Nicholson_Felix_DA201_Assignment_Report

Analysis Process and Methodology

NOTE: More detailed methodology and justification for parts of the code can be found throughout the Jupyter notebook file.

Process & Decision Making Justifications

I performed standard data intake and checks on the various dataframes. I used the .count() function to find amounts of locations. This gives a list of the sub_icb_location_code's the length of which is the number of locations. Count and value count give us table providing answers for top 5 locations and service settings and context types questions.

I used the datetime module to address questions regarding between which dates appointments were scheduled, and aggregation techniques for the subsequent questions (*see code for details)*.

Importantly, I excluded General Practice from some of the subsequent tables. I did this because it is such an extensively used setting that it would be difficult for the viewer to see detailed trends amongst the other service settings.

I used a line plot to visualize "Appointments Per Month By NC", as this allows us to see the general shape and spikes across the national categories.

Some questions were somewhat ambiguous, for example in 'What was the total number of records per month' I interpreted 'records' as rows and performed a count accordingly.

I created 4 barplots comparing service settings. These allow us to clearly see the large amount of unmapped data. I have postulated below that this large unmapped category may reflect the overload of NHS capacity, rendering better data acquisition impossible.

1) What is the number of locations, service settings, context types, national categories, and appointment statuses in the data sets?

Number of Locations = 106

Service Settings = 5

Context Types = 3

National Categories = 18

2) What is the date range of the provided data sets, and which service settings reported the most appointments for a specific period?

Date range = 2021-08-01, 2022-06-30

General Practice (GP) reported the most appointments, followed by unmapped and other.

What is the number of appointments and records per month?

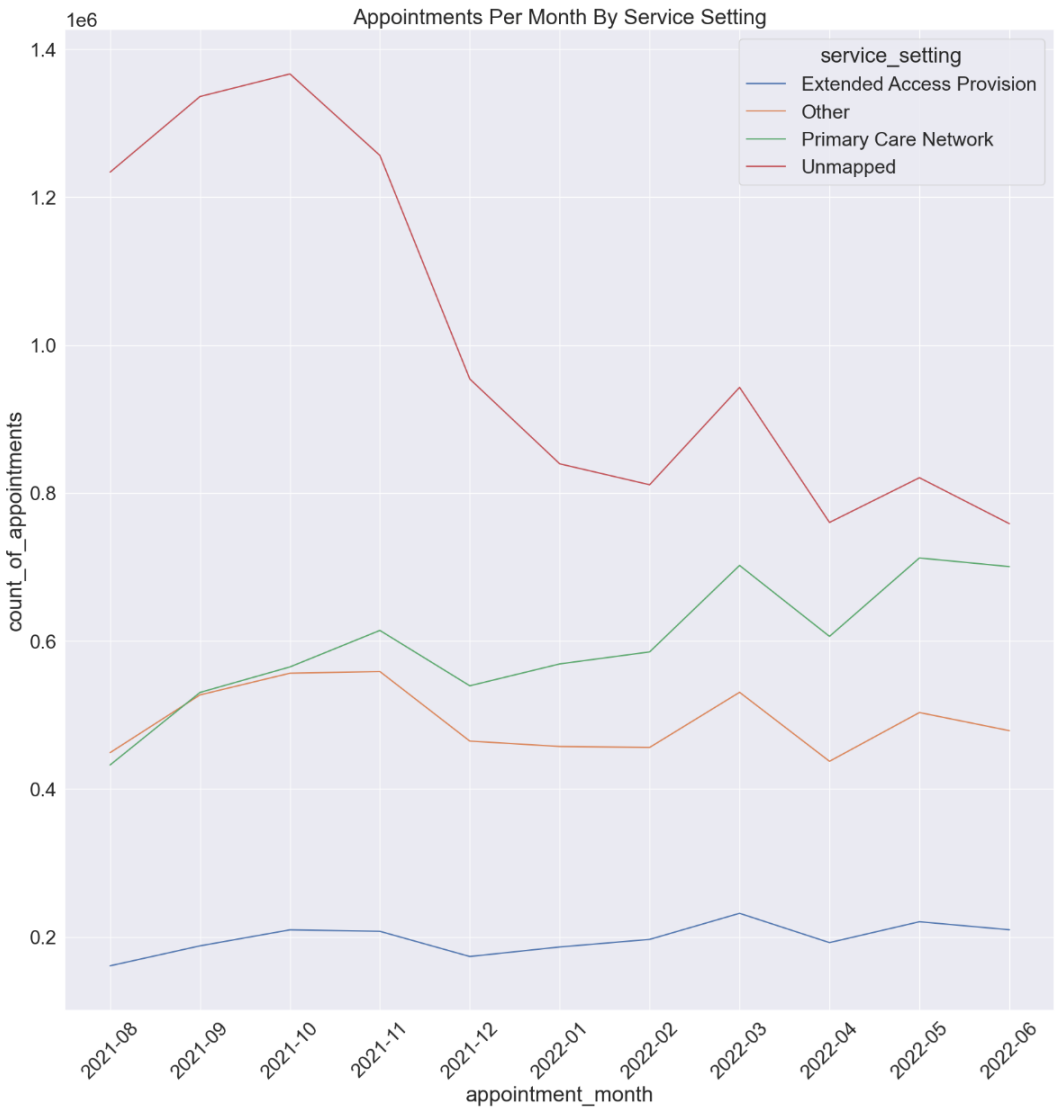
appointment_month	
2021-11	30405070
2021-10	30303834
2022-03	29595038
2021-09	28522501
2022-05	27495508
2022-06	25828078
2022-01	25635474
2022-02	25355260
2021-12	25140776
2022-04	23913060
2021-08	23852171

What monthly and seasonal trends are evident, based on the number of appointments for service settings, context types, and national categories?

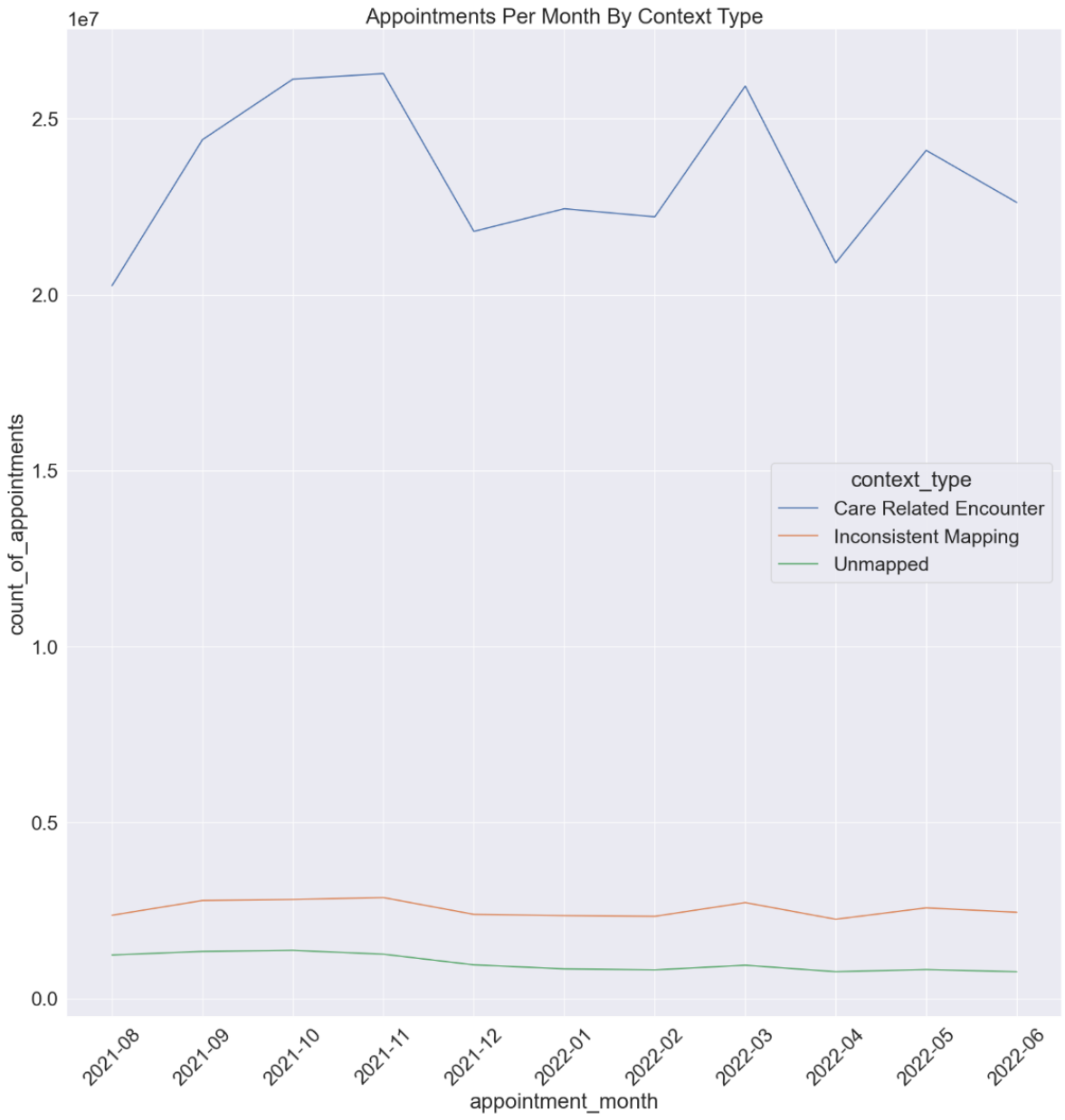
Service Setting

With regards to service setting, we can see that unmapped appointments are the largest category. There are a high amount of these during august to november 2021, which may correlate to increased corona infections during winter months, and overload of capacity to record data.

We get a second spike during March 2022 across all service settings. This may also reflect corona infections (and other infections more common in winter) , especially given increased worry and media attention regarding variants. . Both of these spikes correlate with an increase in appointments approaching the capacity of the service.



Context Types



With regards to context type, care related encounter is clearly the highest. We spikes that match spikes in the previous graph. It should be noted, however, that all context types follow this same shape, though the change in these seasonal spikes is smaller. We can see an larger overall downward trend across all types, because of the decrease in appointments overall.

National Categories

Similar to the other categories, we see spikes in the winter months of 2021 and ‘22 and overall downward trend across categories. Interestingly walk-in remains low and actually has very small spikes like the other categories. This may suggest many things and warrants further investigation. For example the medical problems that drive walk-ins could be very different from those that drive appointments.

However, one may assume that public worry over corona could either decrease or increase these walk-in appointments drastically and this does not seem to be the case.

**See Appointments Per Month By NC visualization.*

What are the top trending hashtags (#) on Twitter related to healthcare in the UK?

**See included Healthcare - A Trending Topic visualization.*

Were there adequate staff and capacity in the networks, and what was the utilization?

I would think: 1,200,000 appointments per day is which is 1.2 x 1e6 appointments per day which is 20x1.2x1e6 in a working month (20 days) which is 2.4x1e7 appointments per month.

It looks to me that at they go over this capacity all the time in the second half of the period being analyzed.

However - if you assume a 6 day working week the capacity becomes 25x1.2x1e6 which is 30x1e6 or 3.0x1e7 and they exceed this capacity once towards the end of 2021.

I would *not* assume a 6 day working week because unlike a normal business, the NHS is constantly operating to offer care to UK citizens. But I do think this is worth noting.

Thus, I would say the evidence provided is that there is not adequate staff and capacity. However more information is needed regarding the work week of the NHS.

The other consideration is what % of maximum capacity is acceptable. An organization working at or above maximum capacity is likely to experience negative consequences such as burn-out, staff quitting etc.

All of this suggests the NHS should move to hire and train more staff.

**See attached graphs 'Appointments Per Month' and 'Utilization per month'*

What possible recommendations does the data provide for the NHS?

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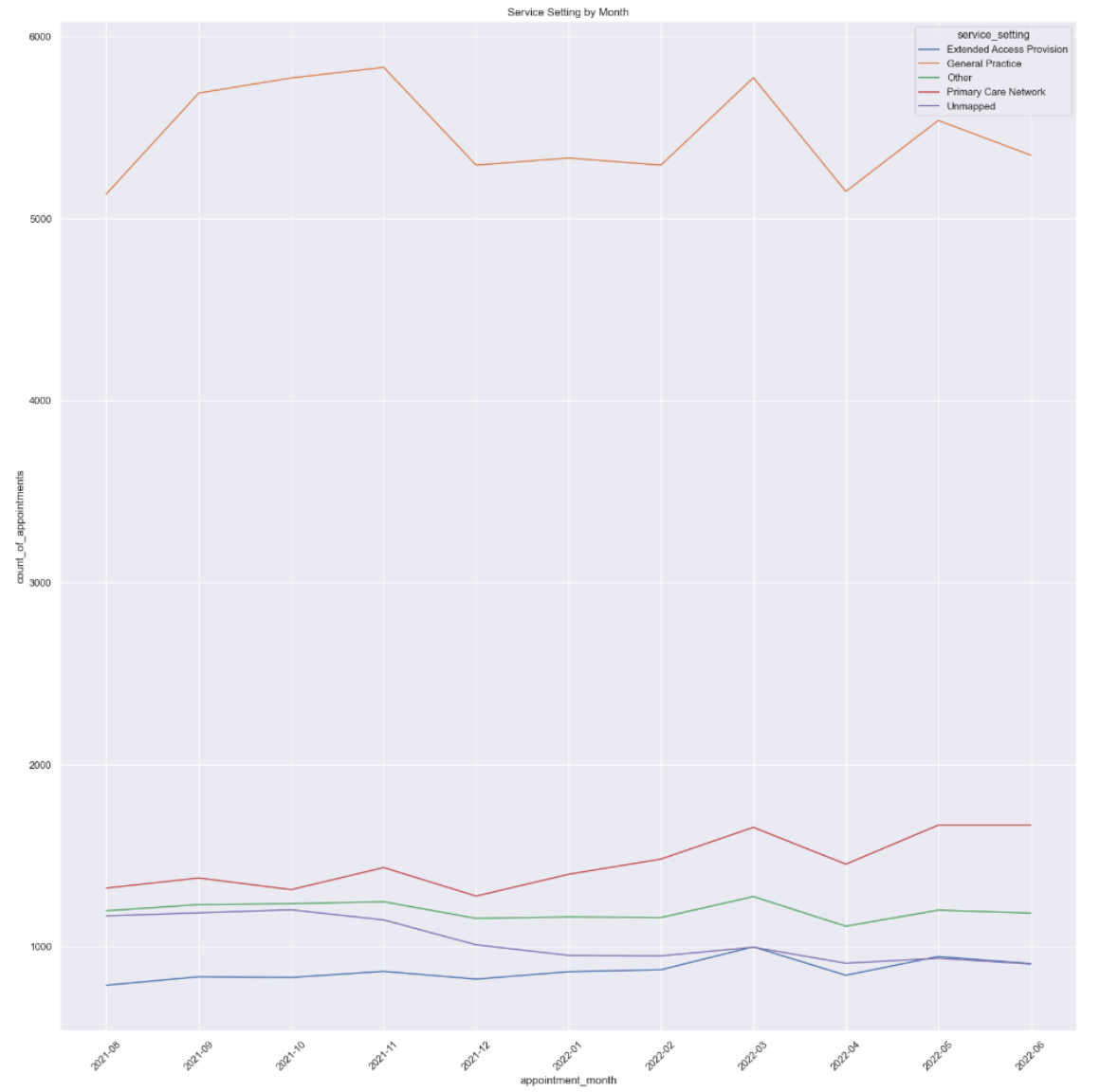
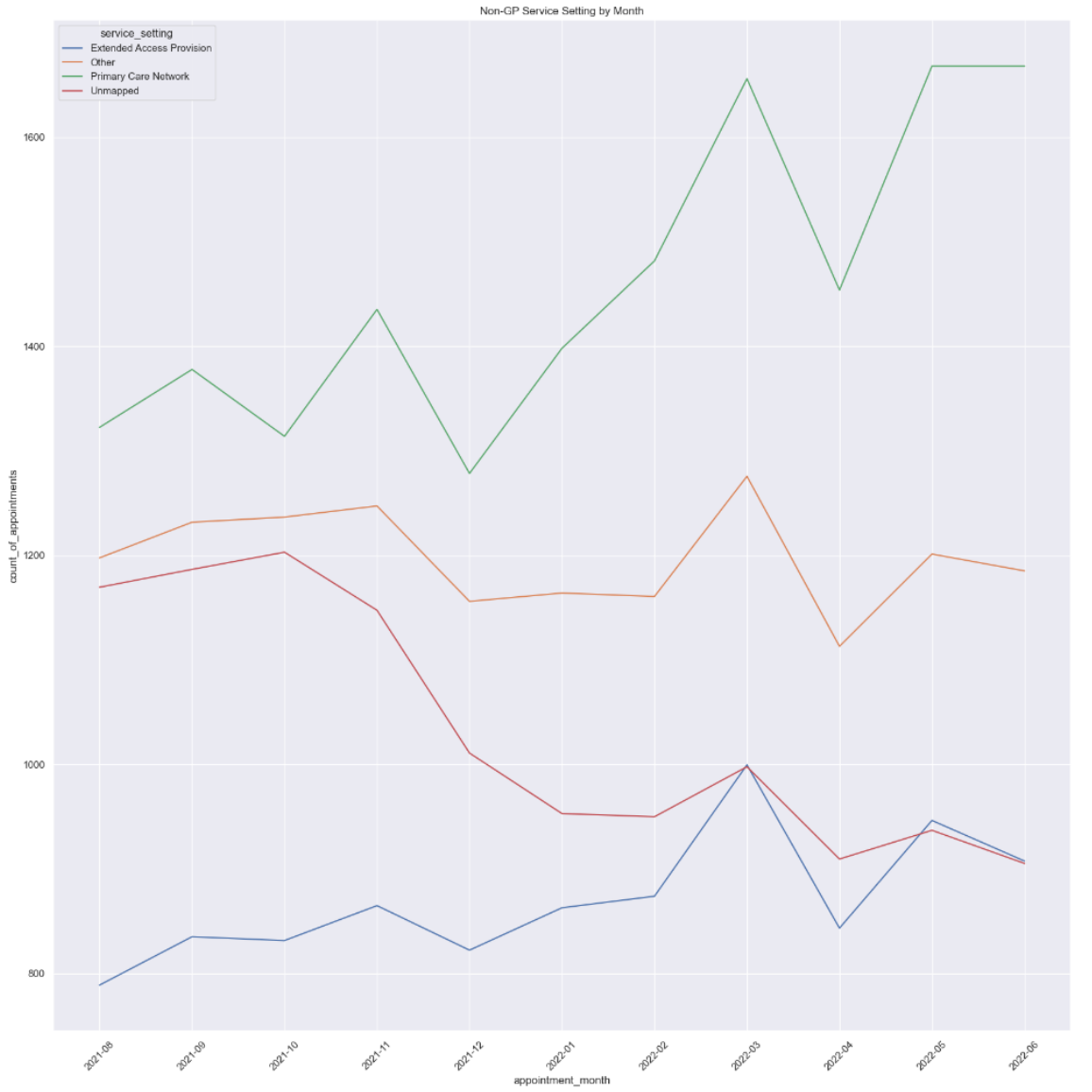
GP's Should be the Focus of New Hires.

- The NHS experiences significant spikes in the winter months. This affects GP the most of all service settings (*see chart below)*.
- In general GP's are the most utilized service setting. We should therefore focus on this group for making new hires.


Service Setting by Month
service_setting
Extended Access Provision
General Practice
Other
Primary Care Network
Unmapped
6000
5000
4000
3000
2000
1000
count_of_appointments
2021-08
2021-09
2021-10
2021-11
2021-12
2022-01
2022-02
2022-03
2022-04
2022-05
2022-06
appointment_month

Primary Care Networks Should Be the Second Focus of New New Hires

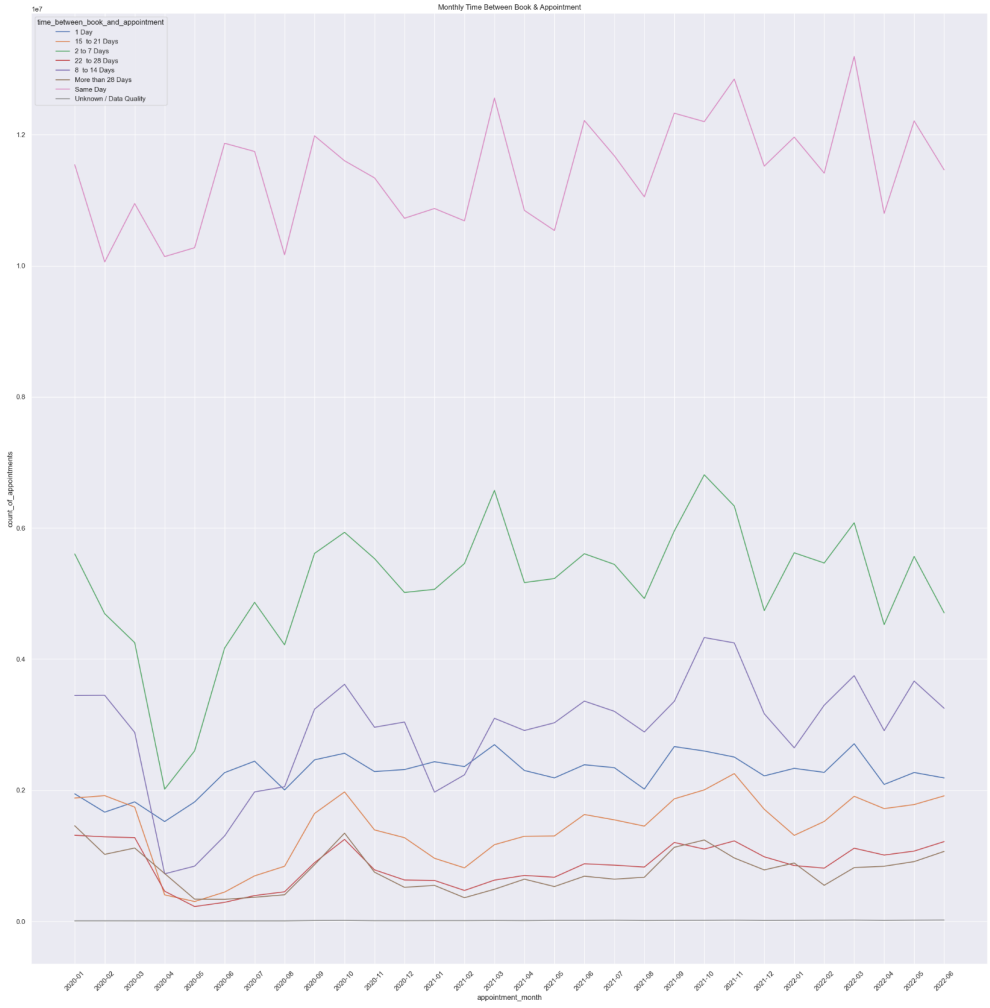
After GP's the primary care network is the second most used (*see chart below)*.



The NHS has said that this group is especially intended to tackle the growing older population of the UK, because of increased life-spans. Because of advances in medical technology it is likely this group will be more-and-more utilized. Therefor the NHS should focus on this group for new hires, after GP's. It should also be noted that the NHS website says that this group *includes* GP's (as well as other staff and practitioners). Increases in GP hiring will there for help to address this problem.

Same Day Appointments are Becoming More Common, Communication Logistics Should Adapt

There is an upward trend in appointments that are being booked the same day (see chart below)



Simply put, more people are booking and going to an appointment in the same day. This spikes in winter months, following similar trends across appointment booking. Because of this, I believe the logistical infrastructure needed to address this increase in same-day booking must adapt. Staff who handle calls/ emails/ online forms etc. that are used to make bookings should be increased. This would follow the above-noted need for more staff in general. The NHS should also hire additional staff during winter months to assist with appointment spikes.