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Laboratory surveillance of streptococcal bacteraemia in England: 2023 update

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Introduction

The analyses in this report are based on data relating to diagnoses of pyogenic and non-pyogenic streptococcal bloodstream infections between 2014 and 2023 (calendar years) in England. Data for England was extracted from the UK Health Security Agency's Second Generation Surveillance System (SGSS), a national laboratory surveillance database, on 11 November 2024. All laboratories in England are requested to [submit data to SGSS](#), with reporting based on clinically relevant isolates.

Invasive group A streptococcal disease is notifiable in England and Wales under the [Health Protection \(Notification\) Regulations 2010](#). Records of group A streptococcal (GAS) bacteraemia based on isolates submitted to the UKHSA Staphylococcal and Streptococcal Reference Service (SSRS) (part of the [Antimicrobial Resistance and Healthcare Associated Infections](#) Reference Unit (AMRHAU, Colindale)) are routinely uploaded and merged into SGSS. Beta-haemolytic streptococci are classified according to the type of major surface polysaccharide antigen (Lancefield group), namely: group A (*Streptococcus pyogenes*; GAS), group B (*Streptococcus agalactiae*; GBS), group C (multiple zoonotic species plus the human species *Streptococcus dysgalactiae* subsp. *equisimilis*; GCS) and group G (human and animal species *Streptococcus dysgalactiae* subsp. *equisimilis* and *Streptococcus canis*; GGS). These are grouped as pyogenic streptococci within this report.

Non-pyogenic streptococci, including alpha- and non-haemolytic streptococci, are subdivided into groups: mitis; sanguinis; anginosus; salivarius; mutans and bovis. [Streptococcus pneumoniae](#) and group D streptococci (now classified as [Enterococcus spp.](#)) are not included in this report, bacteraemia incidence and antimicrobial resistance trends for *S. pneumoniae* and *Enterococcus* spp. are available within the annual [English surveillance programme for antimicrobial utilisation and resistance \(ESPAUR\) reports](#).

The report includes analyses on the trends, age and sex distribution, distribution by ethnicity, geographical and deprivation distribution, and antimicrobial susceptibility of laboratory-reported cases of pyogenic and non-pyogenic streptococcal bacteraemia. Rates of bacteraemia were calculated using [mid-year resident population estimates](#) for the respective year and geography. Rates of GBS bacteraemia in infants were calculated using 2023 [live birth denominators](#). Geographical analyses were based on cases in England being assigned to 1 of 9 regions formed from administrative [local authority boundaries](#); deprivation analyses were based on [indices of multiple deprivation \(IMD\)](#) assigned to the residential postcode where cases live. Ethnicity analyses were based on aggregated ethnic groups derived using the [Method for assigning ethnic group in the COVID-19 Health Inequalities Monitoring for England \(CHIME\) tool](#).

A web appendix is available featuring the findings of this report. It should be noted that the data presented here for earlier years may differ from those in previous publications due to the inclusion of late reports.

Main points

Key findings from this report:

- between 2019 and 2023 there was a 7% overall increase in the number of laboratory reports of streptococcal bacteraemia (from 17,246 to 18,518 reports) in England, with a 12% increase noted in the 12 months between 2022 (16,498 reports) and 2023
- declines in incidence rate were noted during the COVID-19 pandemic (2020 and 2021) for GAS, GBS, mitis group streptococci and sanguinis group streptococci bacteraemia. In 2022 incidence reverted to pre-pandemic levels for each with the notable exception of GAS for which the rate is much greater than pre-pandemic
- the rate of GAS bacteraemia increased by 34% from 4.4 cases per 100,000 population in 2022 to 5.9 per 100,000 in 2023
- resistance to tetracycline in GAS bacteraemia for 2023 remained similar to 2022 at 22%
- in 2023, 2,243 cases of GBS bacteraemia were reported by laboratories in England, a 3% decrease since 2019 (2,301)
- in line with previous reports, rates of pyogenic streptococcal bacteraemia were highest in the elderly, except for GBS where rates were highest in infants; however, an elevation in GAS incidence in children was noted in 2023
- rates of GBS disease in infants less than 90 days old (for both early and late onset of disease) were similar in 2023 to those reported in 2022, 0.64 per 1,000 live births versus 0.65 per 1,000
- resistance to clindamycin and erythromycin in GBS bacteraemia increased between 2019 and 2023, from 30% to 34% for clindamycin and 35% to 41% for erythromycin.
- the number of 'non-pyogenic' streptococcal bacteraemia increased by 11% between 2022 and 2023, from 9,020 to 9,975 reports, although variation was noted by group.
- after declines in incidence noted during the COVID-19 pandemic years (2020 and 2021), mitis and sanguinis group streptococcal bacteraemia continue to see an increase in reports from 2021 to 2023 from 3.4 to 4.4 per 100,000 (mitis) and 2.4 to 2.9 per 100,000 (sanguinis)
- resistance to penicillin was reported for 9% of mitis group isolates (the same as reported in 2019, 9% resistant), 13% of salivarius group isolates (a decrease from 16% in 2019), and 20% of sanguinis isolates (a decrease from 21% in 2019)
- all sterile site beta-haemolytic streptococcal isolates should be referred to UKHSA SSRS laboratory and any with suspected resistance to penicillin (minimum inhibitory concentration (MIC) ≥ 0.25 mg/L), cephalosporins, glycopeptides, lipoglycopeptides, lipopeptides, oxazolidinones, tigecycline, fluoroquinolones or quinupristin-dalfopristin referred to the UKHSA AMRHAI Reference Unit [Antimicrobial Resistance and Mechanisms Service](#) for confirmation

Trends in England

A 7% increase in the number of laboratory reports of 'pyogenic' (beta-haemolytic) and 'non-pyogenic' (alpha- and non-haemolytic) streptococcal bacteraemia (from 17,246 to 18,518 reports; Table 1) was noted in England between 2019 and 2023. The reported reductions in 2020 and 2021 are likely due, at least in part, to the COVID-19 pandemic, which resulted in reduced contact between individuals, decreased planned healthcare and an associated decline in infections associated with healthcare interventions, [particularly surgery](#). The underlying causes of reductions in bloodstream infection rates are likely to be complex and multifactorial. In 2023, 89% (16,471 out of 18,518) of *Streptococcus* spp. isolates from blood (excluding *Streptococcus pneumoniae*) were reported to species level. Of those identified to species level in 2023, 46% (8,543 out of 18,518) were pyogenic streptococci (groups A, B, C and G), similar to the distribution in 2022 (45%; Table 1).

Figures 1a and 1b show the rate per 100,000 population trends of the pyogenic group streptococcal bacteraemia (Figure 1a) and the non-pyogenic group streptococcal bacteraemia (Figure 1b) between 2014 and 2023. Between 2021 and 2022 a level trend in bacteraemia rates was seen for both pyogenic and non-pyogenic streptococcal species, with a few notable exceptions. Large increases in incidence between 2021 and 2023 were seen in GAS bacteraemia (Figure 1a) and for the species of the mitis and sanguinis group (Figure 1b). Rates for the anginosus, mitis, and sanguinis groups have increased from 2022, though remain similar to levels seen prior to the COVID-19 pandemic.

Table 1. Reports of pyogenic and non-pyogenic streptococcal bacteraemia by species in England, 2019 to 2023 [note 1]

Note 1. 'Total streptococci' excludes *S. pneumoniae*.

Species	2019: Number	2019: (%)	2020: Number	2020: (%)	2021: Number	2021: (%)	2022: Number	2022: (%)	2023: Number	2023: (%)
Pyogenic streptococci	7,548	(100)	6,281	(100)	5,563	(100)	7,478	(100)	8,543	(100)
Group A	2,169	(29)	1,312	(21)	689	(12)	2,506	(34)	3,369	(39)
Group B	2,301	(30)	2,207	(35)	2,087	(38)	2,072	(28)	2,243	(26)
Group C	1,696	(22)	1,496	(24)	1,588	(29)	1,662	(22)	1,767	(21)
Group G	1,382	(18)	1,266	(20)	1,199	(22)	1,238	(17)	1,164	(14)
Non-pyogenic streptococci	9,698		8,354		8,681		9,020		9,975	
anginosus group	1,601	(17)	1,631	(20)	1,691	(19)	1,529	(17)	1,757	(18)
<i>S. anginosus</i>	847	(53)	815	(50)	825	(49)	775	(51)	901	(51)
<i>S. constellatus</i>	378	(24)	441	(27)	458	(27)	394	(26)	437	(25)
<i>S. constellatus</i> subsp <i>constellatus</i>	10	(<1)	16	(<1)	17	(1)	13	(<1)	17	(<1)
<i>S. constellatus</i> subsp <i>pharyngis</i>	4	(<1)	4	(<1)	2	(<1)	0	(0)	0	(0)
<i>S. intermedius</i>	211	(13)	218	(13)	243	(14)	228	(15)	279	(16)
<i>S. milleri</i> group	142	(9)	132	(8)	136	(8)	112	(7)	115	(7)
<i>Streptococcus</i> group F	9	(<1)	5	(<1)	10	(<1)	7	(<1)	8	(<1)
bovis group	881	(9)	829	(10)	819	(9)	810	(9)	911	(9)
<i>S. alactolyticus</i>	64	(7)	48	(6)	33	(4)	5	(<1)	5	(<1)
<i>S. bovis</i> biotype II, not further speciated	52	(6)	45	(5)	30	(4)	38	(5)	41	(5)

Species	2019: Number	2019: (%)	2020: Number	2020: (%)	2021: Number	2021: (%)	2022: Number	2022: (%)	2023: Number	2023: (%)
<i>S. bovis</i> untyped	42	(5)	31	(4)	27	(3)	25	(3)	34	(4)
<i>S. gallolyticus</i> subsp <i>gallolyticus</i> [note 2]	524	(59)	452	(55)	466	(57)	482	(60)	524	(58)
<i>S. gallolyticus</i> subsp <i>pasteurianus</i>	15	(2)	27	(3)	29	(4)	30	(4)	52	(6)
<i>S. infantarius</i> [note 3]	42	(5)	55	(7)	62	(8)	84	(10)	140	(15)
<i>S. lutetiensis</i>	119	(14)	151	(18)	156	(19)	122	(15)	103	(11)
<i>S. equinus</i>	23	(3)	20	(2)	16	(2)	24	(3)	12	(1)
<i>mitis</i> group [note 4]	2,453	(25)	1,938	(23)	1,941	(22)	2,353	(26)	2,522	(25)
<i>S. mitis</i> group, not further speciated	1,226	(50)	941	(49)	914	(47)	1,129	(48)	1,706	(68)
<i>S. mitis</i> [note 5]	133	(5)	87	(4)	73	(4)	103	(4)	123	(5)
<i>S. oralis</i>	1,018	(42)	849	(44)	891	(46)	1,016	(43)	561	(22)
<i>S. mitior</i>	17	(<1)	19	(<1)	9	(<1)	19	(<1)	32	(1)
<i>S. pseudopneumoniae</i>	1	(<1)	2	(<1)	4	(<1)	5	(<1)	7	(<1)
<i>S. infantis</i>	10	(<1)	8	(<1)	9	(<1)	13	(<1)	24	(<1)
<i>S. cristatus</i>	48	(2)	32	(2)	41	(2)	68	(3)	69	(3)
<i>mutans</i> group	113	(1)	110	(1)	131	(2)	132	(1)	136	(1)
<i>S. mutans</i>	112	(99)	108	(98)	125	(95)	129	(98)	134	(99)
<i>S. sobrinus</i>	1	(1)	2	(2)	6	(5)	3	(2)	2	(1)

Species	2019: Number	2019: (%)	2020: Number	2020: (%)	2021: Number	2021: (%)	2022: Number	2022: (%)	2023: Number	2023: (%)
salivarius group	831	(9)	703	(8)	854	(10)	849	(9)	897	(9)
<i>S. salivarius</i>	631	(76)	551	(78)	643	(75)	644	(76)	655	(73)
<i>S. vestibularis</i>	200	(24)	152	(22)	211	(25)	205	(24)	242	(27)
sanguinis group	1,544	(16)	1,224	(15)	1,349	(16)	1,562	(17)	1,682	(17)
<i>S. gordonii</i>	241	(16)	199	(16)	248	(18)	265	(17)	282	(17)
<i>S. parasanguinis</i>	828	(54)	640	(52)	700	(52)	838	(54)	860	(51)
<i>S. sanguinis</i> [note 6]	50	(3)	38	(3)	29	(2)	32	(2)	43	(3)
<i>S. sanguinis</i> group, not further speciated	417	(27)	337	(28)	358	(27)	415	(27)	483	(29)
<i>S. massiliensis</i>	8	(<1)	10	(<1)	14	(1)	12	(<1)	14	(<1)
Other streptococci	2,275	(23)	1,919	(23)	1,896	(22)	1,785	(20)	2,070	(21)
Anaerobic <i>Streptococcus</i>	18	(1)	27	(1)	17	(1)	26	(1)	12	(1)
<i>S. acidominimus</i>	2	(<1)	0	(<1)	1	(<1)	0	(<1)	0	(<1)
<i>S. suis</i>	0	(<1)	2	(<1)	4	(<1)	4	(<1)	4	(<1)
<i>Streptococcus</i> not fully identified	2,044	(90)	1,742	(91)	1,716	(91)	1,588	(89)	1,768	(85)
<i>Streptococcus</i> spp. other named [note 7]	207	(9)	147	(8)	155	(8)	165	(9)	279	(13)
Total Streptococci [note 1]	17,246		14,635		14,244		16,498		18,518	

Species	2019: Number	2019: (%)	2020: Number	2020: (%)	2021: Number	2021: (%)	2022: Number	2022: (%)	2023: Number	2023: (%)
Genera closely related to streptococci [note 8]	629	(100)	592	(100)	669	(100)	712	(100)	715	(100)
<i>Abiotrophia</i> spp.	66	(10)	45	(8)	47	(7)	66	(9)	73	(10)
<i>Aerococcus</i> spp.	317	(50)	312	(53)	376	(56)	408	(57)	410	(57)
<i>Gemella</i> spp.	138	(22)	138	(23)	150	(22)	139	(20)	137	(19)
<i>Globicatella</i> spp.	0	(<1)	0	(<1)	2	(<1)	2	(<1)	1	(<1)
<i>Leuconostoc</i> spp.	39	(6)	40	(7)	39	(6)	36	(5)	41	(6)
<i>Pediococcus</i> spp.	7	(1)	10	(2)	7	(1)	14	(2)	11	(2)
<i>Peptostreptococcus</i> spp.	37	(6)	28	(5)	34	(5)	29	(4)	22	(3)

Note 2: total includes those reported as '*Streptococcus bovis* biotype I'.

Note 3: includes those reported as '*Streptococcus infantarius* sp *infantarius*', '*S. infantarius*' and '*Streptococcus infantarius* sp *nov*'

Note 4: total includes those records as *Streptococcus australis*.

Note 5: includes those reported as *S. mitis* I or *S. mitis* II.

Note 6: includes those reported as *S. sanguinis* I or *S. sanguinis* II.

Note 7: including: *Streptococcus thermophilus*, *Streptococcus pluranimalium*, *Streptococcus ovis*, *Streptococcus peroris*, *Streptococcus pseudoporcinus*, *Streptococcus thoralensis*, *Streptococcus porcinus*, *Streptococcus merionis*, *Streptococcus uberis*, '*Streptococcus* spp.', other named' without further information.

Note 8: total includes those recorded as 'nutritionally variant streptococci' without further information.

Figure 1a. Trends in pyogenic streptococcal bacteraemia reports, by group, per 100,000 population in England, 2014 to 2023

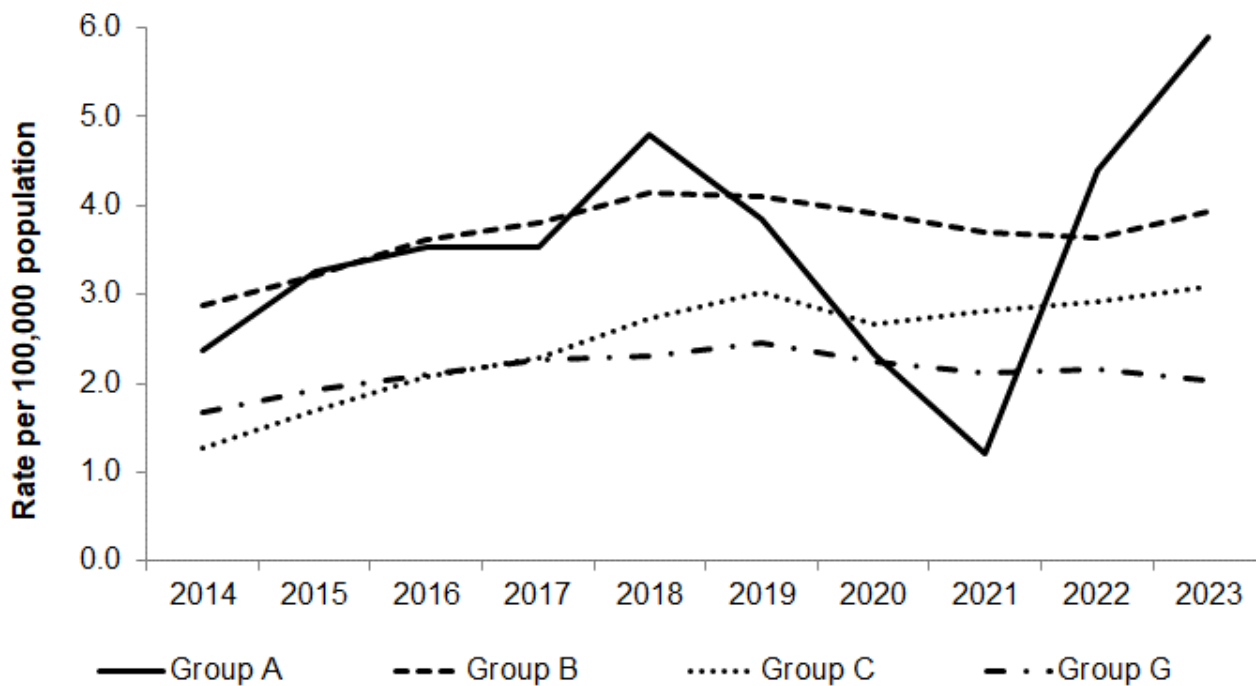
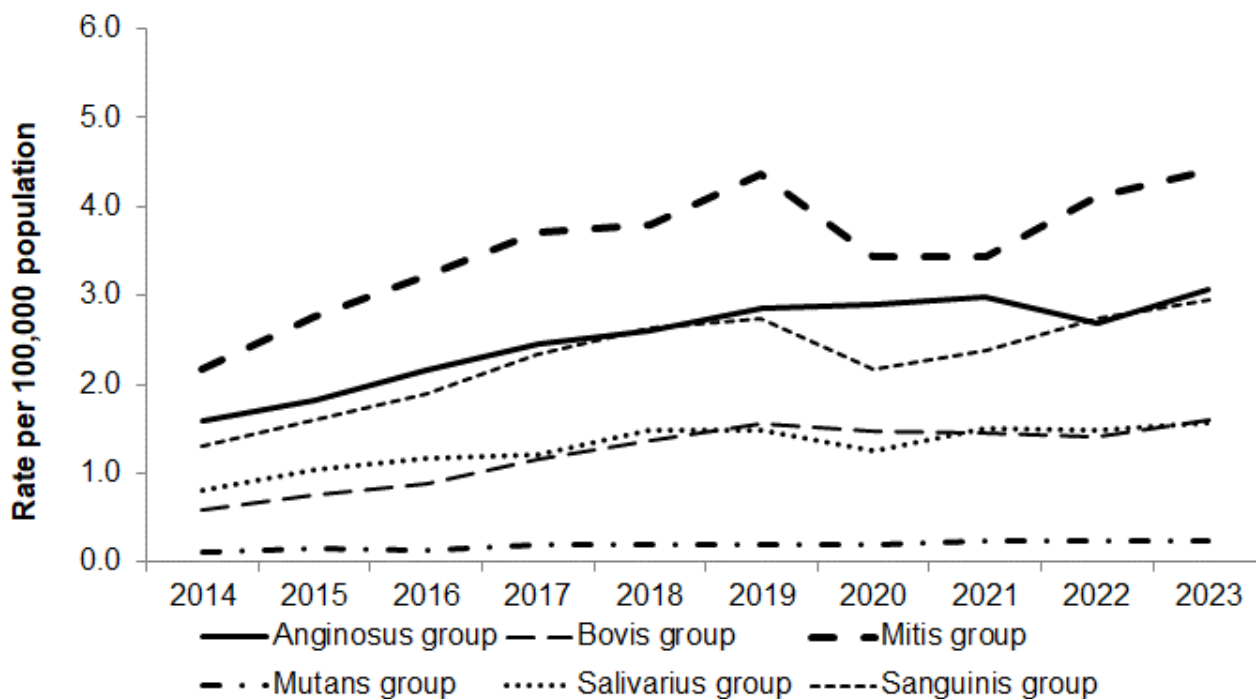


Figure 1b. Trends in non-pyogenic streptococcal bacteraemia reports, by group, per 100,000 population in England, 2014 to 2023



Pyogenic streptococci

Table 2 shows the regional rates of the pyogenic streptococcal bacteraemia by group in 2023.

Table 2. Rate per 100,000 population of pyogenic streptococcal bacteraemia reports by region and group in England, 2023

Region	Rate per 100,000 population			
	Group A	Group B	Group C	Group G
North East	5.6	3.4	2.9	1.5
North West	4.9	3.2	3.2	2.0
Yorkshire and Humber	6.4	4.0	1.5	0.8
East Midlands	7.6	4.0	4.2	0.7
East of England	5.5	4.6	2.6	2.8
West Midlands	5.7	4.0	3.4	1.9
London	5.8	4.2	3.5	2.7
South East	6.1	3.8	3.6	2.2
South West	6.4	3.8	4.2	3.3
England	5.9	3.9	3.1	2.0

Table 3 shows the rates per 100,000 of cases of pyogenic group streptococci, by Index of Multiple Deprivation (IMD a socio-economic deprivation indicator derived from 7 key domains of deprivation assigned to the area of residence). Comparing the least deprived quintile 5 with the most deprived quintile 1, all pyogenic groups have lower rates in quintile 5 than in quintile 1.

Table 3. Rate per 100,000 population of pyogenic streptococcal bacteraemia reports by index of multiple deprivation and group in England, 2023 [note 9]

IMD Quintile	Rate per 100,000 population			
	Group A	Group B	Group C	Group G
1 (most deprived)	7.1	5.1	3.4	2.2
2	5.6	4.3	3.1	2.1
3	5.4	4.1	3.5	2.2
4	5.2	3.9	3.3	2.3
5 (least deprived)	4.7	3.1	2.9	1.9

Note 9: Data for IMD is based on the patient residence information. Records are excluded when this information is not available. In 2023 the number of pyogenic streptococci episodes excluded was 411 out of 8,543 (4.8%).

Table 4 shows the rates per 100,000 of pyogenic group streptococci, by ethnicity.

Table 4. Rate per 100,000 population of pyogenic streptococcal bacteraemia reports by ethnic group in England, 2023

Ethnic group [note 10]	Rate per 100,000			
	Group A	Group B	Group C	Group G
Asian or Asian British	3.4	2.1	0.6	0.5
Black, African, Caribbean or Black British	2.6	2.8	0.9	0.5
Mixed or multiple ethnic groups	2.1	0.8	0.2	0.4
White	5.4	3.3	3.5	2.3
Any other ethnic group	0.8	0.5	0.1	0.2

Note 10: 1,213 (14.2%) pyogenic streptococcal bacteraemia episodes could not be linked to ethnic group information in 2023. Following successful linkage, 125 (1.7%) pyogenic streptococci cases were recorded as 'Not known' or 'Not stated'.

Table 5 shows the number of reports for each pyogenic group streptococcal bacteraemia that were tested and the proportion that resistant to key antibiotics (clindamycin, erythromycin, tetracycline, vancomycin, and linezolid) in England between 2019 and 2023.

Key antibiotic resistance trends for each pyogenic streptococcal group are described within relevant sections of the report.

Table 5. Antimicrobial susceptibility for pyogenic streptococci causing bacteraemia in England, 2019 to 2023

In this table NT = number tested, and R = resistant.

Species	Antimicrobial agent	2019: NT	2019: R (%)	2020: NT	2020: R (%)	2021: NT	2021: R (%)	2022: NT	2022: R (%)	2023: NT	2023: R (%)
Group A	clindamycin	1,312	(9)	819	(9)	435	(11)	1,491	(7)	2,136	(6)
	erythromycin	1,339	(10)	771	(8)	414	(15)	1,458	(7)	1,915	(6)
	tetracycline	1,623	(24)	913	(28)	509	(41)	1,743	(22)	2,220	(22)
	vancomycin	941	(<1)	555	(<1)	307	(<1)	1,063	(<1)	1491	(<1)
	linezolid	556	(<1)	330	(<1)	194	(<1)	638	(<1)	869	(<1)
Group B	clindamycin	1,738	(30)	1,481	(31)	1,463	(33)	1,410	(34)	1,599	(34)
	erythromycin	1,805	(35)	1,577	(36)	1,533	(38)	1,458	(40)	1,561	(41)
	tetracycline	2,086	(84)	1,827	(84)	1,764	(83)	1,669	(83)	1,798	(82)
	vancomycin	1,324	(<1)	1,183	(<1)	1,155	(<1)	1,080	(<1)	1,187	(<1)
	linezolid	766	(<1)	755	(<1)	789	(<1)	666	(<1)	736	(<1)
Group C	clindamycin	1,246	(26)	1,043	(23)	1,204	(27)	1,182	(25)	1,309	(27)
	erythromycin	1,294	(32)	1,031	(29)	1,114	(32)	1,094	(31)	1,180	(32)
	tetracycline	1,488	(31)	1,214	(30)	1,363	(33)	1,322	(32)	1,449	(34)
	vancomycin	842	(<1)	718	(<1)	840	(<1)	830	(<1)	925	(<1)
	linezolid	575	(<1)	510	(<1)	596	(<1)	576	(<1)	616	(<1)
Group G	clindamycin	1,087	(35)	945	(42)	892	(37)	900	(39)	827	(37)
	erythromycin	1,067	(39)	893	(44)	824	(43)	809	(43)	723	(40)
	tetracycline	1,308	(41)	1,059	(44)	1,004	(43)	987	(41)	898	(44)
	vancomycin	817	(<1)	667	(<1)	679	(<1)	625	(<1)	564	(<1)
	linezolid	408	(<1)	377	(<1)	374	(<1)	354	(<1)	324	(<1)

Group A streptococci

Of the pyogenic streptococci causing bacteraemia in England in 2023, group A streptococci (GAS) accounted for 39% (3,369 out of 8,543) of reports (Table 1).

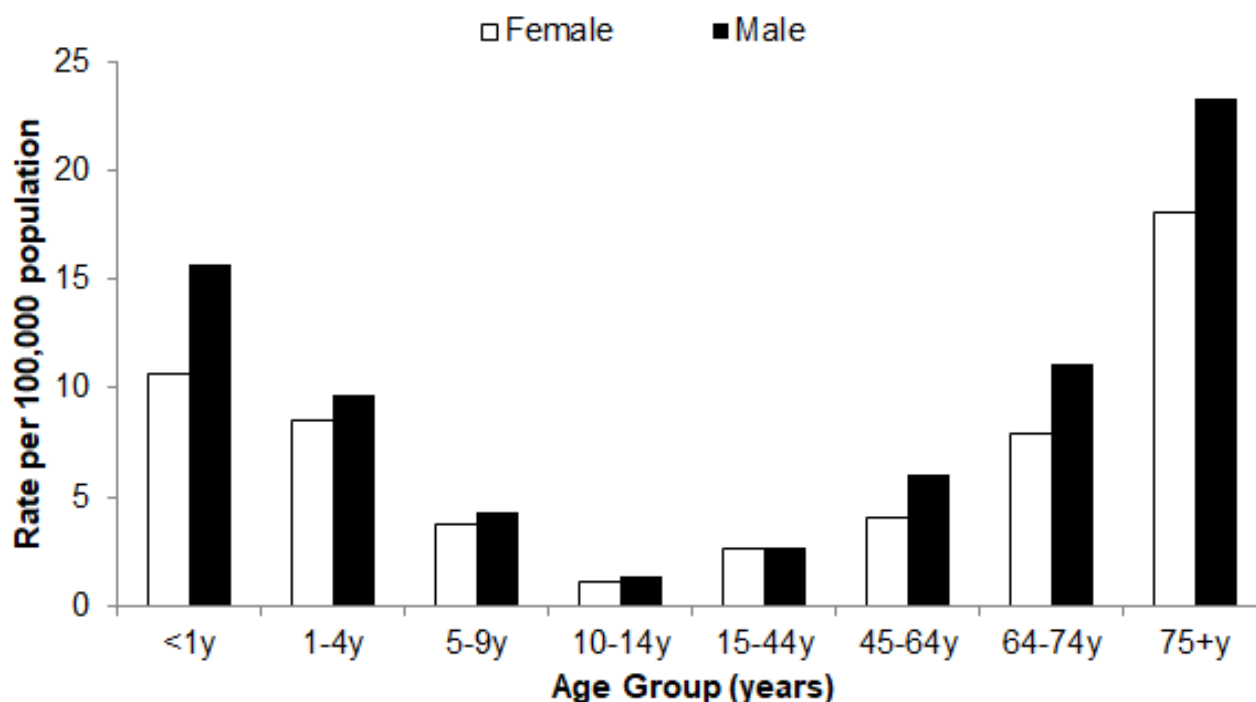
In comparison with other causes of bacteraemia, GAS were ranked 7th amongst monomicrobial and 18th amongst polymicrobial bacteraemia in 2023 (summary tables published in the [ESPAUR report 2023 to 2024](#)), up from 11th and 20th in 2022, respectively. An increasing trend in the rate of GAS bacteraemia was seen between 2014 (2.4 per 100,000 population) and 2018 (4.8 per 100,000) after which cases declined from 2019 to a minimum observed rate in 2021 (1.2 per 100,000 population). Subsequently, a sharp increase was observed in 2022, followed by a further increase in 2023 reaching 5.9 per 100,000 (Figure 1a), a 148% increase from the rate in 2013, and greater than the previous peak observed in 2018.

The upsurge in invasive GAS (sterile-site specimens) and scarlet fever notifications during 2022 and early 2023 are described more fully within the contemporary [seasonal reports](#).

The rate of GAS bacteraemia reports across England in 2023 ranged from 4.9 in the North West to 7.6 per 100,000 in the East Midlands (Table 2).

Figure 2 shows the rates of GAS bacteraemia were higher in males than females the majority of age groups, rates were similar for those aged 15 to 44 years. The highest rate was in the elderly (≥ 75 years) at 20.4 per 100,000 (23.3 in males and 18.1 per 100,000 in females), followed by those aged less than 1 year and 64 to 74 years at 13.4 per 100,000 and 9.4 per 100,000 respectively. GAS bacteraemia rates were higher in all age groups in 2023 compared with 2022, apart from those aged 1 to 4 years where the rate was lower.

Figure 2. Group A streptococcal bacteraemia age and sex rates per 100,000 population in England, 2023



In 2023, the incidence of GAS bacteraemia by IMD quintile exhibited a decreasing pattern with deprivation quintile, from the most deprived 20% to the least deprived 20% of the population in England (Table 3). Compared to the other pyogenic group streptococci, GAS bacteraemia incidence showed the greatest difference between the most deprived quintile and least deprived quintile: 7.1 per 100,000 in quintile 1 compared to 4.7 per 100,000 in quintile 5 (34% decrease). GAS bacteraemia rates varied by ethnic group in 2023, from 5.4 per 100,000 population in the white ethnic group to 0.8 in the 'other' ethnic group (Table 4).

In England, the percentage of GAS bacteraemia reports accompanied by antimicrobial susceptibility data in 2023 were 77% (70% in 2022), 69% (69%), 80% (82%), 54% (50%), and 31% (30%) for clindamycin, erythromycin, tetracycline, vancomycin, and linezolid, respectively. In 2023, resistance to clindamycin, erythromycin, tetracycline was recorded for 6%, 6% and 22% of cases, respectively (Table 3). For both vancomycin, and linezolid, resistance for 2023 was less than 1%. Resistance in 2023 to each of the 5 antibiotics is similar to the resistance reported for 2022. [Tetracycline resistance](#) in *S. pyogenes* has been detected in multiple but not all *emm* gene sequence types (1).

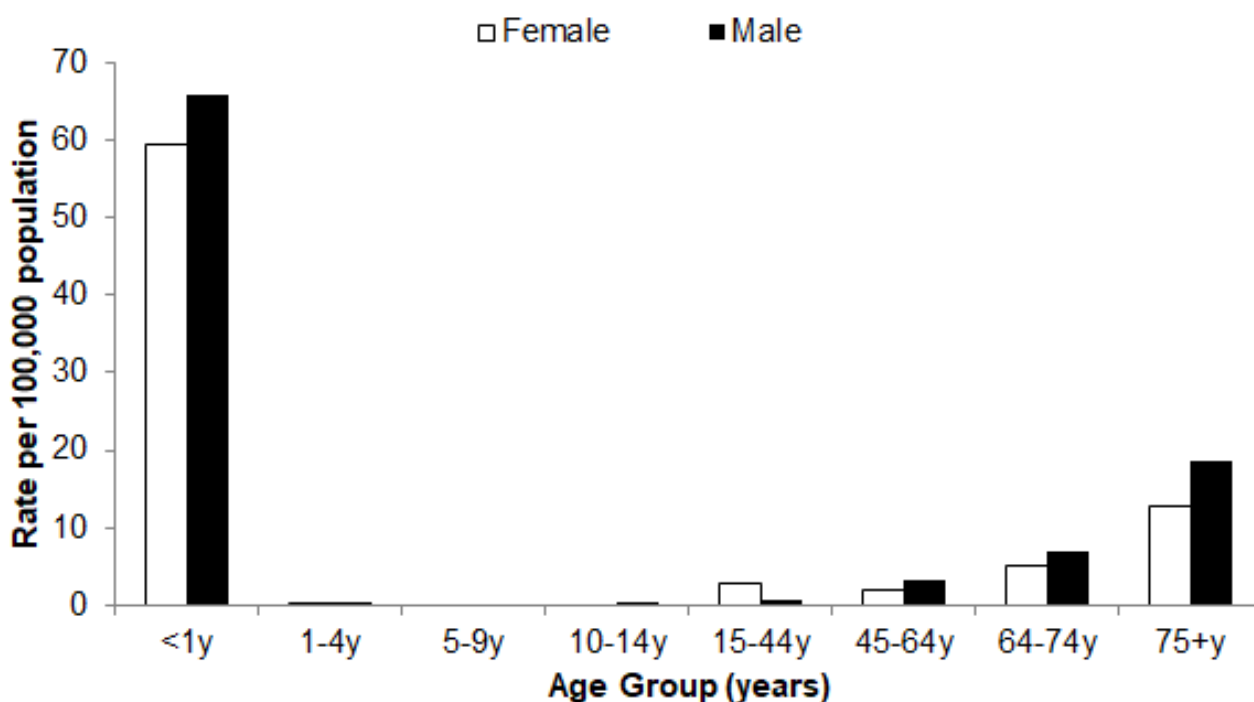
Group B streptococci

GBS is a clinically important pathogen of particular note in the extremes of age. In 2023, 2,243 cases of GBS bacteraemia were reported by laboratories in England, an increase from numbers reported in 2022, and a slight 3% decrease from 2019 (Table 1). GBS bacteraemia accounted for 26% of the pyogenic streptococcal bacteraemia reported in 2023, lower than seen in

previous years, reflecting the increase in GAS bacteraemia in 2022 (Table 1). The rate of GBS bacteraemia in England was 3.9 per 100,000 population in 2023 (Table 2), compared with 2.9 per 100,000 in 2014 (Figure 1a). In England, the North West region reported the lowest rate of infection (3.2 per 100,000), and the South East (4.6 per 100,000) the highest.

Figure 3 shows that in 2023 the rates of GBS bacteraemia were highest in those aged less than 1 year, at 62.9 per 100,000 population (59.4 in females and 65.9 per 100,000 in males). Rates of GBS bacteraemia were higher in males compared with females in most age groups, with the exception of those spanning 1 to 44 years, where females had higher rates of GBS bacteraemia. For the older age groups, the rates of GBS bacteraemia were: 65 to 74 years, males 6.9, females 5.0 per 100,000, and 75 years and over age group, males 18.6, females 12.7 per 100,000.

Figure 3. Group B streptococcal bacteraemia age and sex rates per 100,000 population in England; 2023



In infants under 90 days old, the rate of GBS bacteraemia in England in 2023 was 0.64 per 1,000 live births (Table 6), comparable with [2022](#) (0.63 per 1,000) and a decrease from [2020](#) (0.80 per 1,000).

In England, rates of early-onset neonatal infection (<7 days old) were higher than late-onset infection (7 to 90 days old) (0.40 compared with 0.24 per 1,000 live births). Overall, there is a declining trend in the previous 3 years (2021 to 2023), however in 2023, the rates for both late onset and early onset disease are comparable to rates in 2022.

Table 6. Number and rate per 1,000 live births of group B streptococcal bacteraemia in infants 0 to 90 days old in England, 2023

Infant age group	Number episodes	Rate per 1,000 live births
All infant cases: 0 to 90 days old	360	0.64
Early onset: 0 to 6 days old	227	0.40
Late onset: 7 to 90 days old	133	0.24

Rates of GBS in 2023 ranged from 5.1 per 100,000 in the most deprived IMD quintile (20% of the population) to 3.1 per 100,000 in the least deprived IMD quintile (Table 3).

Similar with the GAS bacteraemia, rates per 100,000 for GBS cases by ethnic group were highest amongst those of white ethnicity (3.3 per 100,000), followed by cases of a Black ethnicity group (2.8 per 100,000) (Table 4) in 2023.

The percentage of GBS bacteraemia reports from England accompanied by antimicrobial susceptibility data in 2023 were 71% (69% in 2022), 70% (72%), 80% (82%), 53% (53%), and 33% (33%) for clindamycin, erythromycin, and tetracycline, vancomycin, and linezolid, respectively. Clindamycin, erythromycin resistance increased in GBS bacteraemia isolates between 2019 and 2023, from 30% to 34% for clindamycin and 35% to 41% for erythromycin (Table 5). Tetracycline resistance remained decreased from 84% in 2019 to 82% in 2023. Resistance for both vancomycin, and linezolid, for 2023 was less than 1%.

GBS resistance to penicillin remains exceedingly rare with just one confirmed report from the UK in 2016 (2). If laboratories [suspect penicillin resistance](#) (MIC \geq 0.25 mg/L, or zone diameter <18mm) in a pyogenic group *Streptococcus*, the isolate should be sent to the UKHSA [AMRHA Reference Unit](#) for confirmation.

Group C and G streptococci

The number of cases of group C streptococcal (GCS) bacteraemia increased by 4% between 2019 and 2023 in England, accounting for 21% of the reported pyogenic streptococcal bacteraemia in 2022 (Table 1). The rate of GCS bacteraemia in England was 3.1 per 100,000 population in 2023, an increase of 144% compared with the rate observed in 2014 (1.3 per 100,000) (Figure 1a). The number of cases of Group G streptococcal (GGS) bacteraemia reported in England was 1,164, similar to the number reported in 2022, however a decline from 1,382 reported in 2019 (Table 1). The rate increased by 22% since 2014 (Figure 1a), from 1.7 to 2.0 per 100,000 population in 2023.

Within England, GCS bacteraemia rates varied considerably by region in 2023, from 1.5 per 100,000 in the Yorkshire and Humber to 4.2 in both the East Midlands and South West (Table

2). Rates of GGS bacteraemia also varied substantially in 2023, ranging from 0.7 in the East Midlands to 3.3 per 100,000 in the South West region.

Rates of GCS and GGS bacteraemia were highest in the 75 years and over age group for both species in 2023, 20.5 and 14.8 per 100,000, respectively (figures 5 and 6). Rates were higher in males than females in most age groups, with the exception of less than 1 year-olds for both groups.

In contrast to GAS and GBS, no obvious pattern in incidence by deprivation quintile was noted for GCS and GGS in 2023 (Table 3), although population rates were lower amongst the least deprived quintile compared with the most deprived. For GCS the rate is different for each quintile, with the greatest rate seen in quintile 3 (3.5 per 100,000). For GGS rates are the same in the most deprived quintile, and quintile 3 (2.2 per 100,000), and the greatest rate is seen in quintile 4 (2.3 per 100,000) (Table 3).

Both GCS and GGS had considerably higher rates in 2023 for those of a white ethnic group, 3.5 and 2.3 respectively, compared to other ethnic groups.

Antimicrobial susceptibility data were available for 74%, 67%, 82%, 52%, and 35% of GCS bacteraemia isolates in 2023 for clindamycin, erythromycin, and tetracycline, vancomycin, and linezolid, respectively, compared with 73%, 67%, 81%, 51%, and 35% in 2022. For GGS bacteraemia, susceptibility data for clindamycin, erythromycin, and tetracycline, vancomycin, and linezolid was reported for 68%, 59%, 74%, 46%, and 27% of isolates, respectively, compared 71%, 64%, 78%, 50%, and 28% in 2022. In 2023, the percentage of GCS bacteraemia isolates resistant to clindamycin, erythromycin and tetracycline were 27%, 32% and 34%, respectively (Table 4). The percentage of resistant isolates was higher in GGS bacteraemia isolates, with 37%, 40% and 44% resistant to clindamycin, erythromycin and tetracycline, respectively. Resistance for vancomycin and linezolid for both GCS and GGS was less than 1%. Resistance for clindamycin is similar to resistance seen in 2019, 26% for GCS but higher for GGS, 35%.

Figure 4. Group C streptococcal bacteraemia age and sex rates per 100,000 population in England, 2023

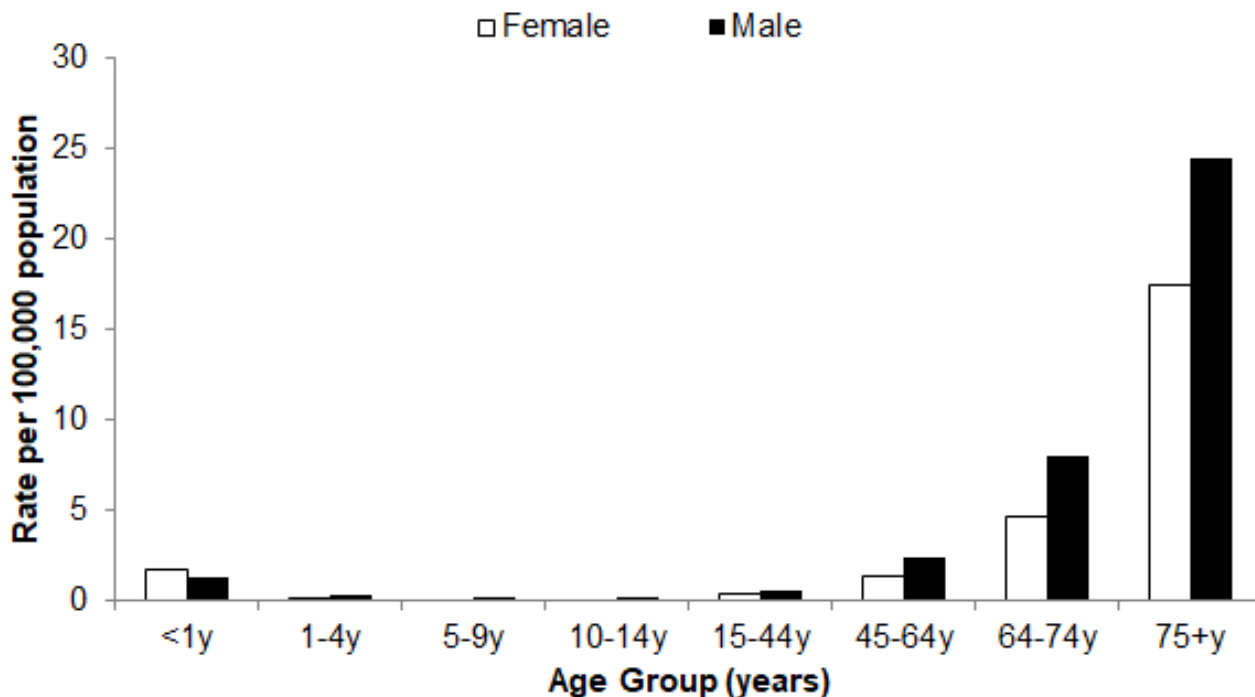
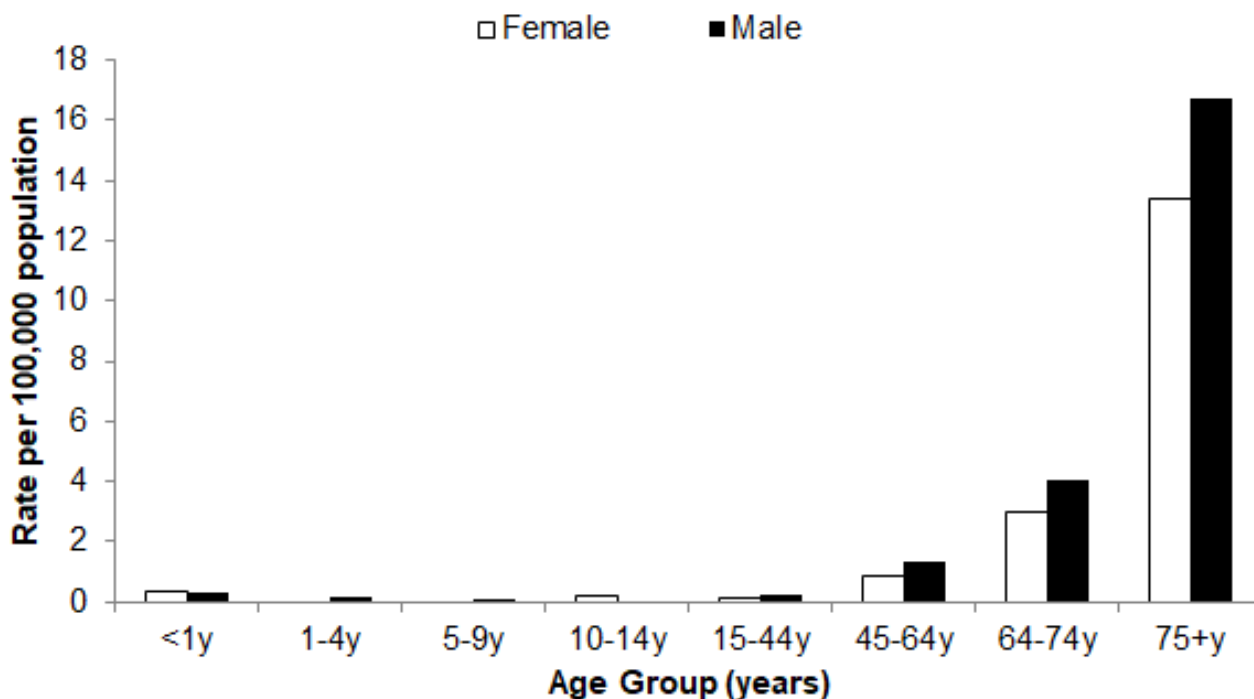


Figure 5. Group G streptococcal bacteraemia age and sex rates per 100,000 population in England; 2023



Non-pyogenic streptococci

Cases of non-pyogenic streptococcal bacteraemia have shown an 11% increase in 2023 from the previous year (9,020 in 2022 to 9,975 in 2023). This is a 3% increase from 2019 (Table 1). Rates of bacteraemia showed an overall increase across all non-pyogenic streptococcal groups in England between 2014 and 2023 (Figure 1b), although some groups (*mitis*, *salivarius*, and *sanguinis* groups) saw declines during the period of COVID-19 pandemic restrictions and disruptions to healthcare delivery (2020 and 2021).

Of the non-pyogenic streptococci, bacteraemia rates were highest for *mitis* group streptococci (4.4 per 100,000 population; Figure 1b), and lowest rates for *mutans* group (0.2 per 100,000). Among all non-pyogenic streptococcal bacteraemia reported in 2023 in England, the *mitis* group accounted for the largest percentage of reports, 2,522 of the 9,975 (25%; Table 1).

The previous increases in reports and subsequent distribution of less common non-pyogenic streptococcal species may in part be due to increasing use of matrix-assisted laser desorption/ionization time of flight (MALDI-ToF) analysis in hospitals, which allows for rapid species identification, facilitating reporting of species not previously recognised by clinical laboratories. It is of note that identification of *Streptococcus* to species level using MALDI-ToF alone is undergoing evaluation by the AMRHA Reference Unit. Accurate species determination may not be achieved with this standalone test for all species and this needs to be accounted for when species such as *S. alactolyticus*, *S. equinus* and *S. acidominimus*, amongst others, which are not usually associated with human infection, are currently being reported, and the isolate should be referred to the *Staphylococcus* and *Streptococcus* Reference Section ([SSRS](#)) for a full identification.

It is also of note that the reference laboratory detected 26 *Streptococcus dysgalactiae* subspecies *equisimilis* (SDSE) expressing the Group A surface antigen from sterile-site isolate referrals in 2023. These isolates would be reported as SDSE by laboratories that perform MALDI-ToF alone, and as GAS by laboratories that do not use MALDI-ToF and perform only Lancefield grouping on beta-haemolytic streptococci. Referral to the national SSRS provides an opportunity to correct any misidentification of species.

Table 7 shows that the incidence rates for each of the non-pyogenic groups varied within England in 2023. Rates of *mitis* group streptococci bacteraemia ranged from 2.3 per 100,000 in the East Midlands region to 5.5 per 100,000 in the South East region. Anginosus group streptococcal bacteraemia rates ranged from 2.4 in the North West and East Midlands regions to 3.8 per 100,000 in the London.

Table 7. Rate per 100,000 population of non-pyogenic streptococcal bacteraemia reports by Region in England, 2023

Region	Rate per 100,000 population					
	anginosus group	bovis group	mitis group	mutans group	salivarius group	sanguinis group
North East	3.2	1.7	4.0	0.2	1.4	2.9
North West	2.4	1.1	3.7	0.3	1.0	2.7
Yorkshire and Humber	2.7	1.3	3.6	0.2	1.5	2.8
East Midlands	2.4	1.3	2.3	0.2	1.4	2.9
East of England	3.3	1.7	5.4	0.2	1.6	3.0
West Midlands	3.1	1.7	5.4	0.3	1.8	3.1
London	3.8	2.0	4.2	0.3	1.9	2.7
South East	3.3	1.9	5.5	0.2	1.9	3.6
South West	3.6	1.6	4.2	0.3	1.6	2.7
England	3.1	1.6	4.4	0.2	1.6	2.9

Table 8. Rate per 100,000 population of non-pyogenic streptococcal bacteraemia reports by IMD in England, 2023 [note 11]

IMD Quintile	Rate per 100,000 population					
	anginosus group	bovis group	mitis group	mutans group	salivarius group	sanguinis group
1 (most deprived)	3.8	1.7	5.2	0.3	2.0	3.2
2	3.1	1.7	4.7	0.3	1.6	3.3
3	3.2	1.6	4.5	0.2	1.4	3.0
4	3.1	1.6	4.4	0.3	1.6	3.1
5 (least deprived)	2.9	1.7	4.2	0.3	1.5	2.8

Note 11: Data for IMD is based on the patient residence information. Records are excluded when this information is not available. In 2023 the number of non-pyogenic streptococci records excluded was 140 out of 7,916 (1.8%).

Table 9. Rate per 100,000 population of non-pyogenic streptococcal bacteraemia reports by ethnic group in England, 2023

Ethnic group [note 12]	Rate per 100,000 population					
	anginosus group	bovis group	mitis group	mutans group	salivarius group	sanguinis group
Asian or Asian British	1.8	0.8	2.7	0.1	0.7	1.5
Black, African, Caribbean or Black British	2.8	0.6	2.7	0.0	1.1	1.6
Mixed or multiple ethnic groups	0.7	0.2	1.7	0.2	0.7	1.3
White	2.9	1.7	3.8	0.2	1.3	2.7
Any other ethnic group	0.4	0.1	0.7	0.0	0.1	0.6

Note 12: 1,301 (16.5%) non-pyogenic streptococcal bacteraemia episodes could not be linked to ethnic group information in 2023. Following successful linkage, 118 (1.8%) non-pyogenic streptococci cases were recorded as 'Not known' or 'Not stated'.

Distributions of non-pyogenic streptococcal bacteraemia reports by age and sex showed generally higher rates among males compared to females, and in the youngest (<1 year) and oldest age groups (figures 7 to 11). Rates were highest in those aged 75 years and above for anginosus (Figure 7) and bovis (Figure 8) streptococcal group bacteraemia (11.0 and 10.1 per 100,000 population, respectively). In contrast, rates were highest in those aged under 1 year old for mitis (35.7 per 100,000, Figure 9), salivarius (22.0 per 100,000, Figure 10) and sanguinis (19.1 per 100,000, Figure 11) streptococcal groups.

Figure 6. Anginosus group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2023

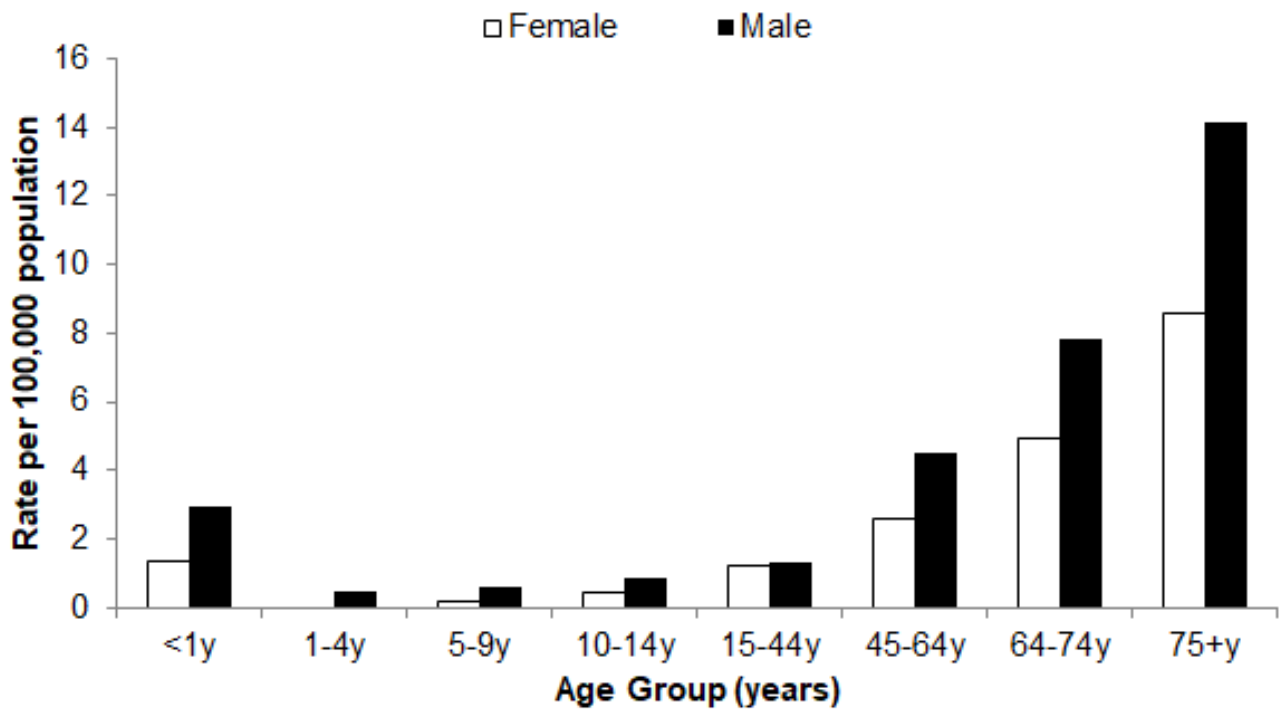


Figure 7. Bovis group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2023

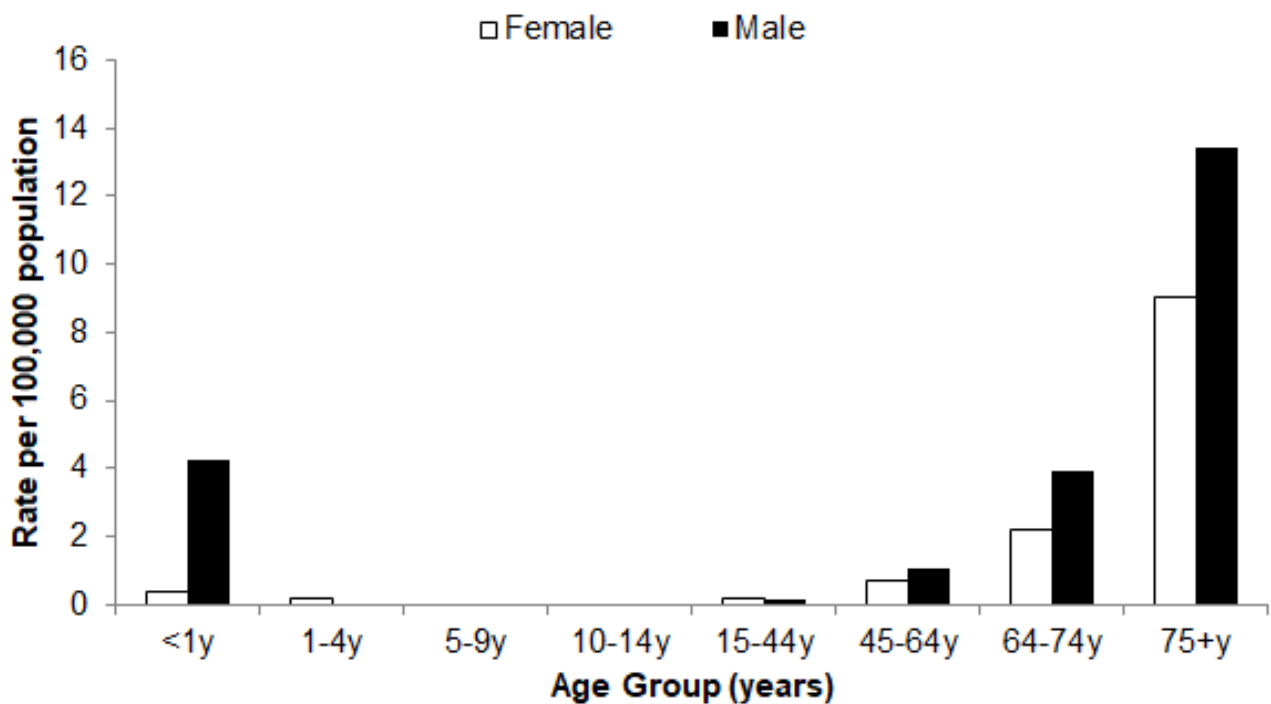


Figure 8. Mitis group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2023

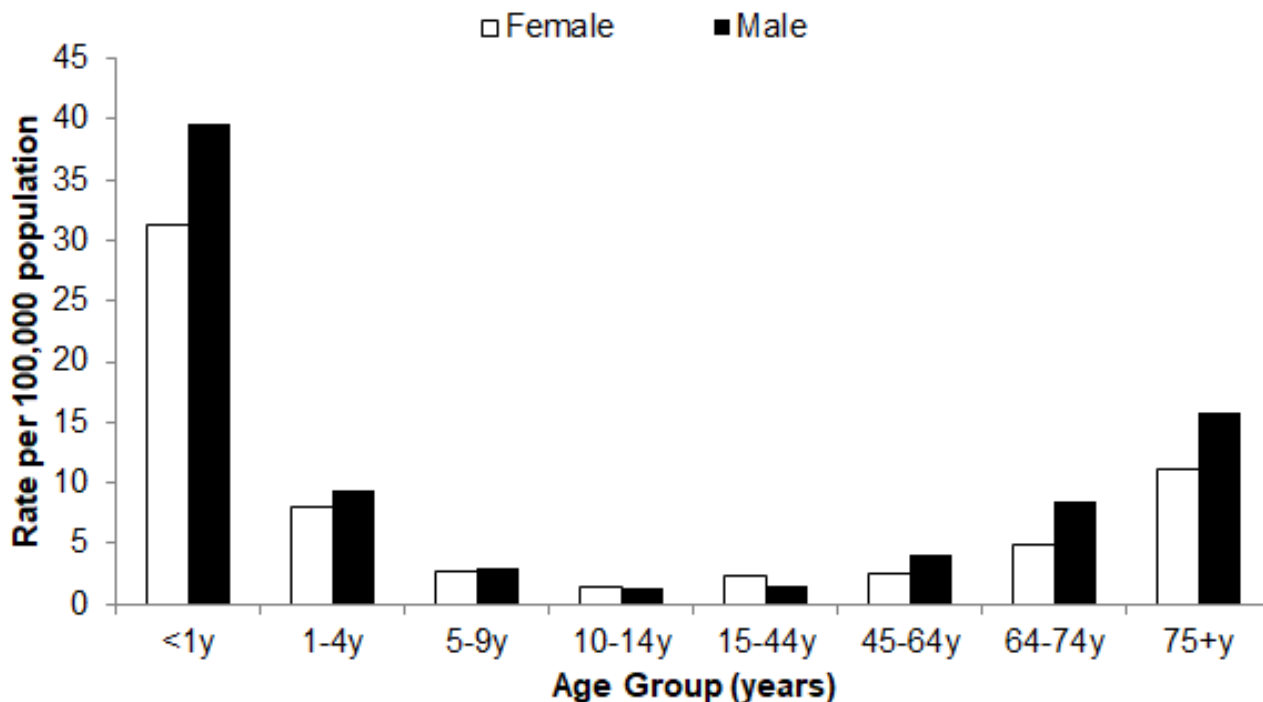


Figure 9. Salivarius group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2023

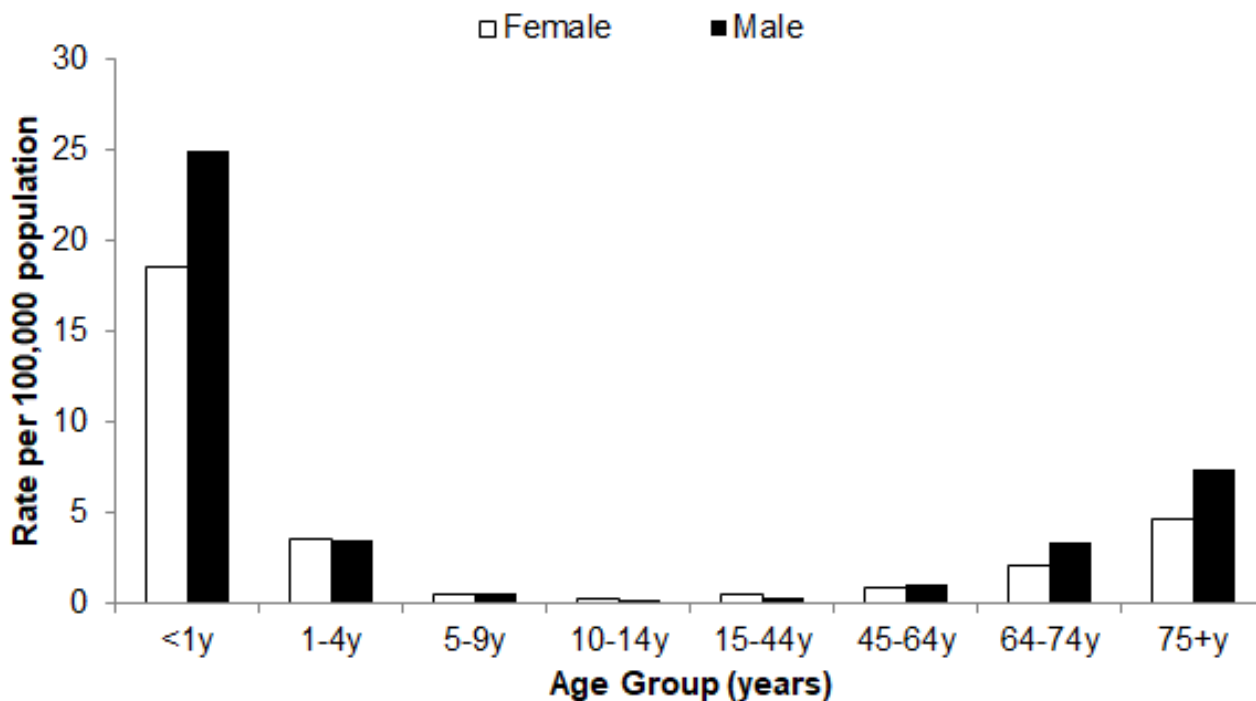


Figure 10. Sanguinis group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2023

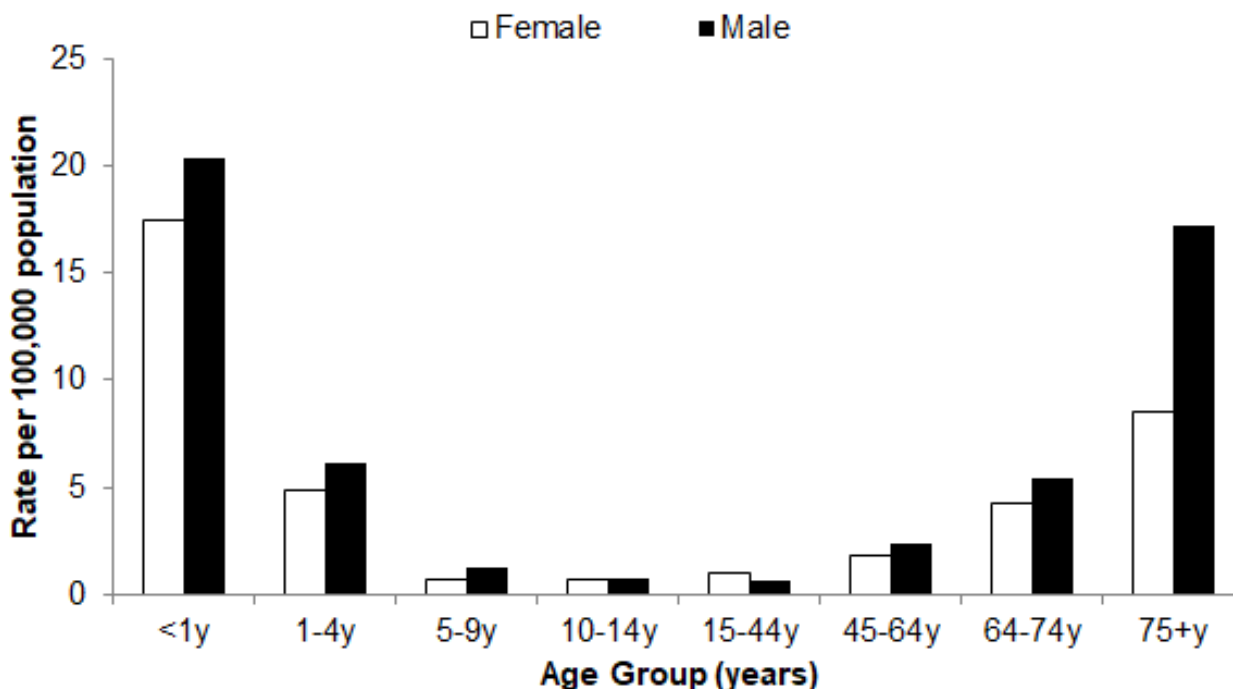


Table 8 shows the rates per 100,000 of cases of non-pyogenic group streptococci, by IMD (socio-economic deprivation indicator derived from 7 key domains of deprivation). Comparing the least deprived quintile 5 with the most deprived quintile 1, all pyogenic groups have lower rates in quintile 5 than in quintile 1.

For non-pyogenic streptococci in 2023, only the mitis group display a clear pattern of decreasing rate with increasing levels of deprivation (measured by IMD quintile; Table 8), all other groups do not display such trends. The anginosus, mitis, salivarius, and sanguinis groups all have a lower rate in the least deprived quintile than the most deprived. The rate for bovis, and mutans group bacteraemia is the same for both the least deprived and most deprived quintiles, 1.7 and 0.3 per 100,000 population respectively.

Table 9 shows the rates per 100,000 of non-pyogenic group streptococci, by ethnicity. Similar to pyogenic streptococci, the rates for non-pyogenic groups in 2023 are all greatest among those of a white ethnicity, although for anginosus group and salivarius group this is marginal. Table 10 shows the number of reports for each non-pyogenic streptococcal group bacteraemia that are tested and the percentage that are resistant to key antibiotics (penicillin, erythromycin and tetracycline) in England between 2019 and 2023.

Erythromycin susceptibility data were available for 19-27% of anginosus, bovis, mitis, salivarius and sanguinis group bacteraemia isolates from England; for tetracycline, data availability was 17-22% and for penicillin, 84-89% in 2023. Resistance to penicillin was reported for 9% of mitis isolates (the same percentage as in 2019), 13% of salivarius isolates (a decrease from 16% in 2019), and 20% of sanguinis isolates (a slight reduction from 21% in 2019) (Table 8). The percentage of isolates reported as resistant to erythromycin decreased or remained similar between 2019 and 2023 for all groups.

Table 10. Antimicrobial susceptibility for non-pyogenic streptococci causing bacteraemia in England, 2019 to 2023

In this table NT = number tested, and R = resistant

Species	Antimicrobial agent	2019: NT	2019: R (%)	2020: NT	2020: R (%)	2021: NT	2021: R (%)	2022: NT	2022: R (%)	2023: NT	2023: R (%)
Anginosus group	erythromycin	733	(12)	571	(12)	634	(12)	477	(16)	440	(12)
Anginosus group	tetracycline	720	(23)	585	(20)	613	(16)	467	(21)	379	(22)
Anginosus group	penicillin	1,535	(<1)	1,377	(<1)	1,526	(<1)	1,351	(<1)	1,576	(<1)
Anginosus group	vancomycin	1,053	(<1)	1,026	(<1)	1,144	(<1)	992	(<1)	1,189	(<1)
Anginosus group	linezolid	266	(<1)	292	(<1)	284	(<1)	208	(2)	153	(<1)
Bovis group	erythromycin	335	(34)	334	(29)	277	(32)	241	(32)	244	(32)
Bovis group	tetracycline	366	(69)	352	(68)	261	(67)	233	(61)	205	(70)
Bovis group	penicillin	770	(<1)	706	(<1)	690	(0)	686	(<1)	784	(<1)
Bovis group	vancomycin	619	(<1)	574	(<1)	560	(<1)	577	(<1)	659	(<1)
Bovis group	linezolid	187	(0)	212	(<1)	178	(0)	160	(0)	121	(0)
Mitis group	erythromycin	830	(48)	579	(43)	594	(41)	584	(44)	480	(40)
Mitis group	tetracycline	864	(26)	609	(23)	573	(22)	560	(24)	426	(26)
Mitis group	penicillin	2,212	(9)	1,702	(9)	1,658	(9)	1,887	(8)	2,160	(9)
Mitis group	vancomycin	1,708	(<1)	1,298	(<1)	1,312	(<1)	1,557	(<1)	1,803	(<1)
Mitis group	linezolid	448	(<1)	381	(1)	354	(<1)	367	(<1)	245	(<1)
Salivarius group	erythromycin	319	(41)	256	(39)	312	(36)	233	(40)	191	(40)
Salivarius group	tetracycline	323	(17)	249	(14)	296	(9)	209	(14)	160	(14)
Salivarius group	penicillin	715	(16)	558	(12)	734	(9)	696	(8)	769	(13)

Species	Antimicrobial agent	2019: NT	2019: R (%)	2020: NT	2020: R (%)	2021: NT	2021: R (%)	2022: NT	2022: R (%)	2023: NT	2023: R (%)
Salivarius group	vancomycin	518	(1)	406	(2)	543	(2)	532	(2)	600	(3)
Salivarius group	linezolid	159	(0)	110	(0)	142	(0)	103	(<1)	85	(0)
Sanguinis group	erythromycin	575	(51)	401	(44)	416	(44)	401	(44)	364	(49)
Sanguinis group	tetracycline	595	(34)	437	(32)	455	(29)	404	(30)	319	(32)
Sanguinis group	penicillin	1,392	(21)	1,038	(22)	1,172	(21)	1,335	(18)	1,509	(20)
Sanguinis group	vancomycin	1,079	(<1)	797	(<1)	950	(<1)	1,094	(<1)	1,228	(<1)
Sanguinis group	linezolid	344	(<1)	254	(0)	270	(<1)	227	(0)	169	(<1)

Reference microbiology service

In 2023, the percentage of reports of streptococcal bacteraemia in which the organism was not fully identified was 11%. Precise species identification of isolates would improve the monitoring of trends in non-pyogenic streptococci and related genera. The UKHSA Staphylococcus and Streptococcus reference section in the [AMRHAI](#) Reference Unit 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, including non-sterile site isolates (of GAS, GBS, GCS and GGS) reported during the referral process as being associated with outbreaks. All such isolates should be [submitted to the AMRHAI Reference Unit](#) along with all GAS, GBS, GCS and GGS isolates from normally sterile sites ([3](#), [4](#)).

Laboratories are also requested to send any pyogenic streptococcal isolates exhibiting resistance to penicillin (MIC \geq 0.25 mg/L, or zone diameter <18mm), cephalosporins, daptomycin, quinupristin-dalfopristin, fluoroquinolones or tigecycline to the [AMRHAI](#) Reference Unit for confirmation. In addition, any streptococci (pyogenic or non-pyogenic) with suspected resistance to vancomycin, teicoplanin, telavancin, dalbavancin, linezolid or tedizolid resistance should be [referred for further investigation](#).

UK public health [guidance on the management of close contacts of iGAS cases in community settings](#) was updated in December 2022, expanding the public health action to include patients with probable invasive GAS infection, with additional close contact groups being recommended for antibiotic prophylaxis. Additional guidelines for the [prevention and control of GAS transmission in acute healthcare and maternity settings](#) in the UK are also available ([5](#)).

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