# Predictors of children's health system use: cross-sectional study of linked data

Article category: Epidemiology

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**Key messages**

- High use of health services is associated with lower socioeconomic status
- This study shows high use of general practice by young children
- Strongest association between the use of Emergency Department and deprivation

**Abstract**

*Background*

Use of health services is increasing in many countries. Most health service research exploring determinants of use has focused on adults and on secondary care. Less is known about factors associated with use of the emergency department and general practice among young children.

*Objective*

To explore factors associated with general practice (GP) consultations and emergency department (ED) attendances among children under five in a single UK city.

*Methods*

Cross-sectional exploratory study using anonymised individual-level health service use data for children aged 0-4 from 21 general practices in Southampton, UK, linked to emergency department data, over a one-year period.

Univariate and multivariable logistic regression were used to explore the association of sociodemographic factors (using the 2015 Index of Multiple Deprivation (IMD) to define socioeconomic status) with high service use (defined as more than eight GP consultations and /or two ED attendances respectively).

*Results*

Among 11,062 children there were 76,092 GP consultations and 6107 ED attendances. 3233 (29%) children were high users of GP and 564 (5%) of ED services. Greater socioeconomic deprivation was

independently associated with high use of GP and ED services separately (odds ratios (OR) for most vs. least deprived IMD quintile 1.45 (95%CI 1.20 to 1.75) and 2.21 (95%CI 1.41 to 3.46) respectively), and together (OR 2.62 (95%CI 1.48 to 4.65)).

*Conclusion*

Young children are frequent users of health services, particularly general practice. Socioeconomic deprivation is an important factor. Parents, carers and health services may benefit from interventions that support families in their management of children's health.

**Key words**

Children; Health services; General Practice; Emergency department; Socioeconomic factors; Cross-sectional study

## Background

Use of health services is increasing, primarily driven by aging populations, increasing prevalence of chronic disease, and advances in health technology[1,2]. Use of both general practice and secondary care services is rising across the lifespan[3,4]. In the United Kingdom (UK) there are trends of increasing use in General Practice (GP) consultation rates[3] and in Emergency Department (ED) total attendances[4], for both adults and children, particularly 0-4-year olds[5,4,6].

The factors associated with the rise in use of ED has been the focus of much research. Whilst there is some evidence in a UK setting supporting an inverse correlation between access to primary care and ED attendance[7], a stronger association is noted between population characteristics such as socioeconomic deprivation and high use of ED[8, 9]. Infants and preschool children living in the most deprived areas are twice as likely to attend ED as those living in the least deprived[5].

Frequency of health service use by all age groups is associated with travel time and distance. In an observational study in South-west England people were less likely to access a service out of hours if they lived rurally compared with an urban area, which was most pronounced for the 0-4-year old age group[10]. In the North-west of England people were less likely to attend ED the further away they lived from it, or the closer they lived to a GP[11].

Factors influencing use of health services by young children, in both general practice and secondary care are less well described than for the adult population. No other UK studies have investigated this at scale, for infants and pre-schoolers as a discrete group, and using linked data. The aim of this study therefore was to explore the use of general practice and acute secondary health services and associated factors in children under 5 years of age across a single UK city using a linked dataset.

## Methods

This study used a exploratory cross-sectional design over a one-year period. The dataset was drawn from anonymised individual level GP data from the commissioning organisation, NHS Southampton

City Clinical Commissioning Group (CCG). It included all 0-4-year olds registered at 21 out of 27 practices in the city and their GP consultations (any consultation with a recorded diagnosis and/or medication issued) and ED attendances for the period June 2017 to May 2018, linked via the child's NHS number; not all Southampton practices submitted data to this particular database for the period in question. Ethical approval for the study was obtained from the University of Southampton Faculty of Medicine Ethics Committee (Submission ID:53158).

Number of GP consultations and ED attendances were treated as binary variables to indicate high users of GP and ED, defined as more than eight GP consultations and more than two ED attendances in a year. The threshold for high GP use was determined using national GP consultation rates, which for the last recorded period were 7.33 and 7.83 per person per year for female and male 0-4-year olds[3]. No such data existed for ED attendances, this threshold was set by reviewing limits applied in similar studies; as different thresholds were applied in each paper with no explanations as to how this was decided, an average of the two was used in this study, also taking into consideration the distribution within the data[12,13]. Further outcome variables were created using combinations of these to explore whether individuals tended to use both primary and secondary care services or one or the other; high and low users were combined as follows: A - high users of both GP and ED, B - high users of GP but not ED, C- high users of ED but not GP and D – lower users of both GP and ED.

The explanatory variables included age at the end of the data period, sex, and 2015 Indices of Multiple Deprivation (IMD) as a measure of socioeconomic status. The IMD is a small-area measure of socioeconomic status, ranked nationally with seven domains: income, employment, education/skills/training, health and disability, crime, barriers to housing and services, and living environment[14]. The IMD was treated categorically using national quintiles for the child's residence (quintile 1 =most deprived, quintile 5= least deprived).

Distance in metres was calculated for two options: distance to the patient's registered GP and distance to the hospital ED. The distance was calculated using the OS Open Roads[15] network in

ArcMap 10.6 (Network Analyst extension) and the patient's population-weighted centroid of their home 2011 Lower Super Output Area (LSOA)[16], a small population area of about 1500, which indicates the centre of the LSOA. The locations of the GP surgeries were identified using the NHS website (Find Services[17]) and postcodes linked to the locations for mapping using UK Grid Reference Finder[18]. Data were linked to each patient record to indicate the distance from their 'home' LSOA population-weighted centroid to their registered GP and the Southampton General Hospital. Distances were analysed and presented as kilometres.

*Statistical methods*

Descriptive statistics were used to identify sociodemographic characteristics of the children and the number and percentage of children who were high service users – including a comparison with the Office of National Statistics (ONS) Mid Year Population Estimates for 0-4-year olds in Southampton in 2017[19] - and in the categories A, B and C as described previously.

Univariate and multivariable logistic regression models were used to explore the association between patient characteristics and high use of GP and ED, individually and in the A, B, C groupings. Potential variables were included in the regression model if they were considered to be of clinical importance or $p<0.1$ in the univariate analysis. This enabled consistency in the final model for all the groupings. Interaction terms were incorporated for distance to ED (as km) and deprivation to explore the potential for a differential effect of socioeconomic status by distance from the hospital. An association was considered statistically significant if the *p-value* was less than 0.05. SPSS (version 25) was used to conduct all analyses.

**Results**

The study included 11,062 children of whom 242 had missing IMD data and were therefore excluded from the descriptive and univariate analyses for IMD, as well as the final regression model. In total there were 76,092 GP consultations, with a median number of consultations per child of five and

interquartile range of seven, and 6,107 ED attendances, median number per child of 0 and interquartile range 1 (table 1). 1,167 (10.5%) children in this study had no GP consultations and 7,413 (67%) had no ED attendance (table 1). In the total study population there were slightly fewer females (48.1%) than males (51.9%); this was most pronounced in group C (high uers of ED and lower user of GP) of whom 113 (59.5%) were male and 77 (40.5%) female (table 2). Overall there were fewer 0-1-year olds (14.9%) than other age categories, and in the high user groupings 1 year olds were the largest category, except in group C where 71 (37.4%) were 2 year olds (table 2). 6,983 (63.9%) of children were from the two most deprived IMD quintiles; in group A (high GP and ED user) this was true for 260 out of 374 (71.7%) children (table 2).

In the study year, 9,895 (89.5%) children saw a GP at least once and 3,649 (33%) had at least one attendance at ED. 3,233 (29.2%) of the study population were high users of GP (>8 attendances/year) and 564 (5.1%) were high users of ED (>2 attendances/year) (table 2). Nearly half of all children lived within 2km of their registered General Practitioner and 5km of the ED (table 1). Linked data showed that 2,859 (25.8%) children were high users of GP but lower users of ED (group B), only 190 (1.7%) were lower users of GP but high users of ED (group C) and 374 (3.4%) were high users of both GP and ED services (group A) (table 2). 7,639 (69%) children were neither high users of GP nor ED. The highest use of general practice for both males and females was seen in the youngest age groups (figure 1). A greater proportion of children from lower IMD (more deprived) were higher users of both GP and ED, and the distribution was broadly similar to that of the 0-4-year old Southampton population estimates (figure 2).

Being a high user of GP services was associated with younger age, being male, greater socioeconomic deprivation and increasing travel distance away from ED. These significant associations were maintained after adjustment for age (odds ratio (OR) 0.68, 95% CI 0.66 to 0.71), sex (OR 1.14, 95% CI 1.05 to 1.24), socioeconomic deprivation (OR 1.45, 95% CI 1.20 to 1.75) and distance to ED (OR 1.02, 95% CI 1.00 to 1.03). Similarly, being a high user of ED was associated with

younger age (OR 0.94, 95% CI 0.88 to 1.00), being male (OR 1.21, 95% CI 1.02 to 1.44) and greater socioeconomic deprivation (OR 2.21, 95% CI 1.41 to 3.46), even after adjustment, but not distance from GP or ED (table 3).

Being in group A (high user of both) was associated with younger age (OR 0.83, 95% CI 0.77 to 0.90) and greater socioeconomic deprivation (OR 2.62, 95% CI 1.48 to 4.65) but not sex or travel distance, which was maintained after adjustment. Group B (high GP lower ED users) was associated with age, sex, socioeconomic deprivation and distance to ED, but after adjustment only age (OR 0.69, 95% CI 0.66 to 0.71), sex (OR 1.13, 95% CI 1.03 to 1.23) and distance to ED (OR 1.02, 95#% CI 1.00 to 1.03), not socioeconomic deprivation. In contrast, group C (high ED lower GP users) was associated with older rather than younger age (OR 1.17, 95% CI 1.05 to 1.31) as well as being male (OR 1.35, 95% CI 1.01 to 1.81) even after adjustment, but not socioeconomic deprivation or distance. Being in Group D (lower users of both), before and after adjustment, was associated with older age (OR 1.42, 95% CI 1.38 – 1.47), being female (OR 0.86, 95% CI 0.79 – 0.93), less socioeconomic deprivation (OR 0.68, 95% CI 0.56 – 0.82) and living closer to ED (OR 0.98, 95% CI 0.97 – 0.99) (table 3). No statistically significant interactions were identified during the analysis.

**Conclusions**

*Summary*

In this cross-sectional exploratory study of general practice and acute secondary care use by children under 5, associations were suggested between high use of services and lower socioeconomic status, younger age, being male, and living further away from ED. In comparison to children in the least deprived IMD quintile, children from lower IMD (more deprived) had greater odds of being high users of GP and ED separately and particularly in combination – 2.62 times more likely to be high users of both. This is an important finding as to date evidence relating to children's use of general practice, and general practice and secondary care in combination, is lacking. Associations with age and sex were observed; with increasing age children were less likely to be high users across the

system, singularly and in combination, and male children were more likely to be high users of both services. Travel distance to GP consultation was not found to be associated with any form of service use, and distance to ED was only associated with high use of general practice; children were more likely to be high GP users the further away from ED they lived.

It is notable that most children were neither high users of general practice nor emergency secondary care; of those who were high users of ED, two thirds were also high users of GP indicating frequent attendance by some parents across the health system. This is an important result that does not support the assertion that some parents of young children use ED instead of general practice; this study suggests that lower GP use is not associated with high ED use.

This study has not shown that greater proximity from general practice is increasing the demand for and use of ED. Demonstrating high use of general practice by almost a third of 0-4-year olds, associated with higher socioeconomic deprivation, highlights the importance of the newly formed primary care networks in addressing local health inequalities[20], reflected in the NHS Long Term Plan[21].

*Strengths and Limitations*

This study has several strengths; it used a large dataset, accounting for 68% of all registered 0-4-year olds across Southampton in April 2017 and, despite missing data from 6 out of 27 practices, was broadly representative of that population regarding gender split and percentage in each IMD quintile.[22,23]. The findings can therefore be applied to the 0-4-year old population of Southampton and potentially other similar urban areas in the UK. No other UK studies have focused on this important age group at such a scale and using linked GP and secondary care data. Identifying a cohort of children as high users of general practice adds to the evidence that already exists on paediatric ED attendance, and furthers our understanding of carers' health seeking behaviour.

This study has important limitations. Data on why a healthcare consultation was sought and the health care professional seen was not available. The time of the attendance is unknown - an important factor in deciding when and where to access care. To further understand how these factors impact on high use of services detailed case note review, or a prospective study, may be useful. Indicators of quality such as practice list size and QOF points were not included, which may be a contributing factor in access to care. However, it has been previously demonstrated that population rather than practice characteristics are the strongest predictors of attendance[9].

Dichotomising count data such as we have done may be perceived as a limitation. However, we used this approach because, in clinical practice, it can be useful to identify people has having an attribute or not in order to assess its impact. IMD data for a small number of children was missing and therefore they were not included in the analysis - this was a small percentage of the total study population (2.2%).

Ethnicity data was not available and may have influenced the way parents access health services; it has been demonstrated that in the UK white children are more likely to attend ED than Black or South Asian children, but the inverse is observed for GP attendance[24,25]. Southampton's ethnic minority population accounts for 15% of the total, it is therefore an important area for further work to better understand this phenomenon locally[22]. This was mainly an urban population; the issues experienced by a rural community may be different and need further exploration. Equally, the findings from this study are based on the UK healthcare system; other healthcare systems may produce different results. As with all observational studies a causal link between the outcomes and population characteristics cannot be inferred from these findings. The limitations of using routine data also apply, in this instance the most important being how and why activity is recorded as well as completeness. Age is an example of this, determined at the end of the study period rather than at the time of attendance – therefore for some 0-1-year olds this is not a complete year of activity.

*Comparison with existing literature*

The findings from this study are supported by two larger studies conducted in East London and central England, which both demonstrated a social gradient to ED attendance for children and adults' separately[26,24,27]. The magnitude of effect for ED attendance from this research was comparable with these much larger studies. There is a paucity of research regarding children's use of general practice and the factors driving it to compare with the findings from this study. Much of the literature has focused on associations with ED attendance, and rarely for infants and pre-school children alone[28]. A study with a much smaller sample from one London GP surgery did also find two thirds of frequent ED attendees were heavy GP users[12].

The associations with younger age and being male have been demonstrated in other studies conducted in the UK and Australia; the nature and cause are unclear and require further research [24,28,29,30]. Local qualitative research with parents of 0-4-year olds identified that parental anxiety is particularly heightened when children are very young[31].

There is little research on distance to services and how it impacts on carers' health-seeking behaviour in an urban environment; most studies to our knowledge have investigated distance to GP and ED in relation to use of ED rather than general practice and often compare rural and urban areas[10,11].

This study looked at demographic factors associated with use of urgent care services; other factors are likely to have influenced carers' health seeking behaviour, including perceived risk of serious illness, worry and reassurance seeking, lack of confidence and ideas for self-help[32,33,34,35,36,37]. Improving parental health literacy, defined as the knowledge, skills and confidence people require to read, understand and use information to improve health[38], especially in families of lower socioeconomic status, has been identified as a strategy for reducing unnecessary health-seeking behaviour. Systematic reviews conducted in the USA have demonstrated an association between low health literacy and increased use of health services, particularly ED and risk of hospitalisation[39]. Furthermore, a large-scale health literacy intervention conducted in the USA with low

socioeconomic families demonstrated a reduction in visits by parents to the ED and primary care physician[40].

*Implications for research and practice*

This study has demonstrated high use of GP services by young children in a UK urban setting. It has identified a small group who are high users of both GP and ED. It is suggestive of a potential relationship between socioeconomic deprivation and being a high user of both services, and in combination. It would be beneficial to better understand the drivers of frequent use and which evidence-based approaches can best address the specific needs of those children. A UK co-designed and evaluated community-based intervention involving families from lower socioeconomic backgrounds and local health and social care professionals would add to this evidence base. Exploration of the role distance to services plays in parental health-seeking behaviour in different settings is also warranted.

**Ethical Approval**

Ethical approval for the study was obtained from the University of Southampton Faculty of Medicine Ethics Committee (Submission ID:53158)

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**Competing Interests**

The authors have declared no competing interests

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**Figure 1: Number of children who are high users of general practice (GP) (n= 3,233) and the emergency department (ED) (n= 564) by age and sex, 0-4-year olds in Southampton, UK, June 2017 – May 2018**

Source: NHS Southampton City Clinical Commissioning Group
Year of Study: 2019

**Figure 2: Proportion of children who are high users of general practice (GP) (n = 3,233) and the emergency department (ED) (n= 564) by Indices of Multiple Deprivation (IMD), 0-4-year olds in Southampton, UK, June 2017 – May 2018**

Source: NHS Southampton City Clinical Commissioning Group
Year of Study: 2019

**Table 1 – Attendance at general practice (GP) and the emergency department (ED) by 0-4-year olds in Southampton UK (n=11,062), June 2017 – May 2018**

| | Total number | Median number per child | Interquartile range | Number of children with 0 (%) |
|---|---|---|---|---|
| **General Practice consultations** | 76,092 | 5 | 7 | 1,167 (10.5%) |
| **Emergency Department attendances** | 6,107 | 0 | 1 | 7,413 (67%) |

#more than 8 GP consultations

##more than 2 ED attendances

Source: NHS Southampton City Clinical Commissioning Group

Year of Study: 2019

**Table 2 – Sociodemographic characteristics of 0-4-year olds in Southampton UK (n=11,062) attending general practice (GP) and the emergency department (ED) between June 2017 and May 2018**

| | Total number of children n (%) | Sex n (%) | | Age (years) n (%) | | | | | Index of Multiple Deprivation (IMD) quintile# n (%) | | | | | Distance to General Practice (km) | | | Distance to Emergency Department (km) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M | F | 0 - 1 | 1 - 2 | 2 - 3 | 3 - 4 | 4 - <5 | 1 (most deprived) | 2 | 3 | 4 | 5 | Median | Inter-quartile range | No. living less than 2km away n (%) | Median | Inter-quartile range | No. living less than 5km away n (%) |
| **All children** | 11,062 (100) | 5,737 (51.9) | 5,325 (48.1) | 1,646 (14.9) | 2,314 (20.9) | 2,314 (20.9) | 2,412 (21.8) | 2,376 (21.5) | 3,348 (30.3) | 3,635 (33.6) | 1,868 (17.3) | 1,207 (11.2) | 762 (7.0) | 1.56 | 1.96 | 5,269 (47.6) | 4.57 | 5.02 | 5,314 (48) |
| **High GP user*** | 3,233 (29.2) | 1740 (53.8) | 1493 (46.2) | 707 (21.9) | 1092 (33.8) | 491 (15.2) | 484 (15.0) | 459 (14.2) | 1026 (32.7) | 1057 (33.7) | 534 (17) | 348 (11.1) | 175 (5.6) | 1.56 | 2.02 | 1,532 (48.8) | 4.71 | 5.16 | 1,479 (47.1) |
| **High ED user**** | 564 (5.1) | 319 (56.6) | 245 (43.4) | 50 (8.9) | 171 (30.3) | 149 (26.4) | 107 (19) | 87 (15.4) | 208 (37.7) | 182 (33) | 94 (17) | 46 (8.3) | 22 (4) | 1.65 | 1.99 | 255 (46.2) | 4.70 | 5.17 | 263 (47.6) |
| **Group A: High user of GP & ED***** | 374 (3.4) | 206 (55.1) | 168 (44.9) | 45 (12) | 141 (37.7) | 78 (20.9) | 62 (16.6) | 48 (12.8) | 148 (40.8) | 112 (30.9) | 61 (16.8) | 29 (8) | 13 (3.6) | 1.68 | 1.92 | 167 (46) | 4.87 | 5.18 | 170 (46.8) |
| **Group B: High user of GP, lower of ED****** | 2,859 (25.8) | 1,534 (53.7) | 1,325 (46.3) | 662 (23.2) | 951 (33.3) | 413 (14.4) | 422 (14.8) | 411 (14.4) | 878 (31.6) | 945 (34) | 473 (17) | 319 (11.5) | 162 (5.8) | 1.53 | 2.03 | 1,366 (49.2) | 4.70 | 5.15 | 1,311 (47.2) |
| **Group C: High user of ED, lower of GP******* | 190 (1.7) | 113 (59.5) | 77 (40.5) | 5 (2.6) | 30 (15.8) | 71 (37.4) | 45 (23.7) | 39 (20.5) | 60 (31.7) | 70 (37) | 33 (17.5) | 17 (9) | 9 (4.8) | 1.57 | 2.1 | 88 (46.6) | 4.56 | 5.13 | 93 (49.2) |
| **Group D: Low users of both GP and ED******** | 7,639 (69.1) | 3,884 (50.8) | 3,755 (49.2) | 934 (12.2) | 1192 (15.6) | 1752 (22.9) | 1883 (24.6) | 1878 (24.6) | 2,262 (30.2) | 2,508 (33.5) | 1,301 (17.4) | 842 (11.2) | 578 (7.7) | 1.56 | 1.91 | 3,648 (48.7) | 4.51 | 4.99 | 3,738 49.9)( |

*more than 8 GP consultations, total for distance to GP and ED 3,140 – 93 cases with missing data removed
**more than 2 ED attendances, total for distance to GP and ED 552 – 12 cases with missing data removed
***more than 8 GP consultations and 2 ED attendances, total for distance to GP and ED 363 – 11 cases with missing data removed
****more than 8 GP consultations but 2 or less ED attendances, total for distance to GP and ED 2,777 – 82 cases with missing data removed
*****more than 2 ED attendances but 8 or less GP consultations, total for distance to GP and ED 189 – 1 case with missing data removed
******8 or less GP consultations and 2 or less ED attendances, total for distance to GP and ED 7,491 –148 cases with missing data removed
#total 10,820 – 242 cases with missing data removed
Some rows do not add up to 100% due to rounding
Source: NHS Southampton City Clinical Commissioning Group
Year of Study: 2019

**Table 3 – Results of univariate and multivariable logistic regression models estimating the associations of high and lower use of general practice (GP) and the emergency department (ED), 0-4-year olds in Southampton, UK, June 2017 – May 2018**

| | **Univariate OR (95% CI)** | ***p-value*** | **Adjusted OR (95% CI)[◊]** | ***p-value*** |
|---|---|---|---|---|
| **High GP user* (n = 3,233)** | | | | |
| Age | 0.69 (0.67 – 0.71) | <0.001 | 0.68 (0.66 – 0.71) | <0.001 |
| Sex (vs female) | 1.12 (1.03 – 1.21) | 0.01 | 1.14 (1.05 – 1.24) | 0.003 |
| Index of Multiple Deprivation (vs 5 least deprived) | | | | |
| 1 (most deprived) | 1.48 (1.23 – 1.78) | 0.001[#] | 1.45 (1.20 – 1.75) | 0.004[#] |
| 2 | 1.38 (1.15 – 1.65) | | 1.32 (1.10 – 1.60) | |
| 3 | 1.34 (1.10 – 1.63) | | 1.30 (1.07 – 1.60) | |
| 4 | 1.36 (1.10 – 1.68) | | 1.35 (1.09 – 1.67) | |
| Distance to GP (km) | 1.00 (0.97 – 1.02) | 0.88 | - | - |
| Distance to ED (km) | 1.02 (1.01 – 1.04) | 0.01 | 1.02 (1.00 – 1.03) | 0.02 |
| **High ED user** (n = 564)** | | | | |
| Age | 0.93 (0.88 – 0.99) | 0.03 | 0.94 (0.88 – 1.00) | 0.04 |
| Sex (vs female) | 1.22 (1.03 – 1.49) | 0.02 | 1.21 (1.02 – 1.44) | 0.03 |
| Index of Multiple Deprivation (vs 5) | | | | |
| 1 | 2.23 (1.43 – 3.48) | <0.001[#] | 2.21 (1.41 – 3.46) | <0.001[#] |
| 2 | 1.77 (1.13 – 2.78) | | 1.76 (1.12 – 2.75) | |
| 3 | 1.78 (1.11 – 2.86) | | 1.77 (1.11 – 2.84) | |
| 4 | 1.33 (0.8 – 2.23) | | 1.33 (0.79 – 2.23) | |
| Distance to GP (km) | 1.01 (0.96 – 1.06) | 0.65 | - | - |
| Distance to ED (km) | 1.02 (0.99 – 1.05) | 0.31 | 1.01 (0.98 – 1.04) | 0.63 |
| **Group A: High user of GP & ED*** (n = 374)** | | | | |
| Age | 0.83 (0.77 – 0.90) | <0.001 | 0.83 (0.77 – 0.90) | <0.001 |
| Sex (vs female) | 1.14 (0.93 – 1.40) | 0.21 | 1.14 (0.92 – 1.40) | 0.24 |
| Index of Multiple Deprivation (vs 5 least deprived) | | | | |
| 1 (most deprived) | 2.67 (1.50 – 4.72) | <0.001[#] | 2.62 (1.48 – 4.65) | <0.001[#] |
| 2 | 1.83 (1.03 – 3.27) | | 1.79 (1.00 – 3.19) | |
| 3 | 1.95 (1.06 – 3.56) | | 1.91 (1.04 – 3.50) | |
| 4 | 1.42 (0.73 – 2.75) | | 1.40 (0.72 – 2.71) | |
| Distance to GP (km) | 1.03 (0.97 – 1.09) | 0.37 | - | - |

| | Univariate OR (95% CI) | *p-value* | Adjusted OR (95% CI)[◊] | *p-value* |
|---|---|---|---|---|
| Distance to ED (km) | 1.02 (0.98 – 1.06) | 0.30 | 1.01 (0.97 – 1.05) | 0.66 |
| **Group B: High user of GP, lower of ED**** **(n = 2,859)** | | | | |
| Age | 0.69 (0.67 – 0.71) | <0.001 | 0.69 (0.66 – 0.71) | <0.001 |
| Sex (vs female) | 1.10 (1.01 – 1.2) | 0.03 | 1.13 (1.03 – 1.23) | 0.008 |
| Index of Multiple Deprivation (vs 5 least deprived) | | | | |
| 1(most deprived) | 1.32 (1.09 – 1.59) | 0.06 | 1.28 (1.05 – 1.55) | 0.13 |
| 2 | 1.30 (1.08 – 1.57) | | 1.25 (1.03 – 1.51) | |
| 3 | 1.26 (1.03 – 1.54) | | 1.21 (0.99 – 1.49) | |
| 4 | 1.33 (1.07 – 1.65) | | 1.31 (1.05 – 1.64) | |
| Distance to GP (km) | 0.99 (0.97 – 1.02) | 0.59 | - | - |
| Distance to ED (km) | 1.02 (1.00 – 1.03) | 0.02 | 1.02 (1.00 – 1.03) | 0.03 |
| **Group C: High user of ED, lower of GP***** **(n = 190)** | | | | |
| Age | 1.18 (1.06 – 1.31) | 0.003 | 1.17 (1.05 – 1.31) | 0.004 |
| Sex (vs female) | 1.37 (1.02 – 1.83) | 0.04 | 1.35 (1.01 – 1.81) | 0.04 |
| Index of Multiple Deprivation (vs 5 least deprived) | | | | |
| 1 (most deprived) | 1.53 (0.75 – 3.09) | 0.57[#] | 1.55 (0.76 – 3.14) | 0.54[#] |
| 2 | 1.64 (0.82 – 3.30) | | 1.68 (0.83 – 3.37) | |
| 3 | 1.51 (0.72 – 3.16) | | 1.54 (0.73 – 3.23) | |
| 4 | 1.20 (0.53 – 2.70) | | 1.21 (0.54 – 2.73) | |
| Distance to GP (km) | 0.98 (0.90 – 1.07) | 0.64 | - | - |
| Distance to ED (km) | 1.01 (0.96 – 1.06) | 0.76 | 1.01 (0.96 – 1.06) | 0.84 |
| **Group D: Lower users of both GP and ED****** | | | | |
| Age | 1.42 (1.38 – 1.46) | <0.001 | 1.42 (1.38 – 1.47) | <0.001 |
| Sex (vs female) | 0.88 (0.81 – 0.95) | 0.001 | 0.86 (0.79 – 0.93) | <0.001 |
| Index of Multiple Deprivation (vs 5 least deprived) | | | | |
| 1 (most deprived) | 0.66 (0.55 – 0.80) | <0.001[#] | 0.68 (0.56 – 0.82) | 0.002[#] |
| 2 | 0.71 (0.59 – 0.85) | | 0.73 (0.61 – 0.88) | |
| 3 | 0.73 (0.60 – 0.89) | | 0.75 (0.62 – 0.91) | |
| 4 | 0.73 (0.60 – 0.90) | | 0.74 (0.60 – 0.92) | |
| Distance to GP (km) | 1.00 (0.98 – 1.03) | 0.76 | | |
| Distance to ED (km) | 0.98 (0.98 – 0.99) | 0.008 | 0.98 (0.97 – 0.99) | 0.021 |

*more than 8 GP consultations
**more than 2 ED attendances
***more than 8 GP consultations and 2 ED attendances
****more than 8 GP consultations but 2 or less ED attendances
*****more than 2 ED attendances but 8 or less GP consultations
******8 or less GP consultations and 2 or less ED attendances
◊adjusted for age, sex, IMD and distance to ED
#p for trend

Source: NHS Southampton City Clinical Commissioning Group
Year of Study: 2019