BritishRedCross

A symptom of unmet need:
Learning more about people who frequently attend Accident and Emergency services

A report for the British Red Cross by Imperial College Health Partners

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Glossary

Term	Acronym	Definition
Accident and Emergency	A&E	A medical department specialising in the acute care of patients.
Body mass index	BMI	A measure of weight with respect to a person's height.
High Intensity Use	HIU	Occurs when person frequently attends A&E. In this report we define it as five or more attendances in a year.
Index of Multiple Deprivation	IMD	A measure of relative deprivation based on postcode – in this report we split the score into quintiles.
Integrated Care System	ICS	An ICS is a collection of all organisations providing publicly-funded healthcare within a geographical area.
Length of stay	LOS	The number of days of an admission into hospital.
Odds ratio	OR	A measure of association between an exposure and an outcome.
Quality and outcomes framework	QOF	A system for performance management for GPs to record chronic disease diagnoses of their patients.
Royal College of Emergency Medicine	RCEM	A professional membership organisation representing A&E and emergency medicine.
Whole System Integrated Care Dataset	WSIC	An integrated dataset linking the health and social care data of all residents registered to a GP in North-West London.

Key takeaways

- People who frequently attend A&E remain poorly understood and are often associated with the stigma that their frequent use of A&E services is down to poor choice or exclusively mental health.

- However, this is an extremely heterogenous group of patients and there is clear evidence of a link to complex physical health disorders and a strong association with higher socio-economic deprivation.

- Patients from the most deprived neighbourhoods are twice as likely to experience periods of high intensity use, compared to those from the least deprived postcodes. Black or Black British patients are 1.3 times more likely to do so compared to patients who are White.

- People who frequently attend are more likely to be over 50 years of age, and obese or under-weight.

- Overall, the background medical history of someone who frequently attends is most likely to include dementia, palliative care, heart failure or epilepsy, and they are 10 times more likely to have three or more medical conditions over having no background medical history at all. Epilepsy and learning disability are diagnoses that are particularly associated with people who frequently attend in the long term.

- The majority of people who frequently attend will use A&E intensively for a one-year period and then return to normal levels.[1] A smaller cohort of people who frequently attend will persistently use A&E services for several years in a row.

- 99 per cent of people who frequently attend are engaged with other health services during their year of crisis attendance. They are particularly likely to be engaged with social care or have had an inpatient stay in the same year.

- High intensity use should be re-framed as a symptom of unmet need associated with inequality, and the healthcare system needs to collaborate across organisational boundaries, including with voluntary sector partners, to treat this group of patients with complex needs.

Introduction and aims of project

Covid-19 has led to a refocus on the role of inequalities driving healthcare outcomes due to the disparate impact the pandemic has had across our society. People who frequently attend A&E are people who frequently attend emergency departments because their healthcare needs are not being met by the wider healthcare system, often during a time of personal crisis. This heterogenous group of people remains poorly understood, and is often labelled with the stigma that their frequent attendance is due to poor choice.

In order to ultimately design more effective services for this cohort of people, we need to learn more about the heterogeneity of this group, the factors that may be driving high intensity use, how people who frequently attend are engaging with other health services, and importantly, what role societal inequalities play. This will allow us to be better at proactively identifying who is likely to become someone who frequently attends A&E, understanding how we should segment this diverse group of people and designing targetable interventions to better meet their needs.

In this study we have conducted a retrospective analysis on the healthcare data of people who frequently attend across the entire healthcare system of North West London (NWL) to answer the following questions:

- Who is most likely to frequently attend A&E?
- How do people who frequently attend use healthcare services before, during and after their year of crisis?
- What has been the impact of Covid-19 on HIU health and care service use?

For each of these questions we present our key quantitative findings with policy and operational recommendations on how the healthcare system could better manage this complex group of patients.

Approach

North West London (NWL) has a population of approximately 2.2 million residents, consisting of eight Local Authorities (LAs), 10 acute and specialist hospitals and two mental health hospitals. Our population is very diverse – we contain four of England and Wales' most diverse local authorities.[2]

The linked health and social care data of NWL residents is held in the Whole System Integrated Care (WSIC) dataset. This allows us to conduct retrospective research on HIU health care system usage across different care settings. Furthermore, it enables us to identify patients who attend different hospitals in a small geographical area, an issue common to most urban sectors.

We used the principles of a case-control study to conduct a retrospective analysis within the WSIC dataset in order to compare a frequently-attending population with a non-frequently attending comparator group: comparing their attendance patterns and the prevalence of demographic and disease variables within each population.

Defining the populations

The Royal College of Emergency Medicine (RCEM) defines a person who frequently attends A&E as someone who attends five or more times in one year, and we have used this definition for our frequently-attending population in this study.[3] We have then split this group to create further sub-cohorts to examine (Table 1), with the High, Medium and Low sub-cohorts defined by the frequency of attendance, and the Persistent sub-cohort defined as someone who has been attending frequently for at least two years in a row. These sub-cohorts are not mutually exclusive, i.e., the same patient could belong to both the 'Persistent' and 'High' cohorts. We excluded people aged under 18 from this study.

Our comparator group was any adult who was not frequently attending A&E. The default year of inclusion was 2018/19 and Table 1 shows the total numbers of people in each of the cohorts.

Population group	Cohort definition	Number of people (2018/19)
Non-frequently attending	Fewer than 5 A&E attendances in 2018/19	2,173,049
RCEM (All)	5 or more A&E attendances in 2018/19	7,495
Sub-cohorts:		
Persistent (or Chronic)	5 or more A&E attendances in both 2018/19 and 2017/18	1,642
High	16+ A&E attendances in 2018/19	359
Medium	10-15 A&E attendances in 2018/19	797
Low	5-9 A&E attendances in 2018/19	6,339

Table 1

The variables of interest

For each cohort we looked at:

- demographics (age, gender*, ethnicity, BMI and deprivation as measured by the Index of Multiple Deprivation (IMD) score[4]);
- disease diagnoses as coded by a patient's GP in the QOF register**; and
- attendance at health services: Primary care, outpatients, inpatient stays, community care, social care.

*Patient information within WISC is pulled from GP records and different GP practices may record 'gender' or 'sex' as the chosen metric. For consistency we have used the term 'gender' throughout.

**The Quality and Outcomes (QOF) framework is used by GPs to record any chronic long-term conditions that a patient has.

We then either present the data as simple aggregate counts for each cohort or calculate the odds ratios for each variable by comparing the prevalence within the non-frequently attending comparator group.

The full methodology can be found in Appendix A.

Limitations

- The WSIC dataset only captures people who are registered to a GP in NWL, therefore there are particular sectors of the population that will be missed, such as those who are homeless.
- This study has looked at the association of particular disease or demographic attributes, and is **not** intended to imply **causation.**
- We have identified the cohorts of frequent attendance by capturing everyone who was frequently attending in a particular year (default year was 2018/19). Therefore, this is not representative of the lifetime risk of someone experiencing a period of high intensity use.
- The non-frequently attending comparator group is not a matched control group. This means that there may be differences between the non-frequently attending and frequently attending groups and this can affect the reliability of the results.
- The reasons why these patients are attending A&E are extremely diverse and caution should be taken when interpreting these aggregate findings.
- These findings may not be applicable to other populations due to fundamental differences in demographics and/or healthcare service access.
- We are mindful that persistent is not the best language and will seek to address in future iterations.

Section 1: Who is most likely to attend A&E frequently?

IMPROVING CARE FOR PEOPLE WHO FREQUENTLY ATTEND URGENT CARE SERVICES

Who is more likely to become a person who frequently attends urgent care services?

1. AGE
The likelihood of becoming a person who frequently attends urgent care services increases with age

2. DEPRIVATION
People from deprived backgrounds are 2.3 times more likely to be a person who frequently attends urgent care services than the least deprived

3. RACE
Black and Black British adults are 1.3 times more likely to be a person who frequently attends urgent care services than those who are White

4. WEIGHT
Obese and underweight adults are approximately 1.5 times more likely to be a person who frequently attends urgent care services than those with a healthy weight

5. PRE-EXISTING CONDITIONS
Dementia, heart failure and epilepsy increase likelihood. Learning difficulties are associated with being person who frequently attends urgent care services

The likelihood of becoming a person who frequently attends increases with age

In terms of absolute numbers of people who frequently attend, there are two peaks in the young adult and elderly age groups (Figure 1). However, when one takes into consideration these numbers as proportions of the non-frequently attending population, the likelihood of frequent attendance increases with age, with 80-89 year olds six times more likely to frequently attend than those under the age of 40 (Figure 2).

There is no difference in the likelihood of frequently attending between men and women when looking at the Total frequently attending group (Figure 3), however when we look at the 'High' frequently

attending group (i.e. people who attended A&E 16 or more times), women are less likely to be in this cohort.

Absolute numbers of people who attend A&E frequently by age and frequency

(Figure 1 — bar chart)

Number of people

Age group	RCEM defintion (>5 times per year)	Persistent attendance (5 times or more in two years)
18-29	1067	207
30-39	934	211
40-49	855	213
50-59	932	264
60-69	908	197
70-79	1225	260
80-89	1223	244
90+	351	46

Figure 1

Likelihood of becoming a person who frequently attends based on age (OR calculated with 18-29 as reference)

Odds Ratio

Age group	RCEM	Persistent
18-29	1.00	1.00
30-39	0.81	0.94
40-49	1.01	1.29
50-59	1.43	2.09
60-69	2.09	2.34
70-79	4.13	4.52
80-89	6.29	6.47
90+	5.08	3.43

Figure 2

Likelihood of becoming a person who attends frequently based on gender (OR calculcated with Male as reference)

Odds Ratio

Gender	RCEM - All	Persistent
Male	1.00	1.00
Female	1.03	1.00

Figure 3

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Obese and underweight adults are more likely to attend frequently

When compared to those with a normal BMI, both obese and underweight adults are around 1.4 times more likely to attend A&E services frequently (Figure 4). In terms of absolute numbers, obese people who frequently attend are a much larger group (total = 1204) than those who have an underweight BMI (total = 450) – see Appendix C for aggregate numbers.
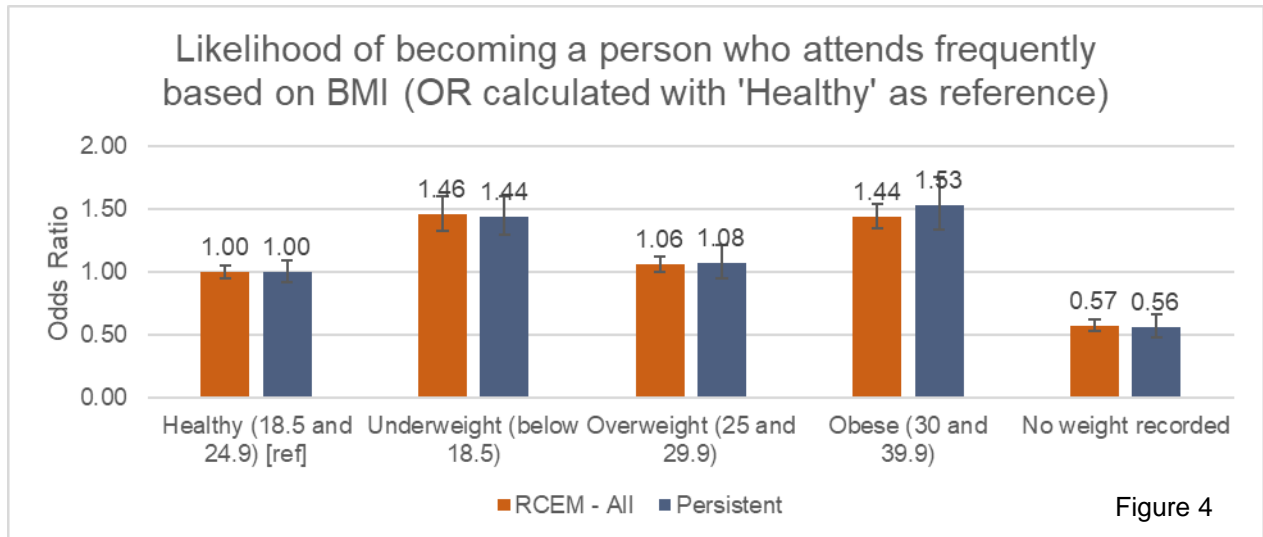
Figure 4

Black and Black British adults are 1.3 times more likely to be a person who frequently attends

People from an Asian/Asian British background are less likely to be a person who frequently attends compared to those who are White (Figure 5). Black or Black British people have a 1.3 times greater likelihood of being a person who frequently attends, however this effect is lost when just looking at the Persistent HIU population. Similarly, people who have a Mixed or Multiple ethnic background are also slightly more likely to be a person who frequently attends, but this effect is lost when just looking at the Persistent HIU population. The reasons driving this mixed result for BAME populations cannot be drawn from this data and warrants further investigation.
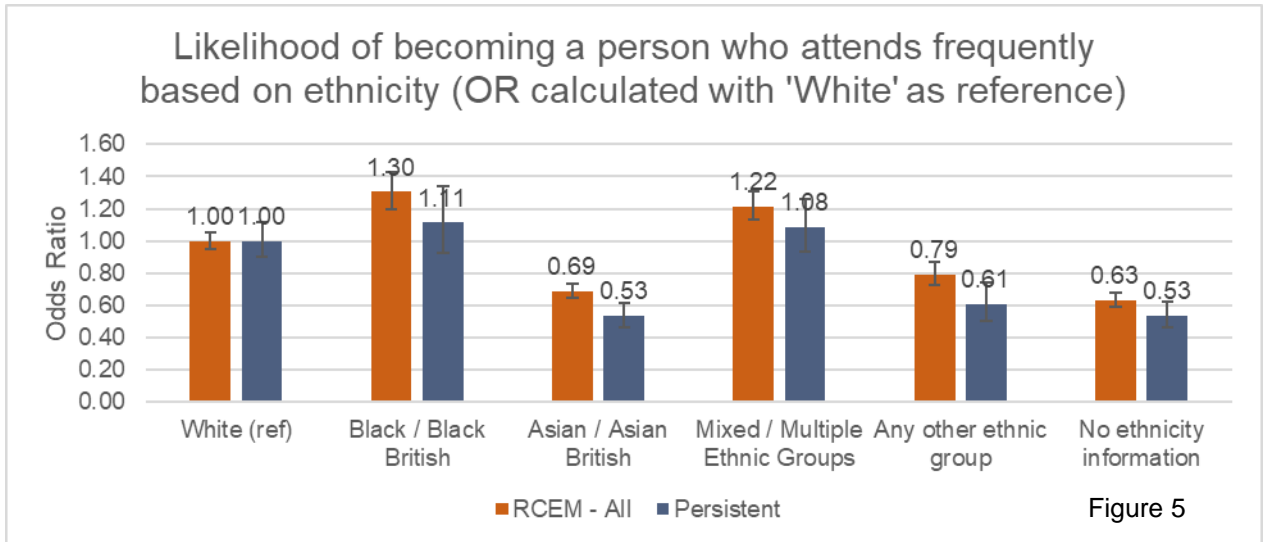
Figure 5

People from more deprived backgrounds are more likely to become People who frequently attend

Most people who frequently attend A&E are in the most deprived three quintiles of the Index of Multiple Deprivation (IMD) score (Figure 6 & Appendix C).

The likelihood of frequent attendance increases with increasing deprivation, with people from the most deprived quintile over two times more likely to attend frequently compared to patients from the least deprived quintile (Figure 7). This cohort of people is even more likely to have a persistently high rate of attendance at A&E services (by approximately 3.5 times).

Examining the high, medium, and low levels of frequent attendance, the same association with deprivation exists, with those attending A&E 16 or more times in one year (ie, in the 'High' sub-cohort) being four times more likely to be from the most deprived quintile when compared to the least deprived (Figure 8).

Figure 6

Likelihood of becoming a person who attends frequently based on IMD Quintile (OR calculated with least deprived group as reference)

Figure 7

Likelihood of becoming a person who attends frequently based on IMD quintile (Odds ratios with least deprived quintile as reference): High vs Medium vs Low sub-cohorts

Figure 8
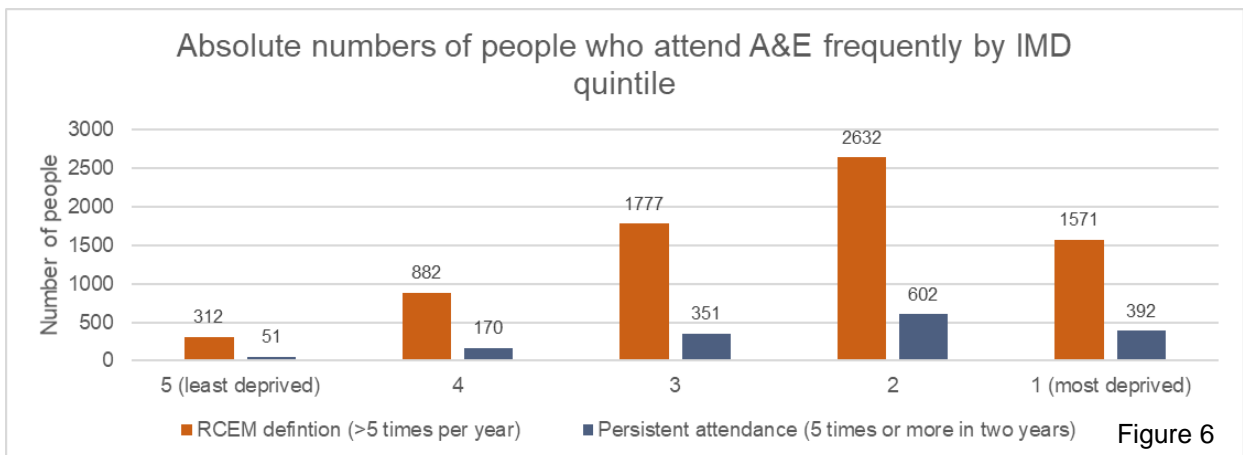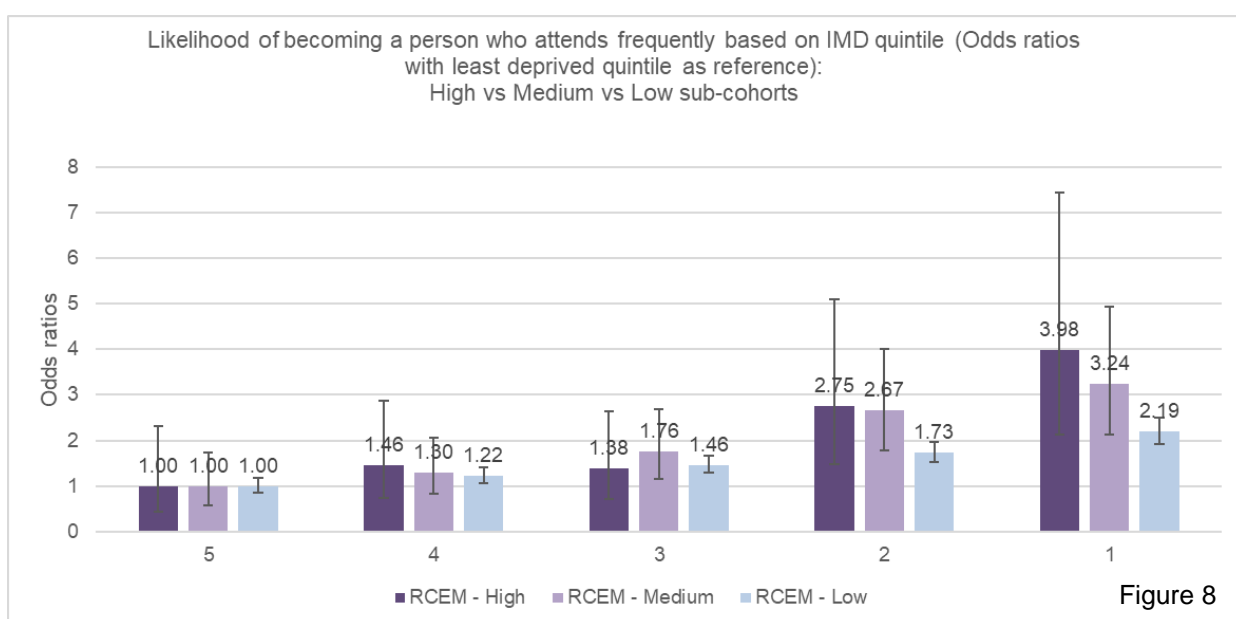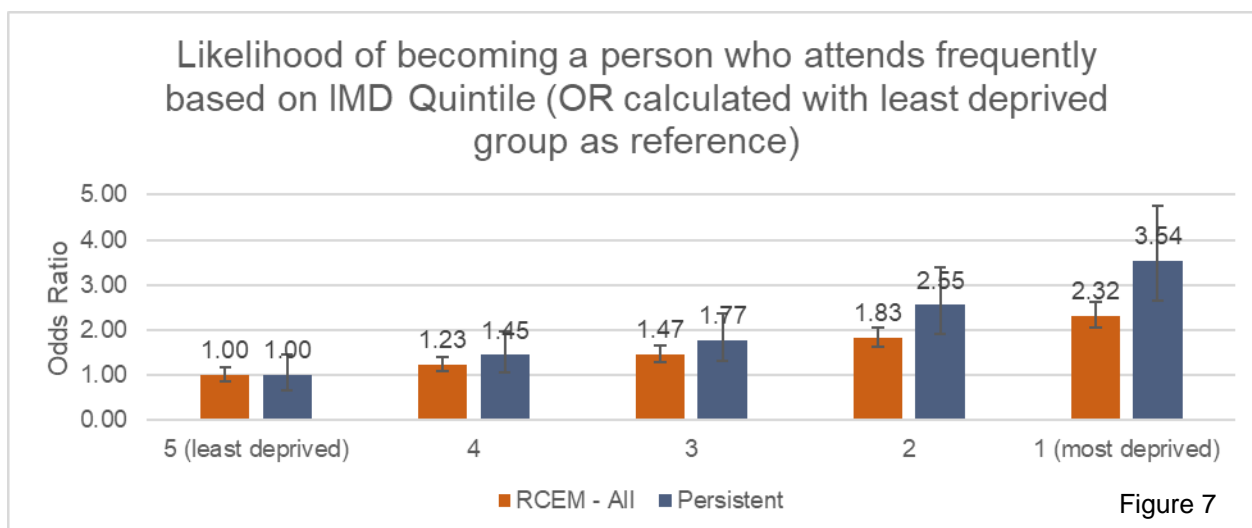
Palliative care, heart failure, dementia and epilepsy are the most common QOF disease diagnoses associated with high intensity use

The Quality and Outcomes (QOF) framework is used by GPs to record the chronic medical conditions of patients. 51 per cent of people who frequently attend had one or more QOF disease diagnoses (3589 out of a total of 7495), and 30 per cent had three or more QOF diseases and are therefore classified as 'multimorbid' (see Appendix C for full breakdown). When compared to the non-frequently attending population, people who frequently attend are 10 times more likely to have three or more QOF disease diagnoses (i.e. multimorbid) compared with having no diagnoses at all (Figure 9).

Of these, diagnoses of dementia, palliative care, heart failure and epilepsy have the highest association with people who frequently attend and the likelihood for all diseases is increased when you compare the Persistent subgroup to the total population of people who attend frequently (Figure 9).

Figure 10 shows the difference in the likelihood of people who frequently attend having each disease diagnosis between the total group vs the Persistent cohort. Learning disability, epilepsy and osteoporosis are the disease diagnoses most associated with the Persistent cohort.

When looking at only the 'High' frequent attendance sub-cohort, patients are 26 times more likely to have a mental health QOF diagnosis, versus an 11 times likelihood for the whole frequently-attending cohort overall (Figure 11).

QOF diagnoses are coded by the patients' GPs and represent their background medical history – we cannot draw conclusions about whether these medical conditions are the reason these patients are attending A&E. To research this area further, one could do a deep dive into the presenting complaint diagnoses recorded by A&E for a subgroup of these patients.

Likelihood of becoming a person who frequently attends based on QOF disease the previous year (OR calculated with 'No QOF diseases' as reference)

Condition	RCEM - All	Persistent
Dementia	16.19	20.52
Palliative care	15.88	27.77
Heart failure	14.08	20.25
Epilepsy	12.53	24.99
Mental health	11.23	18.88
Chronic obstructive pulmonary disease	11.18	18.52
Atrial fibrillation	10.85	16.30
Peripheral arterial disease	10.73	13.90
Stroke and transient ischaemic attack	10.69	17.24
Multi-morbid - 3 or more QOF diseases	10.30	15.25
Osteoporosis: secondary prevention of fragility	8.75	16.78
Learning Disability	8.61	18.60
Secondary prevention of coronary heart disease	8.41	12.25
Chronic kidney disease	7.99	9.24
Depression	4.93	7.10
Asthma	4.88	7.96
Cancer	4.87	6.04
Diabetes mellitus	4.46	5.63
Rheumatoid arthritis	4.17	3.97
Comorbid - Any 2 QOF diseases	3.99	4.83
Hypertension	3.88	4.67
No QOF diseases	1.00	1.00

Odds Ratio

■ RCEM - All ■ Persistent

Figure 9

Ratio of being a person who frequently attends over multiple years. Odds Ratio:RCEM (All)

Condition	Odds Ratio
Learning Disability	2.16
Epilepsy	1.99
Osteoporosis: secondary prevention of fragility	1.92
Palliative care	1.75
Mental health	1.68
Chronic obstructive pulmonary disease	1.66
Asthma	1.63
Stroke and transient ischaemic attack	1.61
Atrial fibrillation	1.50
Multi-morbid - 3 or more QOF diseases	1.48
Secondary prevention of coronary heart disease	1.46
Depression	1.44
Heart failure	1.44
Peripheral arterial disease	1.29
Dementia	1.27
Diabetes mellitus	1.26
Cancer	1.24
Comorbid - Any 2 QOF diseases	1.21
Hypertension	1.20
Chronic kidney disease	1.16
No QOF diseases	1.00
Rheumatoid arthritis	0.95

Odds Ratio

■ RCEM - All

Figure 10

The demographics and diseases associated with frequent attendance among people from deprived backgrounds are broadly similar to those among people who frequently attend who are the least deprived.

When comparing the demographic and disease odds ratios of people who frequently attend from the most deprived to the least deprived quintiles, there were no major differences seen (see Appendix B for full breakdown).

The increased likelihood of frequent attendance seen in Black and Mixed-ethnic groups is most marked in the older age group.

Figure 12 shows the results of a logistic regression to compare how ethnicity and age combine to affect the likelihood of someone who is from a deprived postcode attending A&E frequently. The higher

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likelihood seen with Black and mixed ethnic groups is more marked with increasing age. Figure 13 shows that any differences in likelihood to attend frequently due to ethnicity are most marked in people who are from the most deprived backgrounds.
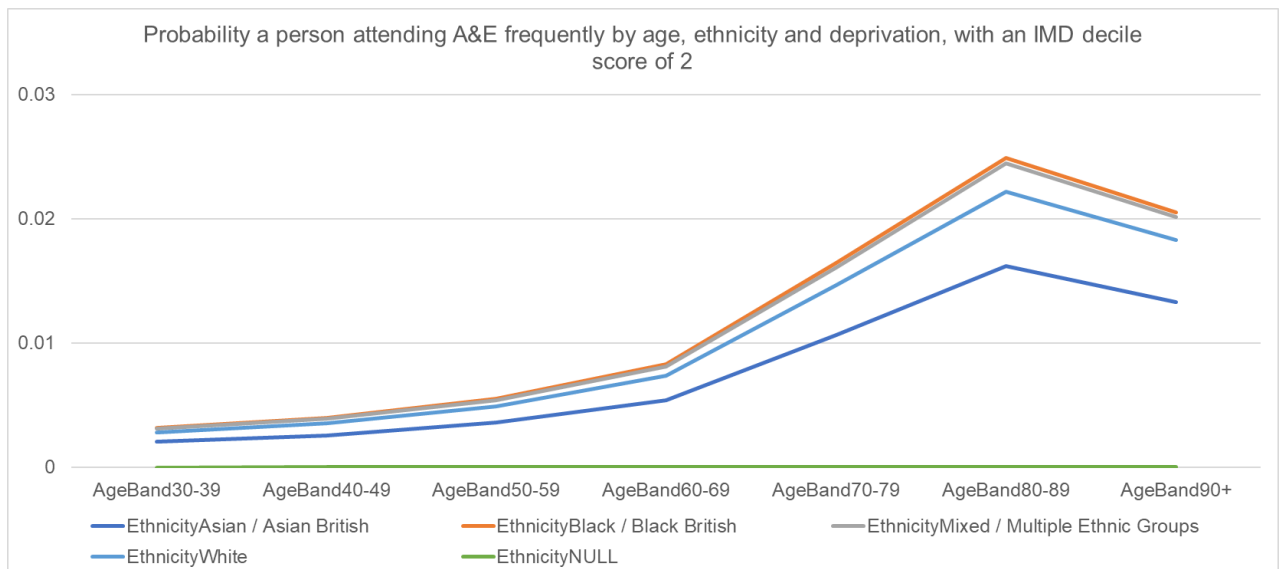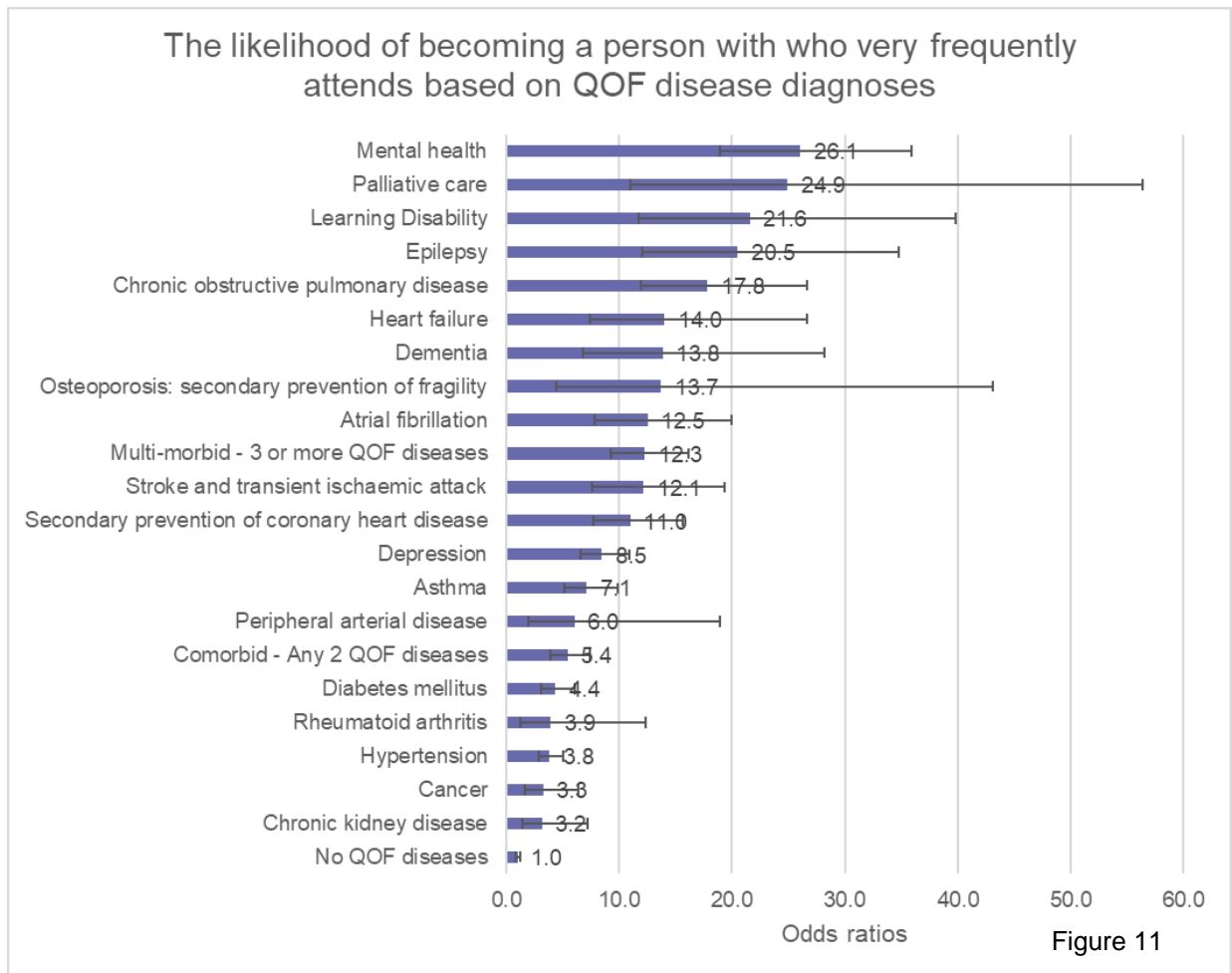
The likelihood of becoming a person with who very frequently attends based on QOF disease diagnoses

Diagnosis	Odds ratio
Mental health	26.1
Palliative care	24.9
Learning Disability	21.6
Epilepsy	20.5
Chronic obstructive pulmonary disease	17.8
Heart failure	14.0
Dementia	13.8
Osteoporosis: secondary prevention of fragility	13.7
Atrial fibrillation	12.5
Multi-morbid - 3 or more QOF diseases	12.3
Stroke and transient ischaemic attack	12.1
Secondary prevention of coronary heart disease	11.0
Depression	8.5
Asthma	7.1
Peripheral arterial disease	6.0
Comorbid - Any 2 QOF diseases	5.4
Diabetes mellitus	4.4
Rheumatoid arthritis	3.9
Hypertension	3.8
Cancer	3.8
Chronic kidney disease	3.2
No QOF diseases	1.0

Odds ratios

Figure 11

Probability a person attending A&E frequently by age, ethnicity and deprivation, with an IMD decile score of 2

Legend:
- EthnicityAsian / Asian British
- EthnicityBlack / Black British
- EthnicityMixed / Multiple Ethnic Groups
- EthnicityWhite
- EthnicityNULL

X-axis: AgeBand30-39, AgeBand40-49, AgeBand50-59, AgeBand60-69, AgeBand70-79, AgeBand80-89, AgeBand90+

Figure 12

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Probability a person attending A&E frequently by age, ethnicity and deprivation for 40-49 year olds
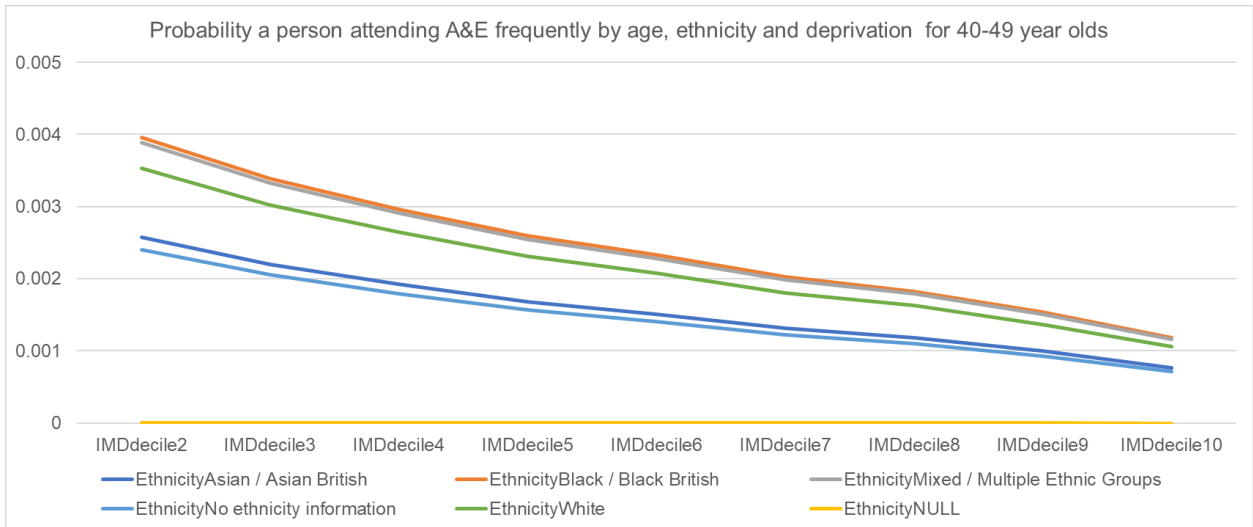
Figure 13

Figure 14 shows how, for someone with a mental health diagnosis, their likelihood of frequent attendance decreases with age. This means that patients who are young with mental health conditions are more likely to be attending A&E frequently than patients who are older. Similar patterns are observed in long-term conditions with significant associations among people who frequently attend e.g. heart failure. The effect from ethnicity remains constant across the age groups.

Probability of becoming someone who frequently attends at RCEM based on age, ethnicity and disease
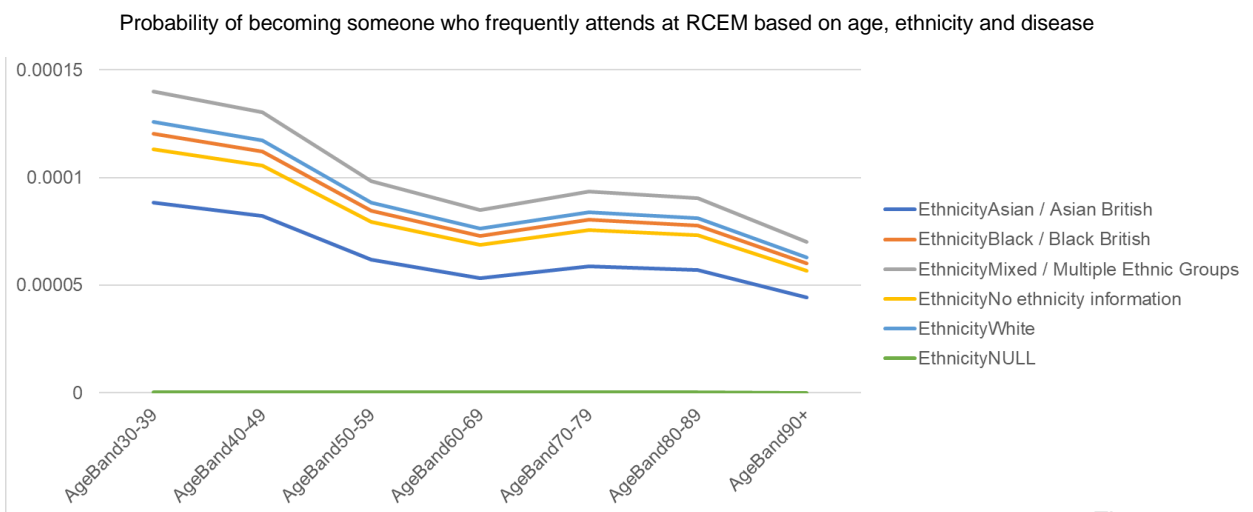
Figure 14

Overall, the differences in probability calculated by the logistic regressions are extremely low because the analysis included the entire non-frequently attending and frequently attending populations, and a high number of variables were looked at. In future work we would recommend conducting a logistic regression with people who frequently attend as the total population and the frequency of A&E use (high, medium and low sub-cohorts) as the output classifiers.

Further research should be conducted into:

- The factors which are most predictive of a patient attending frequently at the Persistent level
- The presenting complaints of People who frequently attend and whether these are linked to the QOF diagnoses of their background medical history
- Whether patients are likely to attend frequently throughout their life as part of a life course analysis
- The factors driving the associations with different ethnicities
- Qualitative engagement with patients from a younger (30-39) and older age bracket (60+) with a particular disease, e.g. mental health diagnoses, to understand the lived experience and drivers behind different A&E attendance patterns.

Section 2: How do people who frequently attend use healthcare services before, during and after crises?

99 per cent of people who frequently attend A&E are engaged with other health services during their year of crisis attendance

Table 2 shows a breakdown of the number of people who frequently attend who used different types of health or social care services during the period of their frequent attendance. Only 41 patients from the total frequently attending group did not use any other health services other than A&E during their year of high A&E use, representing less than 1 per cent of the cohort - and this pattern is seen across all the subgroups. However, we cannot draw conclusions on the level or quality of care given at these other services.

People's service use during a period of frequent attendance	Number of patients in each sub-cohort				
	RCEM – All	Persistent	High	Medium	Low
Did not attend their GP	313	68	14	29	270
Frequent GP attendance (>10/year)	6,935	1,531	338	750	5,847
Registered outpatient	6,714	1,484	331	715	5,668
Minor inpatient episode (0-3 days)	6,166	1,406	325	698	5,143
Major inpatient episode (3 + days)	3,976	894	188	444	3,344
Mental health services (1 or more attendances)	2,259	687	206	352	1,701
Social Care services (1 or more attendances)	1,836	522	95	234	1,507
Community services (1 or more attendances)	1,712	390	58	165	1,489
No attendance at any service	41	6	<5	<5	38
All patients	**7,495**	**1,642**	**359**	**797**	**6,339**

Table 2

People who frequently attend are most likely to have had an inpatient stay or be using mental health or social care services during their year of personal crisis

Likelihood of being a person who frequently attends based on service use during their year of crisis (OR using cohort total as reference
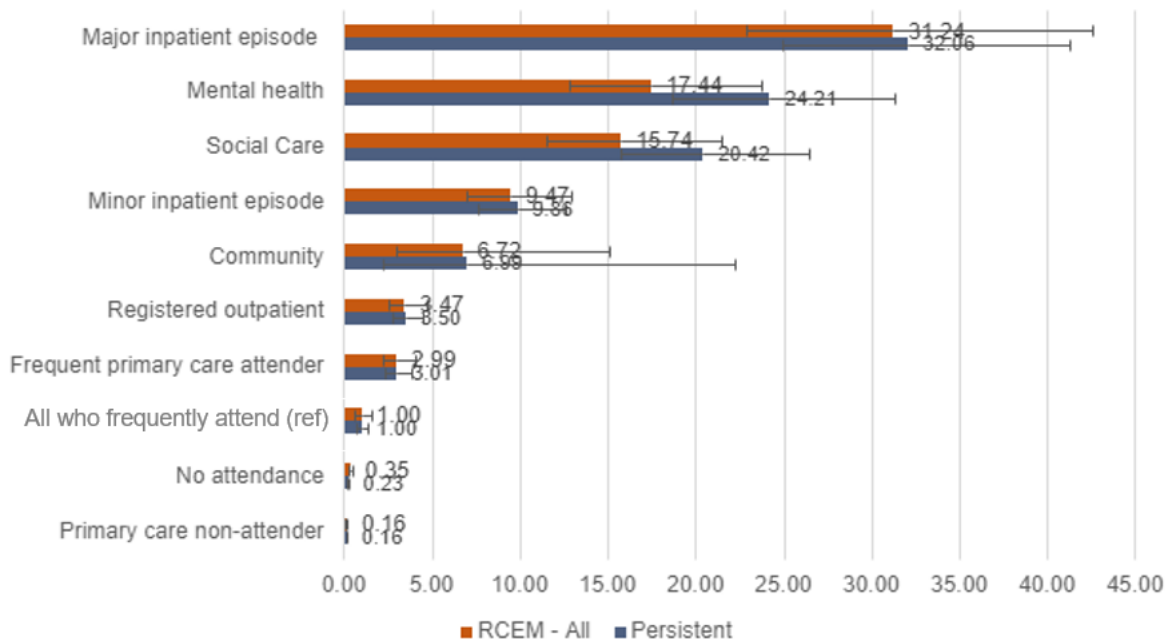
| Category	RCEM - All	Persistent
Major inpatient episode	31.24	32.06
Mental health	17.44	24.21
Social Care	15.74	20.42
Minor inpatient episode	9.47	9.86
Community	6.72	6.68
Registered outpatient	3.47	3.50
Frequent primary care attender	2.99	3.01
All who frequently attend (ref)	1.00	1.00
No attendance	0.35	0.23
Primary care non-attender	0.18	0.16

Figure 15

People who frequently attend are most likely to have had a major inpatient episode, defined as a length of stay > 3 days, mental health or social care service interaction during their year of crisis (Figure 15). They are three times more likely to be attending their GP more frequently than the NWL average (10 times per year) and very unlikely to be not engaging with their GP.

The strong association with inpatient episodes could represent an opportunity to develop targeted discharge services to better support patients. Further work is needed to understand which types of inpatient stays are most associated with high intensity use.

HIU baseline use of primary care services is high and increases with A&E-attending frequency

At a NWL population level, the median annual baseline of people who frequently attend A&E is 24 visits per year (Figure 16), which is significantly higher than the NWL-wide average of 10 per year. The primary care attending frequency increases to a median of 40 during the year of high intensity use, and then falls back down to near the baseline of 26. This implies a high baseline of medical need for these patients even outside their year of crisis. In a similar fashion, at this aggregate level, the median annual frequency of social care attendances increases whilst a person who frequently attends is in their year of crisis and then drops back to baseline (Figure 16).

However, at an individual level there is no (or only weak) correlation between frequency of A&E attendances and frequency of primary care or social care visits (Table 3). This could suggest that there are barriers to access or a lack of engagement for some people who frequently attend in accessing other services, given that at an aggregate population level a pattern is seen.

Figure 16
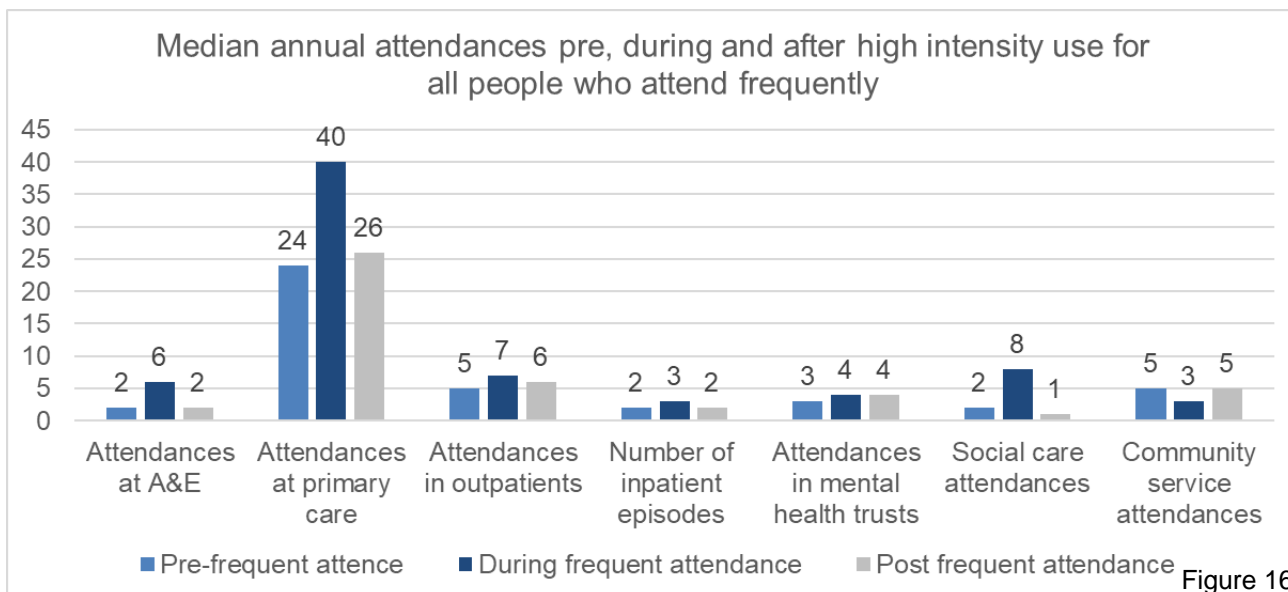
The correlation of frequency of A&E attendance with frequency of other service attendance							
Coefficient correlations		**Attendances at primary care**	**Attendances in outpatients**	**Number of inpatient episodes**	**Attendances in mental health trusts**	**Social care attendances**	**Community Service attendances**
Prior to the period of frequent attendance	**Attendances at A&E**	0.23	0.22	0.16	0.12	0.05	0.02
During the period of frequent attendance		0.08	0.04	0.05	0.12	-0.05	-0.03

Table 3

Further research should be conducted into:
• Which types of inpatient admissions are most associated with high frequent attendance.   • The pathways that patients take after their frequent attendance at A&E declines.

Section 3: What has been the impact of Covid-19 on health and care service use among people who frequently attend?

A&E attendance among those who frequently attend dropped during the pandemic in a similar pattern to the non-frequently attending population

The total number of Type 1 ED attendances across all cohorts dropped significantly during the UK strict lockdown period of 23rd March – 10th May 2020 and then recovered through May and June 2020 as the lockdown restrictions were relaxed (Figure 17). The Persistent frequently-attending cohort dropped the least amount and recovered the quickest, perhaps indicating a reduced avoidability of real or perceived need for A&E services by these patients. However, this only includes the people identifed as frequently attending in the financial year of 2019/2020, and does not include any individuals who may have started to attend frequently afterwards.

The Admission Conversion Rate (ACR – calculated by number of inpatient admissions / number of A&E attendances) of the non-frequently attending cohort was slightly raised during March and April 2020, indicating that more of this group were being admitted when attending A&E (Figure 18). In contrast, the monthly ACRs of the five cohorts have not shown this pattern of being higher during March and April 2020, but do show a slightly upward trend over the whole six months. People who have attended 16 or more times (the High-level cohort) have the lowest ACRs, indicating that these patients are the least likely to be admitted to hospital following an A&E attendance – both before and during the pandemic.

Figure 17

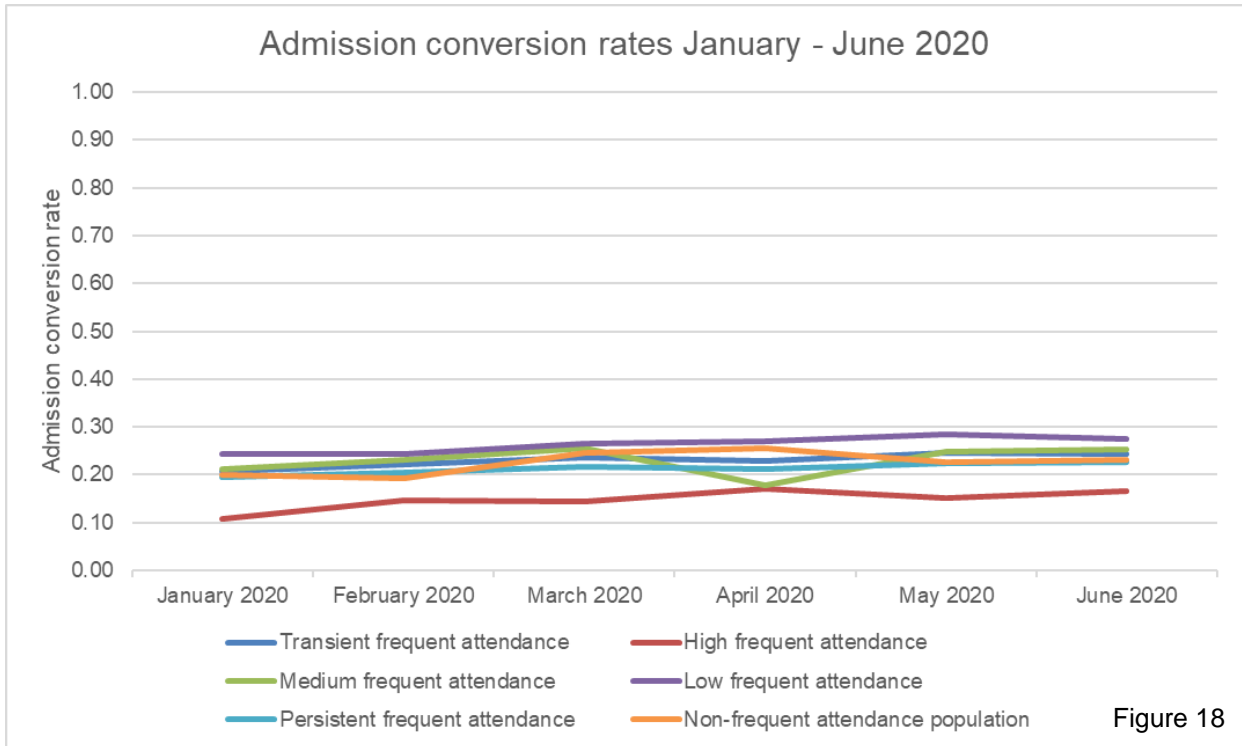Admission conversion rates January - June 2020
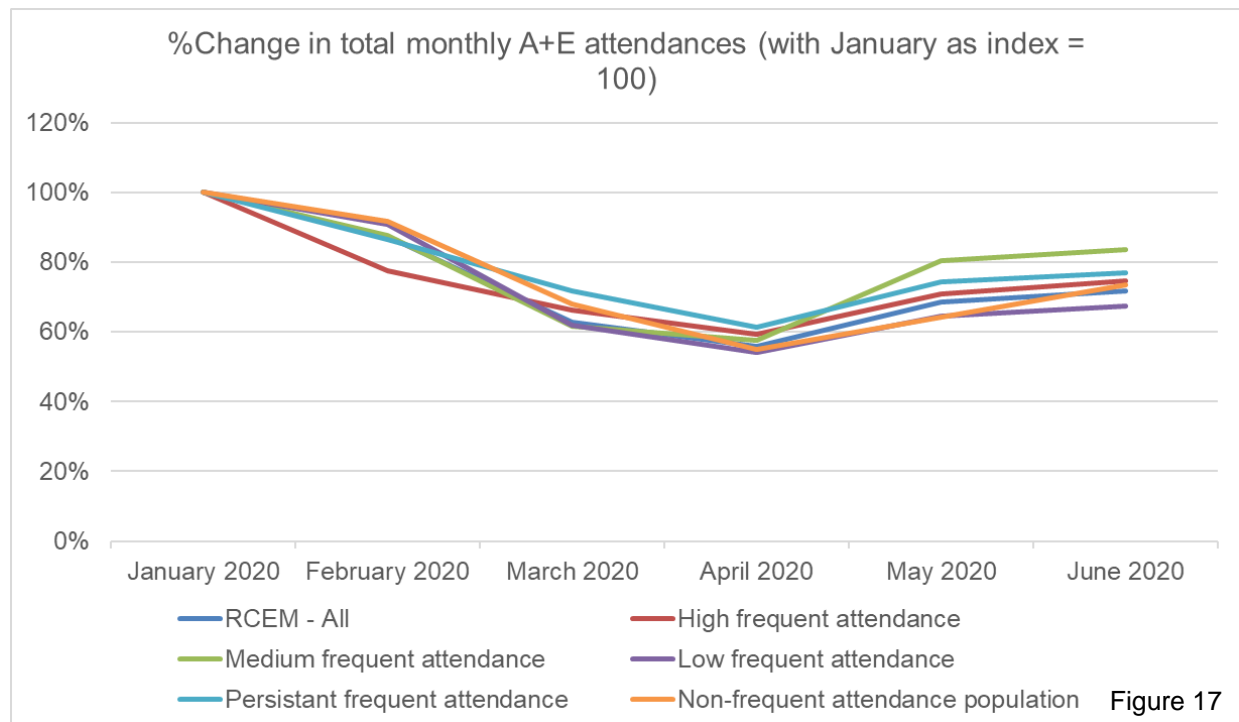
Figure 18

Conclusion

These findings confirm that the high intensity use of A&E services remains an issue across the whole healthcare system and Covid-19 has not eradicated this. The high frequency attendance patterns observed by these members of our community are indicators of underlying unmet health and care needs; it is not an issue caused by 'problematic people'. The association of increased deprivation with high intensity use is clear, and with the pandemic set to widen inequality within our society[5], the un-met need among this group is likely to rise. This heterogenous group of people have complex physical and mental health needs and it is likely that disease-specific support or sign-posting may be needed alongside the holistic case-worker model. These patients are already engaging with multiple parts of the healthcare system, therefore collaboration and local accountability across local health systems is needed to encourage re-engagement of these patients with traditional health services to better manage their needs.

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Appendix A: Methodology and limitations

North West London has a population of approximately 2.2 million residents, consisting of eight Local Authorities (LAs), 10 acute and specialist hospitals and two mental health hospitals. Our population is very diverse – we contain four of England and Wales' most diverse boroughs.[1]

The linked health and social care data of NWL residents are held in the Whole System Integrated Care (WSIC) dataset. This provides the opportunity to conduct retrospective research on high intensity use across the health and care system. Furthermore, it enables us to identify patients who attend different hospitals in a small geographical area, an issue common to most urban sectors.

We used the principles of a case-control study to conduct a retrospective analysis within the WSIC dataset and compare a person who frequently attends population with a non-frequently attending comparator group: comparing their attendance patterns and the prevalence of demographic and disease variables within each population.

Defining the populations and variables

The Royal College of Emergency Medicine (RCEM) defines a person who frequently attends as someone who attends A&E five or more times in one year, and we have used this definition for this study.[2] We have then split this group to create further sub-cohorts to examine (Table 1), with the High, Medium and Low sub-cohorts defined by the frequency of attendance, and the Persistent sub-cohort defined as someone who has attended frequently for at least two years in a row. These sub-cohorts are not mutually exclusive, i.e. the same patient could belong to both the 'Persistent' and 'High' cohorts. We excluded people aged under 18 from this study.

Our comparator group was any adult who does not frequently attend A&E.

Section 1 population extraction analysis:

The populations were defined using 2018/19 as the default year (Table 1).

Population group	Cohort definition
Non-frequently attending	Fewer than 5 A&E attendances in 2018/19
RCEM (All)	5 or more A&E attendances in 2018/19
High	16+ A&E attendances in 2018/19
Medium	10-15 A&E attendances in 2018/19
Low	5-9 A&E attendances in 2018/19
Persistent	5 or more A&E attendances in both 2017/8 and 2018/19

Table 1

After extracting the patients belonging to each of these cohorts we then calculated the number of people from each who fell into the following variable categories:

- demographics (age, gender, ethnicity, BMI and deprivation as measured by the Index of Multiple Deprivation (IMD) score[3]),
- disease diagnoses as coded by a patient's GP in the QOF register in 2017/18 (to ensure that the diagnosis preceded the year of frequent A&E attendance), and
- attendance at health services as defined in Table 2 (note that patients can fall into multiple categories depending on their health attendance during the year).

Services	Definition
Primary care non-attender	High intensity use definition + zero attendances at primary care in 2018/19
Frequent primary care attender	High intensity use definition + >10 attendances at primary care in 2018/9
Registered outpatient	High intensity use definition + attendance at outpatient in 2018/9
Previous major inpatient episode	High intensity use definition + inpatient episode (LoS > 0-3; 3+ days) in 2018/19
Mental health	High intensity use definition + attendance at MH trust in last 12 months in 2018/9
Registered Social Care in previous 12 months	High intensity use definition + attendance from social care in last 12 months 2018/19
Registered community services in previous 12 months	High intensity use definition + outpatient care episode at community care in 2018/9

Table 2

We then either present the data as simple aggregate counts for each cohort or calculate the odds ratios for each variable by comparing the prevalence within the non-frequently attending comparator group.

Section 2 analysis

We extracted our populations based on slightly different criteria here to ensure that we only extracted people who had been attending frequently for one year, so that we could examine their use of health services before, during and after their year of frequent A&E attendance. The population definitions were as follows:

Population group	Cohort definition
RCEM (All)	5 or more A&E attendances in 2017/18 but <5 in both 2016/17 and 2018/19
High	16+ A&E attendances in 2017/18 but <5 in both 2016/17 and 2018/19
Medium	10-15 A&E attendances in 2017/18 but <5 in both 2016/17 and 2018/19
Low	5-9 A&E attendances in 2017/18 but <5 in both 2016/17 and 2018/19
Persistent	5 or more A&E attendances in both 2016/7 and 2017/18 but <5 in 2015/16 and 2018/19

Table 3

After extracting the populations, we then calculated the annual number of attendances at the different health services and presented the median frequencies. We also calculated the coefficient correlation of the frequency of A&E attendance vs. the frequency of other service attendances for each patient.

Section 3 analysis

We used the year 2019/20 as the basis for the population extractions (Table 4).

Population group	Cohort definition
Non-frequently attending	Fewer than 5 A&E attendances in 2019/20
RCEM (All)	5 or more A&E attendances in 2019/20
High	16+ A&E attendances in 2019/20
Medium	10-15 A&E attendances in 2019/20
Low	5-9 A&E attendances in 2019/20
Persistent	5 or more A&E attendances in both 2018/19 and 2019/20

Table 4

We then counted the number of A&E attendances per month from January to June 2020 for each cohort. We also calculated the admission conversion rate for each month by dividing the number of inpatient admissions by A&E attendances by these patients.

A multivariate analysis was completed by developing three logistic regression models. Variables in the multivariable regression model were chosen based on operational team qualitative insights. The multivariable logistic regression models included the following variables:

1. Age, ethnicity and deprivation
2. Age, ethnicity, gender and deprivation
3. All variables available within the data set

Statistical analyses were performed using R version 4.03.

Limitations

- The WSIC dataset only captures people who are registered to a GP in NWL, therefore there are particular sectors of the population that will be missed, such as those who are homeless.
- This study has looked at the association of particular disease or demographic attributes, and is **not** intended to imply **causation.**
- We have identified the frequently attending cohorts by capturing everyone who frequently attended in a particular year (default year was 2018/19). Therefore, this is not representative of the lifetime risk of someone experiencing a period of high intensity use of A&E.
- The non-frequently attending comparator group is not a matched control group.
- The reasons why these patients are attending A&E frequently are extremely diverse and caution should be taken when interpreting these aggregate findings.
- These findings may not be applicable to other populations due to fundamental differences in demographics and/or healthcare service access.

Appendix B: What are the characteristics of those from deprived backgrounds who attend A&E frequently?

Here we have created a profile of people who frequently attend from the most deprived cohort and have compared this to the profile of people who frequently attend from the least deprived cohort. Overall there are no major differences seen, indicating that we cannot draw conclusions on what factors drive the increased likelihood of frequent attendance in patients who are the most deprived.
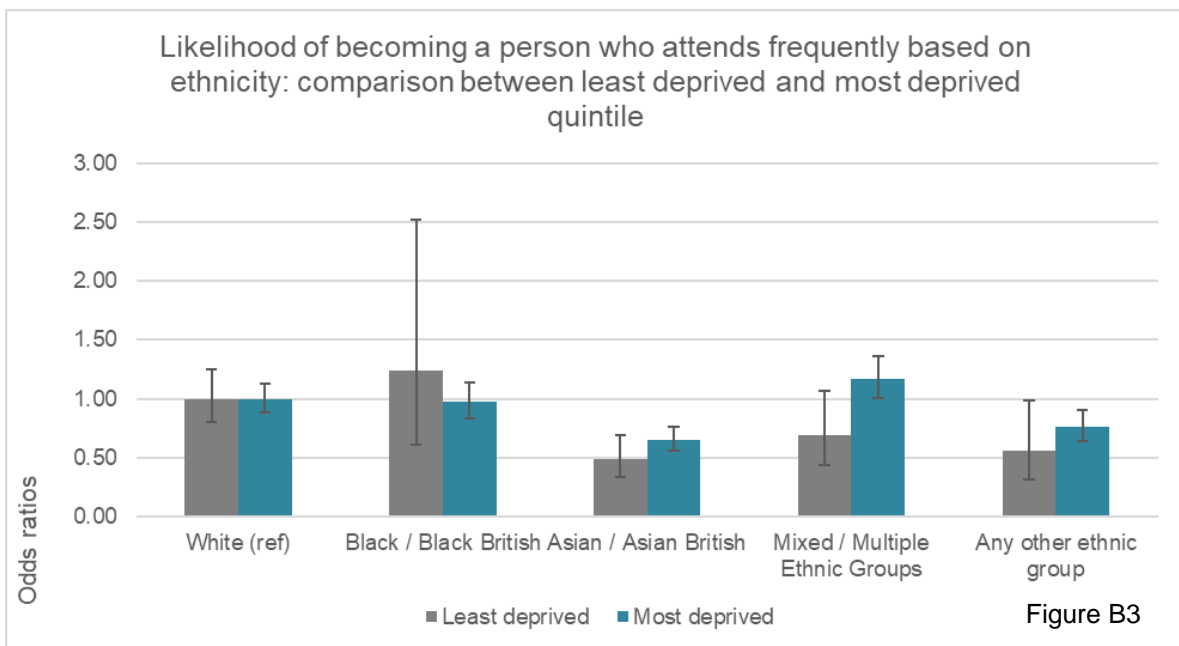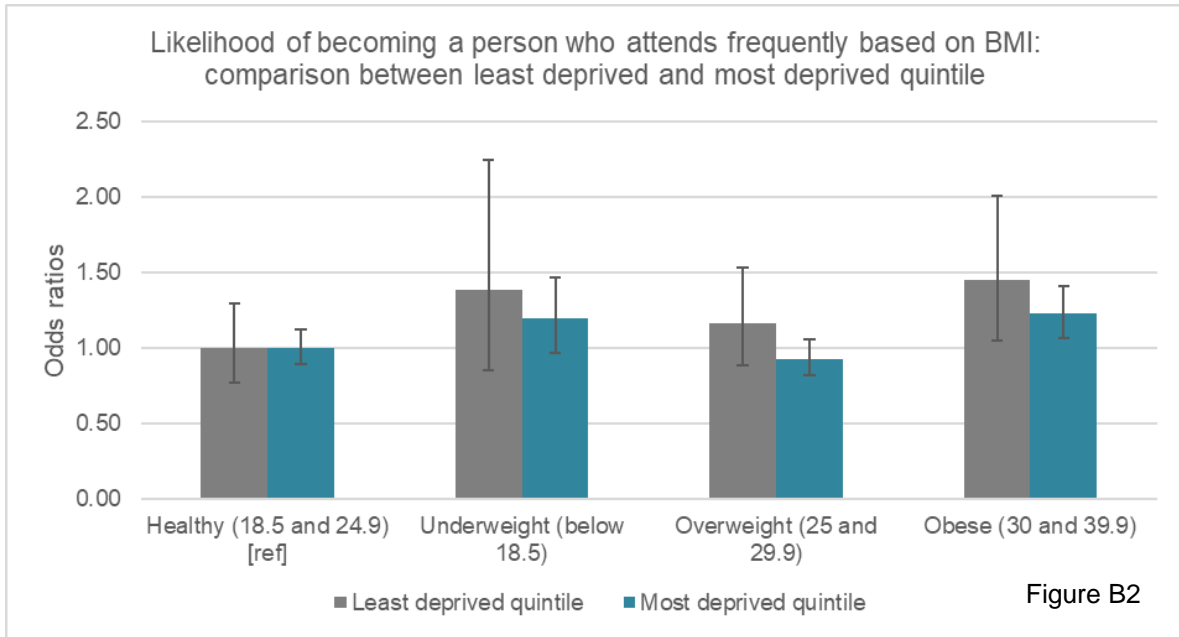
The association with age and likelihood of frequent A&E attendance is similar between the people who frequently attend from the lowest (most deprived) deprivation quintile, vs. the total frequently attending group (Figure 1). There is also no difference in likelihood of becoming a person who frequently attends between men and women.
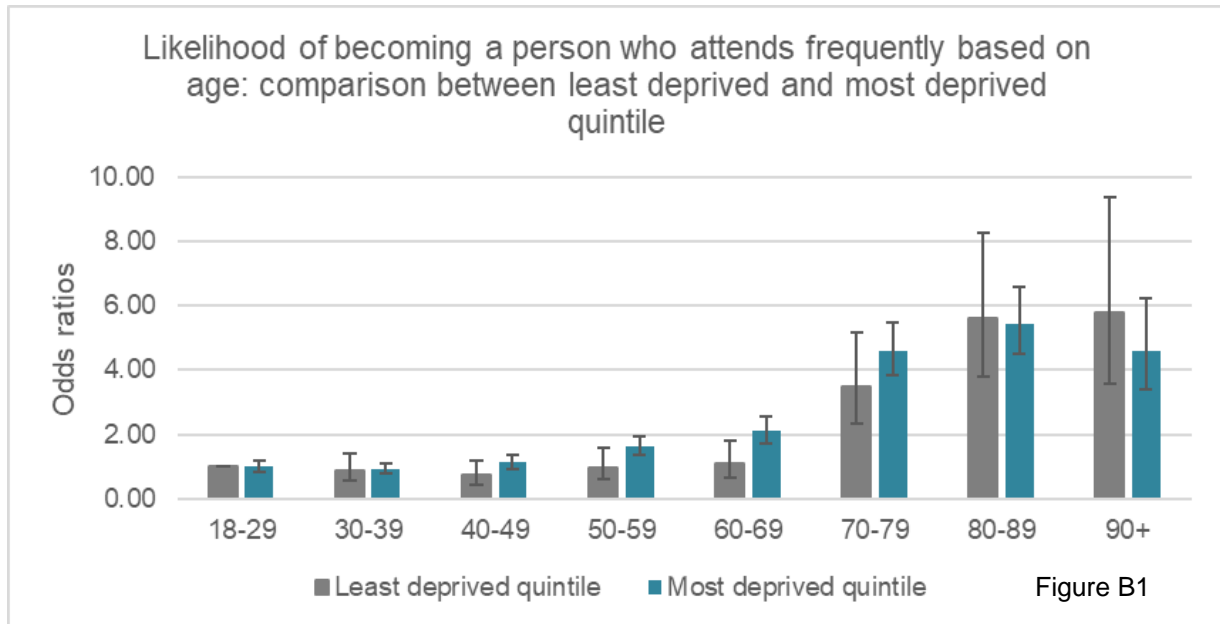
Figure B1

There is little difference in the effect of BMI on likelihood of frequently attending, when comparing the least and most deprived quintiles (Figure 2).

In terms of ethnicity, there is no longer an increased likelihood of frequent attendance in Black/Black British adults when looking at either quintile (Figure 3). However, you still see a similar lower likelihood in Asian/Asian british adults frequently attending in those from the least and most deprived postcodes.

Due to low numbers in some of the disease categories in the least deprived quintile, we have chosen to compare the most deprived quitntile with the frequently attending group as a whole so as to not have skewed data.The associations between background disease diagnoses and the likelihood of becoming a person who frequently attends are fairly similar when comparing the most deprived quintile against the total group (Figure 4). The only statistically signfiicant difference is for mental health and epilepsy diagnoses – both have a lower likelihood of being associated with high intensity use compared to patients from more deprived backgrounds.

Likelihood of becoming a person who attends frequently based on BMI: comparison between least deprived and most deprived quintile

Figure B2

Likelihood of becoming a person who attends frequently based on ethnicity: comparison between least deprived and most deprived quintile

Figure B3

Likelihood of becoming a person who frequently attends based on disease diagnosis: most deprived quintile vs. total frequently-attending group
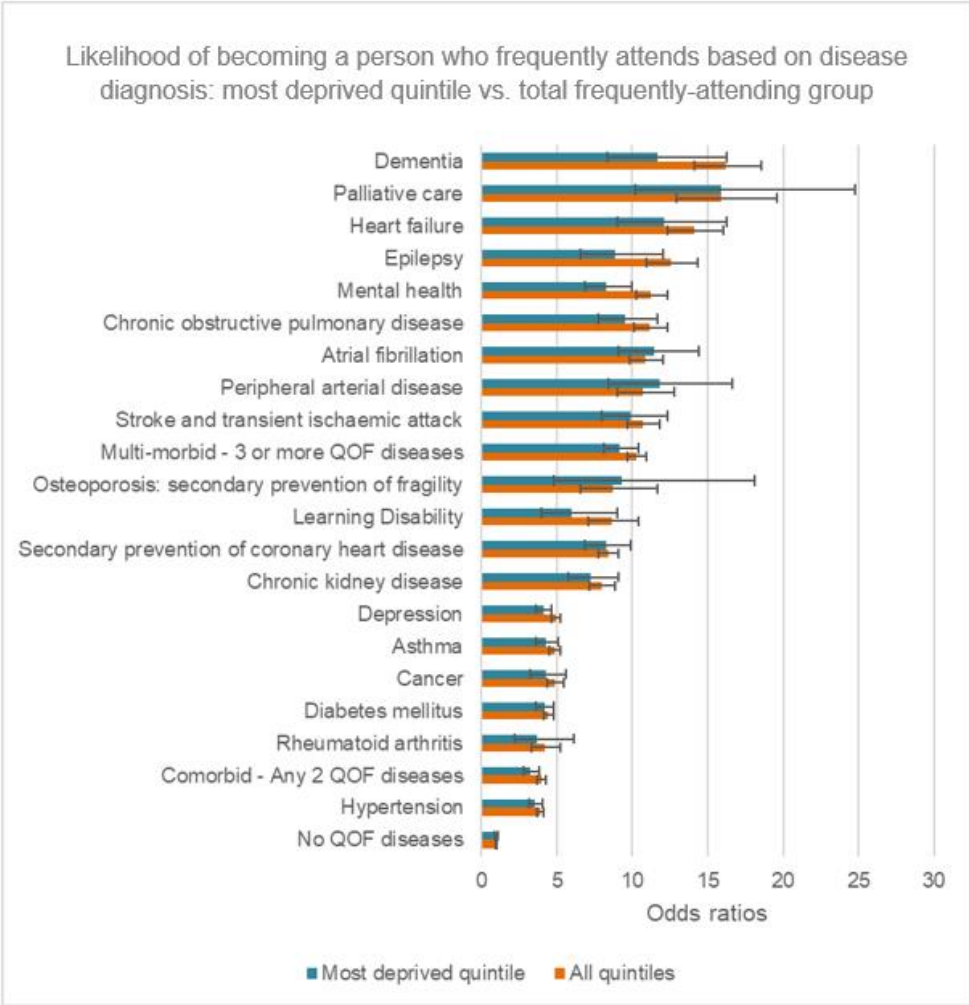
Figure B4

Appendix C: aggregate data outputs

Below is the aggregate data output that is the basis of the analysis for Section 1 of this report.

Breakdown of absolute numbers of people in each category: All deprivation quintiles included			
	Counts of people		
	Non-frequently attending population (2018/19)	**RCEM (All) (2018/19)**	**Persistent sub-cohort**
Total	**2,173,049**	**7,495**	**1,642**
Age			
18-29	491,811	1,067	207
30-39	531,526	934	211
40-49	390,929	855	213
50-59	300,658	932	264
60-69	199,912	908	197
70-79	136,709	1,225	260
80-89	89,632	1,223	244
90+	31,872	351	46
Gender			
Male	1,114,828	3,791	841
Female	1,058,161	3,703	801
Unknown	60	<5	<5
BMI			
Underweight (below 18.5)	107,012	535	115
Healthy (18.5 and 24.9) [ref]	768,356	2,639	572
Overweight (25 and 29.9)	543,363	1,982	435
Obese (30 and 39.9)	285,591	1,415	325
No weight recorded	468,727	924	195
IMD deprivation decile			
1 - most deprived	96,379	484	118
2	222,516	1,087	274
3	364,418	1,484	349
4	314,069	1,148	253
5	300,743	955	184
6	269,054	822	167
7	201,425	547	114
8	136,691	335	56

9	93,142	211	33
10 - least deprived	53,705	101	18
No IMD deprivation decile	120,907	321	76
Ethnicity			
White (ref)	668,062	2,660	656
Black / Black British	118,962	618	130
Asian / Asian British	509,827	1,392	266
Mixed / Multiple Ethnic Groups	216,615	1,048	230
Any other ethnic group	190,624	601	114
No ethnicity information	468,959	1,176	246
Interactions with other services			
Primary care non-attender	569,921	313	68
Frequent primary care attender	672,322	6,935	1,531
Registered outpatient	561,292	6,714	1,484
Minor inpatient episode	188,781	6,166	1,406
Major inpatient episode	36,902	3,976	894
Mental health	37,550	2,259	687
Social Care	33,824	1,836	522
Community	73,817	1,712	390
No attendance	33,833	41	6
Disease groups (registered on the disease register in 2017/18)			
Asthma	77,951	809	249
Atrial fibrillation	18,494	427	121
Cancer	31,775	329	77
Chronic kidney disease	21,839	371	81
Chronic obstructive pulmonary disease	18,165	432	135
Dementia	6,678	230	55
Depression	142,098	1,490	405
Diabetes mellitus	116,838	1,108	264
Epilepsy	8,475	226	85
Heart failure	8,244	247	67
Hypertension	227,336	1,876	426
Learning Disability	5,895	108	44
Mental health	22,174	530	168
Osteoporosis: secondary prevention of fragility	2,525	47	17
Palliative care	2,782	94	31
Peripheral arterial disease	5,738	131	32

Rheumatoid arthritis	8,790	78	14
Secondary prevention of coronary heart disease	40,078	717	197
Stroke and transient ischaemic attack	19,084	434	132
Comorbid - Any 2 QOF diseases	115,682	982	224
Multi-morbid - 3 or more QOF diseases	71,589	1,568	438
No QOF diseases	1,686,998	3,589	677