

Characteristics of invasive pneumococcal disease (IPD) caused by emerging serotypes after the introduction of the 13-valent pneumococcal conjugate vaccine (PCV13) in England; prospective observational cohort study, 2014-18

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SUPPLEMENTARY

TABLES 1a-1e, 2

Supplementary Table 1a: Characteristics of invasive pneumococcal disease (IPD) by serotype group in children under 15 years of age

	Serotype 8	Serotype 12F	Serotype 9N	PCV13	Remaining	All
Clinical presentation	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Meningitis	34 (34.3%)	60 (37.3%)	20 (45.5%)	82 (44.8%)	201 (28.1%)	397 (33.0%)
Pneumonia	22 (22.2%)	48 (29.8%)	16 (36.4%)	57 (31.1%)	250 (35.0%)	393 (32.7%)
Other	8 (8.1%)	12 (7.5%)	1 (2.3%)	15 (8.2%)	64 (9.0%)	100 (8.3%)
Bacteraemia/sepsis	35 (35.4%)	41 (25.5%)	7 (15.9%)	29 (15.8%)	200 (28.0%)	312 (26.0%)
Any comorbidity						
Yes	28 (29.2%)	29 (18.1%)	12 (27.3%)	45 (25.3%)	241 (34.3%)	355 (30.1%)
No	68 (70.8%)	131 (81.9%)	32 (72.7%)	133 (74.7%)	461 (65.7%)	825 (69.9%)
Comorbidities						
Chronic lung disease	11 (11.8%)	13 (8.3%)	1 (2.3%)	15 (8.8%)	53 (7.7%)	93 (8.1%)
Chronic heart disease	7 (7.4%)	4 (2.5%)	4 (9.1%)	5 (2.9%)	46 (6.7%)	66 (5.7%)
Chronic renal disease	3 (3.2%)	3 (1.9%)	0 (0.0%)	7 (4.1%)	22 (3.2%)	35 (3.0%)
Chronic liver disease	1 (1.1%)	3 (1.9%)	0 (0.0%)	2 (1.2%)	19 (2.8%)	25 (2.2%)
CNS disease	2 (2.2%)	3 (1.9%)	0 (0.0%)	3 (1.8%)	13 (1.9%)	21 (1.8%)
Asplenia/splenic dysfunction	0 (0.0%)	0 (0.0%)	1 (2.4%)	0 (0.0%)	25 (3.7%)	26 (2.3%)
Immunosuppression/malignancy	7 (7.3%)	9 (5.6%)	7 (15.9%)	26 (14.6%)	112 (16.0%)	161 (13.6%)
Sickle-cell disease	2 (2.2%)	0 (0.0%)	1 (2.5%)	6 (3.6%)	16 (2.4%)	25 (2.3%)
Diabetes mellitus	0 (0.0%)	1 (0.6%)	0 (0.0%)	2 (1.2%)	2 (0.3%)	5 (0.4%)
Cochlea implants	1 (1.1%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	6 (0.9%)	8 (0.7%)
Coeliac disease	1 (1.1%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	3 (0.4%)	5 (0.4%)
30-day case fatality rate (CFR)						
	1 (1.0%)	9 (5.4%)	0 (0.0%)	10 (5.2%)	34 (4.6%)	54 (4.3%)

Supplementary Table 1b: Characteristics of invasive pneumococcal disease (IPD) in England by serotype group in 15-44 year-olds

	Serotype 8	Serotype 12F	Serotype 9N	PCV13	Remaining	All
Clinical presentation	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Meningitis	30 (4.5%)	34 (8.0%)	15 (11.8%)	29 (7.6%)	112 (19.7%)	220 (10.2%)
Pneumonia	548 (82.5%)	309 (72.7%)	91 (71.7%)	273 (71.7%)	289 (50.9%)	1510 (69.7%)
Other	31 (4.7%)	41 (9.6%)	12 (9.4%)	41 (10.8%)	88 (15.5%)	213 (9.8%)
Bacteraemia/sepsis	55 (8.3%)	41 (9.6%)	9 (7.1%)	38 (10.0%)	79 (13.9%)	222 (10.3%)
Any comorbidity						
Yes	207 (31.0%)	139 (32.0%)	57 (45.0%)	119 (30.0%)	270 (46.0%)	792 (36.0%)
No	467 (69.0%)	294 (68.0%)	69 (55.0%)	273 (70.0%)	318 (54.0%)	1421 (64.0%)
Comorbidities						
Chronic lung disease	115 (17.5%)	69 (16.2%)	25 (21.0%)	55 (14.3%)	78 (13.9%)	342 (15.9%)
Chronic heart disease	7 (7.4%)	4 (2.5%)	4 (9.1%)	5 (2.9%)	46 (6.7%)	66 (5.7%)
Chronic renal disease	3 (3.2%)	3 (1.9%)	0 (0.0%)	7 (4.1%)	22 (3.2%)	35 (3.0%)
Chronic liver disease	1 (1.1%)	3 (1.9%)	0 (0.0%)	2 (1.2%)	19 (2.8%)	25 (2.2%)
CNS disease	2 (2.2%)	3 (1.9%)	0 (0.0%)	3 (1.8%)	13 (1.9%)	21 (1.8%)
Asplenia/splenic dysfunction	0 (0.0%)	0 (0.0%)	1 (2.4%)	0 (0.0%)	25 (3.7%)	26 (2.3%)
Immunosuppression/malignancy	44 (6.5%)	32 (7.4%)	24 (19.0%)	45 (11.5%)	114 (19.4%)	259 (11.7%)
Sickle-cell disease	2 (2.2%)	0 (0.0%)	1 (2.5%)	6 (3.6%)	16 (2.4%)	25 (2.3%)
Diabetes mellitus	0 (0.0%)	1 (0.6%)	0 (0.0%)	2 (1.2%)	2 (0.3%)	5 (0.4%)
Cochlea implants	1 (1.1%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	6 (0.9%)	8 (0.7%)
Coeliac disease	1 (1.1%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	3 (0.4%)	5 (0.4%)
30-day case fatality rate (CFR)						
	14 (1.9%)	12 (2.6%)	10 (7.4%)	23 (5.4%)	34 (5.3%)	93 (3.9%)

Supplementary Table 1c: Characteristics of invasive pneumococcal disease (IPD) in England by serotype group in 45-64 year olds

	Serotype 8	Serotype 12F	Serotype 9N	PCV13	Remaining	All
Clinical presentation	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Meningitis	75 (6.5%)	67 (9.8%)	20 (6.6%)	61 (7.6%)	212 (14.8%)	435 (9.9%)
Pneumonia	919 (80.0%)	439 (63.9%)	223 (73.8%)	613 (76.1%)	763 (53.4%)	2957 (67.6%)
Other	71 (6.2%)	105 (15.3%)	25 (8.3%)	59 (7.3%)	263 (18.4%)	523 (12.0%)
Bacteraemia/sepsis	84 (7.3%)	76 (11.1%)	34 (11.3%)	72 (8.9%)	192 (13.4%)	458 (10.5%)
Any comorbidity						
Yes	615 (53.0%)	322 (47.0%)	200 (64.0%)	504 (60.0%)	1056 (71.0%)	2697 (60.0%)
No	549 (47.0%)	368 (53.0%)	114 (36.0%)	342 (40.0%)	441 (29.0%)	1814 (40.0%)
Comorbidities						
Chronic lung disease	345 (30.2%)	161 (23.7%)	94 (30.8%)	217 (26.6%)	368 (25.5%)	1185 (27.0%)
Chronic heart disease	101 (9.0%)	54 (8.0%)	30 (9.9%)	101 (12.4%)	174 (12.1%)	460 (10.6%)
Chronic renal disease	44 (3.9%)	24 (3.6%)	16 (5.3%)	48 (5.9%)	107 (7.5%)	239 (5.5%)
Chronic liver disease	63 (5.6%)	40 (6.0%)	24 (7.9%)	81 (10.0%)	194 (13.6%)	402 (9.3%)
CNS disease	19 (1.7%)	14 (2.1%)	12 (4.0%)	20 (2.5%)	48 (3.4%)	113 (2.6%)
Asplenia/splenic dysfunction	0 (0.0%)	0 (0.0%)	1 (2.4%)	0 (0.0%)	25 (3.7%)	26 (2.3%)
Immunosuppression/malignancy	133 (11.4%)	76 (11.0%)	76 (24.2%)	185 (21.9%)	485 (32.4%)	955 (21.2%)
Sickle-cell disease	2 (2.2%)	0 (0.0%)	1 (2.5%)	6 (3.6%)	16 (2.4%)	25 (2.3%)
Diabetes mellitus	0 (0.0%)	1 (0.6%)	0 (0.0%)	2 (1.2%)	2 (0.3%)	5 (0.4%)
Cochlea implants	1 (1.1%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	6 (0.9%)	8 (0.7%)
Coeliac disease	1 (1.1%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	3 (0.4%)	5 (0.4%)
30-day case fatality rate (CFR)						
	73 (6.0%)	55 (7.5%)	34 (10.3%)	112 (12.6%)	220 (14.0%)	494 (10.4%)

Supplementary Table 1d: Characteristics of invasive pneumococcal disease (IPD) in England by serotype group in 65-74 year-olds

	Serotype 8	Serotype 12F	Serotype 9N	PCV13	Remaining	All
Clinical presentation	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Meningitis	24 (2.8%)	21 (4.9%)	13 (4.2%)	42 (4.3%)	115 (5.8%)	215 (4.7%)
Pneumonia	697 (81.1%)	312 (72.6%)	234 (76.5%)	779 (79.4%)	1347 (67.5%)	3369 (73.7%)
Other	65 (7.6%)	58 (13.5%)	32 (10.5%)	78 (8.0%)	277 (13.9%)	510 (11.2%)
Bacteraemia/sepsis	73 (8.5%)	39 (9.1%)	27 (8.8%)	82 (8.4%)	258 (12.9%)	479 (10.5%)
Any comorbidity						
Yes	693 (79.0%)	339 (76.0%)	250 (79.0%)	780 (77.0%)	1735 (84.0%)	3797 (80.0%)
No	185 (21.0%)	108 (24.0%)	68 (21.0%)	234 (23.0%)	338 (16.0%)	933 (20.0%)
Comorbidities						
Chronic lung disease	434 (50.9%)	182 (41.3%)	123 (38.9%)	385 (38.9%)	780 (38.8%)	1904 (41.3%)
Chronic heart disease	247 (29.2%)	122 (28.3%)	90 (28.6%)	273 (27.8%)	639 (31.8%)	1371 (29.9%)
Chronic renal disease	128 (15.2%)	71 (16.6%)	63 (19.9%)	163 (16.6%)	384 (19.2%)	809 (17.7%)
Chronic liver disease	33 (4.0%)	19 (4.4%)	18 (5.8%)	57 (5.9%)	133 (6.7%)	260 (5.7%)
CNS disease	20 (2.4%)	17 (3.9%)	11 (3.5%)	24 (2.5%)	66 (3.3%)	138 (3.0%)
Asplenia/splenic dysfunction	3 (0.4%)	4 (0.9%)	2 (0.6%)	3 (0.3%)	17 (0.9%)	29 (0.6%)
Immunosuppression/malignancy	186 (21.2%)	103 (23.0%)	115 (36.2%)	300 (29.6%)	856 (41.3%)	1560 (33.0%)
Sickle-cell disease	2 (0.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (0.2%)	5 (0.1%)
Diabetes	216 (25.6%)	93 (21.3%)	79 (25.4%)	219 (22.2%)	529 (26.3%)	1136 (24.8%)
Cochlea implants	1 (1.1%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	6 (0.9%)	8 (0.7%)
Coeliac disease	5 (0.6%)	3 (0.7%)	0 (0.0%)	8 (0.8%)	13 (0.7%)	29 (0.6%)
30-day case fatality rate (CFR)						
	91 (10.1%)	58 (12.7%)	59 (18.2%)	213 (20.4%)	378 (17.7%)	799 (16.4%)

Supplementary table 1e: Characteristics of invasive pneumococcal disease (IPD) in England by serotype group in 80+ year olds

	Serotype 8	Serotype 12F	Serotype 9N	PCV13	Remaining	All
Clinical presentation	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Meningitis	7 (1.7%)	4 (1.5%)	5 (1.8%)	6 (0.7%)	40 (1.8%)	62 (1.5%)
Pneumonia	330 (81.5%)	222 (84.4%)	224 (79.4%)	742 (83.0%)	1677 (76.6%)	3195 (79.2%)
Other	27 (6.7%)	19 (7.2%)	27 (9.6%)	62 (6.9%)	254 (11.6%)	389 (9.6%)
Bacteraemia/sepsis	41 (10.1%)	18 (6.8%)	26 (9.2%)	84 (9.4%)	218 (10.0%)	387 (9.6%)
Any comorbidity						
Yes	358 (86.1%)	213 (80.7%)	229 (80.4%)	740 (81.1%)	1852 (83.6%)	3392 (82.9%)
No	58 (13.9%)	51 (19.3%)	56 (19.6%)	172 (18.9%)	363 (16.4%)	700 (17.1%)
Comorbidities						
Chronic lung disease	171 (41.9%)	95 (37.1%)	102 (36.6%)	270 (30.5%)	706 (32.8%)	1344 (33.8%)
Chronic heart disease	186 (45.7%)	126 (49.0%)	128 (45.9%)	425 (47.5%)	1044 (48.4%)	1909 (47.8%)
Chronic renal disease	152 (37.4%)	83 (32.2%)	88 (31.5%)	297 (33.6%)	763 (35.4%)	1383 (34.7%)
Chronic liver disease	2 (0.5%)	6 (2.4%)	6 (2.2%)	10 (1.1%)	35 (1.7%)	59 (1.5%)
CNS disease	16 (4.0%)	3 (1.2%)	14 (5.1%)	31 (3.5%)	77 (3.6%)	141 (3.6%)
Asplenia/splenic dysfunction	0 (0.0%)	1 (0.4%)	1 (0.4%)	2 (0.2%)	8 (0.4%)	12 (0.3%)
Immunosuppression/malignancy	88 (21.2%)	58 (22.0%)	69 (24.2%)	190 (20.8%)	560 (25.3%)	965 (23.6%)
Sickle-cell disease	0 (0.0%)	0 (0.0%)	1 (0.4%)	2 (0.2%)	2 (0.1%)	5 (0.1%)
Diabetes mellitus	102 (25.4%)	56 (22.0%)	58 (21.1%)	173 (19.5%)	421 (19.7%)	810 (20.5%)
Cochlea implants	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (0.2%)	4 (0.2%)	6 (0.2%)
Coeliac disease	2 (0.5%)	0 (0.0%)	3 (1.1%)	0 (0.0%)	4 (0.2%)	9 (0.2%)
30-day case fatality rate (CFR)						
	112 (26.4%)	75 (27.8%)	109 (37.1%)	379 (40.1%)	780 (34.0%)	1455 (34.4%)

Supplementary Table 2: Top 10 serotypes by age group, clinical presentation and death within 30 days of IPD

Meningitis	n (%)	Serotype	n (%)	Serotype	n (%)	Serotype	n (%)
1	60 (15.1%)	8	105 (16.0%)	3	34 (12.3%)	12F	186 (14.0%)
2	34 (8.6%)	12F	101 (15.4%)	23B	33 (11.9%)	8	170 (12.8%)
3	32 (8.1%)	3	54 (8.2%)	8	31 (11.2%)	3	120 (9.0%)
4	25 (6.3%)	10A	49 (7.5%)	12F	25 (9.0%)	23B	88 (6.6%)
5	24 (6.0%)	22F	37 (5.6%)	9N	18 (6.5%)	10A	83 (6.3%)
6	24 (6.0%)	23B	35 (5.3%)	22F	17 (6.1%)	22F	78 (5.9%)
7	23 (5.8%)	9N	35 (5.3%)	35F	12 (4.3%)	9N	73 (5.5%)
8	22 (5.5%)	23A	34 (5.2%)	11A	11 (4.0%)	24F	45 (3.4%)
9	20 (5.0%)	24F	18 (2.7%)	10A	10 (3.6%)	33F	44 (3.3%)
10	20 (5.0%)	15A	16 (2.4%)	15B/C	9 (3.2%)	19A	42 (3.2%)
Pneumonia							
1	48 (12.2%)	8	1467 (32.8%)	8	1027 (15.6%)	8	2516 (22.0%)
2	39 (9.9%)	12F	748 (16.7%)	3	809 (12.3%)	12F	1330 (11.6%)
3	32 (8.1%)	9N	314 (7.0%)	22F	553 (8.4%)	3	1138 (10.0%)
4	29 (7.4%)	3	310 (6.9%)	12F	534 (8.1%)	22F	830 (7.3%)
5	23 (5.9%)	19A	273 (6.1%)	9N	458 (7.0%)	9N	788 (6.9%)
6	22 (5.6%)	22F	262 (5.9%)	19A	406 (6.2%)	19A	696 (6.1%)
7	20 (5.1%)	7F	176 (3.9%)	15A	365 (5.6%)	15A	490 (4.3%)
8	20 (5.1%)	33F	140 (3.1%)	33F	253 (3.9%)	33F	416 (3.6%)
9	19 (4.8%)	15A	105 (2.4%)	23A	182 (2.8%)	7F	284 (2.5%)
10	17 (4.3%)	10A	69 (1.5%)	11A	168 (2.6%)	10A	238 (2.1%)
Septicaemia							
1	41 (13.1%)	8	139 (20.4%)	8	114 (13.2%)	8	288 (15.5%)
2	39 (12.5%)	12F	117 (17.2%)	3	92 (10.6%)	12F	215 (11.6%)
3	35 (11.2%)	3	46 (6.8%)	22F	71 (8.2%)	3	151 (8.1%)
4	30 (9.6%)	22F	46 (6.8%)	12F	57 (6.6%)	22F	134 (7.2%)
5	24 (7.7%)	9N	43 (6.3%)	9N	53 (6.1%)	9N	103 (5.5%)

6	17 (5.4%)	15A	28 (4.1%)	15A	46 (5.3%)	10A	79 (4.3%)
7	13 (4.2%)	19A	27 (4.0%)	19A	42 (4.8%)	19A	78 (4.2%)
8	13 (4.2%)	23B	21 (3.1%)	23B	38 (4.4%)	15A	77 (4.1%)
9	12 (3.8%)	10A	17 (2.5%)	33F	31 (3.6%)	23B	72 (3.9%)
10	11 (3.5%)	11A	17 (2.5%)	11A	31 (3.6%)	33F	71 (3.8%)
Other presentations							
1	12 (12.0%)	12F	146 (19.8%)	8	92 (10.2%)	12F	235 (13.5%)
2	12 (12.0%)	8	102 (13.9%)	12F	77 (8.6%)	8	202 (11.6%)
3	8 (8.0%)	22F	46 (6.3%)	22F	68 (7.6%)	22F	115 (6.6%)
4	8 (8.0%)	3	38 (5.2%)	15A	63 (7.0%)	3	107 (6.2%)
5	7 (7.0%)	10A	38 (5.2%)	3	61 (6.8%)	9N	97 (5.6%)
6	7 (7.0%)	9N	37 (5.0%)	9N	59 (6.6%)	15A	94 (5.4%)
7	6 (6.0%)	23B	31 (4.2%)	23B	47 (5.2%)	23B	90 (5.2%)
8	5 (5.0%)	15A	27 (3.7%)	19A	43 (4.8%)	10A	83 (4.8%)
9	4 (4.0%)	19A	25 (3.4%)	33F	38 (4.2%)	19A	70 (4.0%)
10	4 (4.0%)	33F	25 (3.4%)	10A	38 (4.2%)	33F	70 (4.0%)
30-day case fatality rate (CFR)							
1	11/89 (12.4%)	8	87/1,931 (4.5%)	3	357/1,054 (33.9%)	3	434/1,625 (26.7%)
2	9/168 (5.4%)	3	73/497 (14.7%)	8	203/1,328 (15.3%)	8	291/3,365 (8.6%)
3	5/90 (5.6%)	12F	67/1,187 (5.6%)	9N	168/168 (27.2%)	9N	212/1,128 (18.8%)
4	4/101 (4.0%)	9N	44/464 (9.5%)	22F	163/163 (22.0%)	12F	209/2,086 (10.0%)
5	4/59 (6.8%)	19A	28/369 (7.6%)	15A	149/365 (71.0%)	22F	193/1,218 (15.8%)
6	4/74 (5.4%)	22F	26/418 (6.2%)	19A	139/382 (73.3%)	15A	171/758 (22.6%)
7	3/56 (5.4%)	10A	23/197 (11.7%)	12F	133/728 (18.3%)	19A	170/946 (18.0%)
8	3/21 (14.3%)	33F	22/214 (10.3%)	11A	101/257 (39.3%)	11A	118/400 (29.5%)
9	2/4 (50.0%)	15A	21/202 (10.4%)	33F	86/339 (25.4%)	33F	109/632 (17.2%)
10	1/24 (4.2%)	11A	16/118 (13.6%)	23A	75/267 (28.1%)	23A	89/388 (22.9%)