
Infection reports

Pyogenic and non-pyogenic streptococcal bacteraemia, England, Wales and Northern Ireland: 2011

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Introduction

These data are based on records extracted from the voluntary routine surveillance database (LabBase2) on the 24th September 2012 for the period 2007-2011. The exception to this is group A streptococcal (GAS) infection for which data on isolates submitted to the Streptococcus and Diphtheria Reference Unit (SDRU) are merged with routine laboratory reports. From October 2010, microbiological diagnoses of invasive GAS infection must be notified by law [1]. This facilitates local health protection units in undertaking public health action as outlined in national guidance. Statutory notifications were not analysed in this report.

Population rates for 2011 were calculated using 2011 mid year resident population estimates based on the 2011 census for England, Wales and Northern Ireland. Rates of group B streptococcal (GBS) bacteraemia in infants were calculated using 2011 live birth denominators. Regional analyses were made according to the Government Office Regions introduced in April 2002.

The data presented here differ in some instances from data in earlier publications due to the addition of late reports to the database and due to the refinement of the automated de-duplication process for the merged GAS reports.

Group A streptococci

Data from laboratory reports and isolate referrals showed a 13% decrease in the number of reports of GAS bacteraemia in 2010 compared with 2011, where numbers fell from 1574 to 1364 respectively (Table 1).

Table 1 Number of laboratory reports of streptococcal bacteraemia, England, Wales and Northern Ireland, 2007-2011

	2007	2008	2009	2010	2011
Pyogenic streptococci	3873	4181	4479	4579	4387
Group A streptococci	1328	1375	1694	1574	1364
Group B streptococci	1401	1550	1571	1609	1647
Group C streptococci	320	390	378	474	450
Group G Streptococci	824	866	836	922	926
Non-pyogenic streptococci	3083	3232	3182	3185	3295
Anginosus group	771	842	842	827	903
<i>Streptococcus anginosus</i>	222	261	276	305	328
<i>Streptococcus constellatus</i>	201	198	224	201	230
<i>Streptococcus intermedius</i>	93	89	83	86	97
" <i>Streptococcus milleri</i> group"	219	246	197	205	207
<i>Streptococcus</i> group F	36	48	62	30	41
Bovis group	264	290	288	285	306
<i>Streptococcus bovis</i> (untyped)	217	223	223	223	221
<i>Streptococcus bovis</i> biotype I	20	24	34	18	20
<i>Streptococcus bovis</i> biotype II	14	27	17	25	48
<i>Streptococcus equinus</i>	8	10	9	8	11
<i>Streptococcus alactolyticus</i>	5	6	5	11	6
Mitis group	1260	1196	1191	1162	1044
<i>Streptococcus mitis</i>	125	138	129	100	58
<i>Streptococcus oralis</i>	409	358	353	357	347
" <i>Streptococcus mitis</i> group"	726	700	709	705	639
Mutans group	53	58	64	61	73
<i>Streptococcus mutans</i>	53	56	62	58	71
<i>Streptococcus sobrinus</i>	0	2	2	3	2
Salivarius group	334	333	323	337	389
<i>Streptococcus salivarius</i>	302	300	294	314	357
<i>Streptococcus vestibularis</i>	32	33	29	23	32
Sanguinis group	401	513	474	513	580
<i>Streptococcus gordonii</i>	43	53	61	58	69
<i>Streptococcus sanguinis</i>	25	44	31	21	30
<i>Streptococcus parasanguinis</i>	112	146	141	184	177
" <i>Streptococcus sanguinis</i> group"	221	270	241	250	304
Other streptococci	2053	2031	1872	1855	1846
<i>Streptococcus acidominimus</i>	26	20	13	12	13
<i>Streptococcus suis</i>	1	7	1	2	0

<i>Streptococcus uberis</i>	9	5	6	7	6
"Anaerobic streptococcus"	55	47	21	37	36
Streptococci not fully identified	1962	1952	1831	1797	1791
Total:	9009	9444	9533	9619	9528
Genera closely related to streptococci:	555	480	478	418	410
<i>Abiotrophia</i> spp	28	25	25	17	29
<i>Aerococcus</i> spp	152	123	153	125	128
<i>Gemella</i> spp	139	123	115	118	88
<i>Globicatella sanguis</i>	3	0	2	4	3
<i>Leuconostoc</i> spp	39	38	38	34	34
<i>Pediococcus</i> spp	6	6	1	6	2
<i>Peptostreptococcus</i> spp	188	165	144	114	126
<i>* Group D streptococci were excluded from the analysis. Please refer to the enterococcus surveillance reports for further information.</i>					
Group D streptococci	118	100	87	70	83

The rate of GAS bacteraemia reported in England, Wales and Northern Ireland for 2011 was 2.4 (95% CI 2.2-2.5) per 100,000 population (Table 2). The rates of disease in both England (2.4) and Wales (2.0) decreased from those observed in 2010 (2.8 and 2.6 respectively), whereas the rate in Northern Ireland increased slightly from 1.9 to 2.1. There was some variation in rates of reports within England in 2011 from 2.0 in the North East to 2.7/100,000 in the East of England and the North West.

Table 2 Region-specific rates (per 100,000 population) of pyogenic streptococcal bacteraemia: England, Wales and Northern Ireland, 2011

Region	Rate per 100,000 population			
	Group A	Group B	Group C	Group G
East Midlands	2.2	2.9	0.7	1.8
East of England	2.7	3.0	0.8	2.3
London	2.1	3.5	0.4	1.2
North East	2.0	2.5	1.3	0.5
North West	2.7	2.8	1.1	1.7
South East	2.3	2.2	0.5	1.3
South West	2.4	3.0	0.8	1.9
West Midlands	2.4	3.4	0.9	2.2
Yorkshire & Humber	2.3	2.2	1.0	1.4
England	2.4	2.8	0.8	1.6
Wales	2.0	2.9	0.7	1.9
Northern Ireland (N.I.)	2.1	2.7	0.7	0.4
England, Wales and N.I.	2.4	2.8	0.8	1.6

Rates of GAS bacteraemia reports were higher in males than females across most age groups, the exceptions being in the 5-9 years, 15-44 years and 75 and over age groups (Figure 1). The highest rates were in adults aged 75 and over (8.8/100,000) whose rates decreased from over 10/100,000 in 2009 and 2010. The rate in women ≥75y remained reasonably unchanged with the overall drop in incidence in this age

group attributable to marked decreases in men. Rates of disease in other age groups also decreased, most noticeably in those aged less than 1 (7.1 to 4.5/100,000) between the two years.

Figure 1 **Age-specific rates of group A streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2011**

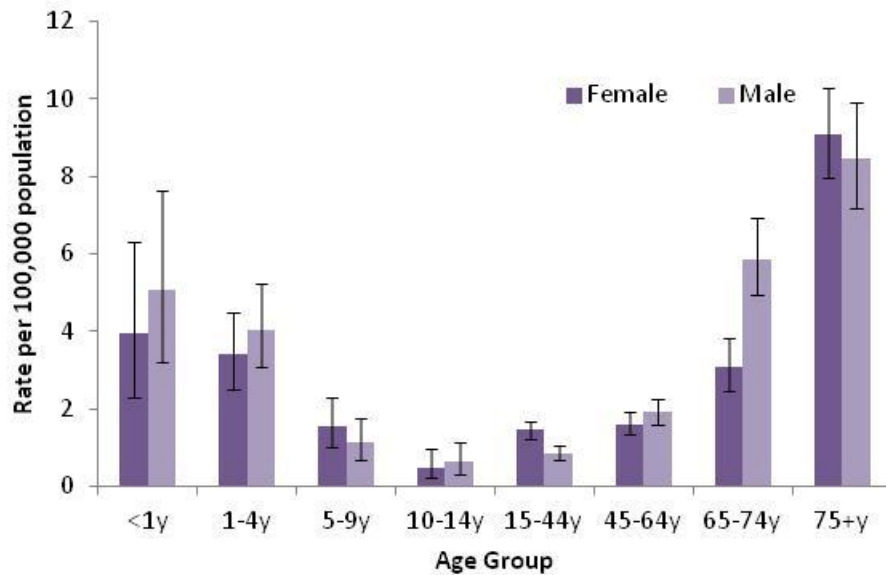


Table 3 Antibiotic resistance data for streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2007-2011

		2007		2008		2009		2010		2011	
		No. tested	(% resistant)	No. tested	(% resistant)	No. tested	(% resistant)	No. tested	(% resistant)	No. tested	(% resistant)
Group A	clindamycin	216	(3%)	318	(3%)	335	(3%)	376	(3%)	421	(3%)
	erythromycin	787	(6%)	896	(5%)	821	(5%)	848	(5%)	801	(5%)
	tetracycline	569	(15%)	615	(11%)	561	(9%)	664	(9%)	592	(13%)
Group B	clindamycin	255	(7%)	358	(8%)	398	(10%)	463	(9%)	561	(17%)
	erythromycin	1025	(11%)	1095	(12%)	1058	(14%)	1127	(15%)	1080	(18%)
	tetracycline	798	(83%)	832	(82%)	814	(79%)	915	(82%)	891	(82%)
Group C	clindamycin	56	(5%)	82	(11%)	83	(4%)	129	(12%)	186	(12%)
	erythromycin	217	(9%)	260	(11%)	247	(13%)	334	(13%)	332	(17%)
	tetracycline	164	(17%)	214	(24%)	187	(24%)	263	(26%)	248	(27%)
Group G	clindamycin	152	(10%)	226	(12%)	192	(8%)	228	(9%)	291	(12%)
	erythromycin	590	(23%)	624	(22%)	547	(24%)	656	(26%)	664	(32%)
	tetracycline	465	(46%)	461	(46%)	421	(49%)	515	(46%)	507	(49%)
"Anginosus"	erythromycin	528	(10%)	579	(8%)	550	(9%)	533	(9%)	615	(10%)
	penicillin	641	(4%)	710	(3%)	713	(3%)	675	(1%)	767	(1%)
	tetracycline	382	(15%)	390	(21%)	390	(19%)	400	(24%)	448	(23%)
"Bovis"	erythromycin	160	(19%)	183	(21%)	169	(23%)	171	(29%)	185	(22%)
	penicillin	197	(5%)	236	(5%)	220	(4%)	227	(4%)	244	(3%)
	tetracycline	122	(66%)	133	(65%)	143	(65%)	132	(60%)	145	(68%)
"Mitis"	erythromycin	814	(41%)	816	(40%)	741	(43%)	731	(43%)	683	(46%)
	penicillin	1009	(23%)	1003	(25%)	961	(23%)	943	(21%)	853	(16%)
	tetracycline	575	(28%)	580	(29%)	554	(28%)	557	(24%)	544	(24%)
"Salivarius"	erythromycin	210	(31%)	229	(37%)	225	(36%)	218	(38%)	244	(34%)
	penicillin	262	(26%)	256	(22%)	254	(22%)	264	(17%)	309	(17%)
	tetracycline	136	(23%)	150	(21%)	156	(21%)	145	(19%)	182	(24%)
"Sanguinis"	erythromycin	272	(35%)	364	(34%)	310	(40%)	340	(42%)	383	(34%)
	penicillin	326	(29%)	412	(27%)	354	(30%)	404	(22%)	481	(18%)
	tetracycline	195	(29%)	237	(30%)	222	(32%)	239	(34%)	276	(27%)

Antimicrobial resistance

Reported rates of resistance to clindamycin, erythromycin and tetracycline for GAS bacteraemic isolates were 3%, 5% and 13% respectively in 2011 (Table 3). Resistance to clindamycin and erythromycin has remained stable since 2007, whereas prevalence of tetracycline resistance has increased slightly in 2011.

Table 4 Region-specific antibiotic susceptibility data for pyogenic streptococcal bacteraemia reports: England, Wales, and Northern Ireland, 2011

Group A streptococci						
Region	clindamycin		erythromycin		tetracycline	
	no. tested	(% resistant)	no. tested	(% resistant)	no. tested	(% resistant)
East Midlands	20	(10%)	56	(4%)	39	(8%)
East of England	72	(3%)	96	(8%)	106	(9%)
London	45	(4%)	107	(6%)	58	(16%)
North East	34	(3%)	41	(2%)	34	(9%)
North West	80	(5%)	141	(4%)	110	(22%)
South East	57	(0%)	117	(3%)	47	(6%)
South West	36	(3%)	62	(5%)	51	(25%)
West Midlands	25	(4%)	88	(5%)	76	(11%)
Yorkshire & Humber	27	(4%)	40	(3%)	30	(10%)
England	396	(4%)	748	(5%)	551	(14%)
Wales	9	(0%)	28	(0%)	21	(0%)
Northern Ireland (N.I.)	16	(0%)	25	(8%)	20	(10%)
England, Wales and N.I.	421	(3%)	801	(5%)	592	(13%)

Group B streptococci						
Region	clindamycin		erythromycin		tetracycline	
	no. tested	(% resistant)	no. tested	(% resistant)	no. tested	(% resistant)
East Midlands	24	(8%)	96	(17%)	56	(88%)
East of England	90	(19%)	125	(18%)	134	(83%)
London	96	(13%)	219	(17%)	134	(87%)
North East	36	(14%)	57	(14%)	50	(80%)
North West	97	(28%)	151	(22%)	119	(83%)
South East	73	(10%)	143	(17%)	95	(78%)
South West	39	(13%)	76	(14%)	94	(71%)
West Midlands	48	(21%)	117	(21%)	113	(86%)
Yorkshire & Humber	22	(14%)	36	(17%)	22	(86%)
England	525	(17%)	1020	(18%)	817	(82%)
Wales	10	(0%)	43	(14%)	29	(83%)
Northern Ireland (N.I.)	26	(23%)	17	(24%)	45	(82%)
England, Wales and N.I.	561	(17%)	1080	(18%)	891	(82%)

Group C streptococci

Region	clindamycin		erythromycin		tetracycline	
	no. tested	(% resistant)	no. tested	(% resistant)	no. tested	(% resistant)
East Midlands	8	(0%)	29	(10%)	20	(25%)
East of England	29	(14%)	40	(20%)	29	(31%)
London	9	(11%)	27	(19%)	15	(13%)
North East	31	(3%)	32	(16%)	29	(31%)
North West	36	(6%)	63	(14%)	44	(30%)
South East	16	(6%)	31	(16%)	12	(8%)
South West	15	(13%)	32	(19%)	31	(29%)
West Midlands	13	(23%)	32	(16%)	32	(31%)
Yorkshire & Humber	22	(36%)	19	(32%)	14	(36%)
England	179	(12%)	305	(17%)	226	(28%)
Wales	2	(0%)	16	(13%)	16	(19%)
Northern Ireland (N.I.)	5	(0%)	11	(9%)	6	(17%)
England, Wales and N.I.	186	(12%)	332	(17%)	248	(27%)

Group G streptococci

Region	clindamycin		erythromycin		tetracycline	
	no. tested	(% resistant)	no. tested	(% resistant)	no. tested	(% resistant)
East Midlands	18	(6%)	65	(28%)	42	(52%)
East of England	59	(10%)	103	(30%)	91	(49%)
London	42	(5%)	79	(19%)	38	(37%)
North East	2	(0%)	11	(27%)	10	(80%)
North West	39	(3%)	99	(32%)	73	(48%)
South East	54	(17%)	95	(32%)	59	(46%)
South West	34	(24%)	55	(36%)	70	(51%)
West Midlands	20	(25%)	87	(48%)	62	(53%)
Yorkshire & Humber	13	(15%)	31	(19%)	24	(38%)
England	281	(12%)	625	(32%)	469	(49%)
Wales	6	(17%)	35	(34%)	32	(53%)
Northern Ireland (N.I.)	4	(0%)	4	(25%)	6	(33%)
England, Wales and N.I.	291	(12%)	664	(32%)	507	(49%)

Low numbers of isolates tested in Northern Ireland and Wales preclude meaningful comparison with resistance rates in England (Table 4). Within England, rates of erythromycin resistance varied geographically, ranging between 2% in the North East region to 8% in the East of England region (Table 4). Substantial variation was also evident for tetracycline resistance, from 6% in the South East to 25% in the South West region.

Erythromycin resistance was commonly associated with resistance to other antibiotics (Table 7), with 77% and 63% of erythromycin resistant isolates also being resistant to clindamycin or tetracycline respectively. Of the 238 isolates reported as having been tested against all three agents, eight (3%) were reported as resistant to

all three. This is a slight increase from that seen in 2010 where only 2% showed multiple resistances to the three antibiotics (5 cases).

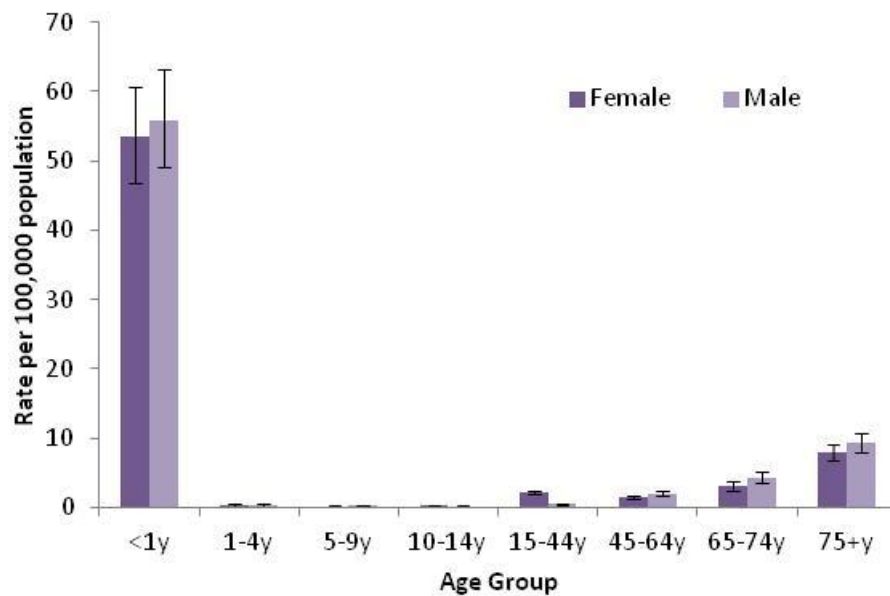
Group B streptococci

Reports of bacteraemia due to group B streptococcus (GBS) in England, Wales and Northern Ireland increased in 2011; this continues a year-on-year trend observed since 2007 and represents an overall increase of 18% over the period. The bulk of this increase was seen between 2007 and 2008; since then more modest increases of 1 to 2% per year have been seen (Table 1).

The overall rate of GBS bacteraemia in 2011 for England, Wales and Northern Ireland was 2.8 per 100,000 population (Table 2). Rates were similar in each country (2.8, 2.9 and 2.7 in England, Wales, and Northern Ireland respectively), with Northern Ireland the only country observing a decline since 2010 (3.4/100,000 population). There was wide variation within the English regions from 2.2 in the South East and Yorkshire and Humber regions to 3.5/100,000 in the London region.

Rates of GBS bacteraemia remain highly concentrated in infants, 53 and 55 per 100,000 population in females and males aged <1y respectively, a decrease on the previous year (64 and 78/100,000 respectively). Rates of GBS bacteraemia are generally higher in males than females across most age groups, with the notable exception of 15-44 year olds (2.2 and 0.4 in females and males respectively) (Figure 2).

Figure 2 Age-specific rates of group B streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2011



Rates of GBS bacteraemia in 0-90 day old infants decreased slightly from 0.67 in 2010 to 0.63 per 1000 live births in 2011 (Table 5) in England, Wales and Northern Ireland. This is largely accounted for by decreases in early (0-6 days) onset disease from 0.40 to 0.38, the most pronounced decrease being seen in Northern Ireland (0.68 to 0.24/1000 live births) compared with England (0.40 to 0.38) or Wales (0.42 to 0.40). Rates of late (7-90 days) onset infant disease decreased slightly between 2010 and 2011 (0.27 to 0.26), however a mixed pattern was evident with an increase seen in Northern Ireland (0.36 to 0.47) and decrease in Wales (0.40 to 0.25) and England (0.27 to 0.25 per 1000 live births). Caution should be used when interpreting these results given the small sample sizes in Wales and Northern Ireland.

Table 5 Number and rate (per 1000 live births) of group B streptococcal bacteraemia reports in infants 0-90 days old in England, Wales and Northern Ireland, 2011

Country	All cases (0-90 days old)			Early onset (0-6 days old)			Late onset (7-90 days old)		
	number	rate	(95% CI)	number	rate	(95% CI)	number	rate	(95% CI)
England	431	0.63	(0.57 - 0.69)	260	0.38	(0.33 - 0.43)	171	0.25	(0.21 - 0.29)
Northern Ireland (N.I.)	18	0.71	(0.42 - 1.13)	6	0.24	(0.09 - 0.52)	12	0.47	(0.25 - 0.83)
Wales	24	0.67	(0.43 - 1.00)	15	0.42	(0.24 - 0.69)	9	0.25	(0.12 - 0.48)
England, Wales & N.I.	473	0.63	(0.58 - 0.69)	281	0.38	(0.33 - 0.42)	192	0.26	(0.22 - 0.30)

Antimicrobial resistance

The proportion of GBS bacteraemia reports accompanied by susceptibility data has increased since 2005 although only 34% reports included results for clindamycin in 2011 (29% in 2010). Resistance of GBS blood culture isolates to clindamycin, erythromycin and tetracycline was recorded in 17%, 18% and 82% of laboratory reports respectively (Table 3).

Resistance to erythromycin in GBS increased from 15% (2010) to 18% of isolates (2011) continuing the general increasing trend previously observed. All countries and regions reported erythromycin resistance in over 13% of isolates (Table 4). Reports of resistance to clindamycin in GBS increased sharply between 2010 and 2011 from 8% to 17%.

Of the erythromycin-resistant GBS isolates tested against clindamycin, 64% were reported to be resistant (Table 8). Of the 325 isolates reported as being tested against all three agents, 37 (11%) were found to be resistant to all three.

Group C & G streptococci

Voluntary reporting has shown a general increase in the numbers of reports of bacteraemia caused by group C streptococci (GCS) from 320 in 2007 to 450 in 2011 (Table 1), although a 5% decrease was seen between 2010 and 2011 (474 to 450). Minimal change in the number of group G streptococci (GGS) bacteraemia reports was seen between 2010 and 2011 (922 to 926), following a 12% increase between 2007 and 2010 (824 to 922; Table 1). Population rates of GCS bacteraemia were similar in England (0.8/100,000), Northern Ireland (0.7) and Wales (0.7), with Wales being the only country to observe a decrease from 1.3 in 2010 to 0.7 (Table 2).

The age distributions of rates of both GCS and GGS bacteraemia reports were concentrated in the elderly, with rates tending to be higher in males than females in the majority of age groups (Figures 3, 4).

Figure 3 Age-specific rates of group C streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2011

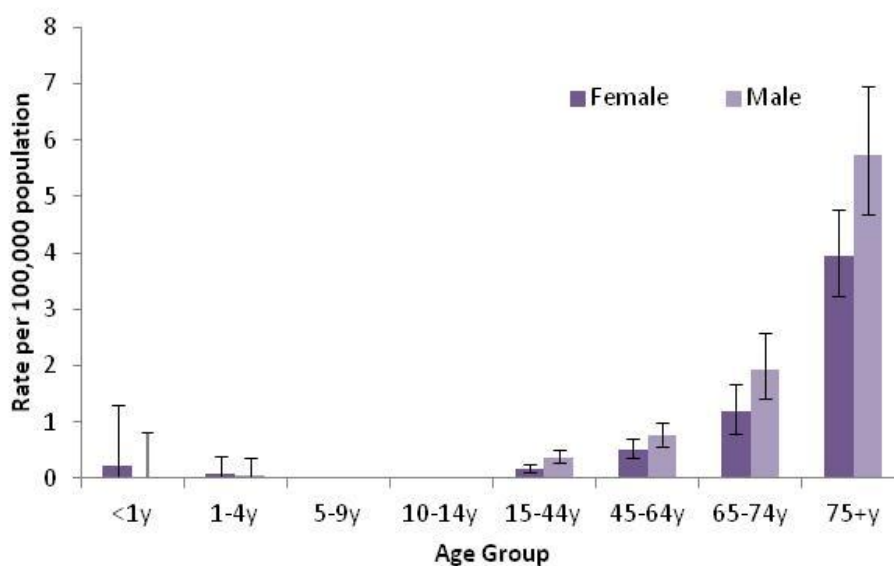
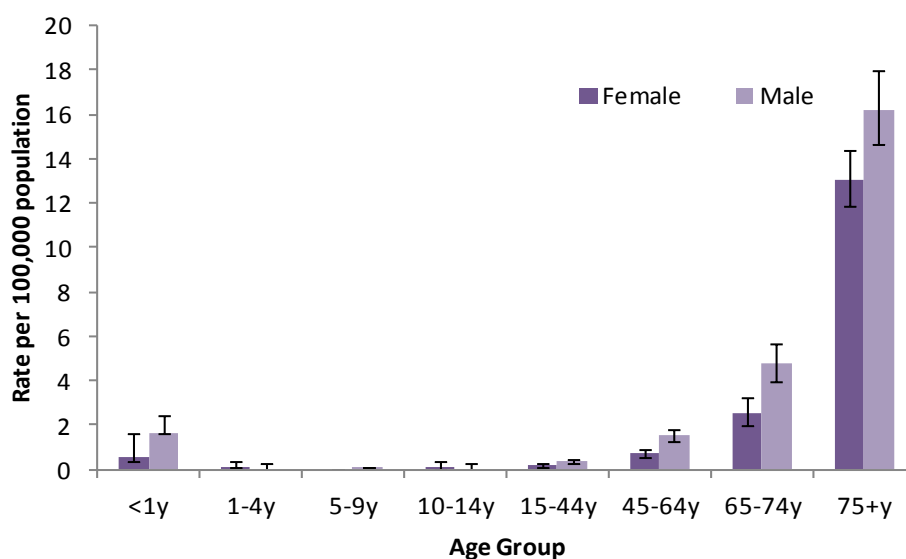


Figure 4 Age-specific rates of group G streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2011



Antimicrobial resistance

For both GCS and GGS bacteraemia, resistance to clindamycin, erythromycin and tetracycline showed some changes between 2005 and 2009. After a decrease in clindamycin resistance in GCS bacteraemia between 2008 and 2009 (11% to 4%), resistance increased to 12% in 2010 and 2011 (Table 3). In contrast, prevalence of clindamycin resistance showed little change for GGS bacteraemia between 2009 (8%) and 2010 (9%) but rose to 12% in 2011. Resistance of GGS isolates to erythromycin has continued to increase in 2011 reaching 32%.

Rates of clindamycin resistance in GCS isolates was 12% in England in 2011 compared with no resistance observed in Wales or Northern Ireland, but small numbers of reports preclude any meaningful analysis of antibiotic resistance by region. All countries and regions reported erythromycin resistance in over 9% of isolates (Table 4). Substantial variation was also evident for tetracycline resistance, from 8% in the South East to 36% in the Yorkshire and Humber region.

For GGS bacteraemic isolates, erythromycin resistance was higher in 2011 than in 2010 in both England (32% from 26%) and Wales (34% from 15%; Table 4). Within England substantial variation in erythromycin resistance was evident, from 19% in the Yorkshire and Humber and London regions to 48% in the West Midlands.

Dual resistance patterns for GCS and GGS bacteraemia are given in Tables 9-10. Two per cent (2 of 114 reports) of GCS bacteraemia reports indicated multiple resistance to clindamycin, erythromycin and tetracycline. For GGS bacteraemia reports multiple resistance (to clindamycin, erythromycin and tetracycline) was seen in 8% (14) of those tested for all 3 (168 tested).

Non-pyogenic streptococci

Reports of bacteraemia due to non-pyogenic streptococci have increased slightly between 2010 and 2011 from 3185 to 3295 reports for all groups combined (Table 1). 'Mitis' group streptococci reports decreased slightly between 2010 and 2011, from 1162 to 1044 reports, continuing a slight decreasing trend seen since 2008. Bacteraemia reports for the 'Bovis group', 'Anginosus group', 'Mutans group', 'Salivarius group' and 'Sanguinis group' streptococci all increased between 2010 and 2011.

Table 6 Region-specific rates (per 100,000 population) of non-pyogenic streptococcal bacteraemia: England, Wales and Northern Ireland, 2011

Region	Rate per 100,000 population				
	Anginosus Group	Bovis Group	Mitis Group	Salivarius Group	Sanguinis Group
East Midlands	1.8	0.4	1.4	0.7	1.3
East of England	1.2	0.5	1.8	0.6	1.0
London	1.2	0.6	1.5	0.7	0.8
North East	1.3	0.7	0.9	0.3	0.9
North West	2.0	0.6	2.1	0.7	1.1
South East	2.2	0.5	1.9	0.7	1.1
South West	1.5	0.6	2.5	0.8	1.3
West Midlands	1.2	0.5	2.4	0.8	1.1
Yorkshire & Humber	1.3	0.5	1.6	0.6	0.7
England	1.7	0.6	1.9	0.7	1.1
Wales	1.0	0.3	0.5	0.4	0.3
Northern Ireland (N.I.)	1.9	0.7	1.3	0.5	1.2
England, Wales and N.I.	1.6	0.5	1.8	0.7	1.0

Rates of non-pyogenic streptococci reports for England, Wales and Northern Ireland in 2011 ranged from 0.5 per 100,000 population (95% CI 0.48-0.60) for bacteraemia due to 'bovis group' streptococci to 1.8/100,000 (95% CI 1.48-1.69) for the 'mitis group' (Table 6).

Distribution of non-pyogenic streptococcal bacteraemia reports by sex in most instances were higher among males compared to females (Figures 5-9). 'Anginosus' and 'bovis' streptococcal group bacteraemia were predominantly concentrated in the oldest age group. The 'mitis', 'salivarius' and 'sanguinis' streptococcal groups rates in 2011 were highest in infants.

Figure 5 Age specific rates of ‘anginosus group’ streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2011

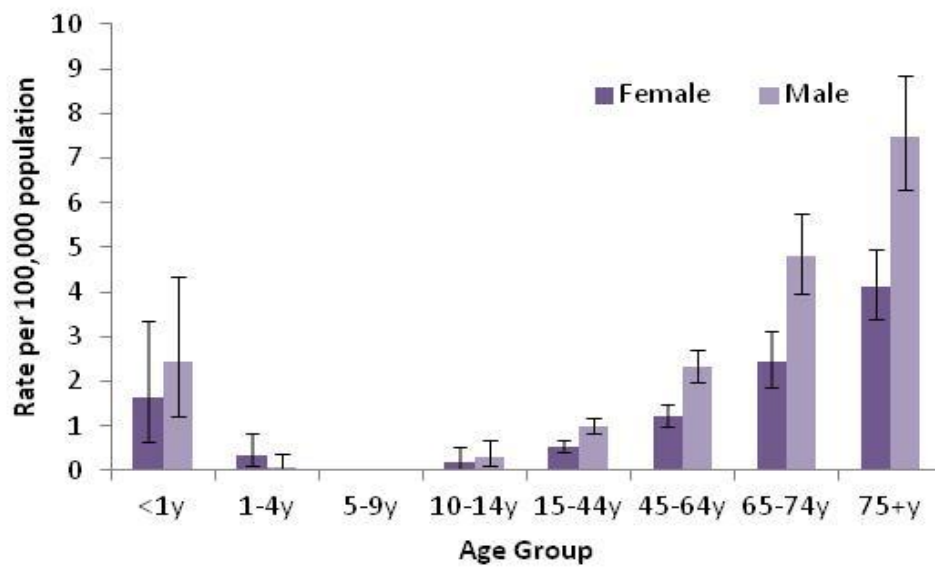


Figure 6 Age-specific rates of ‘bovis group’ streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2011

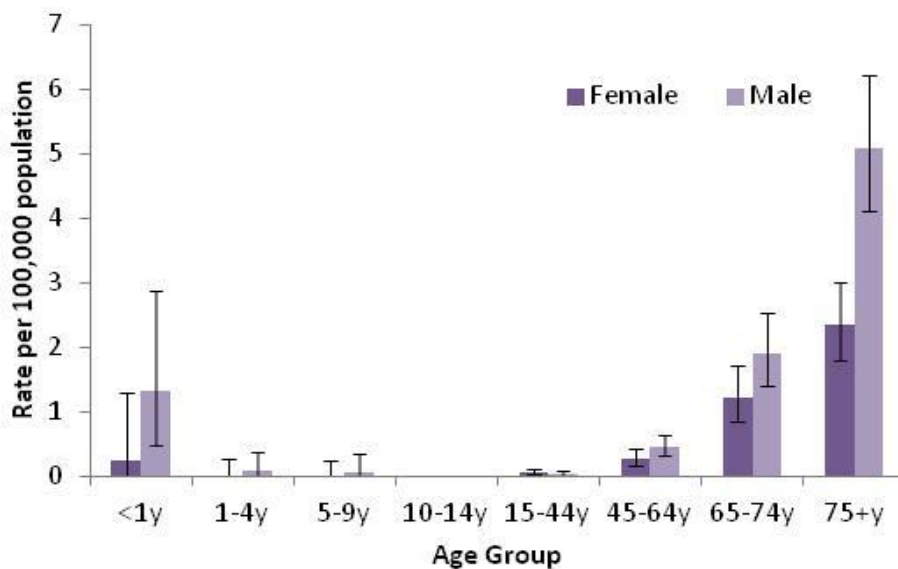


Figure 7 Age-specific rates of 'mitis group' streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2011

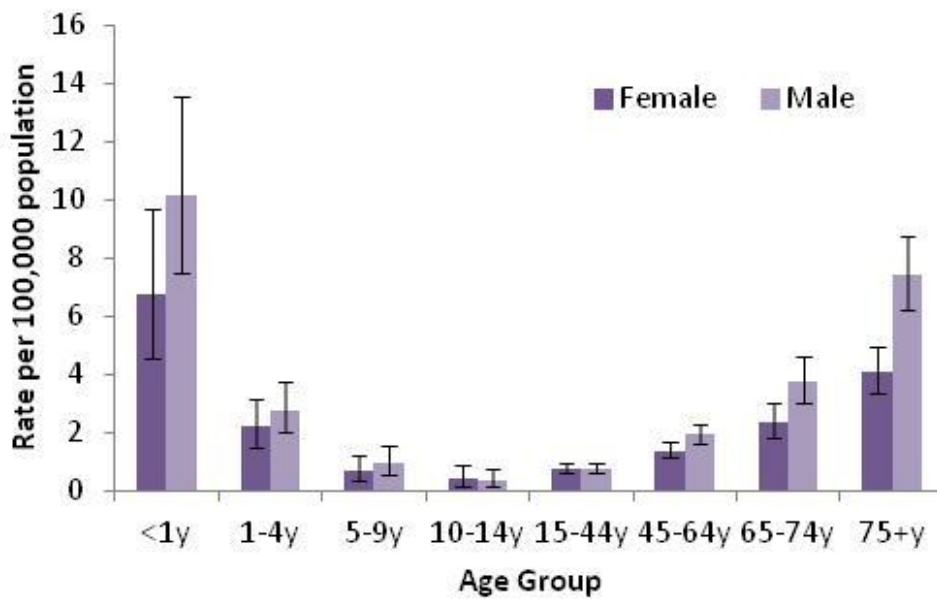


Figure 8 Age-specific rates of 'salivarius group' streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2011

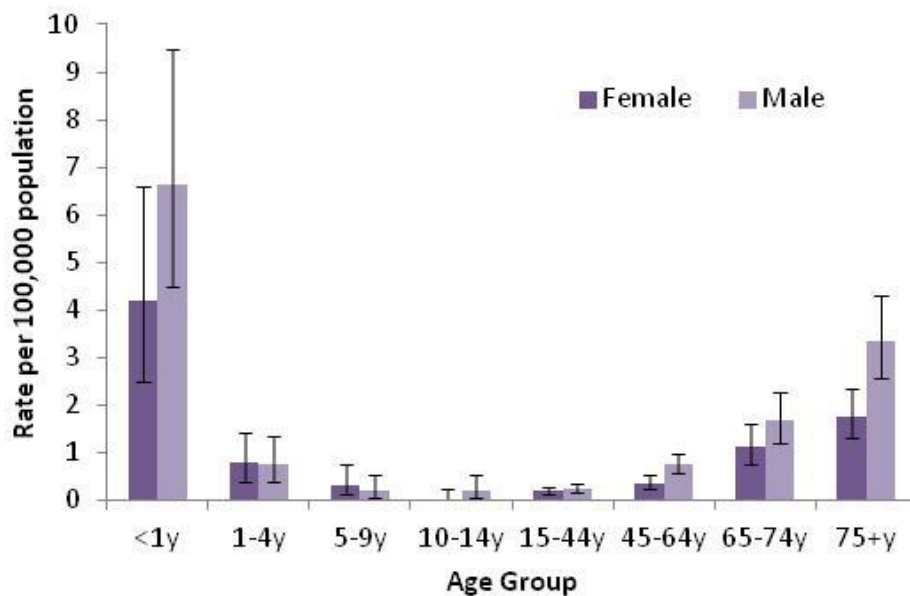
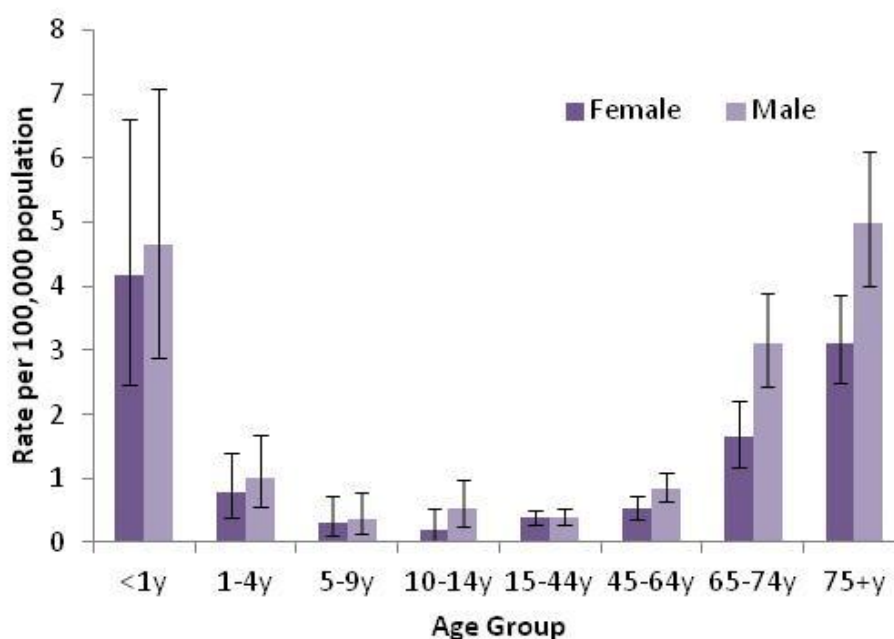


Figure 9 Age-specific rates of 'sanguinis group' streptococcal bacteraemia reports: England, Wales and Northern Ireland, 2011



Antimicrobial resistance

Since 2006, the proportion of non-pyogenic streptococcal bacteraemia reports accompanied by susceptibility data remains high for all non-pyogenic groups, with over 77% including information on susceptibility to penicillin.

In England, Wales and Northern Ireland between 1% and 18% of isolates from non-pyogenic groups were reported as penicillin resistant, with resistance frequency in all non-pyogenic groups showing a general decreasing trend since 2007 (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 22% and 46% of isolates reported as resistant, with the exception of the 'anginosus group' (10%). The highest levels of tetracycline resistance were observed in the 'bovis group' where 68% isolates were reported as resistant.

Reference microbiology service

In 2011, the proportion of reports of streptococcal bacteraemia in which the organism was not fully identified remained the same as in 2009 and 2010 at 19%. Precise species identification of isolates would improve the monitoring of trends in non-pyogenic streptococci and related genera in particular. The Streptococcus and Diphtheria Reference Laboratory offers a referred (charged for) taxonomic identification service for streptococci and other related Gram-positive, catalase-negative genera from systemic and other significant infections. However, a free-of-charge reference service will continue to be available for urgent public health

investigations, outbreaks and incident management, either hospital or community based.

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

Table 7 Dual antibiotic resistance patterns for group A streptococcal bacteraemia reports: England, Wales, and Northern Ireland, 2011

		erythromycin			clindamycin			tetracycline					
		resistant	(%)	sensitive	no info	resistant	(%)	sensitive	no info	resistant	(%)	sensitive	no info
erythromycin	resistant (n= 37)				10	(77%)	3	24	15	(63%)	9	13	
	sensitive (n= 761)				0	(0%)	323	438	52	(11%)	404	305	
clindamycin	resistant (n= 17)	10	(100%)	0	7				10	(77%)	3	4	
	sensitive (n= 407)	3	(1%)	323	81				27	(10%)	248	132	
tetracycline	resistant (n= 78)	15	(22%)	52	11	10	(27%)	27	41				
	sensitive (n= 514)	9	(2%)	404	101	3	(1%)	248	263				

Table 8 Dual antibiotic resistance patterns for group B streptococcal bacteraemia reports: England, Wales, and Northern Ireland, 2011

		erythromycin			clindamycin			tetracycline					
		resistant	(%)	sensitive	no info	resistant	(%)	sensitive	no info	resistant	(%)	sensitive	no info
erythromycin	resistant (n= 192)				48	(64%)	27	117	106	(85%)	18	68	
	sensitive (n= 884)				14	(4%)	335	535	456	(82%)	98	330	
clindamycin	resistant (n= 98)	48	(77%)	14	36				71	(86%)	12	15	
	sensitive (n= 467)	27	(7%)	335	105				266	(79%)	71	130	
tetracycline	resistant (n= 736)	106	(19%)	456	174	71	(21%)	266	399				
	sensitive (n= 155)	18	(16%)	98	39	12	(14%)	71	72				

Table 9 Dual antibiotic resistance patterns for group C streptococcal bacteraemia reports: England, Wales, and Northern Ireland, 2011

		erythromycin			clindamycin			tetracycline					
		resistant	(%)	sensitive	no info	resistant	(%)	sensitive	no info	resistant	(%)	sensitive	no info
erythromycin	resistant (n= 55)				11	(42%)	15	29	13	(33%)	26	16	
	sensitive (n= 275)				2	(1%)	132	141	41	(23%)	141	93	
clindamycin	resistant (n= 24)	11	(85%)	2	11				4	(33%)	8	12	
	sensitive (n= 164)	15	(10%)	132	17				26	(23%)	86	52	
tetracycline	resistant (n= 67)	13	(24%)	41	13	4	(13%)	26	37				
	sensitive (n= 181)	26	(16%)	141	14	8	(9%)	86	87				

Table 10 Dual antibiotic resistance patterns for group G streptococcal bacteraemia reports: England, Wales, and Northern Ireland, 2011

		erythromycin			clindamycin			tetracycline					
		resistant	(%)	sensitive	no info	resistant	(%)	sensitive	no info	resistant	(%)	sensitive	no info
erythromycin	resistant (n= 210)				27	(38%)	44	139	78	(55%)	65	67	
	sensitive (n= 452)				0	(0%)	169	283	129	(46%)	152	171	
clindamycin	resistant (n= 37)	27	(100%)	0	10				16	(62%)	10	11	
	sensitive (n= 256)	44	(21%)	169	43				82	(49%)	85	89	
tetracycline	resistant (n= 249)	78	(38%)	129	42	16	(16%)	82	151				
	sensitive (n= 258)	65	(30%)	152	41	10	(11%)	85	163				

References

- [1] [Health Protection \(Notification\) Regulations 2010](#) (SI 2010/659)