Cheshire and Merseyside	2.9	3.0	2.5	3.7
	Cumbria and Lancashire	3.9	3.2	1.3	1.9
	Greater Manchester	3.3	2.7	1.1	1.8
	North East	4.5	3.4	2.2	0.5
	Yorkshire and Humber	3.5	3.5	2.2	1.4
South of England	Avon Gloucestershire and Wiltshire	2.9	3.3	1.5	1.8
	Devon Cornwall and Somerset	3.8	4.1	2.3	3.4
	Wessex	3.1	3.3	1.1	1.4
	Kent Surrey and Sussex	2.9	2.3	1.8	1.5
	Thames Valley	3.1	1.7	1.8	0.3
England		3.2	3.1	1.7	1.9
Northern Ireland		3.0	3.0	1.2	0.6
Wales		3.4	4.2	3.4	1.3
England, Wales and Northern Ireland		3.2	3.1	1.7	1.9

Figure 2. Group A streptococcal bacteraemia age and sex rates per 100,000 population in England; 2015



The proportion of GAS bacteraemia reports accompanied by antimicrobial susceptibility data in 2015 was 41%, 53% and 61% for clindamycin, erythromycin and tetracycline, respectively (table 3). In 2015 resistance (defined as reduced-susceptibility or non-susceptible) to clindamycin, erythromycin and tetracycline was recorded as 5%, 7% and 10% of cases, respectively.

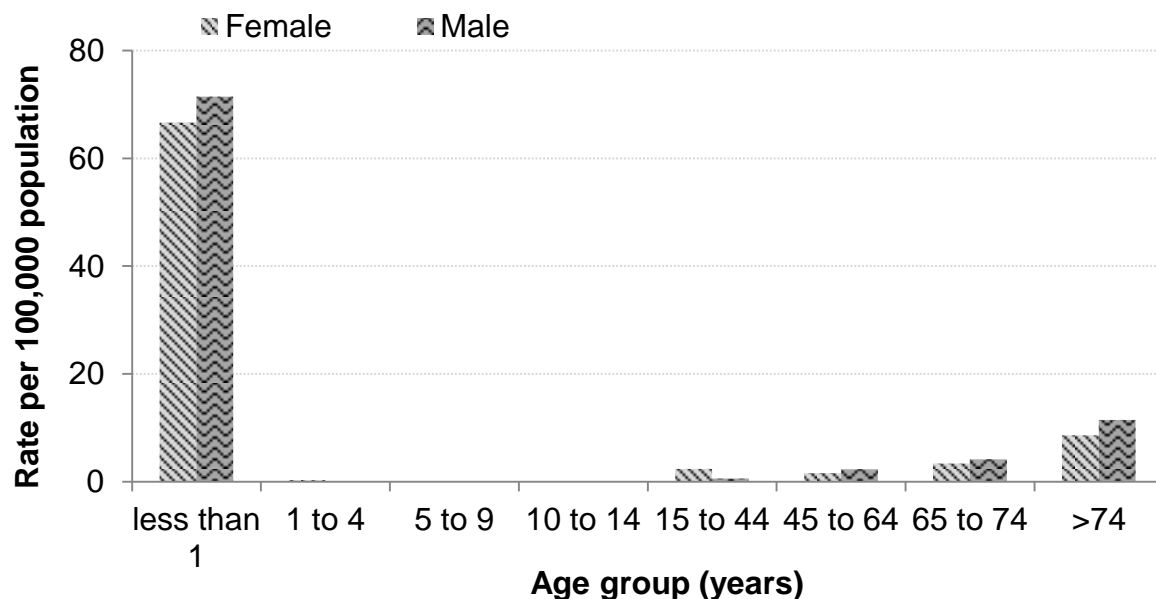
Group B streptococci

In 2015, 1,870 cases of GBS bacteraemia were reported by laboratories in England, Wales and Northern Ireland to PHE, a 7% increase compared to 2014 (1,752 reports; table 1). This is higher than any of the previous four years. GBS bacteraemia accounted for 32% of the pyogenic streptococcal bacteraemia reported in 2015, a decrease from the 36% of pyogenic streptococci reported as GBS in 2014.

The reported rate of GBS bacteraemia in EWNi was 3.1 per 100,000 population in 2015, with some variation between countries (England 3.1/100,000, Wales 3.0/100,000, and Northern Ireland 4.2/100,000; table 2). Within England, there was greater variation with Thames Valley reporting the lowest rate of infection (1.7/100,000) and the Devon, Cornwall and Somerset region reporting the highest rate (4.1/100,000) in 2015.

Rates of GBS bacteraemia remain highest in those aged less than one year at 69.2 per 100,000 population (66.6/100,000 in females and 71.4/100,000 in males; figure 3). Rates were higher in males than females in the majority of age groups, the main exception being the 15 to 44 years age group (females 2.4/100,000 and males 0.6/100,000).

Figure 3. Group B streptococcal bacteraemia age and sex rates per 100,000 population in England; 2015



In infants less than 90 days old the rate of GBS bacteraemia in England increased slightly in 2015 to 0.67 per 1,000 live births (table 4) compared with 0.65/1,000 in 2014. A more pronounced increase was reported within Wales, from 0.60 to 0.81/1,000. In contrast to this, the rate of reports of GBS bacteraemia in infants (<90 days old) decreased markedly in Northern Ireland over the same period, from 1.07/1,000 in 2014 to 0.37/1,000 in 2015.

Consistent with previous years' reports, rates of early onset disease (<7days old) reports were higher than late onset disease (7-90 days old) in 2015 (0.44 compared with 0.23 per 1,000 live births) in England, Wales and Northern Ireland.

Rates of reports of early onset GBS disease increased in England (0.41 to 0.44 per 1,000 live births) and Wales (0.39 to 0.48/1,000) between 2014 and 2015 in contrast to the marked drop in Northern Ireland (0.74 to 0.29/1,000) [7]. Late onset disease reports dropped in both England (0.24 to 0.23/1,000) and Northern Ireland (0.33 to 0.08/1,000) over the past two years unlike Wales where reports increased (0.21 to 0.33/1,000).

The proportion of GBS bacteraemia reports in 2015 accompanied by antimicrobial susceptibility test result data was 54%, 67% and 78% for clindamycin, erythromycin and tetracycline respectively. Clindamycin and erythromycin resistance increased in GBS bacteraemia isolates between 2011 and 2015, from 17% and 18% in 2011 to 23% and 29% resistant in 2015, respectively (table 3). Tetracycline resistance in GBS bacteraemia reports remains above 80% in 2015.

Table 3. Antimicrobial susceptibility for pyogenic streptococci causing bacteraemia (England); 2011 to 2015

		2011		2012		2013		2014		2015	
		No. tested	% Resistant (R)*	No. Tested	% R*	No. Tested	% R*	No. Tested	% R*	No. Tested	% R*
Group A	clindamycin	394	4	430	5	560	3	535	4	735	5
	erythromycin	730	5	692	5	812	5	739	7	908	7
	tetracycline	623	13	657	12	776	10	761	10	1061	10
Group B	clindamycin	511	17	579	13	549	17	567	19	911	23
	erythromycin	993	18	984	19	932	22	966	22	1127	29
	tetracycline	935	83	956	85	937	85	1036	83	1315	84
Group C	clindamycin	176	12	206	13	235	12	293	12	521	19
	erythromycin	297	18	361	24	351	23	450	22	665	31
	tetracycline	251	27	347	31	357	31	489	33	762	31
Group G	clindamycin	277	12	319	20	310	19	370	22	530	24
	erythromycin	613	32	587	37	590	38	630	37	744	40
	tetracycline	545	49	537	50	583	47	686	52	896	47

*defined as reduced- or non-susceptible

Table 4. Number and rate per 1000 live births of group B streptococcal bacteraemia in infants 0-90 days old (England, Wales and Northern Ireland); 2015

	All cases (0-90 days old)			Early onset (0-6 days old)			Late onset (7-90 days old)		
	No.	rate	95 CI	No.	rate	95 CI	No.	rate	95 CI
England	444	0.67	(0.61 - 0.73)	292	0.44	(0.39 - 0.49)	152	0.23	(0.19 - 0.27)
Northern Ireland (NI)	9	0.37	(0.17 - 0.71)	7	0.29	(0.12 - 0.60)	2	0.08	(0.01 - 0.30)
Wales	27	0.81	(0.53 - 1.18)	16	0.48	(0.27 - 0.78)	11	0.33	(0.17 - 0.59)
England, Wales & NI	480	0.66	(0.61 - 0.73)	315	0.44	(0.39 - 0.49)	165	0.23	(0.20 - 0.27)

Groups C and G streptococci

In England, Wales and Northern Ireland the number of cases of Group C streptococcal (GCS) bacteraemia increased by 24% between 2014 and 2015, from 784 reports to 1,039 reports, with an observed year-on-year increase since 2011 (table 1). The rate of GCS bacteraemia in England was 1.7 per 100,000 population in 2015, more than double the rate observed in 2008, 0.7/100,000 (figure 1a).

The numbers of group G streptococcal (GGS) bacteraemia reported in England, Wales and Northern Ireland also increased between 2014 and 2015 (16%; 954 to 1113) , to reach 1.9 per 100,000 population (table 2).

Population rates of infection varied by individual country for both GCS and GGS bacteraemia in 2015, with GCS bacteraemia rates of 1.7, 1.2 and 3.4 per 100,000 population and GGS bacteraemia rates of 1.9, 0.6 and 1.3/100,000 in England, Northern Ireland and Wales, respectively (table 2). Within England GCS bacteraemia rates ranged from 0.8/100,000 in London to 2.5 in the Cheshire and Merseyside region of England. Rates of GGS bacteraemia also varied, ranging from 0.3/100,000 in the Thames Valley to 3.7/100,000 in the East Midlands and Cheshire and Merseyside regions of England.

The rates of both GCS and GGS bacteraemia were highest in the elderly, with 10.2/100,000 and 14.2/100,000 in the 75 years and over age group respectively (figures 4 and 5). Rates tended to be higher in males than in females in the majority of age groups.

Figure 4. Group C streptococcal bacteraemia age and sex rates per 100,000 population in England; 2015

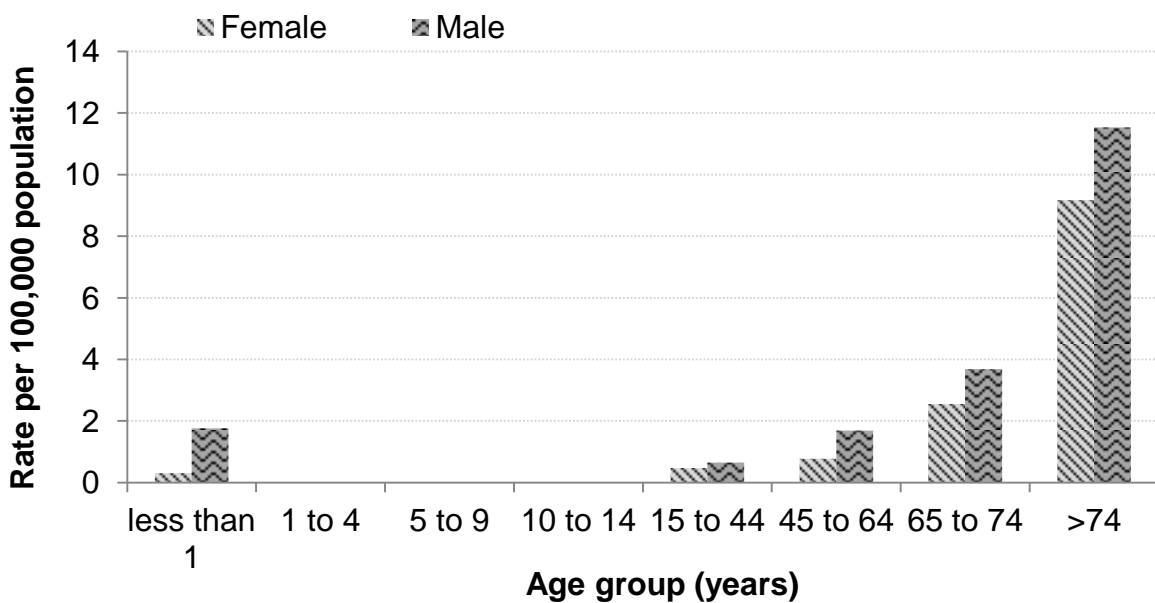
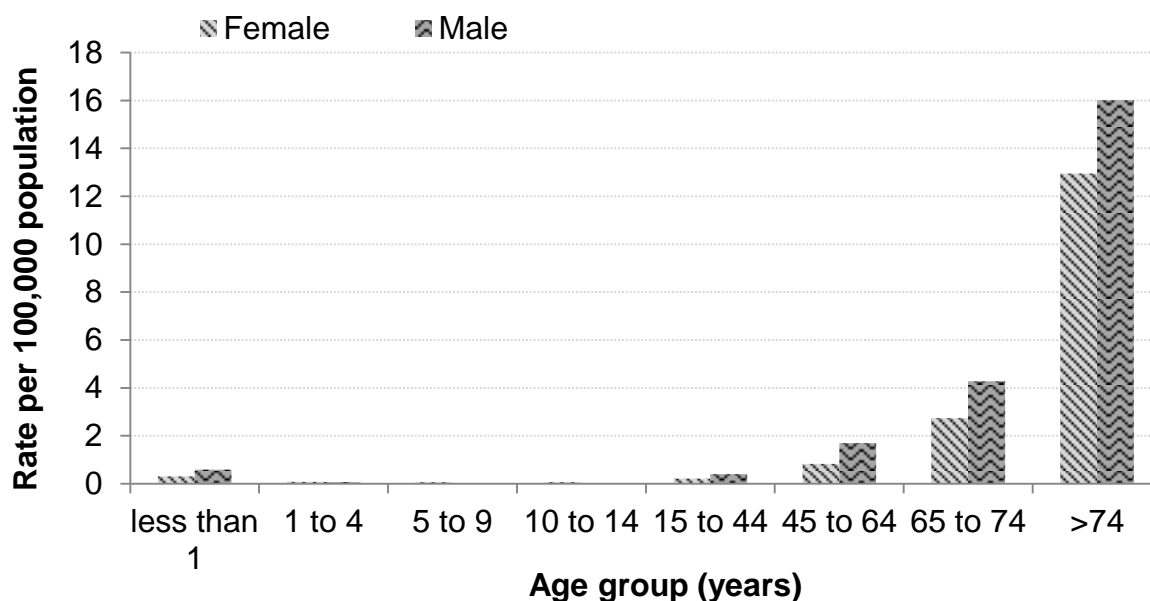


Figure 5. Group G streptococcal bacteraemia age and sex rates per 100,000 population in England; 2015



Susceptibility data were available for 57%, 73% and 84% of GCS bacteraemia isolates in 2015 for clindamycin, erythromycin and tetracycline, respectively (table 3). A similar picture was seen in GGS bacteraemia isolates with susceptibility results to clindamycin, erythromycin and tetracycline reported for 50%, 70% and 85% of cases in 2015, respectively.

In 2015, the proportion of isolates resistant to clindamycin, erythromycin and tetracycline in reported GCS bacteraemia was 19%, 31% and 31%, respectively (table 3). The proportion of resistant isolates was slightly higher in GGS bacteraemia isolates with 24%, 40% and 47% resistant to clindamycin, erythromycin and tetracycline, respectively. This continues a trend of increasing resistance to clindamycin and erythromycin reported since 2011.

Non-pyogenic streptococci

The number of cases of non-pyogenic streptococcal bacteraemia reported in England, Wales and Northern Ireland has increased each year since 2010, an 18% increase overall (3,173 to 3,879 between 2010 and 2014; table 1). The rate of reports stayed level or increased slightly in the majority of non-pyogenic groups between 2008 and 2015 (figure 1b; England only), the greatest increase (95%) being seen in the Salivarius group streptococci (0.6 to 1.2 per 100,000 population). An increase was seen for all non-pyogenic streptococcal groups between 2014 and 2015.

The rates varied by individual country. Of the non-pyogenic streptococci, the rate of bacteraemia reports in England was highest for Mitis group streptococci in 2014 (2.9 per 100,000 population; table 5), with the lowest rates for Mutans group streptococci (0.2/100,000). In contrast, the highest non-pyogenic bacteraemia rates were observed for Anginosus group

streptococci in Wales and Northern Ireland in 2015, with 2.5/100,000 and 3.1/100,000 respectively.

Within England, there was more variation in incidence for each of the non-pyogenic groups. The rate of Anginosus group bacteraemia ranged from 0.9 per 100,000 population in the Avon, Gloucestershire and Wiltshire region to 2.9/100,000 in Cheshire and Merseyside in 2015. Rates of Bovis group bacteraemia varied from 0.2/100,000 in the Yorkshire and Humber region to 1.2/100,000 in the West Midlands, and the largest variation was seen with Mitis group bacteraemia from 1.5/100,000 in Anglia and Essex to 4.3/100,000 in the West Midlands region in 2015.

Within non-pyogenic streptococcal groups, the Mitis group accounted for the majority of bacteraemia reports (34%) in 2015, with a 60% increase in the number of reports between 2011 and 2015 in EWNl (1,020 to 1,632; table 1). An increase in the number of non-pyogenic streptococcal bacteraemia reports has been seen in each of the groups between 2011 and 2015, the greatest increase being seen in the Salivarius group streptococci (74%), from 377 to 655 reports.

The changes in distribution of some other less common species of the non-pyogenic streptococci may in part be due to the increasing use of matrix-assisted laser desorption/ionization time of flight (MALDI-ToF) analysis in hospitals, which allows for better species identification and also a greater reporting of minor species not previously recognised in most clinical laboratories.

Distribution of non-pyogenic streptococcal bacteraemia reports by sex in most instances were higher among males compared to females and displayed wide variation between age groups in England in 2015 (figures 6-10). Rates were highest in those aged 75 years and above in the Anginosus and Bovis streptococcal group bacteraemia in 2015 (5.9 and 4.2 per 100,000 population, respectively). The Mitis, Salivarius and Sanguinis streptococcal group rates in 2015 were highest in those aged less than one year (18.7/100,000, 9.7/100,000 and 9.1/100,000 in Mitis (figure 8), Salivarius group (figure 9) and Sanguinis group (figure 10), respectively).

Table 5. Rate per 100,000 population non-pyogenic streptococcal bacteraemia reports by region and country (England, Wales and Northern Ireland); 2015

		Rate per 100,000 population					
		Anginosus Group	Bovis Group	Mitis Group	Mutans Group	Salivarius Group	Sanguinis Group
Region							
London	London	1.7	0.5	2.8	0.2	1.3	1.6
Midlands and East of England	South Midlands and Hertfordshire	1.9	0.4	2.9	0.0	1.1	1.4
	East Midlands	2.0	0.5	3.0	0.1	1.2	1.5
	Anglia and Essex	1.4	0.3	1.5	0.0	0.5	1.0
	West Midlands	2.0	1.7	4.3	0.2	1.5	2.1
North of England	Cheshire and Merseyside	2.9	0.4	2.2	0.1	1.6	2.2
	Cumbria and Lancashire	1.3	0.7	3.4	0.1	1.4	1.9
	Greater Manchester	2.1	0.7	1.9	0.2	1.3	2.0
	North East	1.8	0.9	2.7	0.1	1.1	2.1
	Yorkshire and Humber	2.1	0.2	2.7	0.2	1.2	1.3
South of England	Avon Gloucestershire and Wiltshire	0.9	0.6	3.0	0.2	0.7	1.8
	Devon Cornwall and Somerset	2.7	0.7	3.6	0.5	1.7	2.1
	Wessex	1.9	0.7	2.9	0.1	1.0	1.3
	Kent Surrey and Sussex	1.5	0.3	3.0	0.2	1.1	1.6
	Thames Valley	1.8	0.5	2.5	0.4	1.0	1.9
England		1.8	0.6	2.9	0.2	1.2	1.7
Northern Ireland		3.1	1.0	2.2	0.0	0.4	1.3
Wales		2.5	1.0	0.3	0.0	0.0	0.4
England, Wales and Northern Ireland		1.9	0.6	2.7	0.2	1.1	1.6

Figure 6. Anginosus group streptococcal bacteraemia age and sex rates per 100,000 population in England; 2015

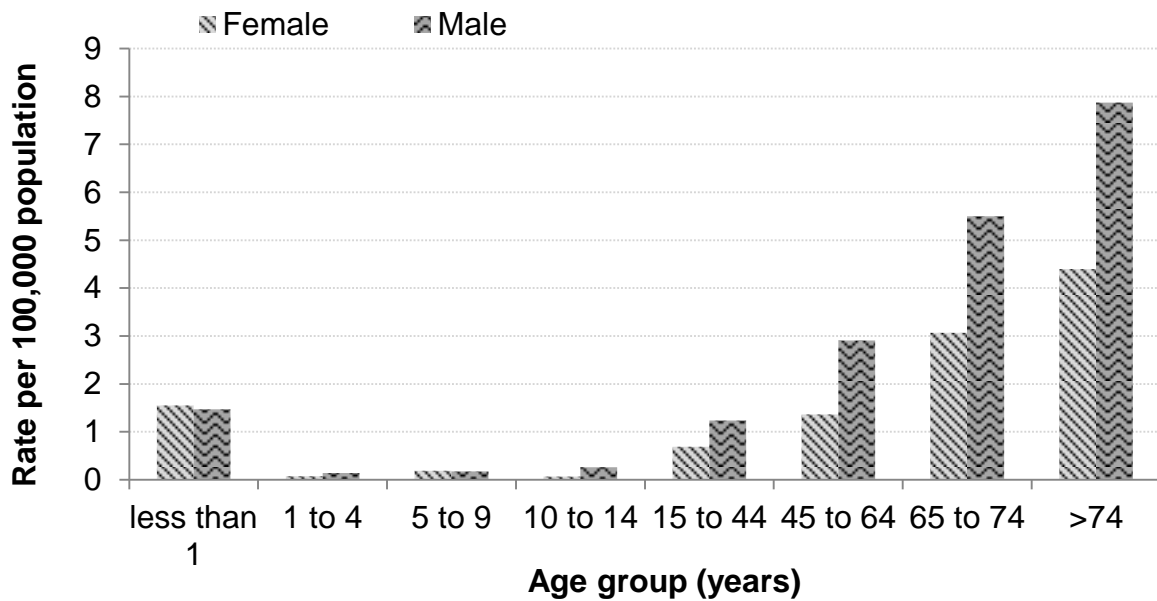
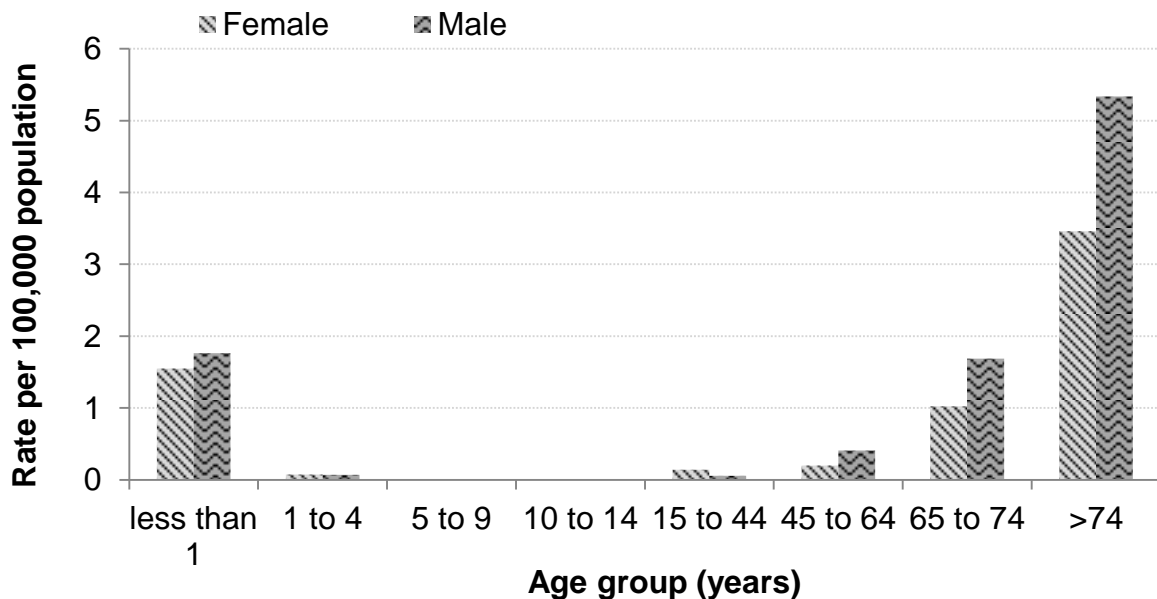


Figure 7. Bovis group streptococcal bacteraemia age and sex rates per 100,000 population (England); 2015



Since 2011, the proportion of non-pyogenic streptococcal bacteraemia reports accompanied by susceptibility data remains above 50% for all non-pyogenic groups, with over 74% including information on susceptibility to penicillin in England in 2015.

In England between 1% and 30% of isolates from non-pyogenic groups were reported as penicillin resistant in 2015 (table 3). This is a contrast from the pyogenic streptococci, where penicillin resistance is undocumented. Erythromycin resistance was also high in the non-pyogenic groups compared to the pyogenic groups, with between 31% and 51% of isolates

reported as resistant, with the exception of the Anginosus group streptococci (9%). The proportion of isolates reported as resistant to erythromycin has increased between 2011 and 2015 in all of the non-pyogenic streptococcal groups, except Anginosus where a slight decrease has been observed. The highest levels of tetracycline resistance were observed in the Bovis group where 71% isolates were reported as resistant.

Figure 8. Mitis group streptococcal bacteraemia age and sex rates per 100,000 population in England; 2015

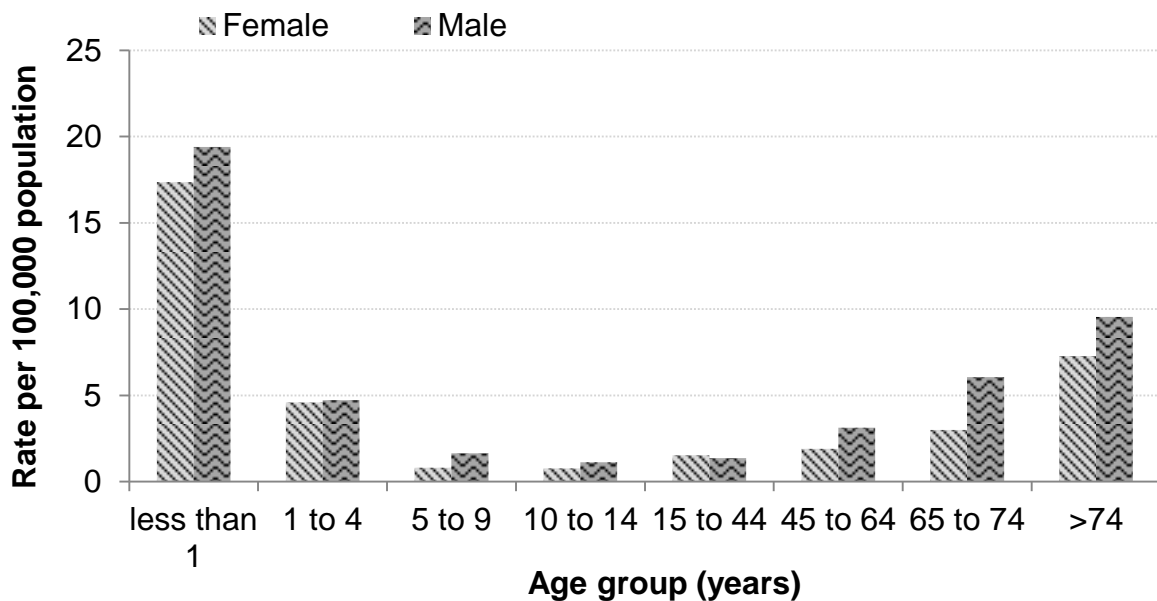


Figure 9. Salivarius group streptococcal bacteraemia age and sex rates per 100,000 population in England; 2015

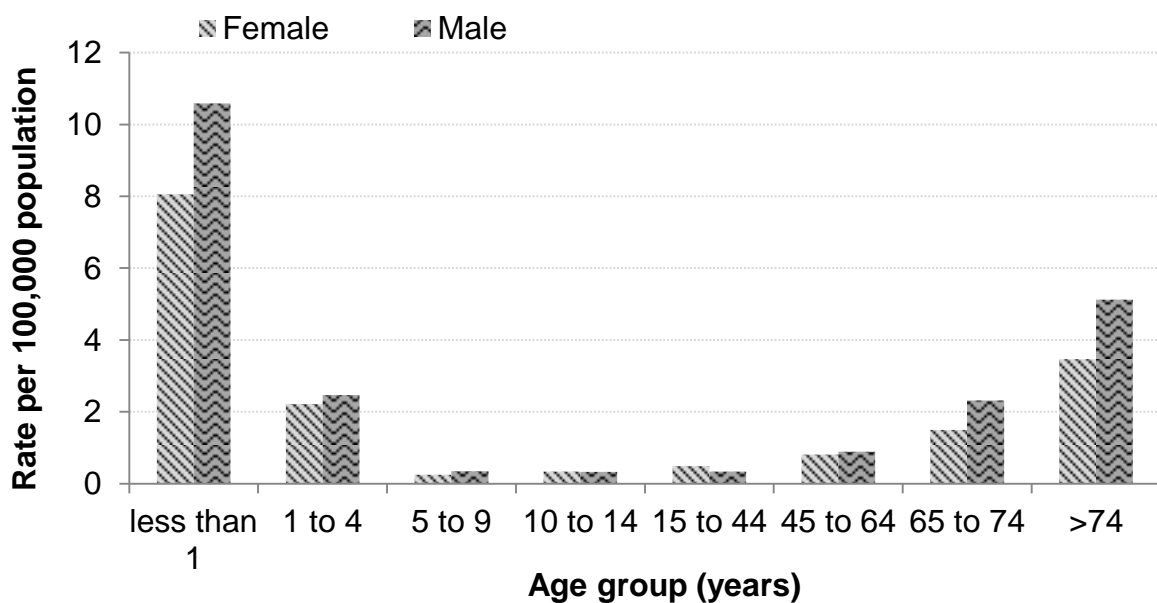
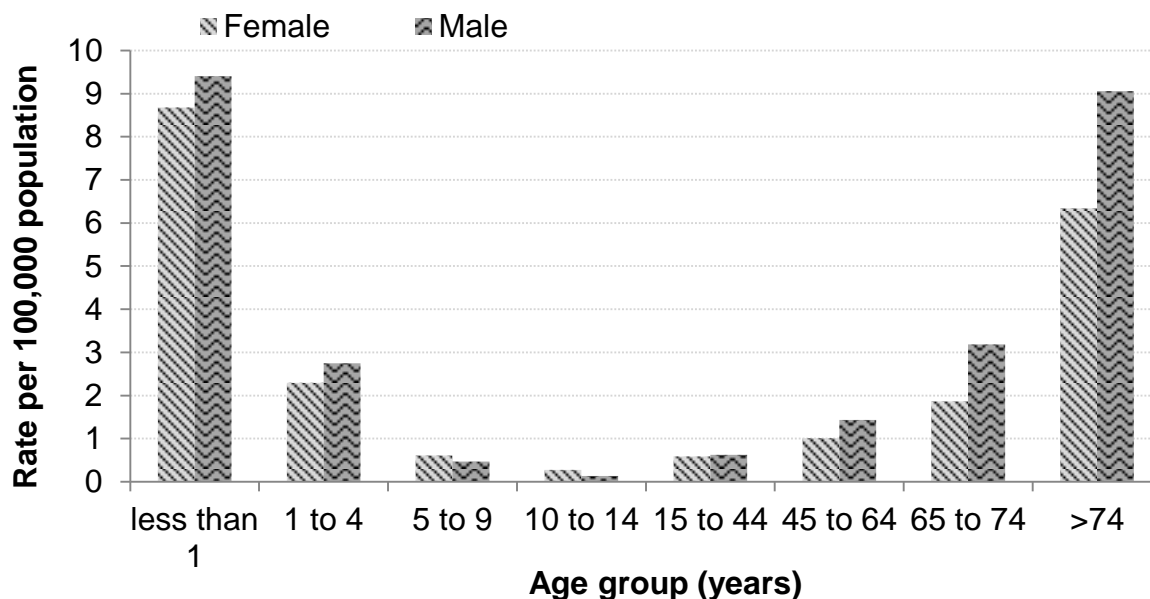


Figure 10. Sanguinis group streptococcal bacteraemia age and sex rates per 100,000 population in England; 2015



Reference microbiology service

In 2015, the proportion of reports of streptococcal bacteraemia in which the organism was not fully identified remained around 19%. Precise species identification of isolates would improve the monitoring of trends in non-pyogenic streptococci and related genera in particular. The Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU, Colindale) offers a referred (charged for) taxonomic identification service for streptococci and other related Gram-positive, catalase-negative genera from systemic and other significant infections. A free-of-charge reference service is available for urgent public health investigations. All such isolates should be submitted to RVPBRU along with all GAS, GBS, GCS and GGS isolates from normally sterile sites.

Laboratories are requested to send any pyogenic streptococcal isolates exhibiting a decreased sensitivity to penicillin to the Antimicrobial Resistance and Healthcare Associated Infections Reference Unit (AMRHAI, Colindale) for confirmation. In addition, any streptococci (pyogenic or non-pyogenic) with suspected glycopeptide or linezolid resistance should be referred for further investigation. Both AMRHAI and RVPBRU are based at the Public Health England, Colindale.

Guidelines for the management of close community contacts of invasive GAS cases [8] and the prevention and control of GAS transmission in acute healthcare and maternity settings [9] are available at the following web-page: <https://www.gov.uk/government/collections/group-a-streptococcal-infections-guidance-and-data>.

Table 6. Antimicrobial susceptibility for non-pyogenic streptococci causing bacteraemia (England); 2011 to 2015

		2011		2012		2013		2014		2015	
		No. Tested	% resistant (R)	No. Tested	% R	No. Tested	% R	No. Tested	% R	No. Tested	% R
Anginosus	erythromycin	581	10	533	11	573	10	503	9	630	9
	penicillin	727	1	701	2	772	2	722	2	893	1
	tetracycline	478	22	477	21	560	17	469	19	626	20
Bovis	erythromycin	176	22	167	26	172	31	185	30	232	31
	penicillin	226	5	221	3	233	2	260	3	283	2
	tetracycline	163	67	139	70	168	70	175	75	191	71
Mitis	erythromycin	676	46	750	46	724	46	772	47	993	51
	penicillin	840	18	945	19	973	18	1080	19	1374	18
	tetracycline	596	25	606	29	602	28	636	29	796	31
Salivarius	erythromycin	235	34	266	41	254	46	275	43	376	47
	penicillin	296	23	327	19	333	21	374	24	507	20
	tetracycline	190	24	198	20	196	16	238	21	303	19
Sanguinis	erythromycin	363	34	390	38	426	39	458	44	588	48
	penicillin	453	26	508	22	569	24	609	29	751	30
	tetracycline	296	29	312	32	372	26	374	37	474	36

Acknowledgements

These reports would not be possible without the ongoing contributions from microbiology colleagues in laboratories across England, Wales and Northern Ireland, without whom there would be no surveillance data. The support from colleagues within Public Health England, and the PHE Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU, Colindale), in particular, is valued in the preparation of this report. Feedback and any specific enquiries regarding this report should be sent to hcai.armdepartment@phe.gov.uk.

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