UK Health Security Agency

Laboratory surveillance of pyogenic and non-pyogenic streptococcal bacteraemia in England: 2022 update

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Contents

Introduction

The analyses in this report are based on data relating to diagnoses of pyogenic and non-pyogenic streptococcal bloodstream infections between 2013 and 2022 in England. Data for England was extracted from the UK Health Security Agency's Second Generation Surveillance System (SGSS), a voluntary surveillance database, on 20 September 2023. In England, laboratories are requested to submit data individually 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 (AMRHAI) Reference Unit, Colindale – were merged with laboratory reports.

Beta-haemolytic pyogenic 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).

Non-pyogenic 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.

The report includes analyses on the trends, age and sex distribution, geographical distribution, socio-economic deprivation (through English indices of multiple deprivation (IMD) quintile) 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 or IMD quintile (population total for the lower super output areas in each IMD quintile). Rates of GBS bacteraemia in infants were calculated using 2022 live birth denominators.

Geographical analyses were based on cases in England being assigned to one of 9 regions formed from administrative local authority boundaries.

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 that in previous publications due to the inclusion of late reports.

Main points

Between 2018 and 2022 there was a 2% decrease in the number of laboratory reports of streptococcal bacteraemia (from 17,575 to 17,162 reports) in England, although a 16% increase was seen between 2021 (14,849 reports) and 2022 (17,162).

Declines in incidence rates were noted during the COVID-19 pandemic (2020 and 2021) for GAS, GBS, mitis group streptococci and sanguinis group streptococci bacteraemia, however in 2022 incidence reverted to pre-pandemic levels for each.

Resistance to tetracycline in GAS bacteraemia decreased between 2021 and 2022, from 41% to 23%.

In 2022, 2,043 cases of GBS bacteraemia were reported by laboratories in England, a 11% decrease since 2018 (2,289).

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 increase in GAS incidence in children was noted in 2022.

The overall rate for England of GBS disease in infants less than 90 days old decreased from 0.75 to 0.63 per 1,000 live births between 2021 and 2022; both late (0.25 to 0.24 per 1,000 live births) and early onset infant disease (0.51 to 0.39 per 1,000 live births) fell between 2020 and 2022.

Resistance to clindamycin and erythromycin in GBS bacteraemia increased between 2018 and 2022, from 29% to 34% for clindamycin and 33% to 40% for erythromycin.

This is the first year where socio-economic deprivation rates per 100,000 population are included within the report. In 2022, pyogenic streptococcal groups showed a gradient of higher rates in the most deprived quintile to lower rates in the least deprived, with GGS bacteraemia showing the least variation by deprivation quintile.

The number of non-pyogenic streptococcal bacteraemia reports increased by 5% between 2021 and 2022, from 9,257 to 9,711 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 saw the biggest increases between 2021 and 2022 from 3.6 to 4.4 per 100,000 and 2.5 to 3.0 per 100,000 respectively.

Resistance to penicillin was reported for 9% of mitis group isolates (a slight decrease from 11% in 2017), 9% of salivarius group isolates (a decrease from 17% in 2017), and 18% of sanguinis group isolates (a decrease from 21% in 2017).

All sterile site pyogenic streptococcal isolates should be referred to UKHSA *Staphylococcus* and *Streptococcus* Reference Service (SSRS) and any with suspected resistance to penicillin, cephalosporins, glycopeptides, lipoglycopeptides, lipopeptides, oxazolidinones, tigecycline, fluoroquinolones or quinupristin-dalfopristin referred to the UKHSA AMRHAI Reference Unit for confirmation.

Trends in England

Overall, there was a 2% decrease in the number of laboratory reports of pyogenic and non-pyogenic streptococcal bacteraemia (from 17,575 to 17,162 reports; Table 1) in England between 2018 and 2022. A decline in streptococcal bacteraemia was noted between 2019 and 2020 (17,907 to 15,230 a 15% decrease), this decline continued into 2021 before increasing in 2022 (Table 1). The reported reductions in 2020 and 2021 are likely to be due, at least in part, to the COVID-19 pandemic, which resulted in reduced contact between individuals, decreased planned healthcare visits 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 2022, 90% (15,386 out of 17,162) of *Streptococcus* spp. isolates from blood (excluding *Streptococcus pneumoniae*) were reported to species level. Of those identified to species level in 2022, 48% (7,451 out of 15,386) were pyogenic streptococci (groups A, B, C and G), which is higher compared to 2021 (43%; 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 2011 and 2022. 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 2022 were seen in GAS bacteraemia (Figure 1a) and for the species of the Mitis and Sanguinis group bacteraemia (Figure 1b), returning to levels seen prior to the COVID-19 pandemic.

Table 1. Reports of pyogenic and non-pyogenic streptococcal bacteraemia by species in England, 2018 to 2022

Species	2018 Number	2018 %	2019 Number	2019 %	2020 Number	2020 %	2021 Number	2021 %	2022 Number	2022 %
Pyogenic streptococci	**7,806**	100	**7,538**	100	**6,331**	100	**5,592**	100	**7,451**	100
Group A	2,674	34	2,151	29	1,333	21	732	13	2,528	34
Group B	2,289	29	2,282	30	2,190	35	2,050	37	2,043	27
Group C	1,526	20	1,695	22	1,492	24	1,563	28	1,643	22
Group G	1,317	17	1,410	19	1,316	21	1,247	22	1,237	17
Non-pyogenic streptococci	**9,769**	100	**10,369**	100	**8,899**	100	**9,257**	100	**9,711**	100
anginosus group	**1,492**	**15**	**1,645**	**16**	**1,664**	**19**	**1,749**	**19**	**1,593**	**16**
S. anginosus	708	7	853	8	817	9	849	9	801	8
S. constellatus	438	4	397	4	478	5	491	5	422	4
S. intermedius	192	2	226	2	217	2	253	3	235	2
S. milleri	145	1	160	2	145	2	145	2	126	1
Streptococcus group F	9	<1	9	<1	7	<1	11	<1	9	<1
bovis group	**795**	**8**	**889**	**9**	**849**	**10**	**824**	**9**	**820**	**8**
S. alactolyticus	64	<1	64	<1	49	<1	35	<1	5	<1
S. bovis biotype II	180	2	216	2	195	2	202	2	202	2

Species	2018 Number	2018 %	2019 Number	2019 %	2020 Number	2020 %	2021 Number	2021 %	2022 Number	2022 %
S. bovis untyped	309	3	355	3	296	3	288	3	306	3
S. equinus	21	<1	23	<1	20	<1	16	<1	24	<1
S. gallolyticus	38	<1	53	<1	45	<1	30	<1	39	<1
S. infantarius	49	<1	41	<1	60	<1	62	<1	88	<1
S. lutetiensis	114	1	121	1	156	2	160	2	123	1
S. pasteurianus	20	<1	16	<1	28	<1	31	<1	33	<1
mitis group	**2,277**	**23**	**2,585**	**25**	**2,066**	**23**	**2,058**	**22**	**2,475**	**25**
S. mitis	1,294	13	1,398	13	1,055	12	1,019	11	1,261	13
S. oralis	920	9	1,108	11	945	11	971	10	1,105	11
S. cristatus	39	<1	47	<1	35	<1	45	<1	70	<1
mutans group	**116**	**1**	**119**	**1**	**116**	**1**	**139**	**2**	**137**	**1**
S. mutans	115	1	118	1	114	1	133	1	133	1
S. sobrinus	1	<1	1	<1	2	<1	6	<1	4	<1
salivarius group¥	**949**	**10**	**969**	**9**	**803**	**9**	**974**	**11**	**1,011**	**10**
S. salivarius	741	8	723	7	623	7	717	8	751	8
S. vestibularis	208	2	246	2	180	2	257	3	260	3
sanguinis groupα	1,580	16	1,660	16	1,309	15	1,431	15	1,678	17
S. gordonii	235	2	248	2	206	2	256	2	274	3

Species	2018 Number	2018 %	2019 Number	2019 %	2020 Number	2020 %	2021 Number	2021 %	2022 Number	2022 %
S. parasanguinis	818	8	881	8	678	8	746	8	899	9
S. sanguinis	517	5	522	5	415	5	415	4	491	5
Other streptococci	**2,560**	**26**	**2,502**	**24**	**2,092**	**24**	**2,082**	**22**	**1,997**	**21**
Anaerobic *Streptococcus*	27	<1	18	<1	27	<1	18	<1	30	<1
S. acidominus	1	<1	2	<1	0	0	1	<1	0	0
S. suis	2	<1	2	<1	2	<1	4	<1	4	<1
S. uberis	3	<1	1	<1	1	<1	1	<1	1	<1
Streptococcus not fully identified	2,300	24	2,244	22	1,901	21	1,880	20	1,776	18
Streptococcus spp. other named‡	227	2	235	2	161	2	178	2	186	2
Total streptococci	**17,575**		**17,907**		**15,230**		**14,849**		**17,162**	
Genera closely related to streptococci†	**587**	100	**625**	100	**589**	100	**673**	100	**716**	100
Abiotrophia spp.	33	6	64	10	45	8	48	7	66	9
Aerococcus spp.	307	52	319	51	311	53	378	56	411	57
Gemella spp.	142	24	137	22	138	23	153	23	141	20
Globicatella spp.	23	4	24	4	15	3	14	2	17	2

Species	2018 Number	2018 %	2019 Number	2019 %	2020 Number	2020 %	2021 Number	2021 %	2022 Number	2022 %
Leuconostoc spp.	47	8	39	6	40	7	38	6	38	5
Pediococcus spp.	7	1	7	1	11	2	7	1	13	2
Peptostreptococcus spp.	28	6	35	6	28	5	34	5	30	4

Note: 'Total streptococci' exclude *S. pneumoniae*

¥ total includes those recorded as '*S. hyointestinalis'* without further information

[α] total includes those recorded as '*S. massiliensis*' without further information

‡ including: *Streptococcus thermophilus*, *Streptococcus infantis*, *Streptococcus pluranimalium*, *Streptococcus ovis*, *Streptococcus peroris*, *Streptococcus sobrinus*, *Streptococcus australis*, *Streptococcus pseudoporcinus*, *Streptococcus thoraltensis*, *Streptococcus peroris*, *Streptococcus porcinus*

[†] 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, 2013 to 2022

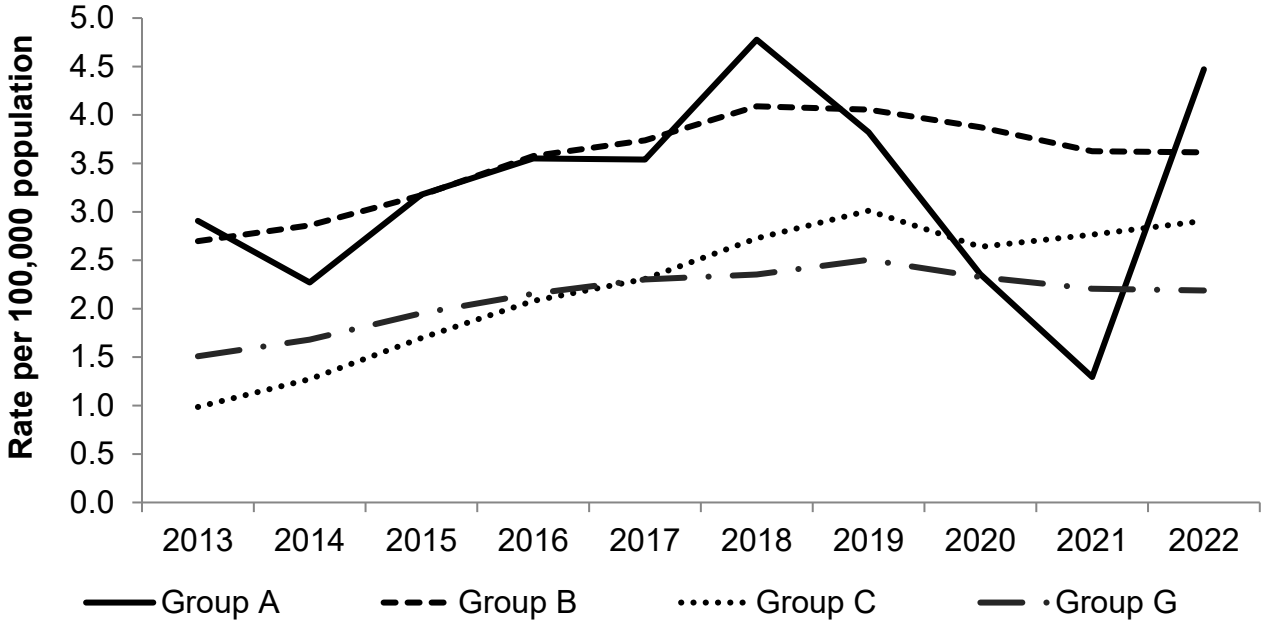
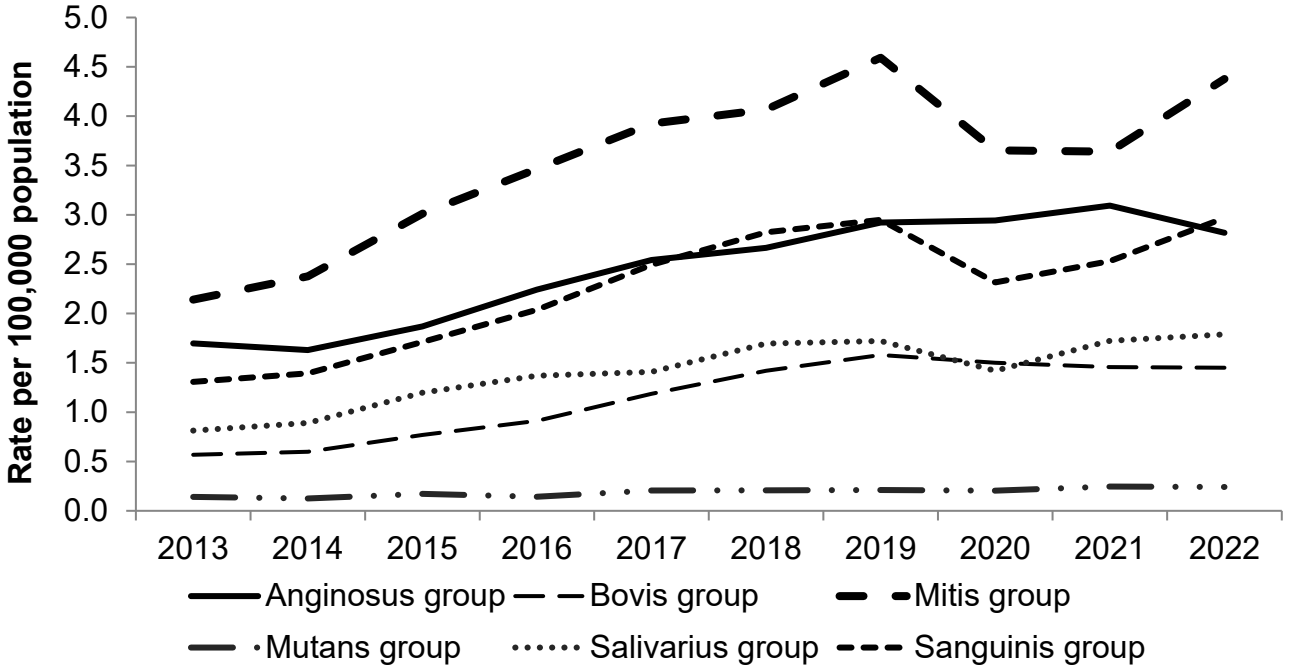


Figure 1b. Trends in non-pyogenic streptococcal bacteraemia reports, by group, per 100,000 population in England, 2013 to 2022



Pyogenic streptococci

Table 2 shows the regional rates of the pyogenic streptococcal bacteraemia by group in 2022.

Table 2. Rate per 100,000 population of pyogenic streptococcal bacteraemia reports by region in England, 2022

Region		Rate per 100,000 population			
		Group A	Group B	Group C	Group G
North of England	North East	5.7	3.7	4.4	1.1
	North West	4.9	3.7	1.9	2.7
	Yorkshire and Humber	6.3	3.1	4.1	3.3
Midlands and East of England	East Midlands	4.1	3.7	3.8	2.3
	East of England	3.9	3.3	3.0	2.4
	West Midlands	4.4	4.2	3.8	2.6
London	London	3.4	4.1	1.3	1.0
South of England	South East	4.3	3.3	3.1	1.8
	South West	4.7	3.6	2.8	2.7
England		**4.5**	**3.6**	**2.9**	**2.2**

Table 3 shows the rates per 100,000 of cases of pyogenic group streptococci, by Index of Multiple Deprivation (IMD; socio-economic deprivation indicator derived from seven 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.

Table 3. Rate per 100,000 population pyogenic group streptococci by IMD quintile, England, 2022

IMD Quintile	Rate per 100,000 population			
	Group A	Group B	Group C	Group G
1 (most deprived)	5.8	4.4	3.2	2.5
2	4.3	4.1	3.0	2.0
3	4.6	3.4	2.6	2.1
4	3.9	3.2	3.0	2.1
5 (least deprived)	3.7	2.9	2.7	2.2

Table 4 shows the number of reports for each pyogenic group streptococcal bacteraemia that are tested and the proportion that are resistant to key antibiotics (clindamycin, erythromycin and tetracycline) in England between 2018 and 2022.

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

Table 4. Antimicrobial susceptibility for pyogenic streptococci causing bacteraemia in England, 2018 to 2022

Antimicrobial agent		2018		2019		2020		2021		2022	
		Number tested	R (%)	Number tested	R (%)	Number tested	R (%)	Number tested	R (%)	Number tested	R (%)
Group A	clindamycin	1,605	6	1,344	9	873	9	489	11	1,645	7
	erythromycin	1,779	7	1,364	10	810	10	453	14	1,586	8
	tetracycline	2,009	15	1,660	24	995	24	560	41	1,877	23
Group B	clindamycin	1,773	29	1,780	30	1,547	31	1,548	33	1,521	34
	erythromycin	1,835	33	1,825	34	1,646	36	1,606	38	1,578	40
	tetracycline	2,105	83	2,125	84	1,943	84	1,892	83	1,827	84
Group C	clindamycin	1,181	23	1,305	26	1,166	25	1,288	28	1,283	26
	erythromycin	1,245	29	1,309	32	1,107	30	1,201	32	1,169	31
	tetracycline	1,459	31	1,554	32	1,341	31	1,474	33	1,458	32
Group G	clindamycin	1,060	37	1,127	35	1,017	43	993	38	975	40
	erythromycin	1,086	41	1,115	39	954	44	914	44	909	42
	tetracycline	1,320	41	1,397	41	1,191	44	1,176	43	1,136	41

Note: In this table R = resistant.

Group A streptococci

Of the pyogenic streptococci causing bacteraemia in England in 2022, group A streptococci (GAS) accounted for 34% (2,528 out of 7,451) of reports (Table 1).

In comparison with other causes of bacteraemia, GAS were ranked 11th among monomicrobial and 20th among polymicrobial bacteraemia 2021 summary tables (published in the ESPAUR report 2022 to 2023), up from 21st and 45th in 2020, respectively. An increasing trend in the rate of GAS bacteraemia was seen between 2013 (2.9 per 100,000 population) and 2018 (4.8 per 100,000) after which cases declined from 2019 to a minimum observed rate in 2021 (1.3 per 100,000 population). Subsequently, a sharp increase was observed in 2022, reaching 4.5 per 100,000 population (Figure 1a), a 54% increase from 2.9 per 100,000 in 2013, but lower than the last peak year in 2018 (4.8 per 100,000).

The upsurge in invasive GAS (sterile-site specimens) and scarlet fever notifications during 2022 are describe more fully within the seasonal reports.

The rate of GAS bacteraemia reports across England in 2022 ranged from 3.4 in London to 6.3 per 100,000 in Yorkshire and Humber (Table 2).

Figure 2 shows the rates of GAS bacteraemia were higher in males than females in all age groups. The highest rate was in the elderly (≥75 years) at 12.3 per 100,000 (10.4 in males and 14.8 per 100,000 in females), followed by those aged less than one year and one to 4 years at 11.6 per 100,000 and 10.9 per 100,000, respectively. GAS bacteraemia rates were higher in all age groups in 2022 compared with 2021.

Comparing the annual differences in rates, the one to 4 years age group saw a consistent decline in from 2018 to 2021 (Figure 3) with rates of 5.7 to 0.6 per 100,000 respectively in 2018 and 2021. In 2022 the rate in this age group increased to exceed that seen in 2018 (9.3 per 100,000). The 5-9 age group saw a similar decline in rate between 2018 and 2021 (2.5 to 0.4 per 100,000), and again had a greater rate of cases per 100,000 in 2022 than in 2018 (4.1 per 100,000).

In terms of older age groups, of those aged 75 years and over, the rate of GAS bacteraemia again declined from 2018 to 2021 (18.6 to 4.9 per 100,000); in this age group the rate in 2022 was not higher than in 2018 (12.3 per 100,000).

In 2022, the incidence of GAS bacteraemia by IMD quintile exhibited a pattern of decreasing incidence with an increase in 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: 5.8 per 100,000 in quintile 1 compared to 3.7 per 100,000 in quintile 5 (36% decrease).

Figure 2. Group A streptococcal bacteraemia age and sex rates per 100,000 population in England, 2022

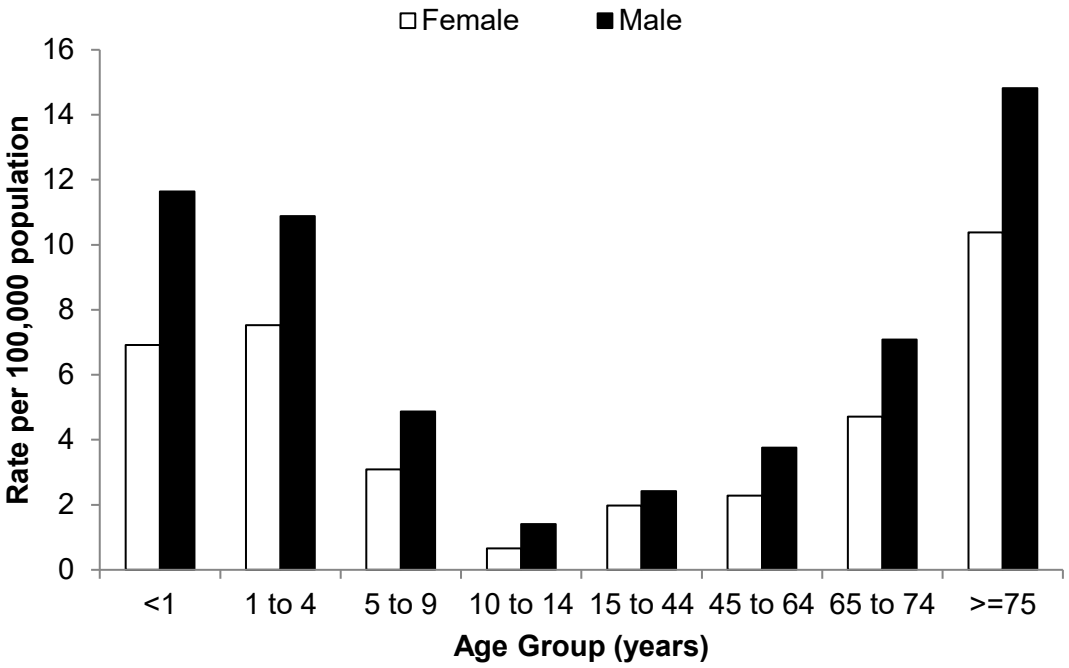
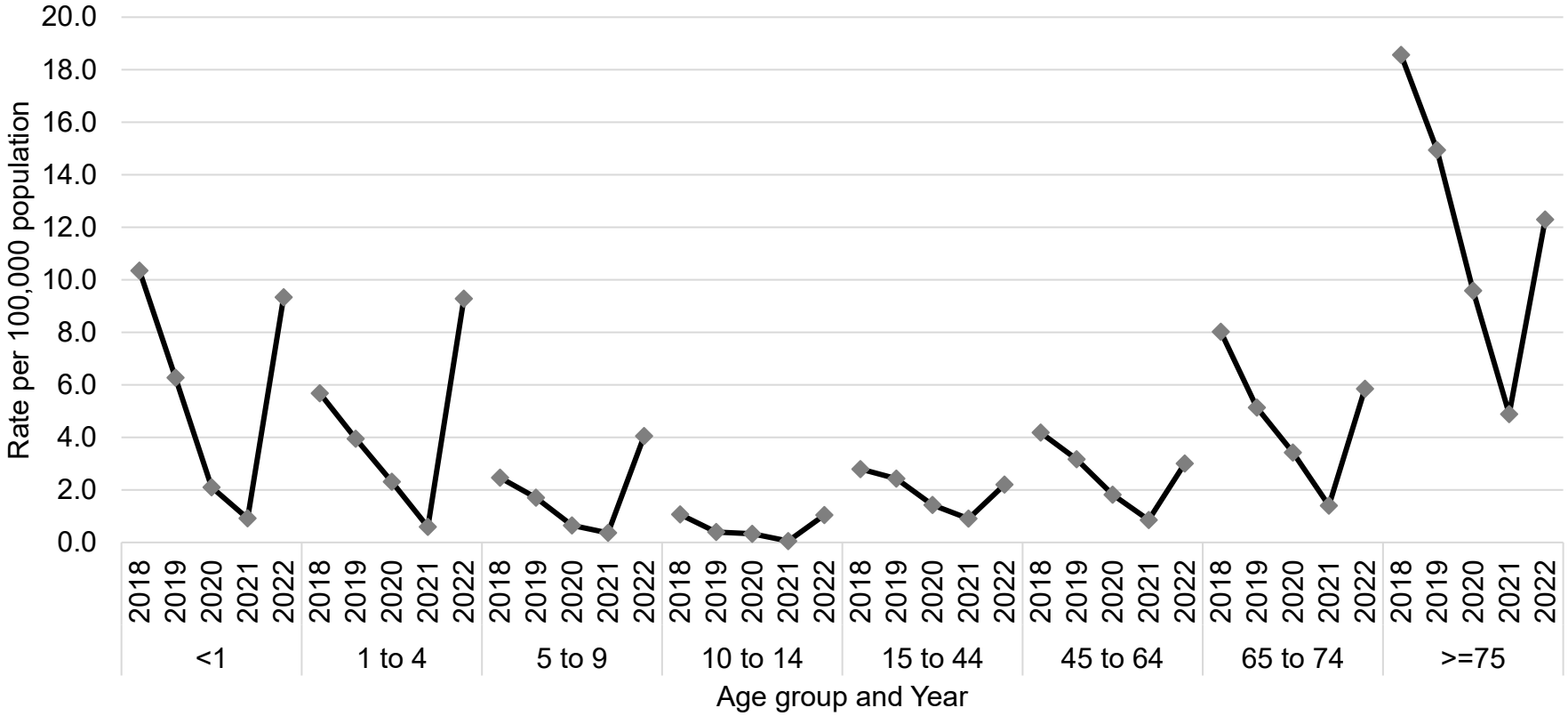


Figure 3. Group A streptococcal bacteraemia age rates per 100,000 population in England, 2018 to 2022



In England, the percentage of GAS bacteraemia reports that were accompanied by antimicrobial susceptibility data in 2022 was 65% (67% in 2021), 63% (62%) and 74% (77%) for clindamycin, erythromycin and tetracycline, respectively. In 2022, resistance to clindamycin, erythromycin and tetracycline was recorded for 7%, 8% and 23% of cases, respectively (Table 4). Resistance in 2022 to each of the 3 antibiotics was lower than reported for 2021, in particular for tetracycline. Tetracycline resistance in *S. pyogenes* has been detected in multiple but not all *emm* gene sequence types (1).

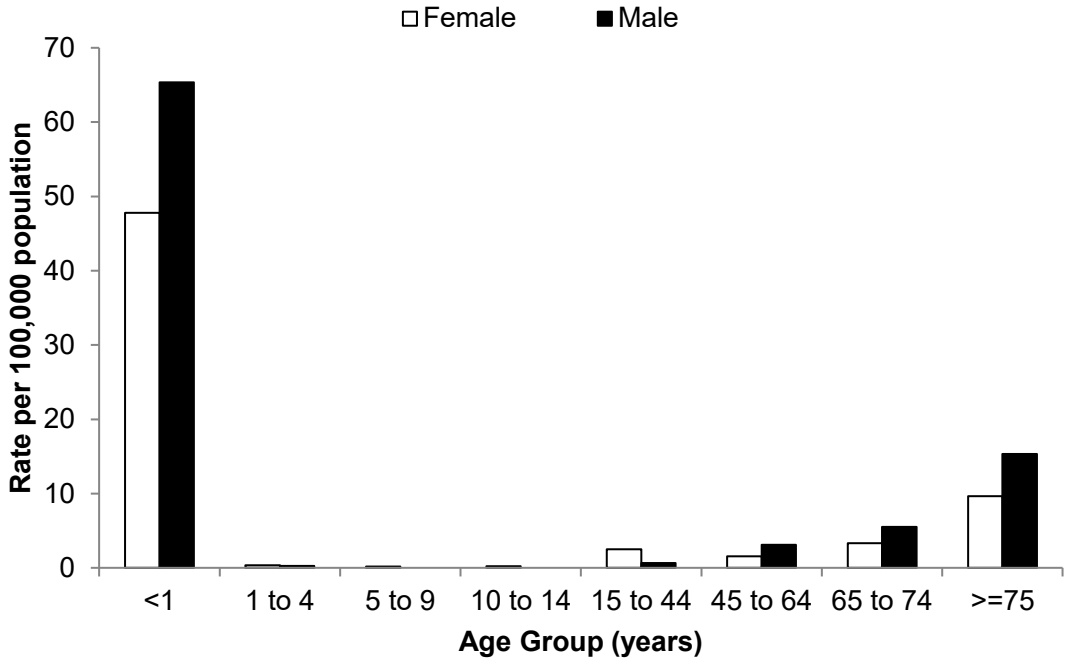
Group B streptococci

GBS is a clinically important pathogen of particular note in the extremes of age. In 2022, 2,043 cases of GBS bacteraemia were reported by laboratories in England, similar with the numbers reported in 2021, though a 11% decrease from 2018 (Table 1). GBS bacteraemia accounted for 27% of the pyogenic streptococcal bacteraemia reported in 2022, lower than seen in previous years, reflecting the increase in GAS bacteraemia in 2022 following the substantial reduction during the COVID-19 pandemic (2020 and 2021; Table 1). The rate of GBS bacteraemia in England was 3.6 per 100,000 population in 2022 (Table 2), compared with 2.7 per 100,000 in 2013 (Figure 1a). Within England, the Yorkshire and Humber region reported the lowest rate of infection (3.1 per 100,000), and West Midlands (4.2) the highest.

Figure 4 shows that in 2022 the rates of GBS bacteraemia were highest in those aged less than one year, at 57.8 per 100,000 population (47.8 in females and 65.3 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 one to 44 years, where females had higher rates of GBS bacteraemia. For the older age groups, the rates of GBS bacteraemia were:

- in those 65 to 74 years – males 5.5, females 3.3 per 100,000
- in those 75 years and over – males 15.3, females 9.7 per 100,000

Figure 4. Group B streptococcal bacteraemia age and sex rates per 100,000 population in England; 2022



In infants under 90 days old, the rate of GBS bacteraemia in England in 2022 was 0.63 per 1,000 live births (Table 5), a slight decrease compared with what was reported for 2021 (0.75 per 1,000) and 2020 (0.80 per 1,000).

In England, rates of early-onset neonatal infection (<7 days old) were higher than late-onset neonatal infection (7 to 90 days old) (0.39 compared with 0.24 per 1,000 live births). The rate of late onset disease decreased slightly from 2021 (0.25 per 1,000 live births), with a larger decline noted in the rate of early onset disease (from 0.51 per 1,000 live births). This is the third year in a row where the rates of early and late onset GBS bacteraemia have declined.

Table 5. Number and rate per 1,000 live births of group B streptococcal bacteraemia in infants 0 to 90 days old in England, 2022

Region	All cases (0-90 days old)		Early onset (0-6 days old)		Late onset (7-90 days old)	
	Number	Rate	Number	Rate	Number	Rate
England	361	0.63	225	0.39	136	0.24

Looking at IMD, rates of GBS per 100,000 population in 2022 declined with each increase in deprivation quintile (Table 3), from 4.4 per 100,000 in the most deprived quintile (20% of the population) to 2.9 per 100,000 in the least deprived quintile.

The percentage of GBS bacteraemia reports from England in 2022 accompanied by antimicrobial susceptibility test result data was 74% (76% in 2021), 77% (78%) and 89% (92%)

for clindamycin, erythromycin and tetracycline, respectively. Clindamycin and erythromycin resistance increased in GBS bacteraemia isolates between 2018 and 2022, from 29% to 34% for clindamycin and 33% to 40% for erythromycin (Table 4). Tetracycline resistance remained steady at 84% in 2022. Resistance levels were similar in infants <1 year, in 2022 33%, 43% and 88% sterile-site GBS specimens were resistant to clindamycin, erythromycin and tetracycline, respectively. These results support guidance by the Royal College of Obstetricians and Gynaecologists regarding the prevention of early-onset neonatal GBS disease, specifically that clindamycin is not recommended due to the rate of resistance (2).

GBS resistance to penicillin remains exceedingly rare with just one confirmed report from the UK in 2016. If laboratories suspect penicillin resistance in a pyogenic group *Streptococcus*, the isolate should be sent to the UKHSA AMRHAI Reference Unit for confirmation.

Group C and G streptococci

The number of cases of group C streptococcal (GCS) bacteraemia increased by 8% between 2018 and 2022 in England, accounting for 22% of the reported pyogenic streptococcal bacteraemia in 2022 (Table 1). The rate of GCS bacteraemia in England was 2.9 per 100,000 population in 2022, an increase of 195% compared with the rate observed in 2013 (1.0 per 100,000) (Figure 1a). The number of cases of Group G streptococcal (GGS) bacteraemia reported in England was 1,237, similar to the number reported in 2021, however a decline from 1,410 reported in 2019 (Table 1). The rate increased by 45% since 2013 (Figure 1a), from 1.5 to 2.2 per 100,000 population in 2022 (Table 2).

Within England, GCS bacteraemia rates varied considerably by region in 2022, from 1.3 per 100,000 in London to 4.4 in the North East (Table 2). Rates of GGS bacteraemia also varied substantially in 2022, ranging from 1.0 in the London region to 3.3 per 100,000 in the Yorkshire and Humber region.

Rates of GCS and GGS bacteraemia were highest in the 75 years and over age group for both species in 2022, 18.5 and 13.8 per 100,000, respectively (Figures 5 and 6). Rates were higher in males than females in all age groups, with the exception of less than 1 year-olds with GCS bacteraemia.

In contrast to GAS and GBS, no obvious pattern in incidence by deprivation quintile was noted for GCS and GGS (Table 3), although population rates are lower amongst the least deprived quintile compared with the most deprived. For GCS, the rate is the same in quintiles 2 and 4 (3.0 per 100,000), and similar for quintiles 3 and 5 (2.6 and 2.7 per 100,000 respectively). For GGS, rates are lower in all other quintiles than in the most deprived quintile (2.5 per 100,000) (Table 3).

Antimicrobial susceptibility data was available for 78%, 71% and 89% of GCS bacteraemia isolates in 2022 for clindamycin, erythromycin and tetracycline, respectively, compared with 76%, 78% and 92% in 2021. For GGS bacteraemia, susceptibility data for clindamycin, erythromycin and tetracycline was reported for 79%, 73% and 92% of isolates, respectively, compared with 80%, 73% and 94% in 2021. In 2022, the percentage of GCS bacteraemia isolates resistant to clindamycin, erythromycin and tetracycline were 26%, 31% and 32%, respectively (Table 4). The percentage of resistant isolates was higher in GGS bacteraemia isolates, with 40%, 42% and 41% resistant to clindamycin, erythromycin and tetracycline, respectively. Resistance to clindamycin has increased since 2018 for GCS (from 23%) and GGS (from 37%).

Figure 5. Group C streptococcal bacteraemia age and sex rates per 100,000 population in England, 2022

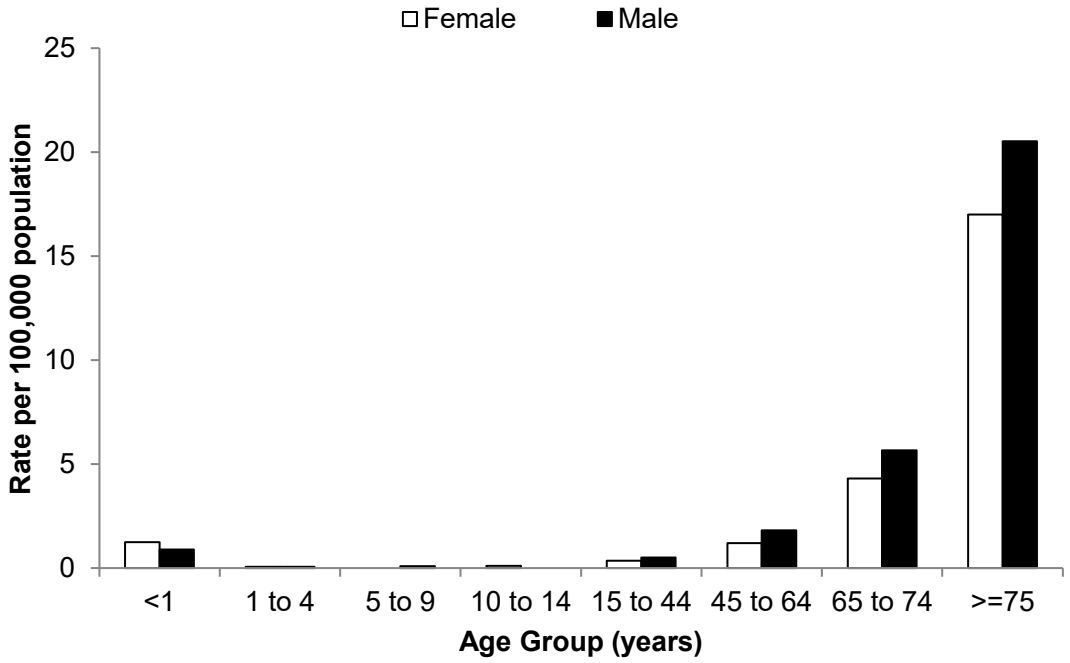
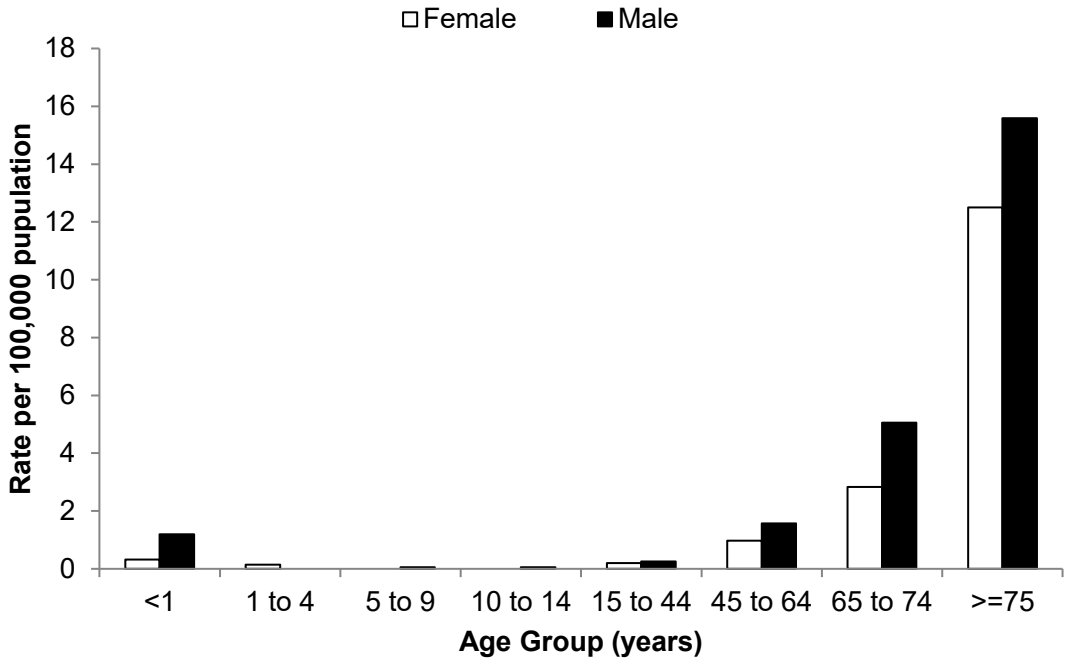


Figure 6. Group G streptococcal bacteraemia age and sex rates per 100,000 population in England; 2022



Non-pyogenic streptococci

Further to the increases in the number of cases of non-pyogenic streptococcal bacteraemia cases reported in England between 2018 and 2019 (from 9,769 to 10,369 reports; Table 1), numbers have declined back to 2018 levels with 9,711 reports in 2022. Rates of bacteraemia showed an overall increase across all non-pyogenic streptococcal groups in England between 2013 and 2022 (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; Table 6), and lowest rates for mutans group (0.2 per 100,000).

Among all non-pyogenic streptococcal bacteraemia reported in 2022 in England, the mitis group accounted for the largest percentage of reports accounting for 2,475 of the 9,711 reports (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 reference laboratory. 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*, *S. acidominimus* and *S. uberis*, among 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 has detected *Streptococcus dysgalactiae* subspecies *equisimillis* (SDSE) with the ‘A’ surface antigen. 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 reference laboratory provides an opportunity to correct any misidentification of species.

Table 6 shows that the incidence rates for each of the non-pyogenic groups varied within England. Rates of mitis group streptococci bacteraemia ranged from 3.6 per 100,000 in the London region to 5.4 per 100,000 in the West Midlands regions. Anginosus group streptococcal bacteraemia rates ranged from 2.1 in the London region to 3.5 per 100,000 in the East Midlands region.

Table 6. Rate per 100,000 population of non-pyogenic streptococcal bacteraemia reports by Region in England, 2022

Region		Rate per 100,000 population					
		anginosus group	bovis group	mitis group	mutans group	salivarius group	sanguinis group
North of England	North East	2.8	1.4	4.5	0.4	2.6	3.3
	North West	3.1	1.8	4.7	0.2	1.7	2.9
	Yorkshire and Humber	3.2	1.2	4.5	0.1	1.9	3.2
Midlands and East of England	East Midlands	3.5	1.4	3.7	0.3	1.3	2.7
	East of England	2.3	1.1	3.7	0.2	1.5	2.4
	West Midlands	2.7	2.0	5.4	0.3	2.2	3.7
London	London	2.1	1.0	3.6	0.3	1.6	2.4
South of England	South East	2.9	1.4	4.9	0.1	1.8	3.2
	South West	3.2	1.9	4.4	0.4	2.2	3.3
England		**2.8**	**1.5**	**4.4**	**0.2**	**1.8**	**3.0**

Distributions of non-pyogenic streptococcal bacteraemia reports by age and sex showed 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 (9.6 and 9.3 per 100,000 population, respectively). In contrast, rates were highest in those aged under 1 year old for mitis (34.6 per 100,000, Figure 9), salivarius (21.0 per 100,000, Figure 10) and sanguinis (15.3 per 100,000, Figure 11) streptococcal groups.

Figure 7. Anginosus group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2022

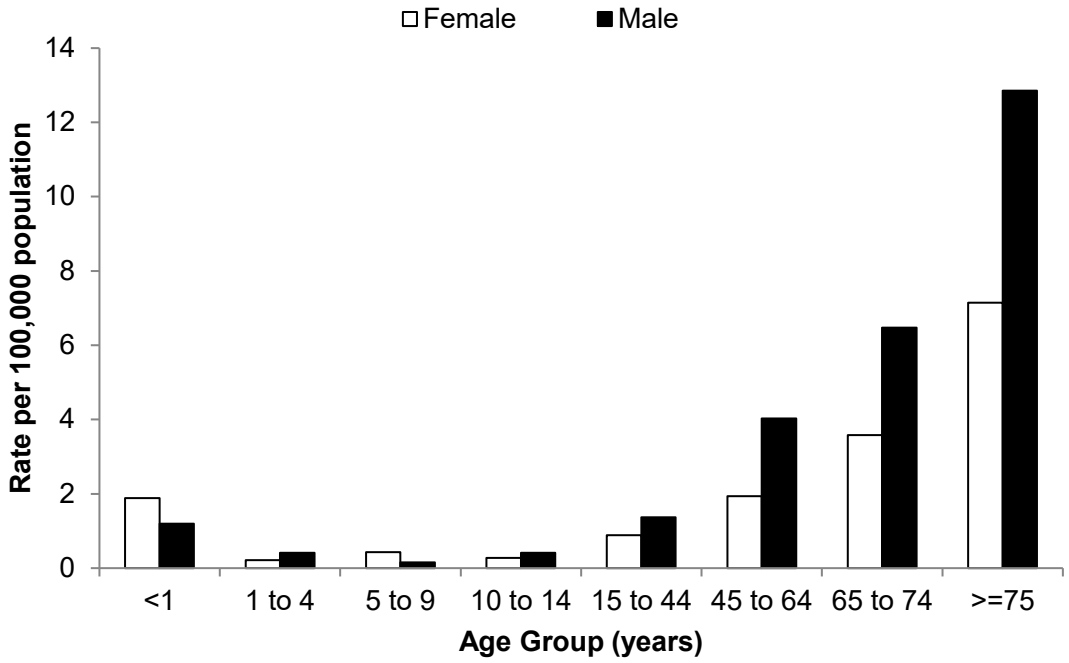


Figure 8. Bovis group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2022

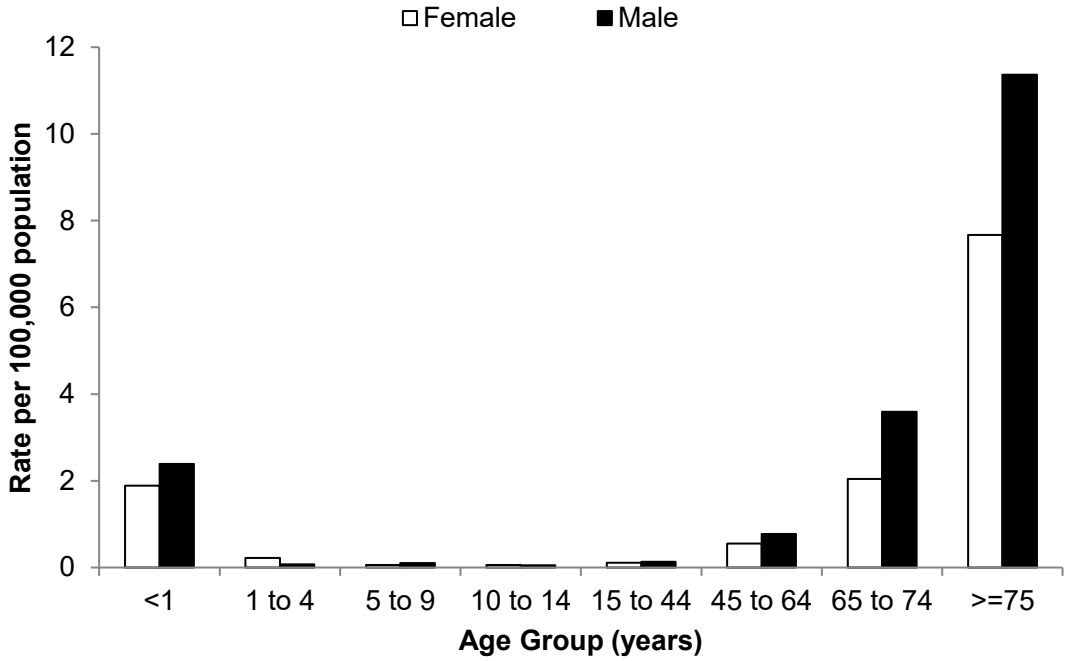


Figure 9. Mitis group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2022

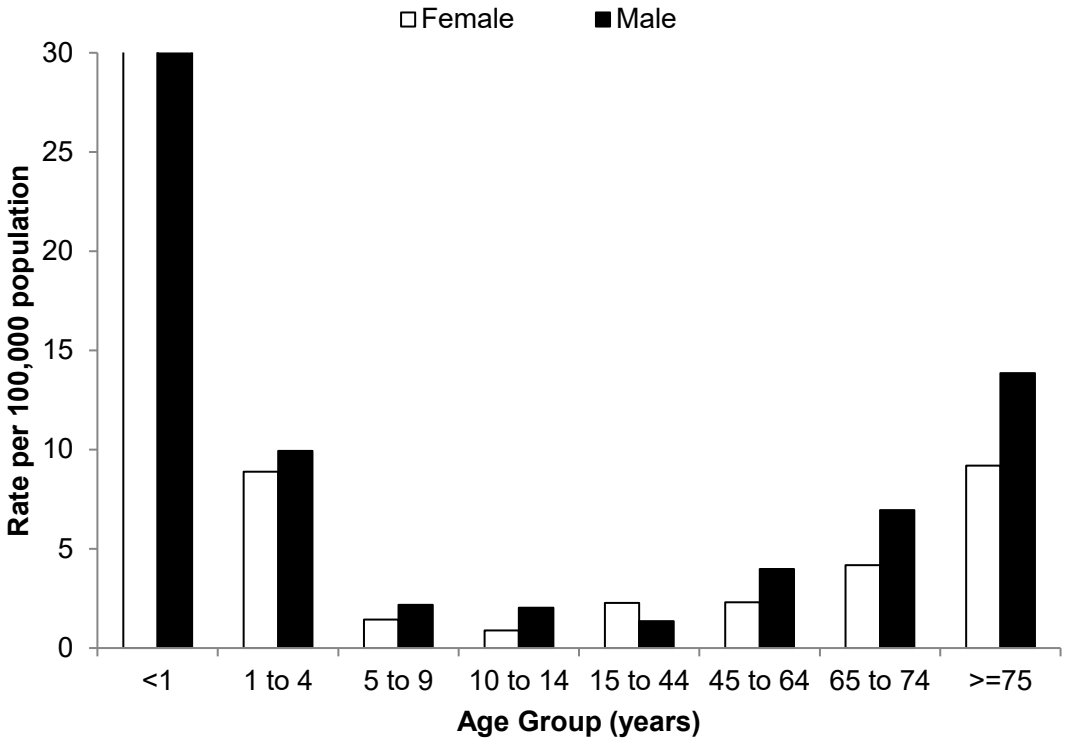


Figure 10. Salivarius group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2022

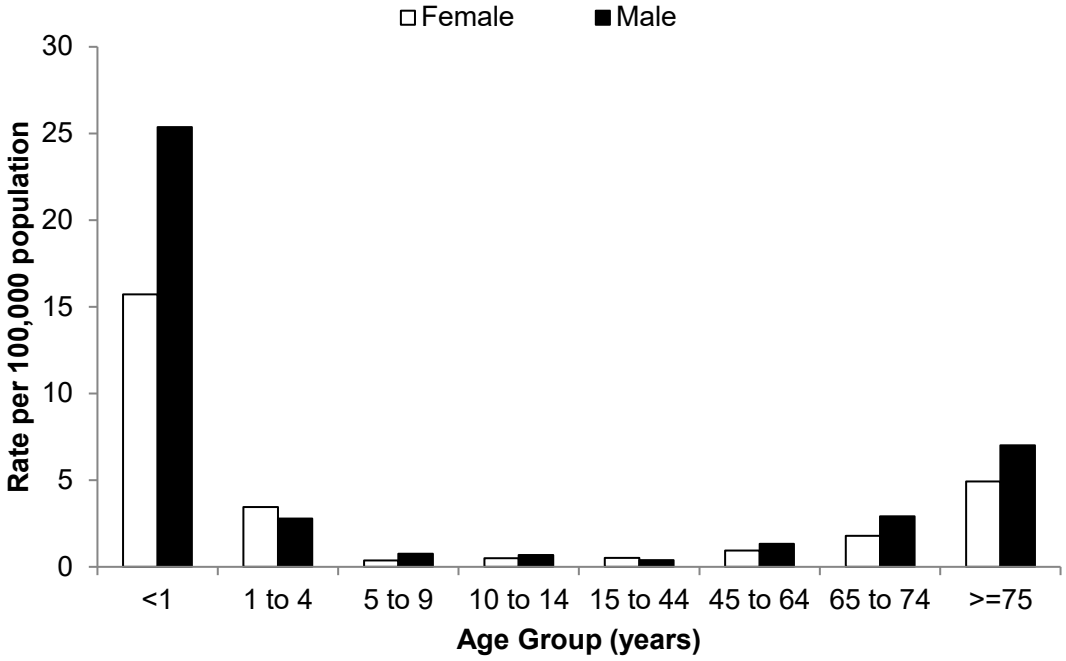


Figure 11. Sanguinis group streptococcal bacteraemia age and sex rates per 100,000 population in England, 2022

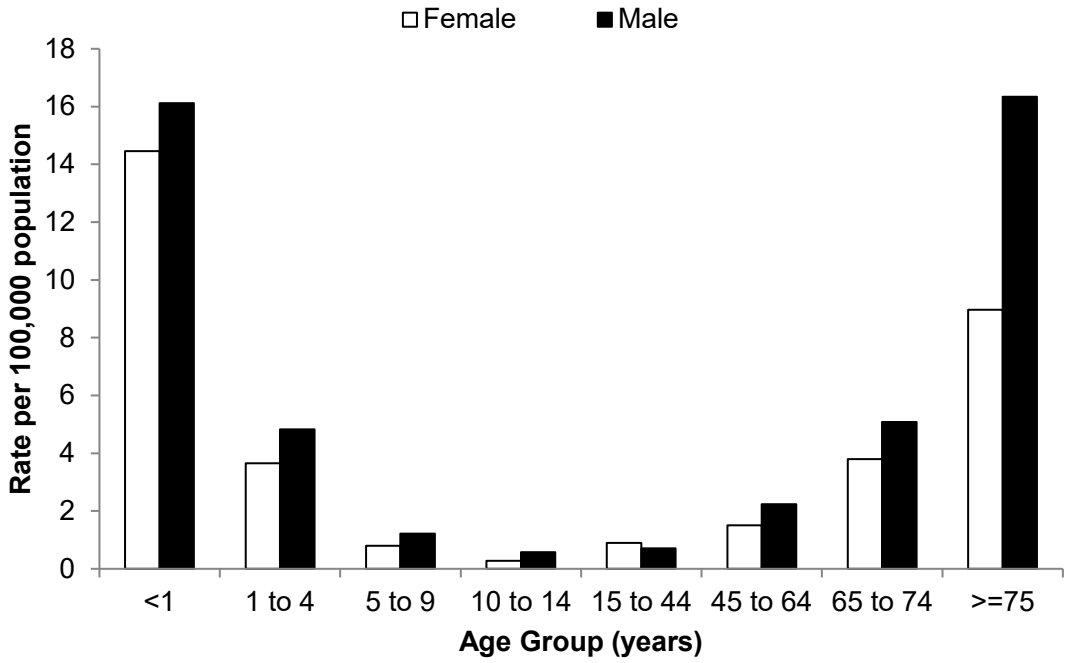


Table 7 shows the rates per 100,000 of cases of non-pyogenic group streptococci, by IMD. Comparing quintile 5 (the least deprived) with quintile 1 (the most deprived), all non-pyogenic groups have lower rates in quintile 5 than in quintile 1, with the exception of the mutans and bovis groups where rates of infection remain similar across all deprivation quintiles (Table 7).

Table 7. Rate per 100,000 population non-pyogenic group streptococci by IMD quintile, England, 2022

IMD quintile	Rate per 100,000 population					
	anginosus group	bovis group	mitis group	mutans group	salivarius group	sanguinis group
1 (most deprived)	3.5	1.4	5.0	0.2	2.3	3.5
2	2.8	1.7	4.5	0.2	1.8	2.9
3	2.7	1.4	4.6	0.3	1.7	2.8
4	2.3	1.4	3.8	0.2	1.7	2.9
5 (least deprived)	2.8	1.3	3.9	0.2	1.5	2.7

Table 8 shows the number of reports for each non-pyogenic streptococcal group bacteraemia that were tested and the percentage resistant to key antibiotics (penicillin, erythromycin and tetracycline) in England between 2018 and 2022.

Erythromycin susceptibility data was available for 26 to 32% of anginosus, bovis, mitis, salivarius and sanguinis bacteraemia isolates from England; for tetracycline, data availability was 26 to 33% and for penicillin, 91 to 94% in 2022. Resistance to penicillin was reported for 9% of mitis isolates (a decrease from 11% in 2018), 9% of salivarius isolates (a decrease from 17% in 2018), and 18% of sanguinis isolates (a reduction from 21% in 2018) (Table 8). The percentage of isolates reported as resistant to erythromycin increased between 2018 and 2022 for salivarius group, from 39% to 43%, and anginous group, from 12% to 16%.

Table 8. Antimicrobial susceptibility for non-pyogenic streptococci causing bacteraemia in England, 2018 to 2022

Species	Antimicrobial agent	2018		2019		2020		2021		2022	
		Number tested	R (%)	Number tested	R (%)	Number tested	R (%)	Number tested	R (%)	Number tested	R (%)
Anginosus	erythromycin	758	12	771	12	588	12	654	12	494	16
	tetracycline	799	21	763	22	624	20	646	18	514	21
	penicillin	1,497	<1	1,614	<1	1,498	<1	1,644	<1	1,472	<1
Bovis	erythromycin	411	33	348	34	348	30	298	34	265	32
	tetracycline	418	72	386	68	370	70	294	69	254	61
	penicillin	716	1	810	<1	771	<1	762	<1	764	0
Mitis	erythromycin	1,046	52	899	43	621	43	635	42	619	47
	tetracycline	973	26	949	25	673	25	618	23	623	25
	penicillin	2264	11	2,448	9	1,928	9	1,953	9	2,206	9
Salivarius	erythromycin	457	39	374	42	277	42	338	41	264	43
	tetracycline	410	16	386	17	288	13	326	10	256	18
	penicillin	865	17	867	15	677	12	884	9	838	9
Sanguinis	erythromycin	720	45	628	49	428	45	438	45	427	47
	tetracycline	730	33	664	32	483	32	483	30	447	32
	penicillin	1536	21	1,553	21	1,180	21	1,320	20	1,514	18

Note: In this table R = resistant

Reference microbiology service

In 2022, the percentage of reports of streptococcal bacteraemia in which the organism was not fully identified was 10%. Precise species identification of isolates would improve the monitoring of trends in non-pyogenic streptococci and related genera. The UKHSA Staphylococcus and Streptococcus Reference Service 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 and transmission events. All such isolates should be submitted to the AMRHAI Reference Unit along with all GAS, GBS, GCS and GGS isolates from normally sterile sites (4,5).

Laboratories are also requested to send any pyogenic streptococcal isolates exhibiting a resistance to penicillin, 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 (6) are also available.

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References

1. Sanson M and others. ‘Unexpected relationships between frequency of antimicrobial resistance, disease phenotype and emm type in group A Streptococcus’ Microbial Genomics 2019: volume 5, number 11
2. Royal College of Obstetricians and Gynaecologists. Group B Streptococcal Disease, Early-onset (Green-top Guideline No. 36) 2017
3. McGuire E. ‘Antimicrobial resistance in Group B Streptococcus’ Group B Strep in pregnancy and babies conference 2022
4. Staphylococcus and streptococcus reference service: single isolate
5. Staphylococcus and streptococcus reference service: multiple isolates
6. Steer JA, Lamagni TL, Healy B, Morgan M, Dryden M, Rao B and others. Guidelines for prevention and control of group A streptococcal infection in acute healthcare and maternity settings in the UK Journal of Infections 2011: volume 64, number 1

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