

Performing Descriptive Statistics on NHS Appointment Data

Background

This project was an exercise in applying data analytics skills to real world NHS data and is underpinned by concern regarding underutilization of NHS appointments. In 2019, there were 15 million missed GP appointments, costing the NHS £216 million, putting tremendous strain on healthcare resources. The reason for underutilization is likely to be multifactorial and include factors such as patient challenges, communication and overly inflexible scheduling of appointments.

Solutions are urgently needed to address underutilization of NHS appointments. A data driven approach to forecast and manage patient demand and NHS staffing more accurately could have potential use. In this project I analysed data on 1.Utilisation of Services; 2. Appointment Attendance and 3. The Effectivity of Twitter for the Purposes of the NHS. I was also tasked to address a number of related key questions.

Methodology

1. **Data sources: 4 sources were available:**
 - a. 'national_categories.xlsx' ('NC'), **National category describes the care related encounter** i.e., General consultation Acute, General consultation Routine, Triage.
 - b. 'appointments_regional.csv' ('AR'), describes each **integrated care board (ICB)** for the **30 month reporting period**. These CSV files include data for each ICB for the 30-month reporting period. The data is aggregated to monthly counts, including breakdowns for Appointment Status, Healthcare Professional, Mode of Appointment, and Time between Booking and Appointment.
 - c. 'actual_duration.csv' ('AD') files. **Actual duration is the length in minutes of the consultation that took place.**
 - d. 'tweets.csv'.
2. **Data selection:** The files were uploaded into Jupyter Notebook.
3. **Data analysis:** Relevant libraries (e.g. Pandas) **within Python** were used to conduct descriptive and exploratory data analysis.
4. **Data visualisation/presentation:** Data was transformed into visualisations using relevant libraries (e.g. Seaborn) to better uncover trends.

Results:

Descriptive/Exploratory Analytics

1. Number of Sub-ICB locations and the location of the top 5 ICB locations There are 106 unique Sub-ICB locations within the datasets.

Top 5 Sub-ICB locations from NC.

Sub-ICB Location Name	Appointment Count
NHS North West London ICB - W2U3Z	12142390
NHS North East London ICB - A3A8R	9588891
NHS Kent and Medway ICB - 91Q	9286167
NHS Hampshire and Isle Of Wight ICB - D9Y0V	8288102
NHS South East London ICB - 72Q	7850170

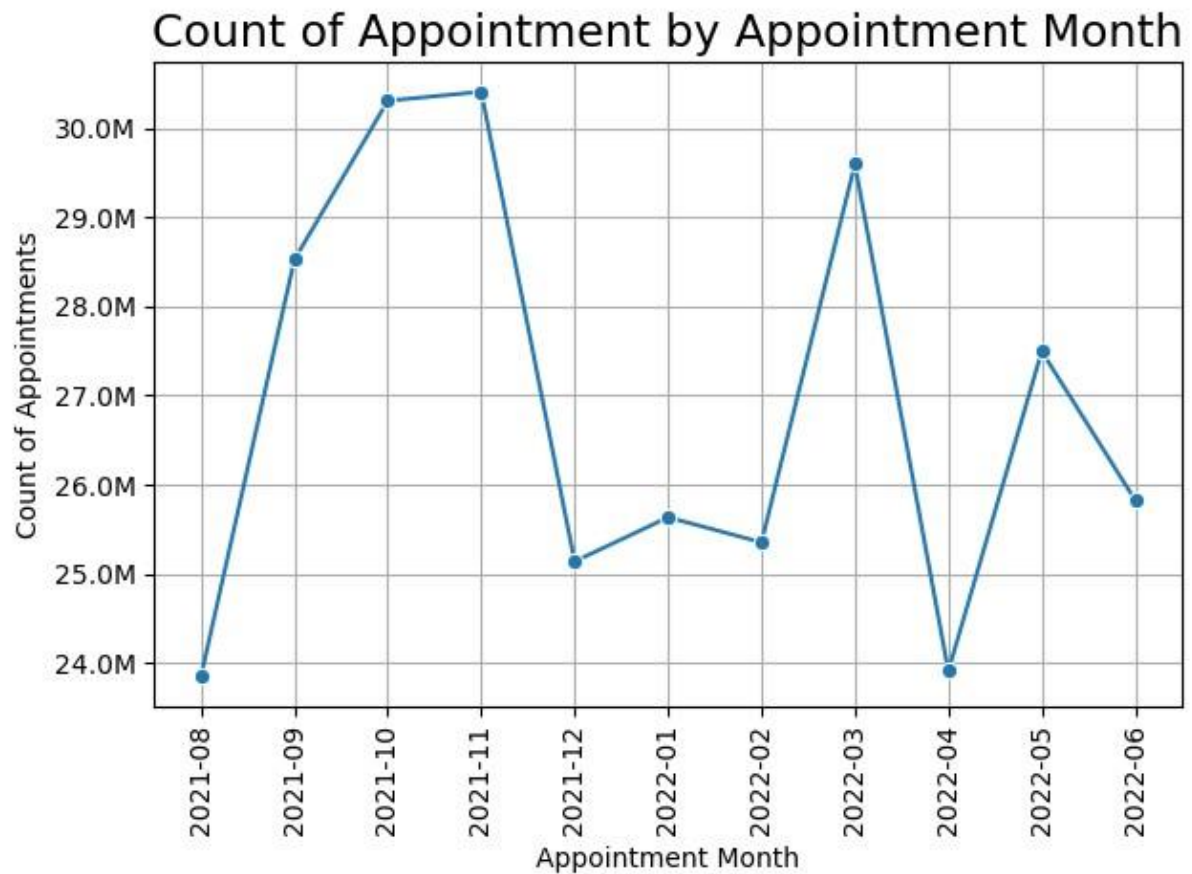
Top 5 Sub-ICB locations from AD.

Sub-ICB Location Name	Appointment Count
NHS North West London ICB - W2U3Z	6976986
NHS North East London ICB - A3A8R	5341883
NHS Kent and Medway ICB - 91Q	5209641
NHS Hampshire and Isle Of Wight ICB - D9Y0V	4712737
NHS South East London ICB - 72Q	4360079

There are **different appointment counts for these two datasets**. because NC describes care-related encounters. AD reports the actual duration appointments.

Exploratory analysis

November 2021 had the highest appointment count per month within NC.



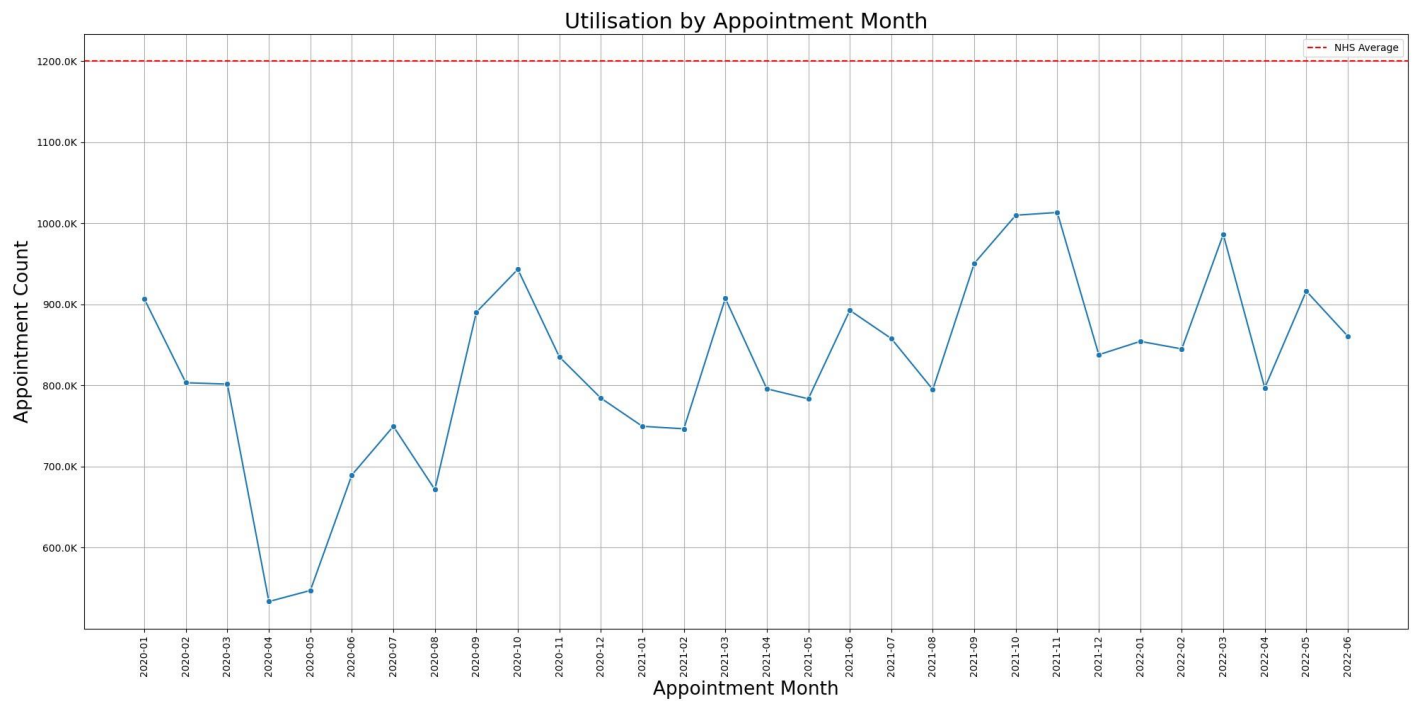
November 2021 had the highest appointment count per month within AR.



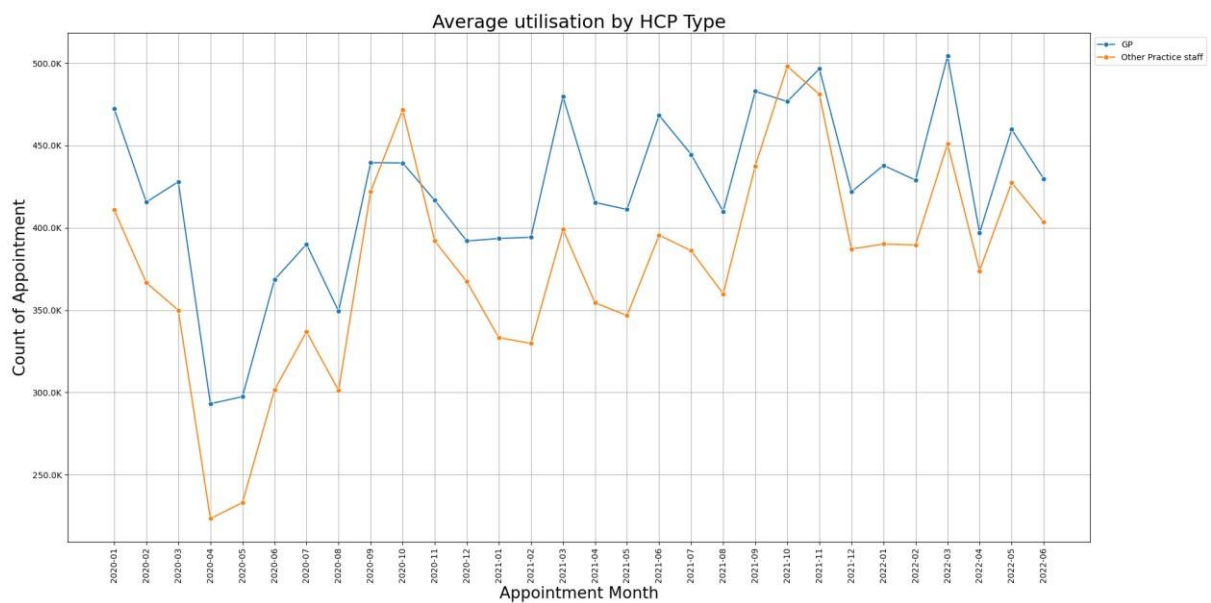
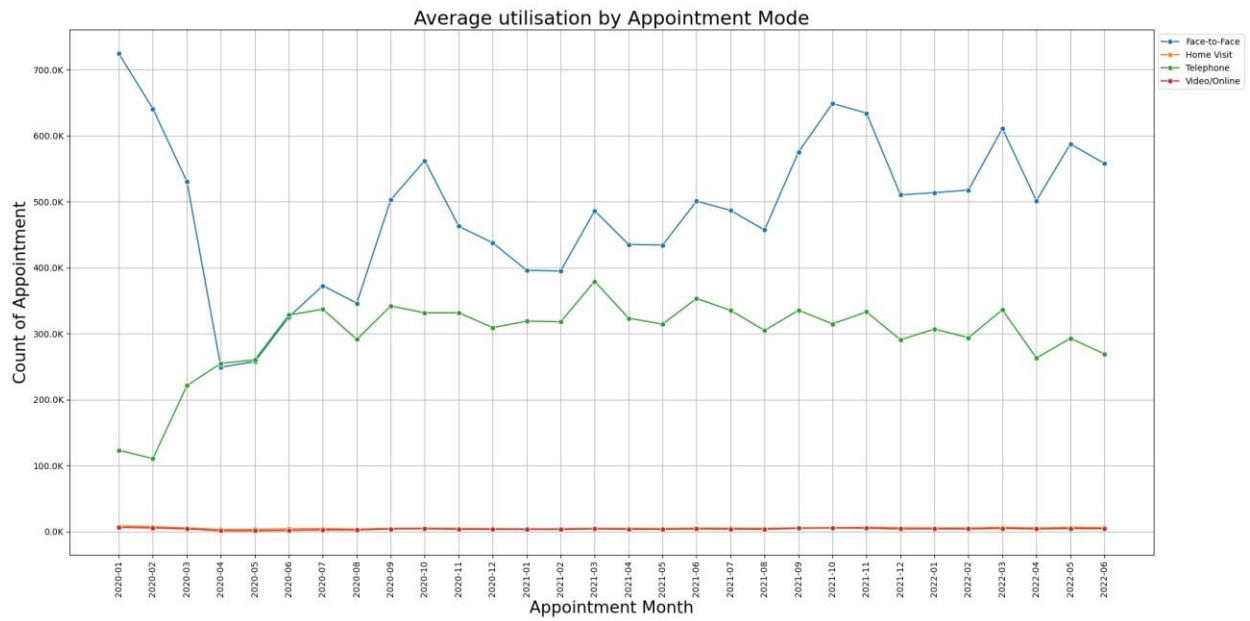
Q1

Insufficient staffing levels may have a detrimental impact on a range of health, safety and performance outcomes. Within AR, the average utilisation throughout the reporting period

was approx. 900,000 appointments per day which is much lower than the maximum capacity guidance for the NHS (1200000).



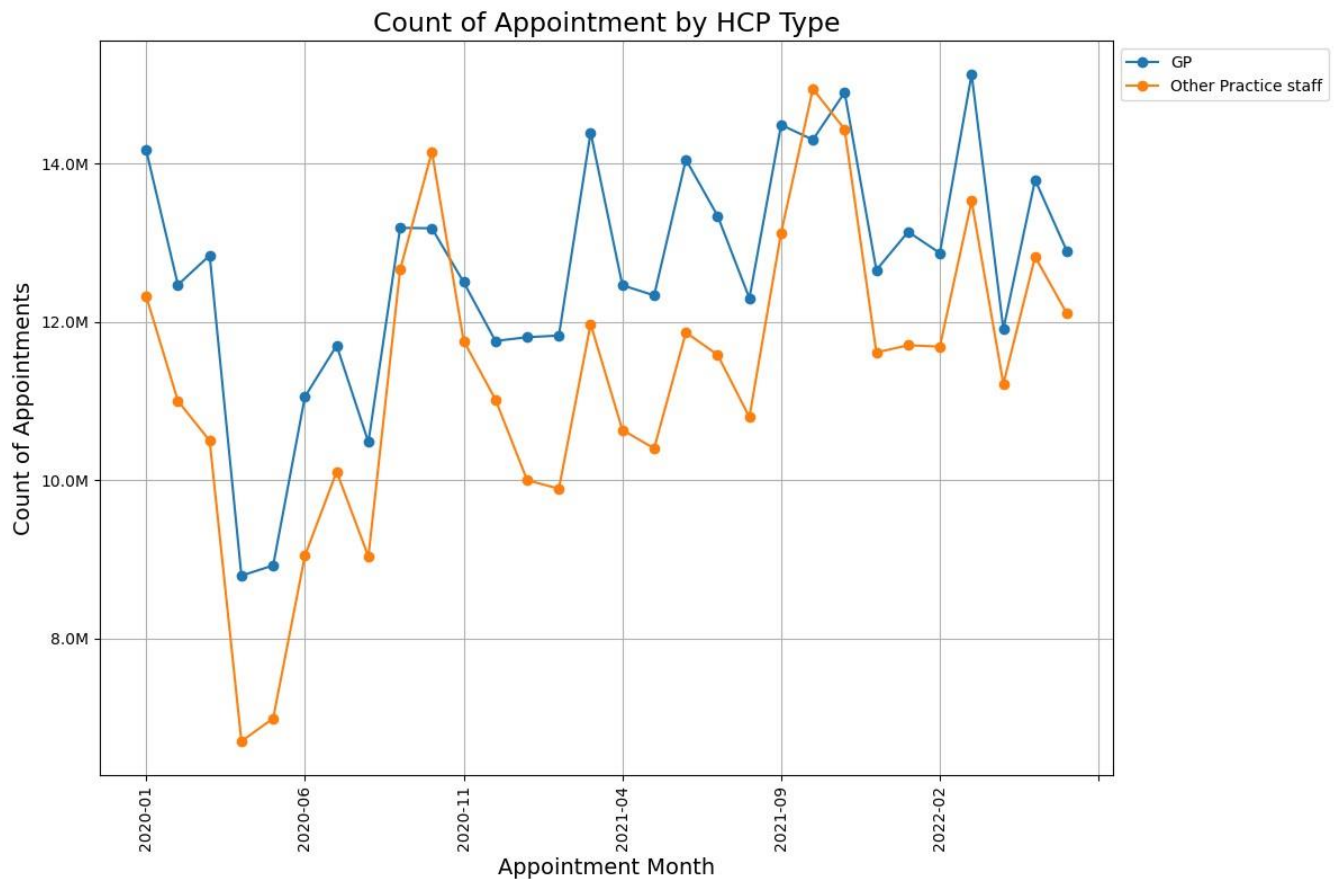
I analysed data regarding HCP type and appointment mode average utilisation (see below). The activity of staff is below the maximum capacity guidance for the NHS.



Q2

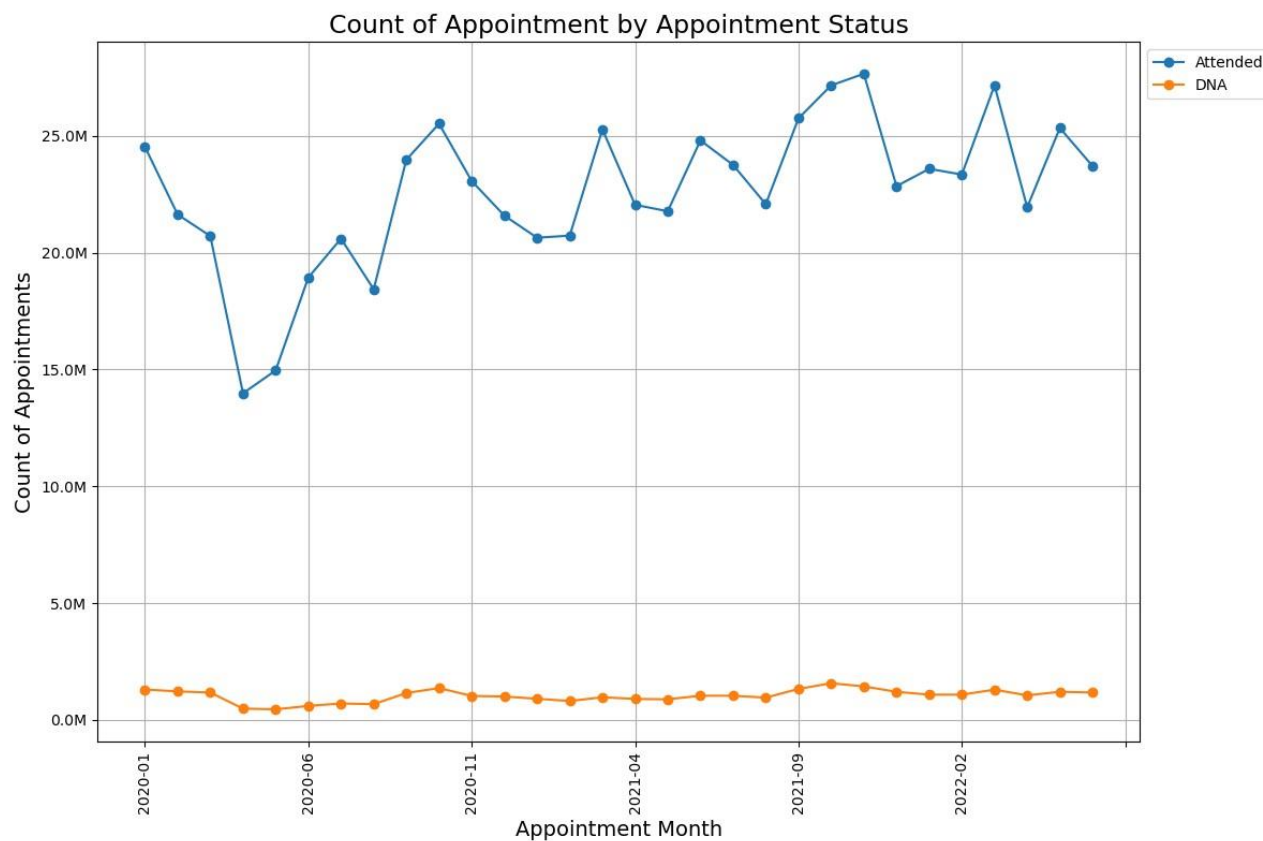
The Figure below shows appointment count by HCP Type in AR. There was a sharp drop in appointment counts for both professional types from Feb 2020 to May 2020.

The start of the COVID-19 pandemic had an impact on primary care, and those working within it. In April and May of 2020 – the first months of the UK’s first lockdown – the number of appointments booked in GP plummeted involving all professional types



Q3

With the first lockdown, there were concerns about unmet need, particularly for people with long-term health conditions, and the potential for delayed diagnoses. However, consultation numbers recovered fast – and by September 2020 total consultations by GPs and Other Practice Staff had recovered to pre-pandemic levels. The DNA levels were static



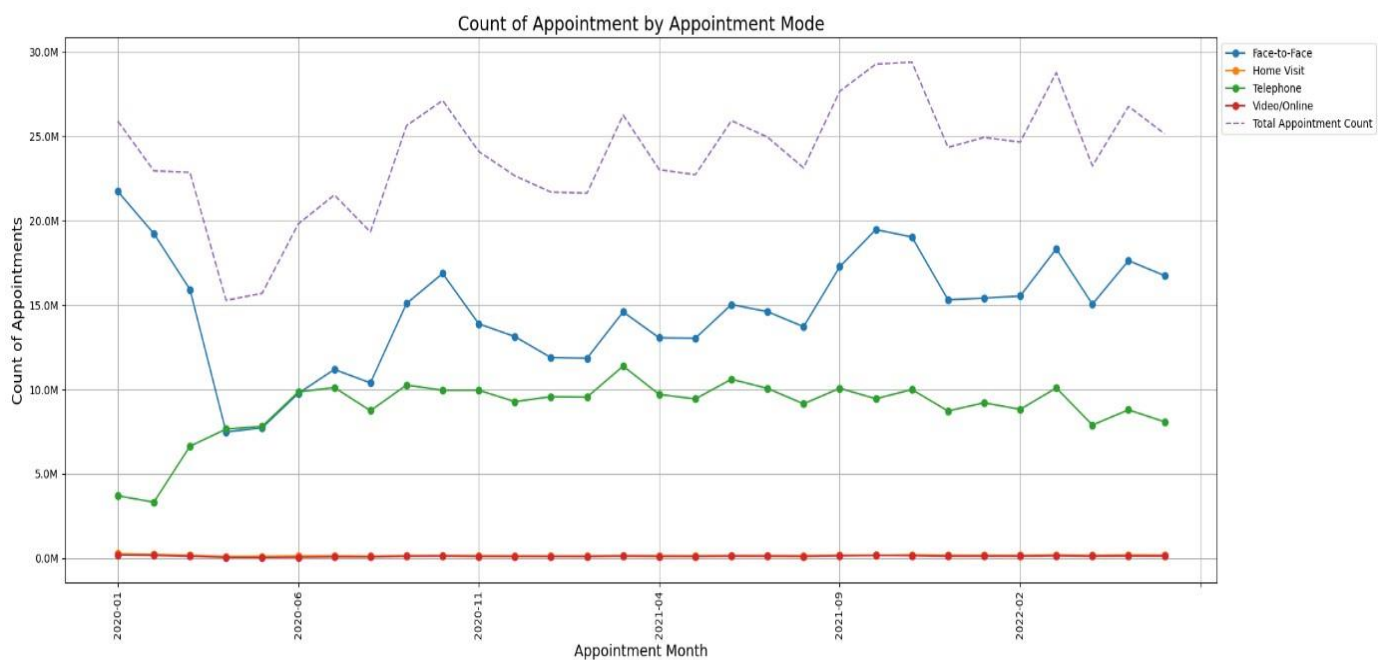
Q4

My analysis and the findings are shown in the Figure below. In March 2020, the COVID -19 pandemic required a rapid reconfiguration of UK general practice to minimise **face to face** contact with patients to reduce face to face encounters. As the figure shows, face to face appointment counts plummeted to 2020.

GP practices rapidly changed the way they deliver consultations. In March 2020, the UK Government instructed GP practices to conduct consultations remotely unless there was

urgent need for a face-to-face appointment. As a result, most GP practices stopped using face-to-face appointments as the first point of contact. Instead, most patients were offered telephone or video consultations. This is shown in the figure below with a drop in face to face consultations and an increase in telephone consultations.

In terms of busiest months, there were 2 peaks, one in October 2020 and another in December 2021. The peak in October could be due to the back log of cases from the first lock down. The second peak in December 2021 could be due the peaks in GP consultations during Winter months peaks of common infections which also affect primary care staff.

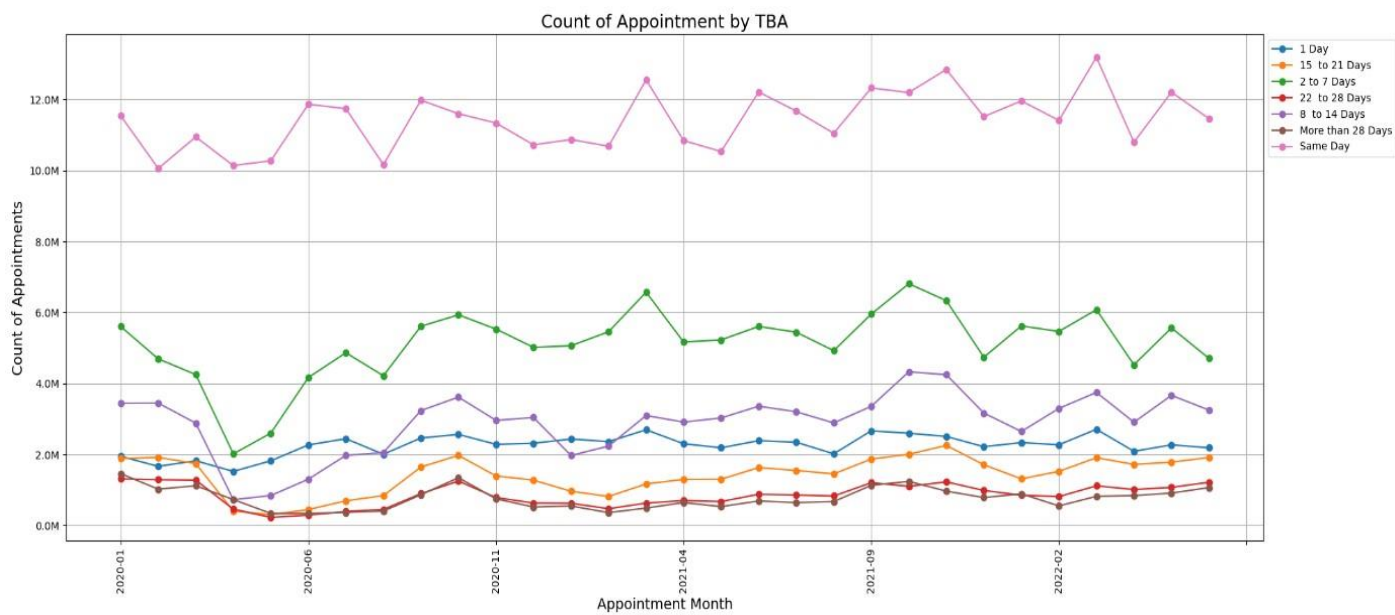


Q5

The analysis of trends in time between booking and appointments shows an interesting

In terms of **immediate appointments** i.e., Same day and seen within 1 day when patients' need is urgent, there was no impact of Covid 19 and the curves. Patients were still being given appointments on the same day or within 1 day.

For less urgent cases, less urgent appointments i.e, day 2-7, day 8-14 days between booking and appointments, these drop during Covid 19 and returned to prepandemic appointments. This is not unexpected with the Covid-19 and backlog of cases. There was also a peak during winter month.

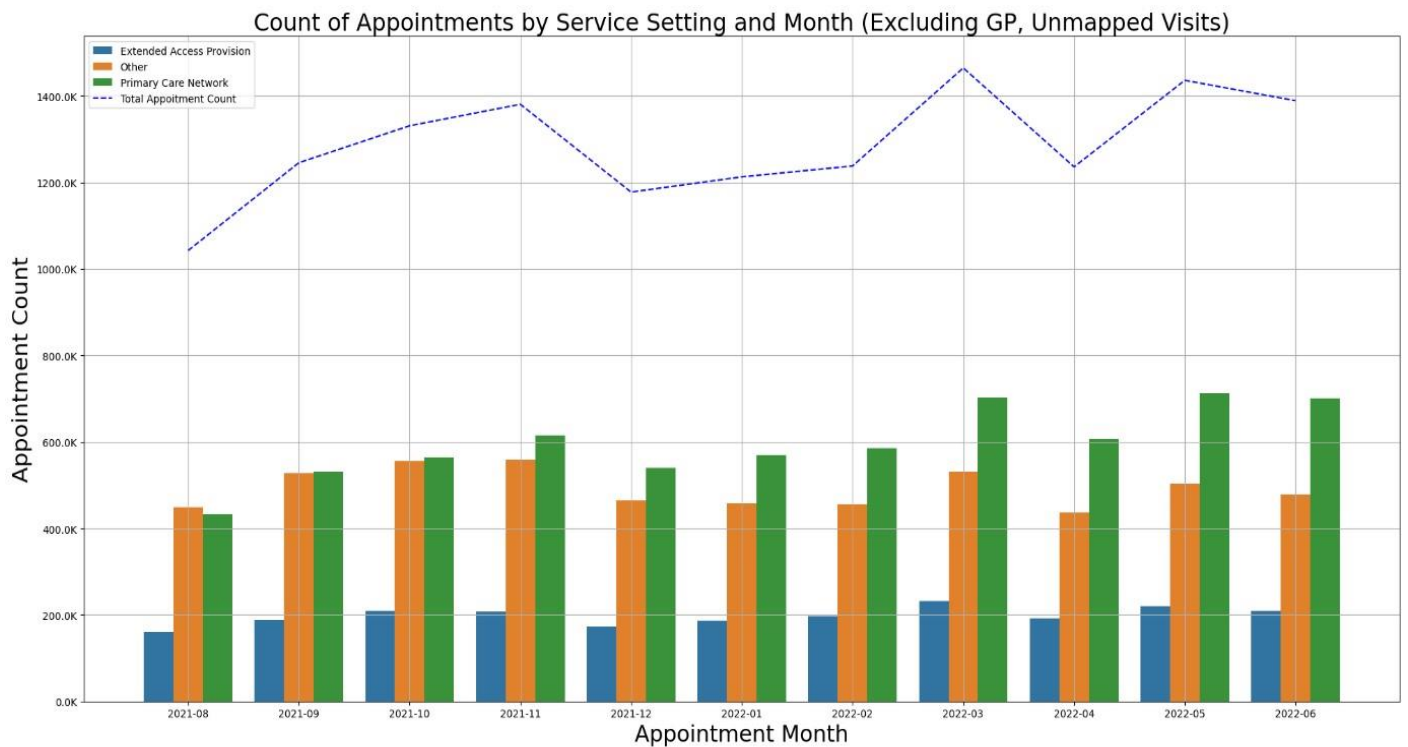
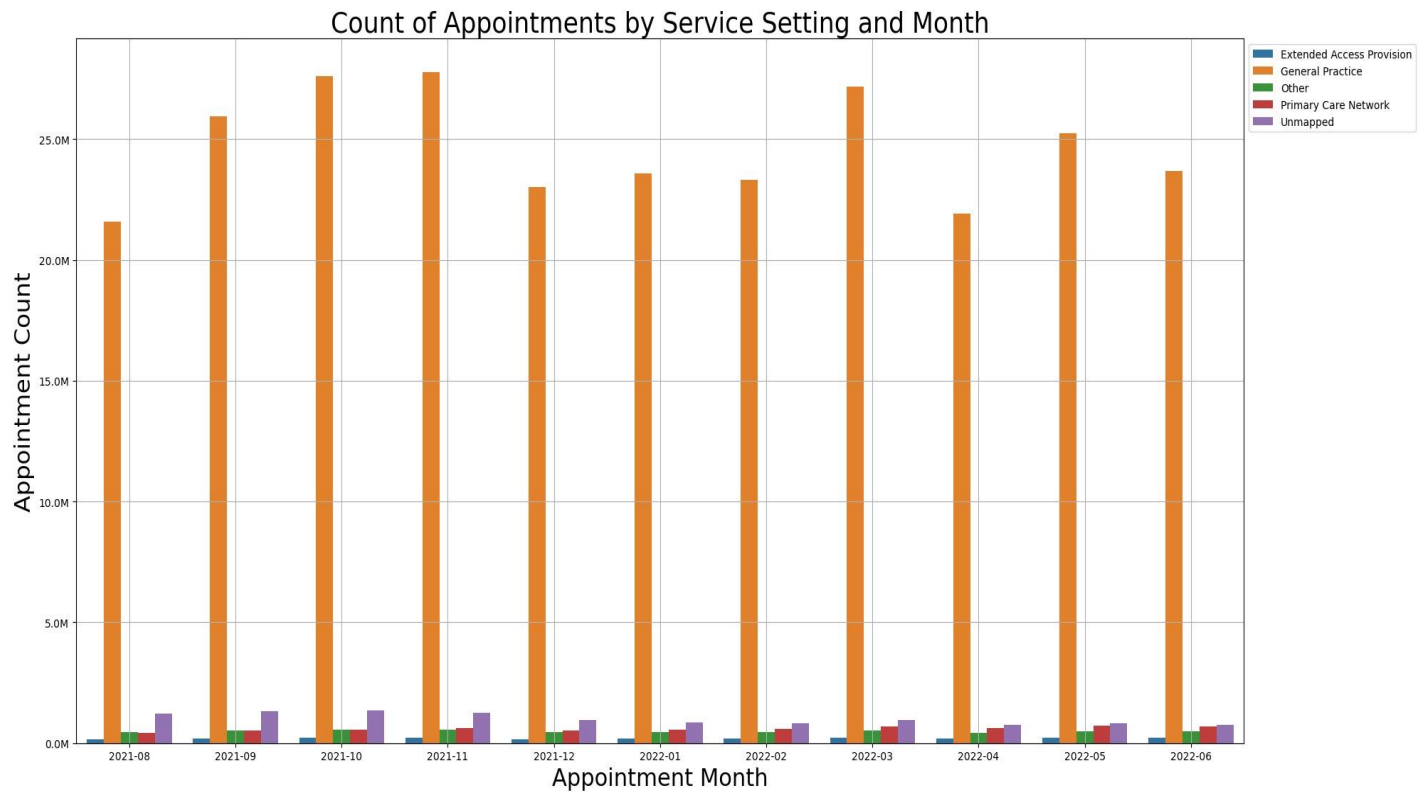


Q6

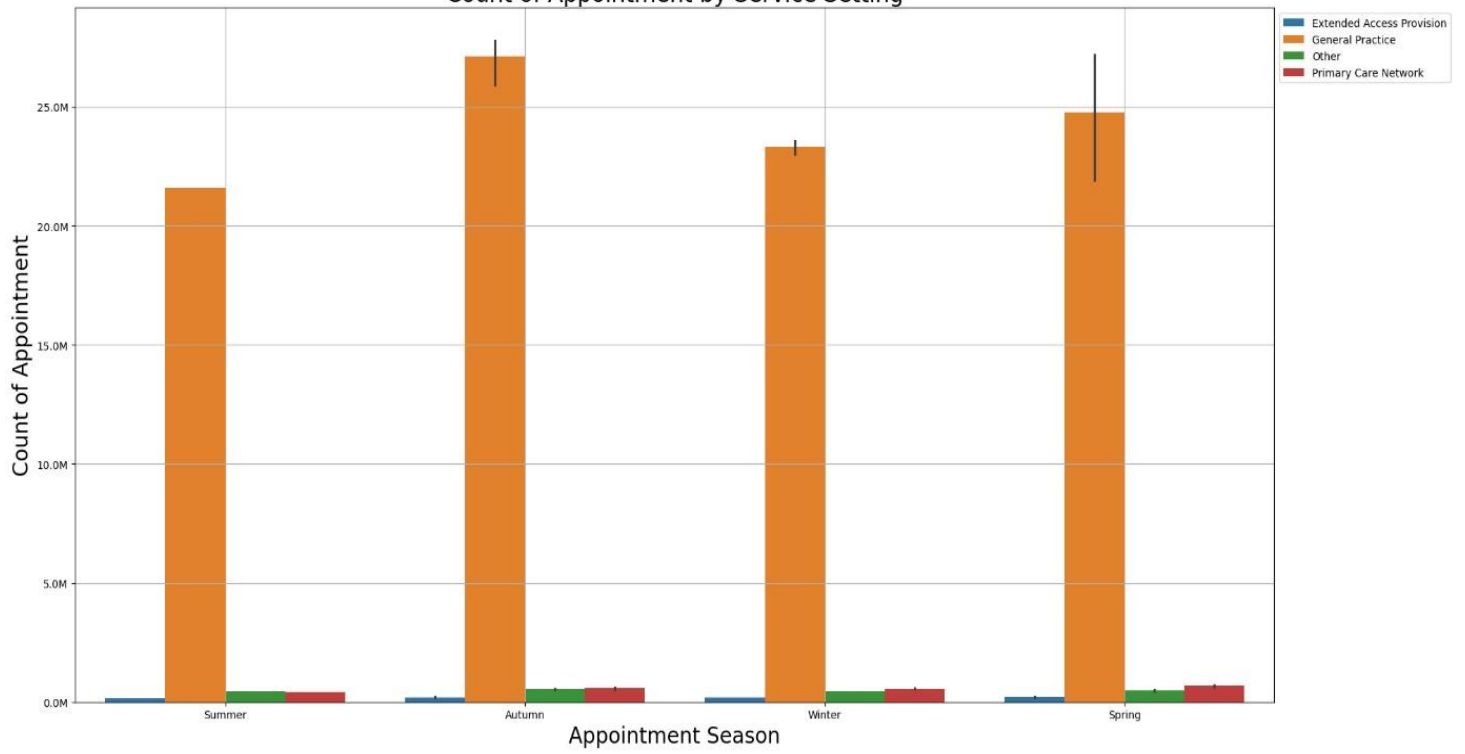
For this analysis, I explored the different service setting by appointment count. Specifically, I looked at appointments with General Practice, Primary Care Network – Appointments delivered by staff employed or engaged under the Additional Roles Reimbursement Scheme (ARRS) and Extended Access Provision with enhanced access appointments during evenings and weekends

Most activities were provided by appointments with General Practice. Appointments through primary Network and Extended Access Provision were much less and varied over time. I have also shown Appointment Counts by Service Setting over different seasons (excluding unmapped data). There do not seem to be seasonal differences by service type.

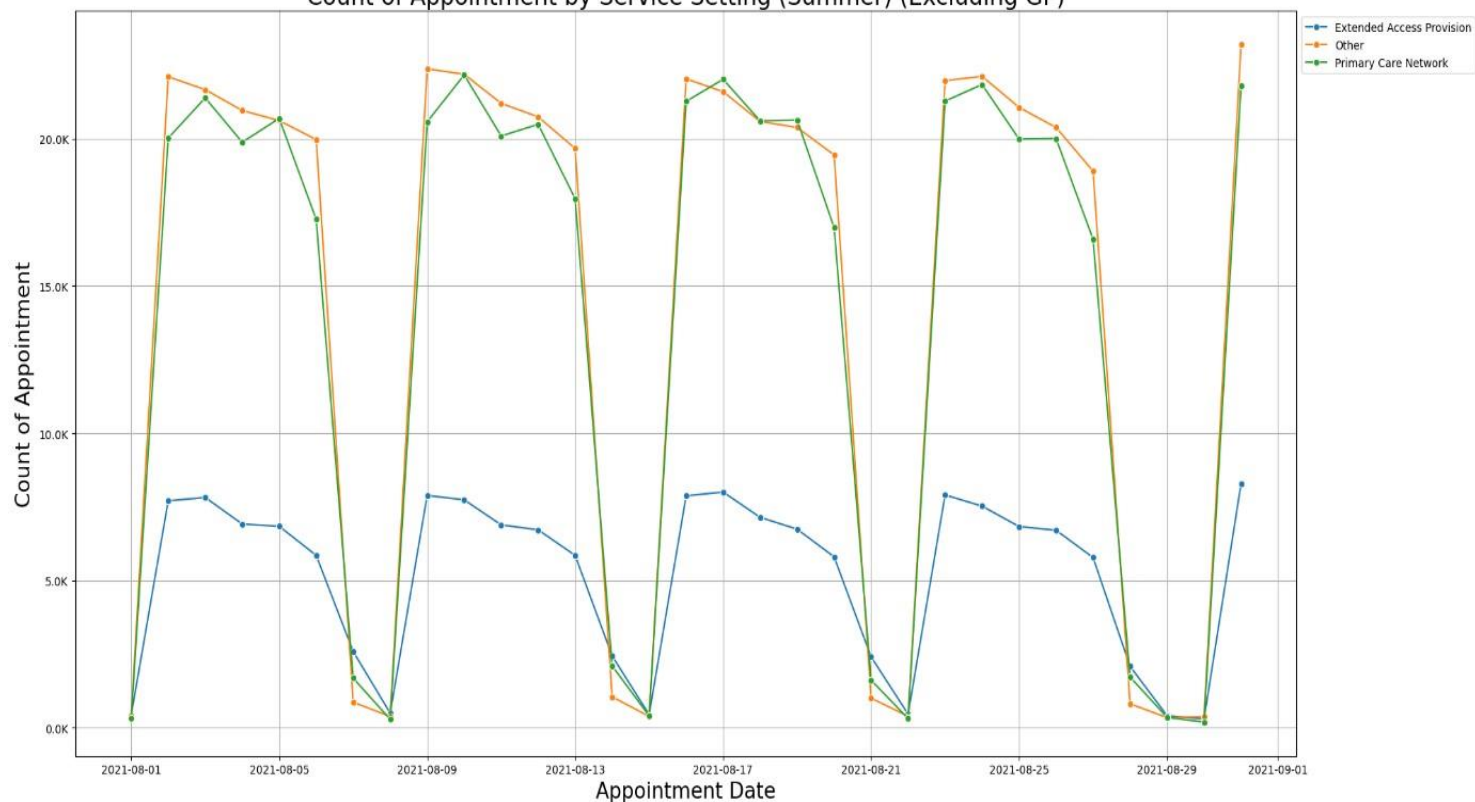
In terms of service types, there are peaks and troughs. The troughs appear to coincide with weekend where more service setting would not be operating.



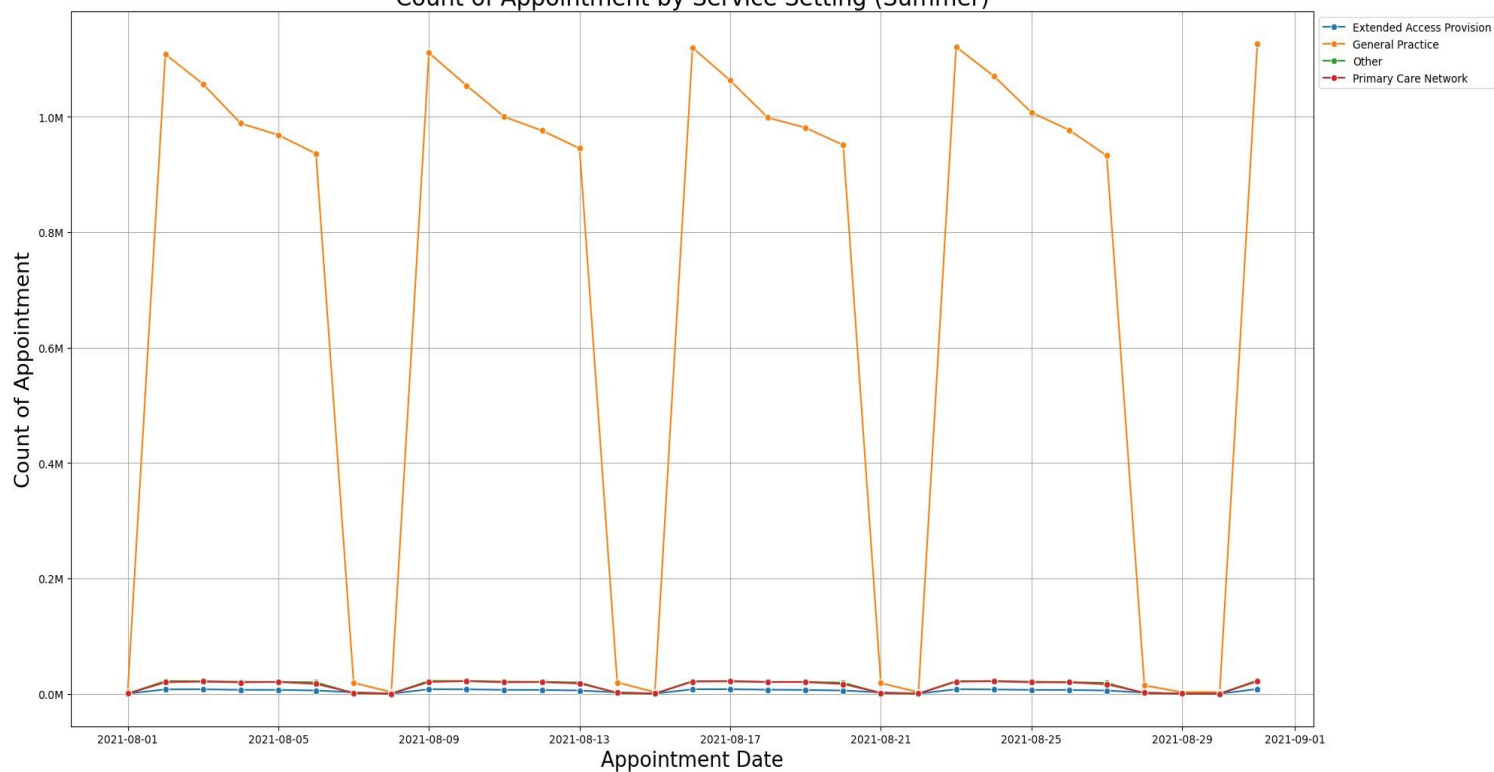
Count of Appointment by Service Setting



Count of Appointment by Service Setting (Summer) (Excluding GP)

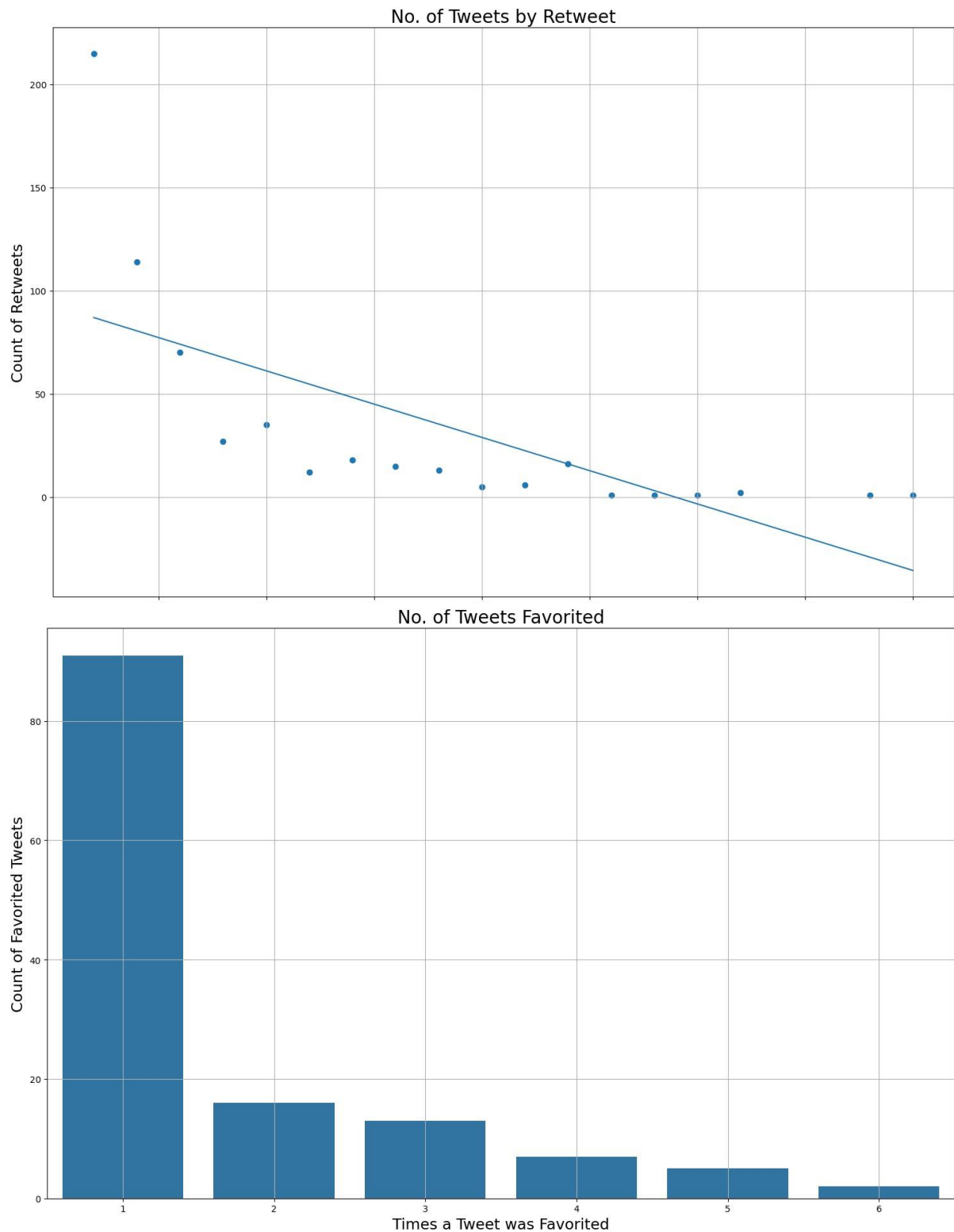


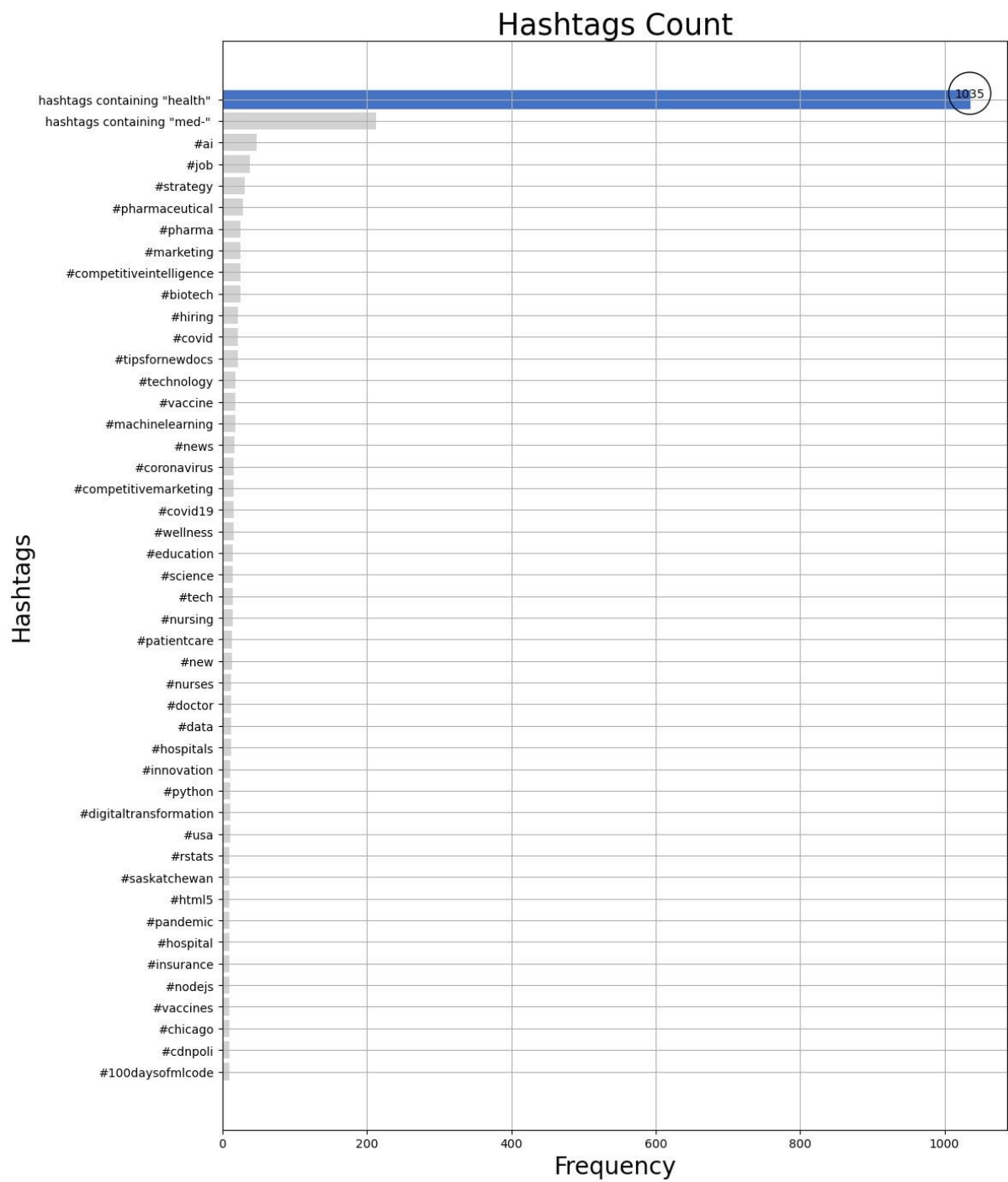
Count of Appointment by Service Setting (Summer)

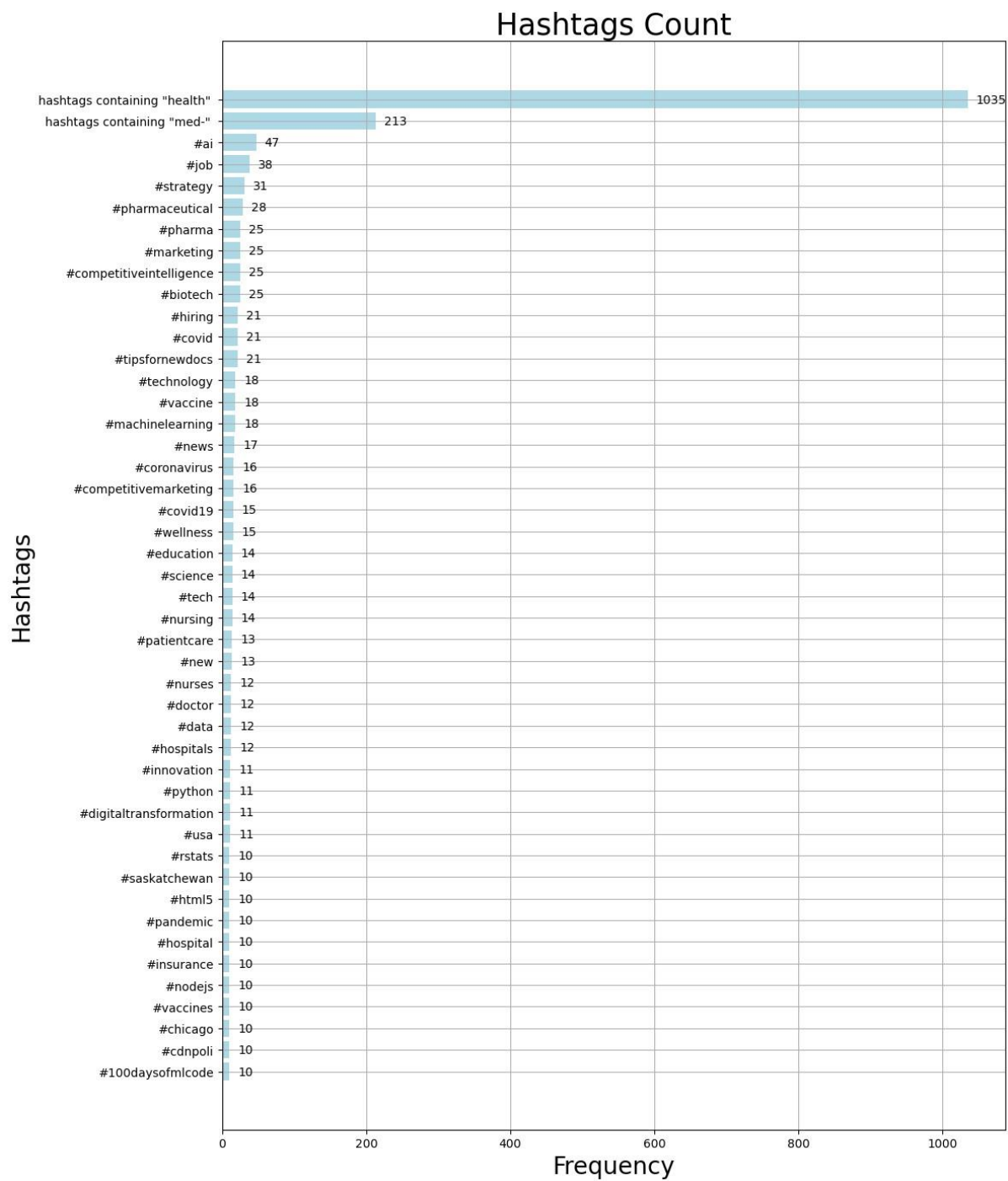


Q7

Twitter offers the NHS a potential platform to increase awareness of appointments. In my analysis, I found that tweets are rarely retweeted on large scale, limited to 1 and 2 times. This raises some concern about the utility of twitter as tool for improving appointment attendance. Regarding hashtags, the most popular hashtag contains the word 'health', or 'med-', indicating the ineffectivity of other hashtags.







Conclusions

I have learnt from this data analytics module using NHS data. I believe that such data, when analysed properly, can have the potential of enhancing service efficiency and resource management.