

## Appendix 1

### Supplementary Statistical Analysis Description

To examine the association between a CYP's healthcare utilisation and the characteristics of the CYP, their parents and their household, we used multivariable generalised linear models.[25] To take into account that CYP from the same household are more similar than CYP from different households, CYP with siblings were analysed using multilevel random intercept regression models. [26,27] As such a model structure was not appropriate in the case of only children (i.e. it is not be appropriate to estimate a household level variance for a household with only one child), households with CYP without siblings were modelled using multivariable generalised linear models with a single intercept. [25]

We predicted CYP's total number of general practice appointments in the previous year using count based regression; assuming a Poisson distribution in models for CYP with siblings and a negative binomial distribution for CYP without. Initial data analysis demonstrated that secondary care utilisation was rare, and therefore more suitable to model as a dichotomous variable. For each of the three types of secondary care utilisation (emergency department attendances, inpatient admissions and outpatient appointments), we predicted the likelihood of a CYP ever utilising care in the previous year using logistic regression. Rate and odds ratios were produced to interpret the results.

A variety of models with different combinations of covariates and interaction terms were examined. The Akaike Information Criterion was used to select the final model. The chosen model included all CYP characteristics, parental long-term conditions (asthma, depression, diabetes, epilepsy, hypertension, mental health conditions and osteoarthritis) and the mean parental healthcare utilisation. This model was used for the main, subgroup and sensitivity analysis.

## Appendix 2

Children's parent's and household's characteristics by healthcare utilisation, for those with siblings, mean (standard deviation) or count (percentage<sup>0</sup>)

	Child's general practice appointments			Child with at least one emergency department attendance		Child with at least one inpatient admission		Child with at least one outpatient appointment		All children with siblings (n=4,519)
	0 (n=1,253)	1 to 2 (n=1,598)	3+ (n=1,668)	No (n=3,718)	Yes (n=801)	No (n=4,137)	Yes (n=382)	No (n=3,746)	Yes (n=773)	
Parent with asthma	89 (7%)	142 (9%)	185 (11%)	334 (9%)	82 (10%)	372 (9%)	44 (12%)	325 (9%)	91 (12%)	416 (9%)
Parent with depression	170 (14%)	261 (16%)	312 (19%)	588 (16%)	155 (19%)	662 (16%)	81 (21%)	562 (15%)	181 (23%)	743 (16%)
Parent with diabetes	92 (7%)	113 (7%)	95 (6%)	254 (7%)	46 (6%)	276 (7%)	24 (6%)	244 (7%)	56 (7%)	300 (7%)
Parent with epilepsy	10 (1%)	17 (1%)	22 (1%)	--	<10	--	<10	39 (1%)	10 (1%)	49 (1%)
Parent with hypertension	196 (16%)	226 (14%)	225 (13%)	553 (15%)	94 (12%)	597 (14%)	50 (13%)	536 (14%)	111 (14%)	647 (14%)
Parent with a mental health condition	20 (2%)	22 (1%)	29 (2%)	60 (2%)	11 (1%)	--	<10	56 (1%)	15 (2%)	71 (2%)
Parent with osteoarthritis	40 (3%)	56 (4%)	70 (4%)	141 (4%)	25 (3%)	149 (4%)	17 (4%)	127 (3%)	39 (5%)	166 (4%)
Mean parent general practice appointments	2.9 (3)	3.5 (3.3)	4.4 (3.8)	3.5 (3.3)	4.3 (3.8)	3.6 (3.4)	4.7 (4)	3.5 (3.4)	4.5 (3.6)	3.7 (3.4)
Mean parent emergency department attendances	0.2 (0.6)	0.2 (0.5)	0.3 (0.8)	0.2 (0.6)	0.4 (0.9)	0.2 (0.7)	0.4 (0.8)	0.2 (0.7)	0.3 (0.6)	0.2 (0.7)
Mean parent inpatient admissions	0.1 (0.3)	0.1 (0.3)	0.1 (0.4)	0.1 (0.3)	0.1 (0.4)	0.1 (0.3)	0.2 (0.5)	0.1 (0.3)	0.1 (0.3)	0.1 (0.3)
Mean parent outpatient appointments	0.5 (1.3)	0.7 (1.4)	0.7 (1.3)	0.6 (1.3)	0.7 (1.5)	0.6 (1.3)	0.8 (1.7)	0.6 (1.3)	0.8 (1.3)	0.7 (1.3)
Mean parent long-term conditions	0.3 (0.5)	0.3 (0.5)	0.4 (0.6)	0.3 (0.5)	0.3 (0.5)	0.3 (0.5)	0.4 (0.6)	0.3 (0.5)	0.4 (0.6)	0.3 (0.5)
Mean parent age	36.9 (6.2)	36.3 (6.2)	35.3 (5.8)	36.4 (6.1)	34.8 (5.8)	36.2 (6)	35 (6)	36.2 (6.1)	35.9 (5.8)	36.1 (6.1)
Number of parents (aged 18 to 55) band										
1	494 (39%)	596 (37%)	634 (38%)	1414 (38%)	310 (39%)	1581 (38%)	143 (37%)	1425 (38%)	299 (39%)	1724 (38%)
2	518 (41%)	701 (44%)	731 (44%)	1612 (43%)	338 (42%)	1797 (43%)	153 (40%)	1615 (43%)	335 (43%)	1950 (43%)
3+	241 (19%)	301 (19%)	303 (18%)	692 (19%)	153 (19%)	759 (18%)	86 (23%)	706 (19%)	139 (18%)	845 (19%)
Number of siblings	3 (1.2)	2.9 (1.2)	2.7 (1)	2.9 (1.1)	2.8 (1.1)	2.9 (1.1)	2.8 (1.1)	2.9 (1.1)	2.8 (1)	2.9 (1.1)
Number of people in the household	5.1 (1.8)	5 (1.7)	4.8 (1.7)	5 (1.7)	4.9 (1.7)	5 (1.7)	4.9 (1.7)	5 (1.7)	4.9 (1.6)	5 (1.7)

### Appendix 3

Characteristics of children in the study sample by healthcare utilisation mean (standard deviation) or count (percentage%)

	Child's general practice appointments			Child with at least one emergency department attendance		Child with at least one inpatient admission		Child with at least one outpatient appointment		Total child cohort (n=6,124)
	0 (n=1,614)	1 to 2 (n=2,110)	3+ (n=2,400)	No (n=4,921)	Yes (n=1,203)	No (n=5,562)	Yes (n=562)	No (n=5,010)	Yes (n=1,114)	
General practice appointments	--	1.4 (0.5)	5.6 (3.5)	2 (2.4)	5.3 (4.7)	2.3 (2.7)	6.2 (5.3)	2.3 (2.7)	4.7 (4.7)	2.7 (3.3)
Emergency department attendances	0.1 (0.3)	0.2 (0.5)	0.6 (1.2)	--	1.7 (1.3)	0.2 (0.5)	1.7 (1.7)	0.2 (0.6)	0.7 (1.4)	0.3 (0.9)
Inpatient admissions	0 (0.2)	0.1 (0.3)	0.4 (1.2)	0 (0.2)	0.8 (1.6)	--	1.9 (1.9)	0.1 (0.4)	0.5 (1.6)	0.2 (0.8)
Outpatient appointments	0.1 (0.6)	0.3 (0.9)	0.7 (1.7)	0.3 (1)	0.8 (1.7)	0.3 (1)	1.4 (2.4)	--	2.2 (2.1)	0.4 (1.2)
Age	9.0 (3.8)	7.6 (4.1)	4.9 (4.2)	7.5 (4.3)	4.3 (4.1)	7.2 (4.3)	4.4 (4.4)	7 (4.4)	6.6 (4.5)	6.9 (4.4)
Age band										
0 to 5	282 (17%)	750 (36%)	1551 (65%)	1720 (35%)	863 (72%)	2189 (39%)	394 (70%)	2064 (41%)	519 (47%)	2583 (42%)
6 to 10	731 (45%)	772 (37%)	502 (21%)	1819 (37%)	186 (15%)	1918 (34%)	87 (15%)	1695 (34%)	310 (28%)	2005 (33%)
11 to 15	601 (37%)	588 (28%)	347 (14%)	1382 (28%)	154 (13%)	1455 (26%)	81 (14%)	1251 (25%)	285 (26%)	1536 (25%)
Female	767 (48%)	1052 (50%)	1200 (50%)	2476 (50%)	543 (45%)	2771 (50%)	248 (44%)	2555 (51%)	464 (42%)	3019 (49%)
IMD quintile										
1	284 (18%)	426 (20%)	455 (19%)	939 (19%)	226 (19%)	1053 (19%)	112 (20%)	949 (19%)	216 (19%)	1165 (19%)
2	338 (21%)	434 (21%)	497 (21%)	1016 (21%)	253 (21%)	1169 (21%)	100 (18%)	1052 (21%)	217 (19%)	1269 (21%)
3	326 (20%)	402 (19%)	491 (20%)	980 (20%)	239 (20%)	1110 (20%)	109 (19%)	1007 (20%)	212 (19%)	1219 (20%)
4	350 (22%)	389 (18%)	502 (21%)	1002 (20%)	239 (20%)	1119 (20%)	122 (22%)	998 (20%)	243 (22%)	1241 (20%)
5	316 (20%)	459 (22%)	455 (19%)	984 (20%)	246 (20%)	1111 (20%)	119 (21%)	1004 (20%)	226 (20%)	1230 (20%)
At least one long-term condition	48 (3%)	133 (6%)	214 (9%)	293 (6%)	102 (8%)	327 (6%)	68 (12%)	233 (5%)	162 (15%)	395 (6%)

Note: percentages may not sum to 100% due to rounding.

## Appendix 4

Children's characteristics by child healthcare utilisation, for those with siblings, mean (standard deviation) or count (percentage<sup>0</sup>)

	Child's general practice appointments			Child with at least one emergency department attendance		Child with at least one inpatient admission		Child with at least one outpatient appointment		All children with siblings (n=4,519)
	0 (n=1,253)	1 to 2 (n=1,598)	3+ (n=1,668)	No (n=3,718)	Yes (n=801)	No (n=4,137)	Yes (n=382)	No (n=3,746)	Yes (n=773)	
General practice appointments	--	1.4 (0.5)	5.4 (3.1)	1.9 (2.3)	5 (4.3)	2.2 (2.6)	5.8 (4.7)	2.1 (2.5)	4.4 (4.2)	2.5 (3.0)
Emergency department attendances	0.1 (0.3)	0.2 (0.5)	0.6 (1.2)	--	1.6 (1.2)	0.2 (0.5)	1.7 (1.7)	0.2 (0.6)	0.7 (1.4)	0.3 (0.8)
Inpatient admissions	0 (0.2)	0.1 (0.3)	0.3 (1.1)	0 (0.2)	0.8 (1.5)	--	1.9 (1.7)	0.1 (0.4)	0.5 (1.4)	0.2 (0.7)
Outpatient appointments	0.1 (0.5)	0.3 (0.9)	0.7 (1.8)	0.3 (1.1)	0.8 (1.8)	0.3 (0.9)	1.5 (2.7)	--	2.2 (2.2)	0.4 (1.2)
Age	8.9 (3.6)	7.6 (4.0)	5.1 (4.2)	7.6 (4.1)	4.6 (4.2)	7.3 (4.2)	4.6 (4.5)	7.1 (4.2)	6.7 (4.4)	7.1 (4.2)
Age band										
0 to 5	215 (17%)	555 (35%)	1029 (62%)	1247 (34%)	552 (69%)	1538 (37%)	261 (68%)	1454 (39%)	345 (45%)	1799 (40%)
6 to 10	597 (48%)	615 (38%)	386 (23%)	1460 (39%)	138 (17%)	1537 (37%)	61 (16%)	1363 (36%)	235 (30%)	1598 (35%)
11 to 15	441 (35%)	428 (27%)	253 (15%)	1011 (27%)	111 (14%)	1062 (26%)	60 (16%)	929 (25%)	193 (25%)	1122 (25%)
Female	607 (48%)	813 (51%)	849 (51%)	1913 (51%)	356 (44%)	2104 (51%)	165 (43%)	1946 (52%)	323 (42%)	2269 (50%)
IMD quintile										
1	225 (18%)	318 (20%)	312 (19%)	704 (19%)	151 (19%)	780 (19%)	75 (20%)	702 (19%)	153 (20%)	855 (19%)
2	277 (22%)	337 (21%)	366 (22%)	795 (21%)	185 (23%)	904 (22%)	76 (20%)	823 (22%)	157 (20%)	980 (22%)
3	246 (20%)	290 (18%)	341 (20%)	731 (20%)	146 (18%)	809 (20%)	68 (18%)	731 (20%)	146 (19%)	877 (19%)
4	266 (21%)	299 (19%)	342 (21%)	749 (20%)	158 (20%)	830 (20%)	77 (20%)	743 (20%)	164 (21%)	907 (20%)
5	239 (19%)	354 (22%)	307 (18%)	739 (20%)	161 (20%)	814 (20%)	86 (23%)	747 (20%)	153 (20%)	900 (20%)
At least one long-term condition	33 (3%)	99 (6%)	150 (9%)	215 (6%)	67 (8%)	239 (6%)	43 (11%)	162 (4%)	120 (16%)	282 (6%)

## Appendix 5

Best fitting models predicting children's general practice utilisation

	Children with siblings (n=4,519)	
	Rate ratio (95% CI)	P value
<b>Child characteristics</b>		
Child age band (vs 0 to 5)		
6 - 10	0.42 (0.40-0.44)	<.001
11 - 15	0.39 (0.37-0.42)	<.001
Child female (vs male)	1.02 (0.98-1.07)	0.344
Child IMD Quintile (vs 1)		
2	0.96 (0.86-1.08)	0.525
3	1.02 (0.90-1.15)	0.809
4	1.02 (0.90-1.15)	0.775
5	0.98 (0.87-1.10)	0.704
Child long-term condition (vs not)	1.92 (1.76-2.09)	<.001
<b>Parent characteristics</b>		
Parent with asthma (vs not)	1.00 (0.86-1.17)	0.971
Parent with depression (vs not)	1.04 (0.90-1.19)	0.585
Parent with diabetes (vs not)	0.88 (0.74-1.05)	0.170
Parent with epilepsy (vs not)	1.06 (0.73-1.53)	0.772
Parent with hypertension (vs not)	0.87 (0.76-1.01)	0.063
Parent with a mental health condition (vs not)	0.95 (0.70-1.28)	0.731
Parent with osteoarthritis (vs not)	1.20 (0.97-1.49)	0.089
Parent general practice appointments	1.10 (1.08-1.11)	<.001
Parent long-term condition mean	1.28 (1.07-1.53)	0.007
*Parent long-term condition mean	0.96 (0.94-0.98)	<.001
<b>Household characteristics</b>		
Single parent house (vs not)	0.89 (0.82-0.97)	0.011
Number of children in the house	0.94 (0.91-0.98)	0.005

Best fitting models predicting children's emergency department utilisation

	<b>Children with siblings (n=4,519)</b>	
	<b>Odds ratio (95% CI)</b>	<b>P value</b>
<b>Child characteristics</b>		
Child age band (vs 0 to 5)		
6 - 10	0·18 (0·15-0·23)	<·001
11 - 15	0·20 (0·15-0·26)	<·001
Child female (vs male)	0·74 (0·62-0·88)	<·001
Child IMD Quintile (vs 1)		
2	1·05 (0·79-1·41)	0·722
3	0·96 (0·71-1·30)	0·772
4	0·99 (0·73-1·33)	0·939
5	1·08 (0·80-1·45)	0·620
Child long-term condition (vs not)	2·60 (1·85-3·64)	<·001
<b>Parent characteristics</b>		
Parent with asthma (vs not)	0·92 (0·66-1·27)	0·613
Parent with depression (vs not)	1·38 (1·07-1·76)	0·011
Parent with diabetes (vs not)	0·98 (0·65-1·48)	0·931
Parent with epilepsy (vs not)	1·11 (0·45-2·71)	0·822
Parent with hypertension (vs not)	0·91 (0·68-1·24)	0·560
Parent with a mental health condition (vs not)	0·64 (0·29-1·41)	0·270
Parent with osteoarthritis (vs not)	0·99 (0·58-1·69)	0·972
Parent emergency department attendance	1·26 (1·11-1·43)	<·001
*Parent long-term condition mean	--	--
Parent age mean	0·98 (0·97-1·00)	0·035

Best fitting models predicting children's inpatient utilisation

	<b>Children with siblings (n=4,519)</b>	
	<b>Odds ratio (95% CI)</b>	<b>P value</b>
<b>Child characteristics</b>		
Child age band (vs 0 to 5)		
6 - 10	0.19 (0.14-0.27)	<.001
11 - 15	0.25 (0.18-0.35)	<.001
Child female (vs male)	0.73 (0.58-0.93)	0.009
Child IMD Quintile (vs 1)		
2	0.80 (0.54-1.19)	0.267
3	0.86 (0.57-1.29)	0.456
4	0.94 (0.63-1.39)	0.751
5	1.13 (0.76-1.66)	0.551
Child long-term condition (vs not)	3.23 (2.13-4.88)	<.001
<b>Parent characteristics</b>		
Parent with asthma (vs not)	1.12 (0.75-1.69)	0.579
Parent with depression (vs not)	1.47 (1.07-2.03)	0.018
Parent with diabetes (vs not)	0.97 (0.56-1.67)	0.910
Parent with epilepsy (vs not)	1.41 (0.47-4.23)	0.538
Parent with hypertension (vs not)	0.93 (0.63-1.38)	0.732
Parent with a mental health condition (vs not)	0.78 (0.29-2.12)	0.623
Parent with osteoarthritis (vs not)	1.45 (0.76-2.77)	0.259
Parent inpatient admissions	1.43 (1.06-1.93)	0.020

Best fitting models predicting children's outpatient utilisation

	<b>Children with siblings (n=4,519)</b>	
	<b>Odds ratio (95% CI)</b>	<b>P value</b>
<b>Child characteristics</b>		
Child age band (vs 0 to 5)		
6 - 10	0·62 (0·51-0·76)	<·001
11 - 15	0·70 (0·56-0·88)	0·002
Child female (vs male)	0·66 (0·55-0·78)	<·001
Child IMD Quintile (vs 1)		
2	0·91 (0·68-1·21)	0·501
3	0·96 (0·71-1·28)	0·769
4	1·02 (0·77-1·36)	0·888
5	0·96 (0·72-1·29)	0·783
Child long-term condition (vs not)	4·62 (3·43-6·23)	<·001
<b>Parent characteristics</b>		
Parent with asthma (vs not)	1·13 (0·83-1·53)	0·439
Parent with depression (vs not)	1·67 (1·32-2·12)	<·001
Parent with diabetes (vs not)	1·05 (0·72-1·55)	0·787
Parent with epilepsy (vs not)	1·17 (0·50-2·77)	0·714
Parent with hypertension (vs not)	0·98 (0·75-1·30)	0·913
Parent with a mental health condition (vs not)	1·01 (0·50-2·03)	0·971
Parent with osteoarthritis (vs not)	1·51 (0·95-2·40)	0·078
Parent outpatient admissions	1·08 (1·01-1·15)	0·021
<b>Household characteristics</b>		
Number of people in the household	0·94 (0·89-1·00)	0·039



## Appendix 6

Logistic regression models predicting child inpatient utilisation. Models first control for just child characteristics, and then both child and parent characteristics

	Children with siblings* (n=4,519)			
	Model 1		Model 2	
	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value
<b>Child characteristics</b>				
Child age band (vs 0 to 5)				
6 - 10	0.20 (0.14-0.27)	<.001	0.19 (0.14-0.27)	<.001
11 - 15	0.25 (0.18-0.35)	<.001	0.25 (0.18-0.35)	<.001
Child female (vs male)	0.74 (0.58-0.93)	0.011	0.73 (0.58-0.93)	0.009
Child IMD Quintile (vs 1)				
2	0.81 (0.54-1.20)	0.288	0.80 (0.54-1.19)	0.267
3	0.84 (0.56-1.27)	0.405	0.86 (0.57-1.29)	0.456
4	0.95 (0.64-1.41)	0.794	0.94 (0.63-1.39)	0.751
5	1.12 (0.76-1.66)	0.570	1.13 (0.76-1.66)	0.551
Child long-term condition (vs not)	3.37 (2.22-5.11)	<.001	3.23 (2.13-4.88)	<.001
<b>Parent characteristics</b>				
Parent with asthma (vs not)	--	--	1.12 (0.75-1.69)	0.579
Parent with depression (vs not)	--	--	1.47 (1.07-2.03)	0.018
Parent with diabetes (vs not)	--	--	0.97 (0.56-1.67)	0.910
Parent with epilepsy (vs not)	--	--	1.41 (0.47-4.23)	0.538
Parent with hypertension (vs not)	--	--	0.93 (0.63-1.38)	0.732
Parent with a mental health condition (vs not)	--	--	0.78 (0.29-2.12)	0.623
Parent with osteoarthritis (vs not)	--	--	1.45 (0.76-2.77)	0.259
Parent inpatient appointments	--	--	1.43 (1.06-1.93)	0.020

Logistic regression models predicting child outpatient utilisation. Models first control for just child characteristics, and then both child and parent characteristics

<b>Children with siblings (n=4,519)</b>				
	<b>Model 1</b>		<b>Model 2</b>	
	<b>Odds ratio (95% CI)</b>	<b>P value</b>	<b>Odds ratio (95% CI)</b>	<b>P value</b>
<b>Child characteristics</b>				
Child age band (vs 0 to 5)				
6 - 10	0.63 (0.52-0.78)	<.001	0.61 (0.50-0.75)	<.001
11 - 15	0.71 (0.57-0.89)	0.003	0.69 (0.55-0.86)	0.001
Child female (vs male)	0.66 (0.55-0.78)	<.001	0.65 (0.55-0.78)	<.001
Child IMD Quintile (vs 1)				
2	0.89 (0.67-1.20)	0.455	0.91 (0.68-1.21)	0.517
3	0.94 (0.70-1.27)	0.709	0.96 (0.71-1.29)	0.788
4	1.05 (0.78-1.40)	0.767	1.04 (0.78-1.39)	0.805
5	0.94 (0.70-1.27)	0.697	0.96 (0.72-1.29)	0.783
Child long-term condition (vs not)	5.00 (3.70-6.75)	<.001	4.65 (3.44-6.28)	<.001
<b>Parent characteristics</b>				
Parent with asthma (vs not)	--	--	1.11 (0.82-1.50)	0.516
Parent with depression (vs not)	--	--	1.67 (1.32-2.11)	<.001
Parent with diabetes (vs not)	--	--	1.02 (0.69-1.49)	0.935
Parent with epilepsy (vs not)	--	--	1.10 (0.46-2.60)	0.832
Parent with hypertension (vs not)	--	--	0.96 (0.73-1.27)	0.780
Parent with a mental health condition (vs not)	--	--	1.00 (0.50-2.01)	0.995
Parent with osteoarthritis (vs not)	--	--	1.44 (0.91-2.28)	0.124
Parent outpatient admissions	--	--	1.08 (1.01-1.15)	0.017

## Appendix 7

Subgroup analysis by age category, for children with siblings

Children with siblings								
	General practice appointments		At least one emergency department attendance		At least one inpatient admission		At least one outpatient appointment	
	Rate ratio (95% CI)	P value	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value
<b>Children 0 - 5</b>	<b>(n=1,799)</b>							
Parent with depression (vs not)	0.94 (0.83-1.07)	0.325	1.23 (0.89-1.69)	0.203	1.45 (0.99-2.14)	0.059	1.63 (1.09-2.42)	0.016
Parent with osteoarthritis (vs not)	1.23 (0.93-1.64)	0.152	1.12 (0.52-2.41)	0.763	1.94 (0.82-4.58)	0.130	1.67 (0.67-4.14)	0.266
<b>Children 6 - 10</b>	<b>(n=1,598)</b>							
Parent with depression (vs not)	1.11 (0.93-1.32)	0.238	1.21 (0.27-5.46)	0.807	1.79 (0.17-18.4)	0.625	1.49 (0.40-5.48)	0.548
Parent with osteoarthritis (vs not)	1.28 (0.93-1.76)	0.123	0.45 (0.01-18.0)	0.671	0.30 (<.01- 318)	0.735	1.37 (0.11-17.7)	0.811
<b>Children 11 - 15</b>	<b>(n=1,122)</b>							
Parent with depression (vs not)	1.28 (1.04-1.57)	0.018	2.33 (0.51-10.6)	0.272	1.17 (0.13-10.7)	0.892	2.13 (1.38-3.27)	<.001
Parent with osteoarthritis (vs not)	1.24 (0.87-1.78)	0.229	1.54 (0.10-22.9)	0.754	3.54 (0.15-81.6)	0.428	1.49 (0.71-3.14)	0.291

## Appendix 8

Sensitivity analysis, all parental factors maternal, for children with siblings

	Children with siblings (n=4,348)							
	General practice appointments		At least one emergency department attendance		At least one inpatient admission		At least one outpatient appointment	
	Rate ratio (95% CI)	P value	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value
<b>Child characteristics</b>								
Child age band (vs 0 to 5)								
6 - 10	0.42 (0.40-0.44)	<.001	0.17 (0.14-0.22)	<.001	0.20 (0.15-0.28)	<.001	0.63 (0.51-0.77)	<.001
11 - 15	0.39 (0.37-0.42)	<.001	0.19 (0.14-0.24)	<.001	0.24 (0.17-0.34)	<.001	0.68 (0.54-0.85)	<.001
Child female (vs male)	1.03 (0.98-1.08)	0.256	0.75 (0.63-0.90)	0.002	0.73 (0.57-0.93)	0.011	0.67 (0.56-0.80)	<.001
Child IMD Quintile (vs 1)								
2	0.96 (0.85-1.08)	0.484	1.09 (0.80-1.47)	0.591	0.75 (0.50-1.13)	0.171	0.90 (0.67-1.22)	0.509
3	0.99 (0.87-1.12)	0.847	0.92 (0.67-1.26)	0.615	0.84 (0.55-1.27)	0.403	0.97 (0.71-1.31)	0.823
4	1.01 (0.90-1.15)	0.842	0.99 (0.73-1.35)	0.946	0.92 (0.61-1.38)	0.686	1.08 (0.80-1.45)	0.626
5	0.98 (0.87-1.11)	0.776	1.06 (0.78-1.44)	0.721	1.14 (0.76-1.70)	0.523	0.96 (0.71-1.29)	0.766
Child long-term condition (vs not)	1.94 (1.78-2.12)	<.001	2.73 (1.92-3.88)	<.001	3.38 (2.20-5.18)	<.001	4.87 (3.57-6.66)	<.001
<b>Maternal characteristics</b>								
Mother with asthma (vs not)	1.04 (0.90-1.21)	0.568	0.77 (0.52-1.14)	0.195	1.06 (0.65-1.72)	0.809	0.99 (0.69-1.42)	0.958
Mother with depression (vs not)	1.08 (0.96-1.21)	0.184	1.55 (1.19-2.02)	0.001	1.43 (1.01-2.03)	0.042	1.66 (1.28-2.14)	<.001
Mother with diabetes (vs not)	1.02 (0.82-1.29)	0.834	1.30 (0.75-2.27)	0.352	1.62 (0.79-3.29)	0.185	1.27 (0.75-2.15)	0.379
Mother with epilepsy (vs not)	1.15 (0.68-1.95)	0.603	0.63 (0.15-2.67)	0.527	1.67 (0.35-7.88)	0.518	1.01 (0.25-3.98)	0.991
Mother with hypertension (vs not)	0.88 (0.76-1.02)	0.089	1.01 (0.70-1.45)	0.977	0.88 (0.53-1.45)	0.622	1.08 (0.77-1.52)	0.655
Mother with a mental health condition (vs not)	1.06 (0.74-1.53)	0.734	0.87 (0.35-2.14)	0.763	0.79 (0.23-2.70)	0.706	1.18 (0.52-2.68)	0.700
Mother with osteoarthritis (vs not)	1.33 (1.05-1.67)	0.018	0.82 (0.44-1.54)	0.533	1.56 (0.74-3.25)	0.239	1.30 (0.76-2.22)	0.347
Mother utilisation	1.06 (1.05-1.07)	<.001	1.28 (1.12-1.47)	<.001	1.39 (0.98-1.98)	0.064	1.09 (1.01-1.16)	0.022

## Appendix 9

Sensitivity analysis, at least two instances of utilisation, for children with siblings

	Children with siblings (n=4,519)					
	At least two emergency department attendances		At least two inpatient admissions		At least two outpatient appointments	
	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value
<b>Child characteristics</b>						
Child age band (vs 0 to 5)						
6 - 10	0.03 (0.01-0.06)	<.001	0.04 (0.02-0.10)	<.001	0.62 (0.46-0.84)	0.002
11 - 15	0.02 (0.01-0.06)	<.001	0.08 (0.03-0.20)	<.001	0.76 (0.54-1.06)	0.100
Child female (vs male)	0.42 (0.27-0.65)	<.001	0.60 (0.35-1.00)	0.051	0.55 (0.42-0.72)	<.001
Child IMD Quintile (vs 1)						
2	0.65 (0.23-1.82)	0.417	0.49 (0.15-1.66)	0.252	0.73 (0.45-1.17)	0.195
3	0.83 (0.29-2.35)	0.721	0.78 (0.24-2.54)	0.685	0.79 (0.49-1.28)	0.337
4	0.88 (0.32-2.45)	0.808	0.80 (0.25-2.56)	0.709	1.03 (0.65-1.63)	0.907
5	0.89 (0.32-2.51)	0.829	0.79 (0.25-2.56)	0.699	0.88 (0.55-1.42)	0.606
Child long-term condition (vs not)	8.10 (3.29-19.9)	<.001	7.61 (3.04-19.1)	<.001	6.86 (4.48-10.5)	<.001
<b>Parent characteristics</b>						
Parent with asthma (vs not)	1.06 (0.34-3.29)	0.923	1.14 (0.33-3.96)	0.833	0.64 (0.38-1.09)	0.104
Parent with depression (vs not)	1.45 (0.60-3.47)	0.409	1.20 (0.43-3.32)	0.730	2.00 (1.37-2.93)	<.001
Parent with diabetes (vs not)	0.55 (0.11-2.78)	0.468	0.95 (0.18-5.09)	0.957	1.00 (0.54-1.86)	0.998
Parent with epilepsy (vs not)	3.35 (0.16-71.8)	0.440	1.85 (0.07-48.5)	0.711	0.11 (0.01-1.17)	0.067
Parent with hypertension (vs not)	1.06 (0.37-2.99)	0.917	1.14 (0.36-3.65)	0.823	1.15 (0.74-1.79)	0.529
Parent with a mental health condition (vs not)	0.45 (0.03-7.86)	0.587	0.21 (<.01-20.0)	0.506	0.67 (0.20-2.22)	0.515
Parent with osteoarthritis (vs not)	1.25 (0.19-8.28)	0.818	1.93 (0.28-13.3)	0.504	2.63 (1.29-5.37)	0.008
Parent utilisation	1.37 (0.82-2.29)	0.224	1.30 (0.51-3.32)	0.588	1.13 (1.02-1.25)	0.020

