



# NHS UNATTENDED APPOINTMENTS ANALYSIS REPORT



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# 1. Introduction

## 1.1. Background

As part of the Course 2, Data Analytics for Business, final assignment we will analyse a data set to help the NHS, a publicly funded healthcare system in England, to understand the reasons for missed appointments. The NHS incurs significant, potentially avoidable, costs when patients miss general practitioner (GP) appointments, therefore, reducing or eliminating missed appointments would be beneficial financially as well as socially. The government needs a data-informed approach to deciding how best to handle this problem

To complete this analysis, we will be analysing four datafiles, `actual_duration.csv`, `appointments_regional.csv`, `national_categories.xlsx` and `tweets.csv`, for data exploration and analysis we will be using Python.

## 1.2. Objectives

At this stage of the project the two main questions posed by the NHS are:

- Has there been adequate staff and capacity in the networks?
- What was the actual utilisation of resources?

## 2. Analytical approach

### 2.1. Data Exploration

All the data exploration was completed using Pandas, Seaborn, Matplotlib and NumPy libraries. In order to familiarise ourselves with the data we will determine the following:

#### 1. How many locations are there in the data set?

Analysing the national categories data set we saw that the data refers to 106 different locations.

#### 2. What are the five locations with the highest number of records?

Below we can see the five locations with the highest number of records. It can be seen that NHS North West London ICB has the highest number of records.

Location	Record Count
NHS North West London ICB - W2U3Z	13007
NHS Kent and Medway ICB - 91Q	12637
NHS Devon ICB - 15N	12526
NHS Hampshire and Isle Of Wight ICB - D9Y0V	12171
NHS North East London ICB - A3A8R	11837

Table 1 – Top 5 locations with the highest number of records

#### 3. How many service settings, context types, national categories, and appointment statuses are there?

Below we can see how many different types there are in each category.

Category	Count of types
Service Settings	5
Context Types	3
National Categories	18
Appointment Statuses	3

Table 2 - service settings, context types, national categories, and appointment statuses types

### 2.2. Data Analysis

#### 2.2.1. Introduction

In this chapter we will perform data wrangling and manipulation to search for answers to general questions that will help us better understand the data and create visualisations to identify possible trends.

## 2.2.2. Initial Data Analysis

In this section we will search for answers to general questions that will help you better understand the data.

- Date range of the provided data sets.

Data Set	Start Date	End Date
National Category	2021-08-01	2022-06-30
Actual Duration	2021-12-01	2022-06-30

Table 3 - Data sets range

- On Table 4 below we can see that General Practice was the most popular service setting for NHS North West London (the location with the highest number of records) from 1 January to 1 June 2022.

Service Setting	Number of Appointments
General Practice	4804239
Unmapped	391106
Other	152897
Primary Care Network	109840
Extended Access Provision	98159

Table 4 - NHS North West London appointments per service setting from 1<sup>st</sup> Jan to 1<sup>st</sup> Jun 2022

- On Table 5 we can see that the months of October and November 2021 had the highest number of appointments during the period.

Appointment Year	Appointment Month	Number of Appointments
2021	11	30405070
	10	30303834
2022	3	29595038
2021	9	28522501
2022	5	27495508
	6	25828078
	1	25635474
	2	25355260
2021	12	25140776
2022	4	23913060
2021	8	23852171

Table 5 – Number of appointments per month

- On Table 6 we can see that the month of March 2022 had the highest number of records during the period.

Appointment Year	Appointment Month	Number of Records
2022	3	82822

2021	11	77652
2022	5	77425
2021	9	74922
2022	6	74168
2021	10	74078
	12	72651
2022	1	71896
	2	71769
	4	70012
2021	8	69999

Table 6 - Number of records per month

## 2.2.3. Monthly and Seasonal Trends

On this section we will check what monthly and seasonal trends are evident, based on the number of appointments for service settings, context types, and national categories.

### Number of appointments per month

- **Service Settings**

Figure 1 shows that the General Practice is by far the service setting with highest total number of appointments.



Figure 1 - Number of appointments per month for service settings

By excluding the General Practice (figure 2) we can see that unmapped bookings (No record of a category against an appointment) is the second service setting with the highest total number of appointments.

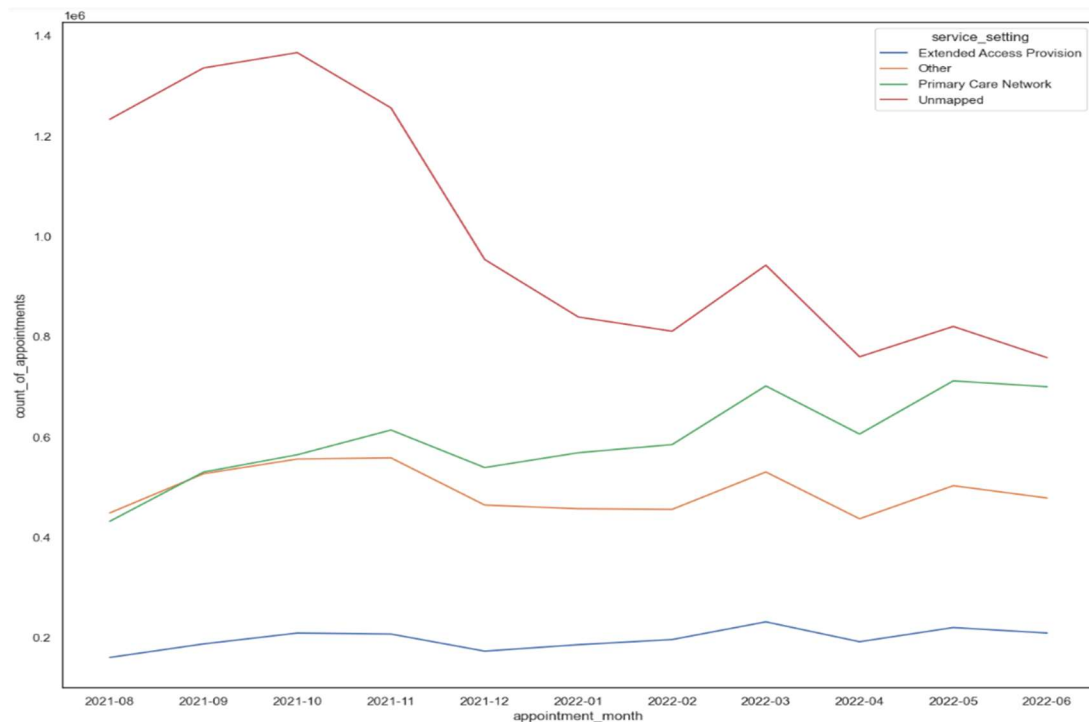


Figure 2 - Number of appointments per month for service settings, excluding General Practice

- **Context Types**

Figure 3 shows that the Care Related Encounter is by far the context type with the highest total number of appointments. This also has peaks in October 2021 and March 2022.

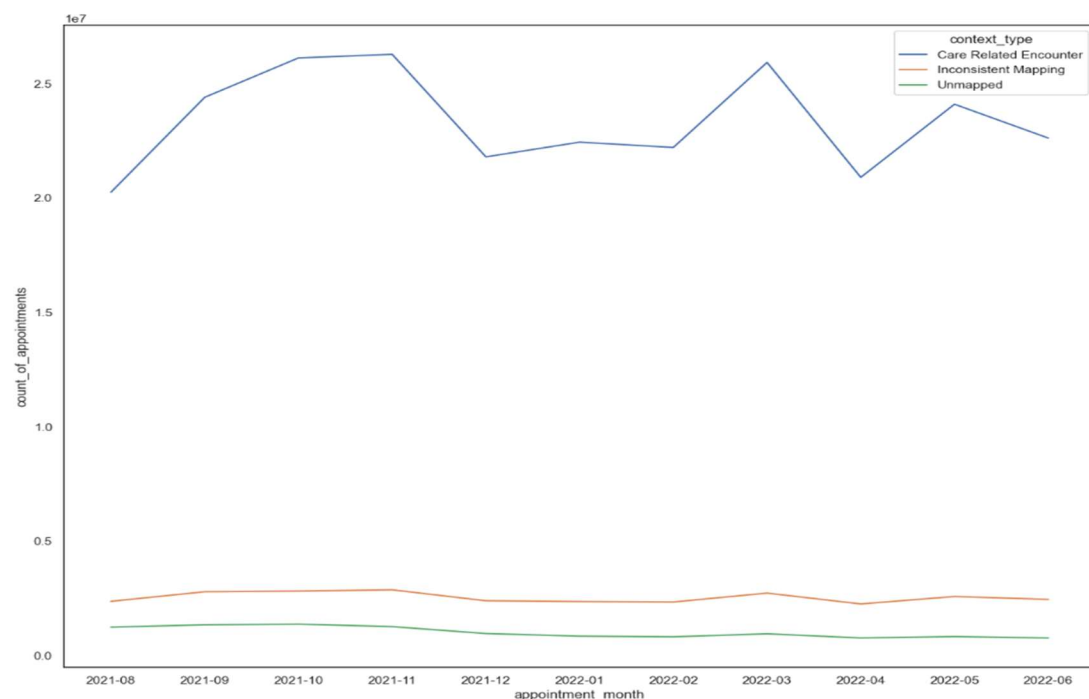


Figure 3 - Number of appointments per month for context types

- **National Categories**

Figure 4 shows that the General Consultation Routine is by far the national category with the highest total number of appointments. This also has peaks in October 2021 and March 2022.

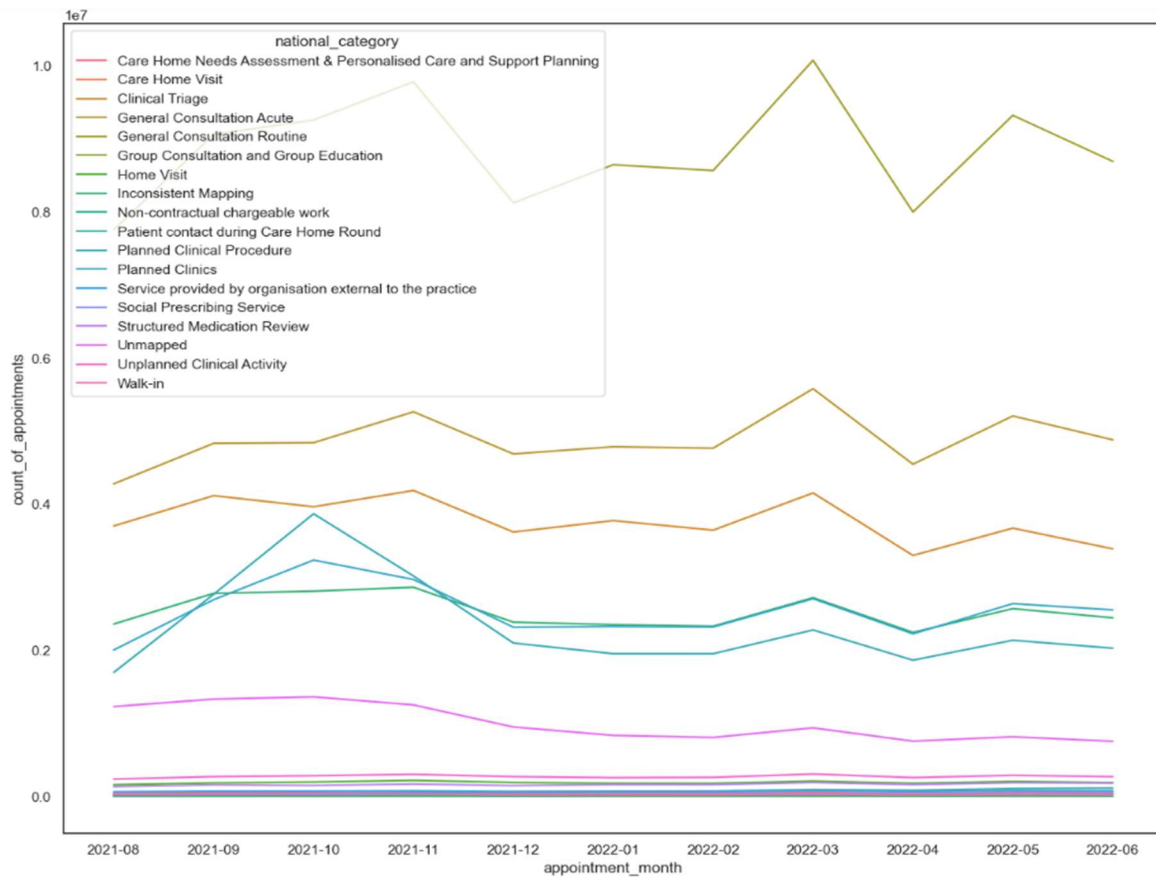


Figure 4 - Number of appointments per month for national categories

## Number of appointments for service setting per season

- **Summer (August 2021)**



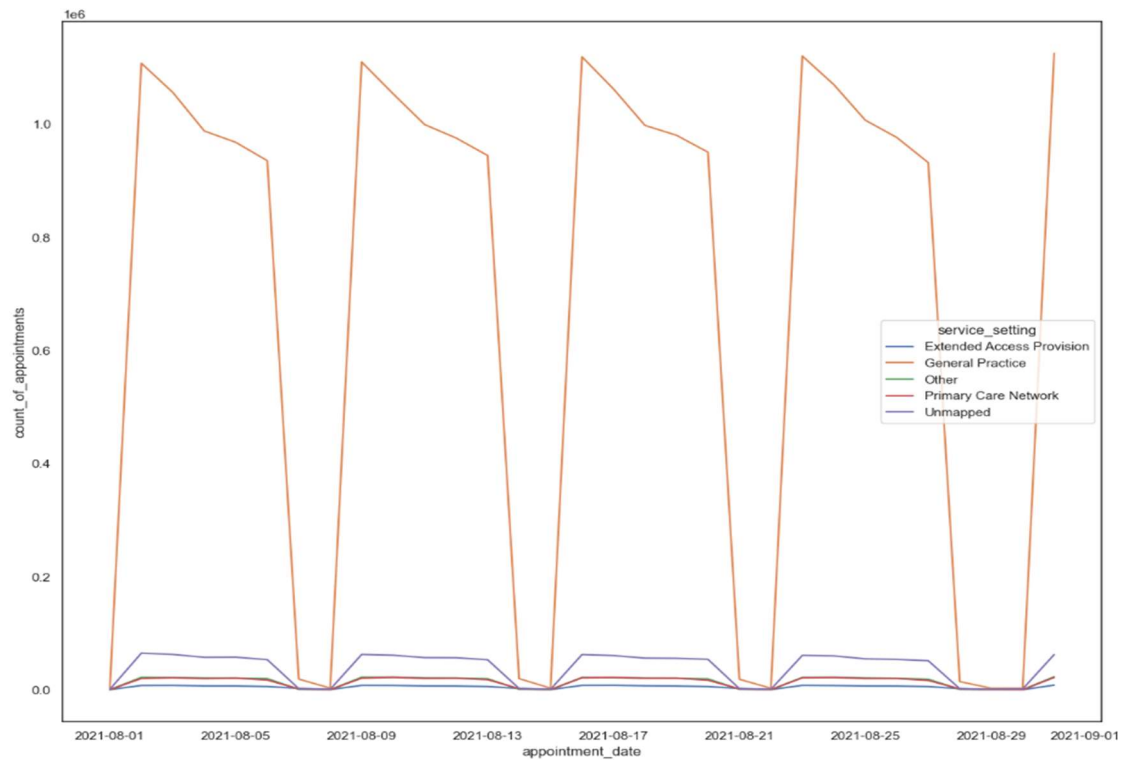


Figure 5 - Number of appointments for service setting Summer (August 2021)

- **Autumn (October 2021)**

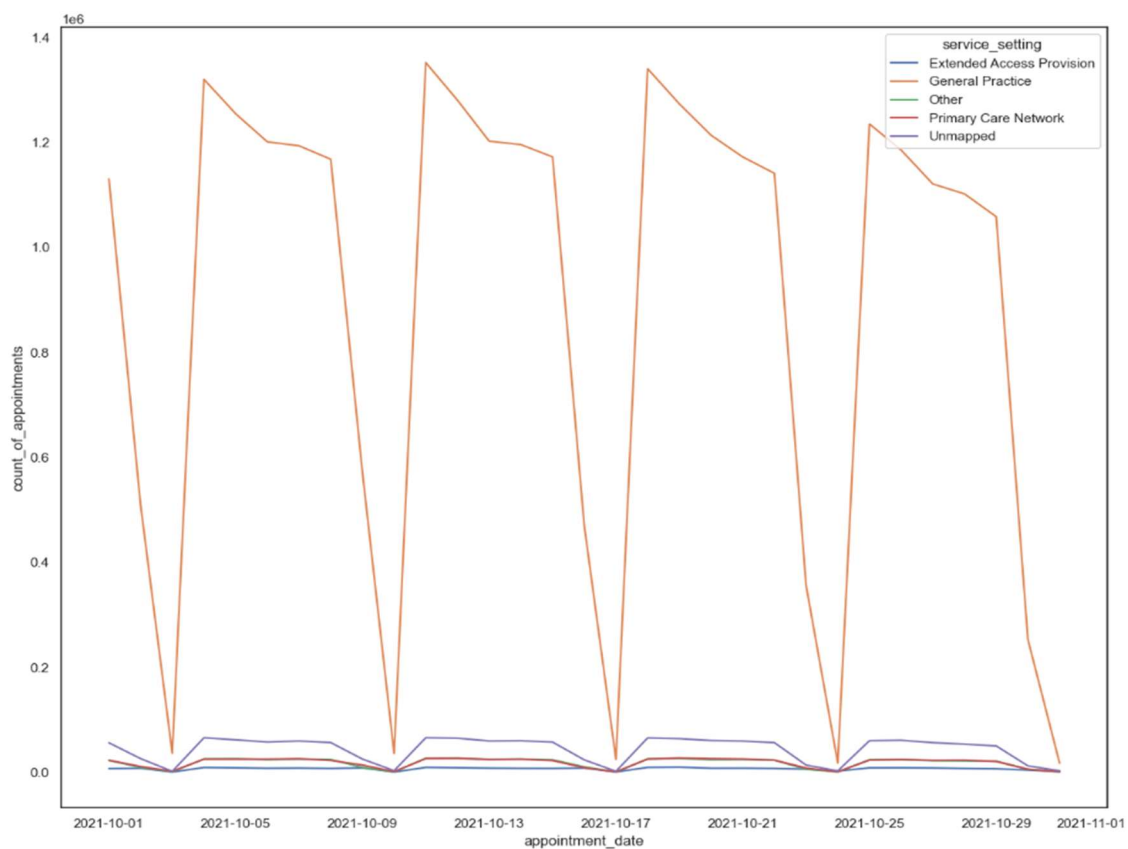


Figure 6 - Number of appointments for service setting Autumn (October 2021)

- **Winter (January 2022)**

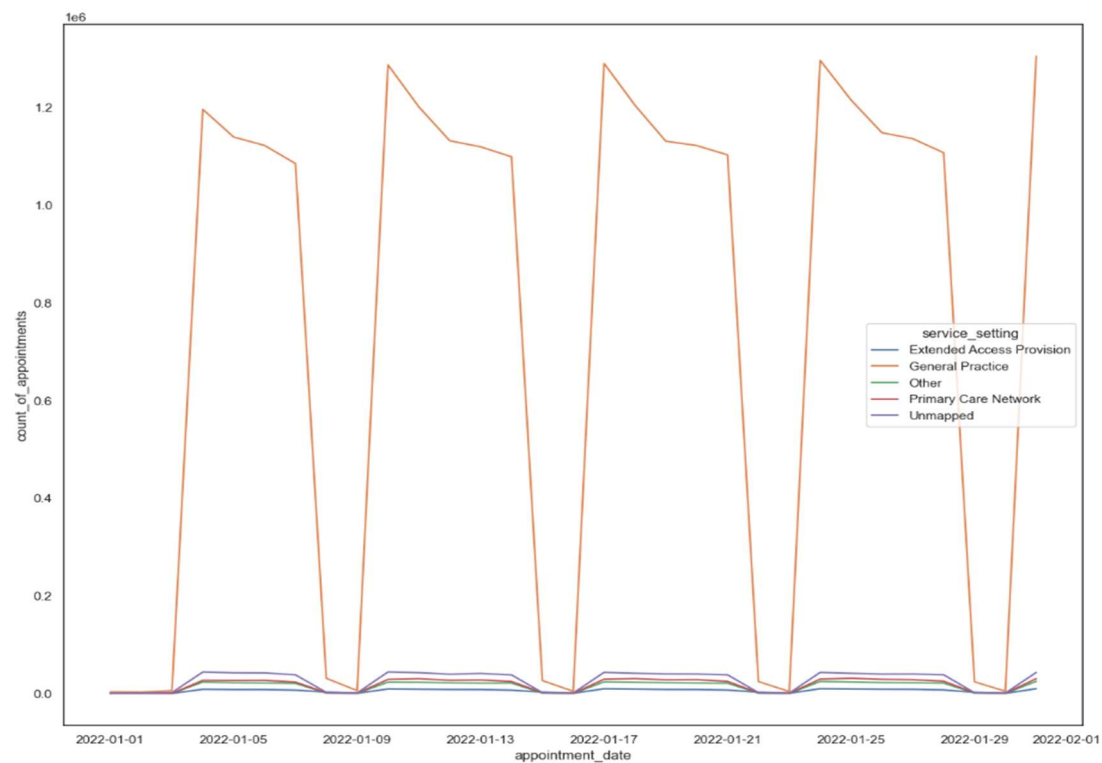


Figure 7 - Number of appointments for service setting Winter (January 2022)

- **Spring (April 2022)**

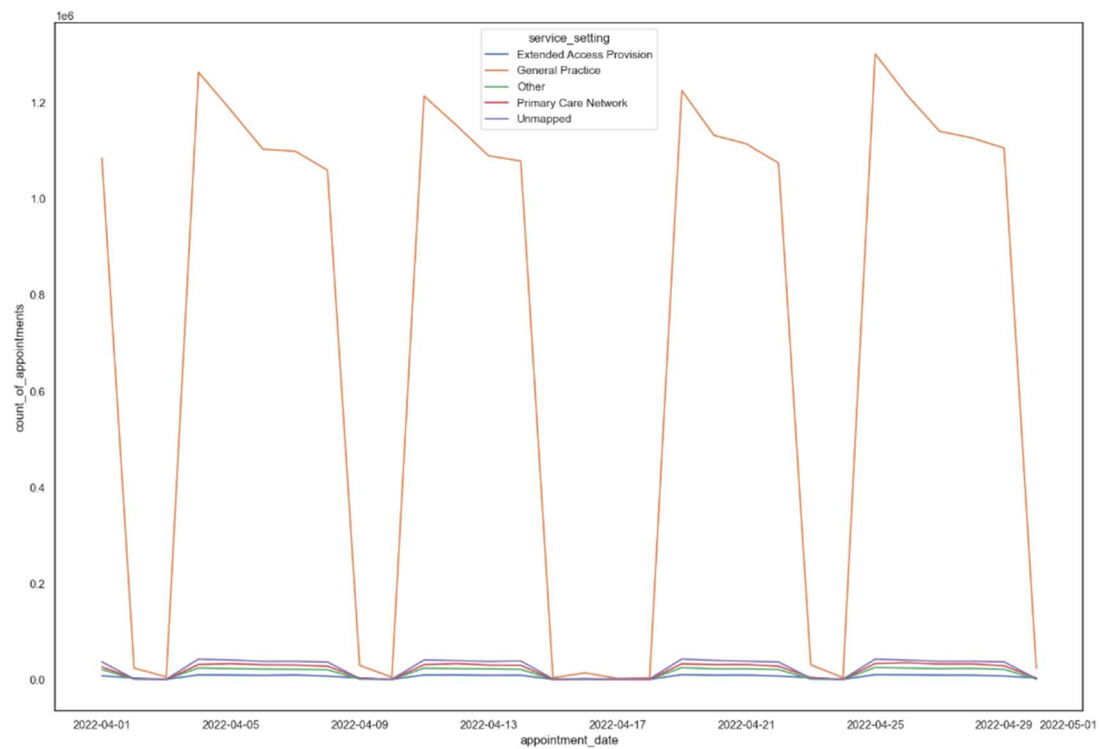


Figure 8 - Number of appointments for service setting Spring (April 2022)

In general Autumn is the season with the highest number of appointments and Summer the lowest. It looks like there is a trend for the appointments to have a peak at the beginning of each week and then start decreasing towards the weekend, it can be seen as well that the appointments go close to zero during the weekends.

# 3. Findings

## 3.1. Patterns / Recommendations

- Should the NHS start looking at increasing staff levels?

The NHS can accommodate a maximum of 1,200,000 appointments per day and the max utilisation checked on the data set is 1,013,502.3 (figure 11) so the increase isn't recommended.

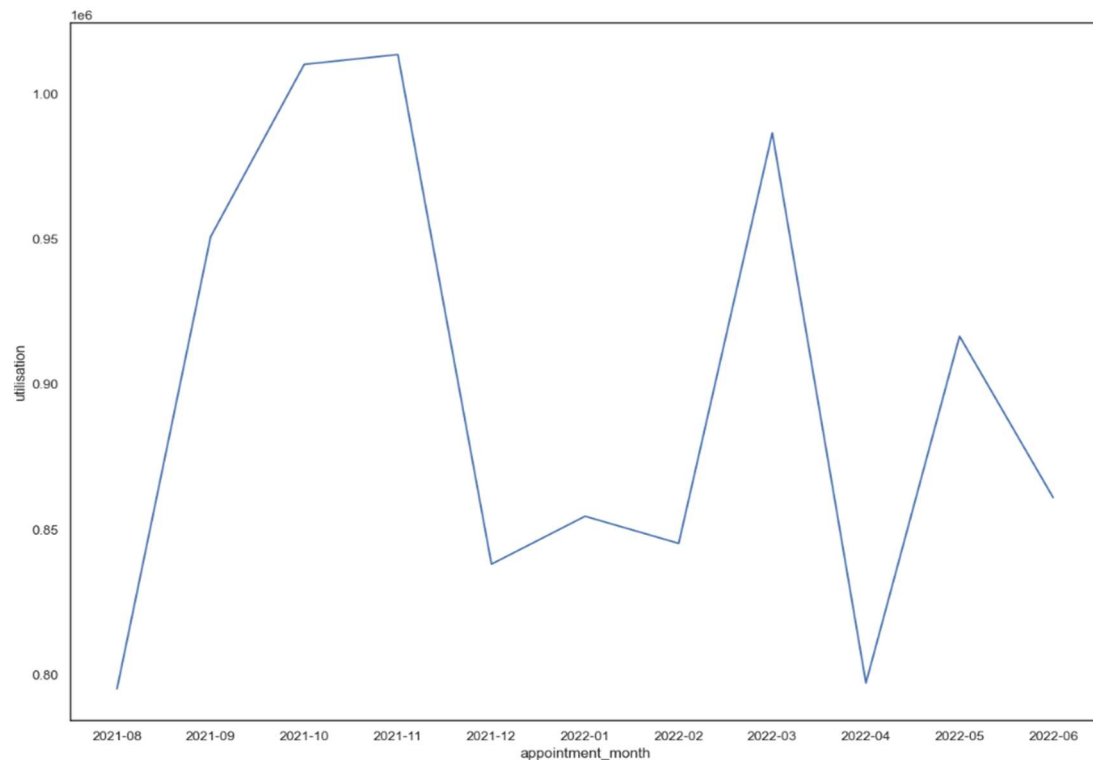


Figure 9 - Monthly capacity utilisation

- How do the healthcare professional types differ over time?

By looking at figure 12 it can be seen that the healthcare professionals seem to be constant over time, there isn't a big variance.

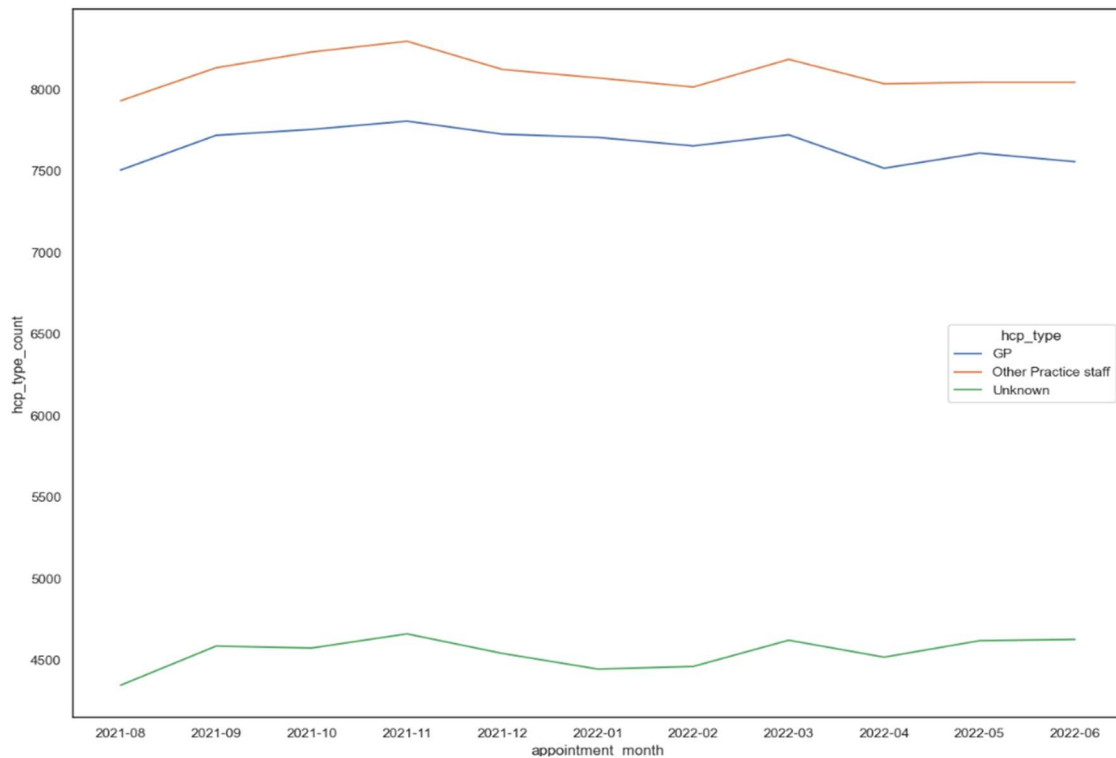


Figure 10 - Healthcare Professionals variation over time

- Are there significant changes in whether or not visits are attended?

There are no significant changes over time.

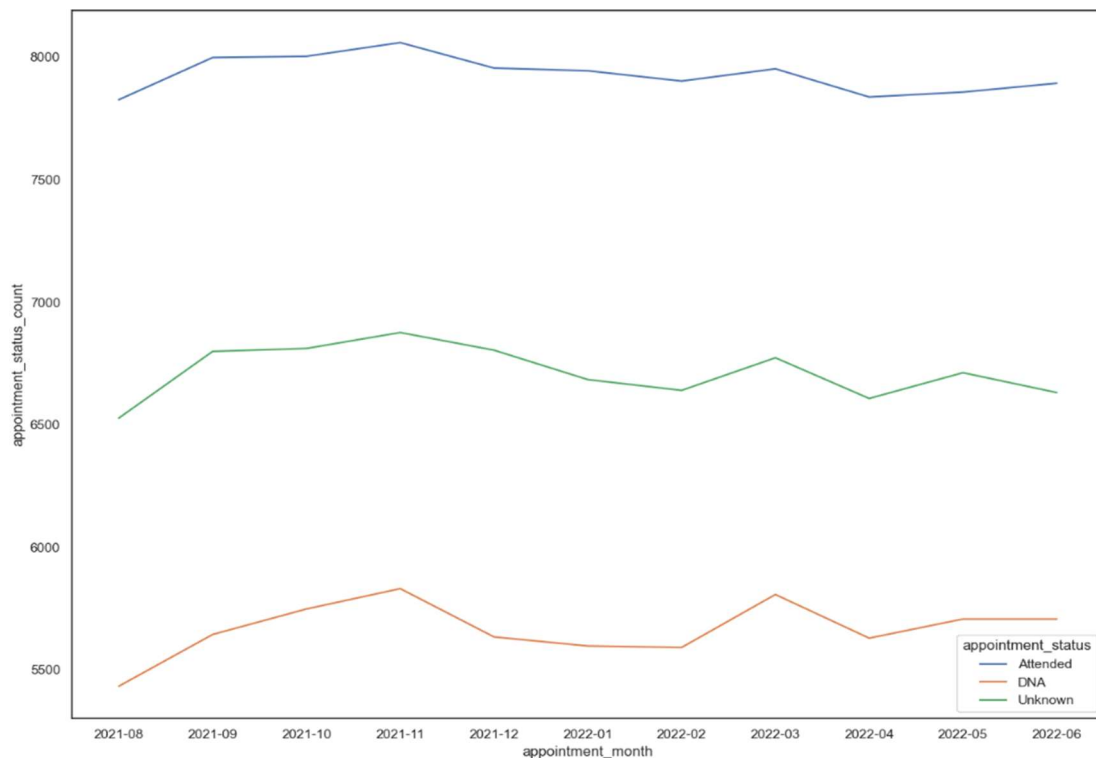


Figure 11 - Appointments attendance variation over time

- Are there changes in terms of appointment type and the busiest months?

The appointment type numbers seem to be constant over time.

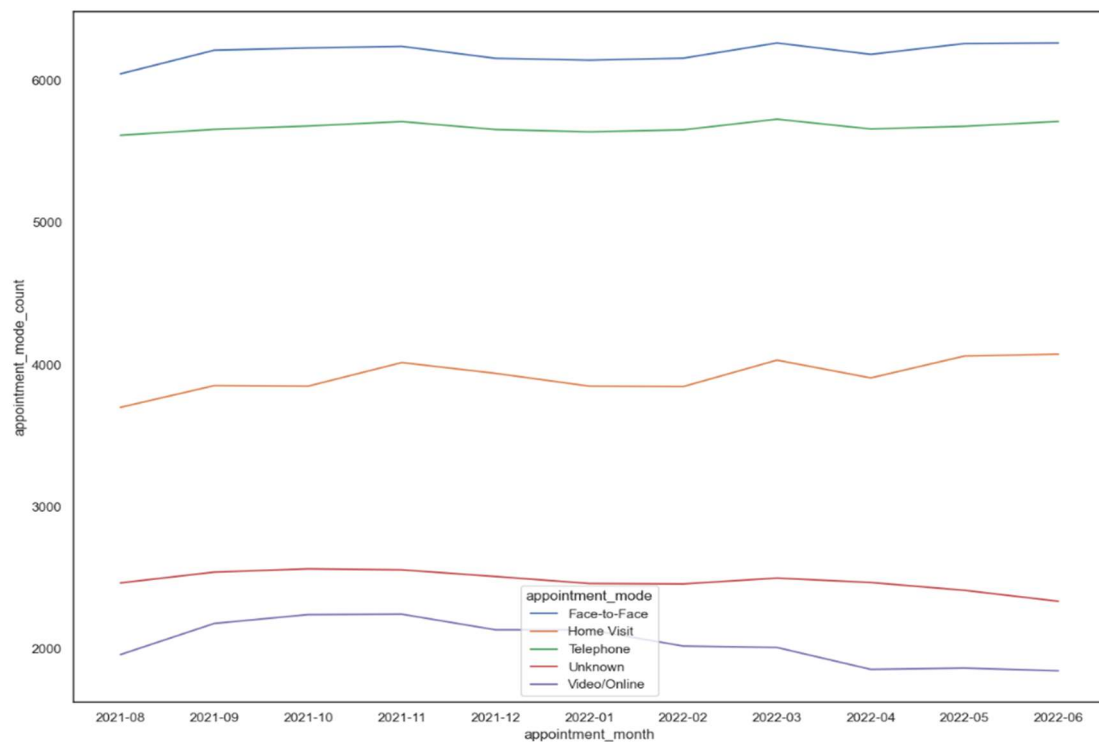


Figure 12 - Appointment mode variation over time

- Are there any trends in time between booking an appointment?

The time between booking an appointment seems constant over time and there no significant changes.

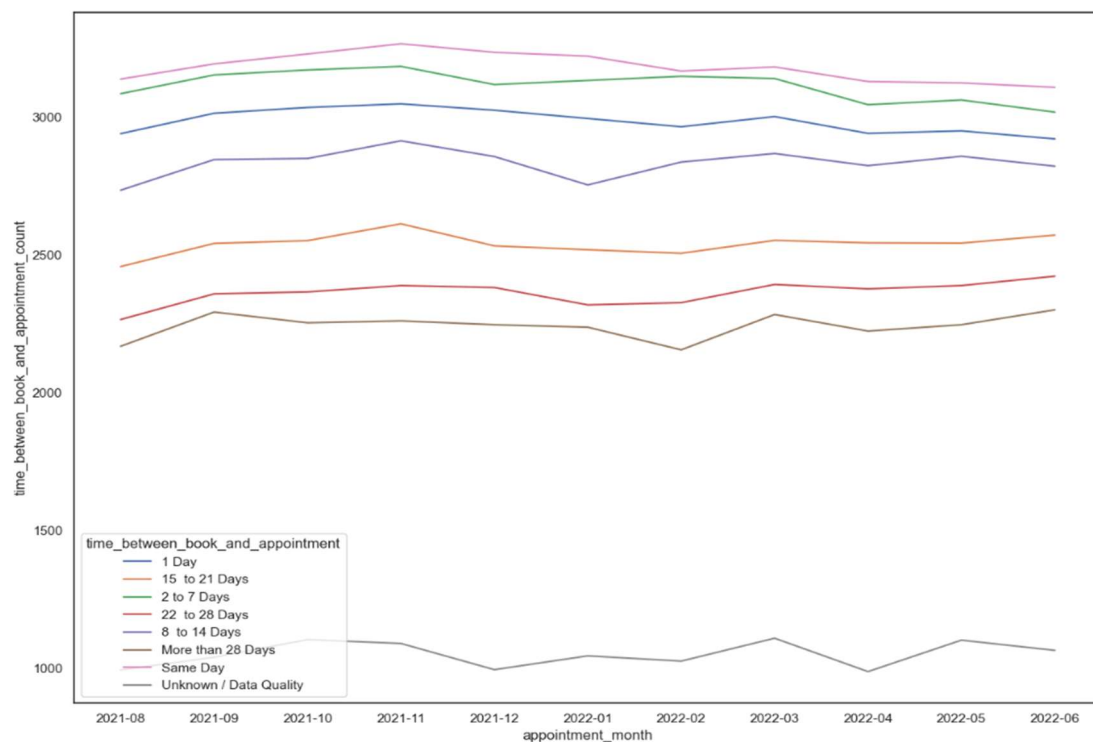


Figure 13 - Time between booking an appointment variation over time

## 3.2. Trends, Insights and Further Recommendations

### Trends and Insights

- At the moment the NHS has the right staff levels and enough to cover all appointments recorded.
- In general there are two peaks in all analysis one in October 2021 and one in March 2022. This might be related to the UK Covid19 lockdowns, the second lockdown was announced in October 2021 and in March 2022 the third lockdown restrictions started to be lifted.
- Outside the noticed peaks mentioned above the number of non-attended appointments seems to stay constant over time.
- General practice is the service setting most attended and in face appointments followed by telephone are the preferred appointment modes. General Consultation Routine is the national category with the most appointments.
- Same day appointments closely followed by 2 to 7 days are the most common time between booking and appointment.

### Recommendations for further exploration

We would recommend further exploration on the following areas:

- Analysed data outside the Covid19 period. This would allow to understand if the trends would be the same outside the pandemic period.
- It would be interesting to analyse the Healthcare professional type and locations in more depth and understand if the staff levels and locations capacity are adequate for the number of different type of appointments.
- Correlate the unattended appointments with different parameters to check if any correlations could be found.