NHS Data Analysis technical Report

Charles Garrod, Data Analyst

1.0 Project Scope

Missed appointments cost the NHS, on average, £30 per appointment, costing the NHS upwards of £216 million in calendar year 2019 (NHS England, 2019). As a result, NHS England commissioned this project to understand 2 things; **is there adequate human capital in the NHS** and **are these resources being deployed efficiently**.

2.0 Analytical Approach

My analytical approach was to, first, import the data and get a feel for its characteristics. This was important to ensure I was working with adequately full and clean data. I found and created an Excel file containing the NHS Regions and their codes which was merged to each data set to allow an initial high-level view (Office for National Statistics, 2022). I found there was 21,604 duplicated records in the ***appointments_regional.xlsx*** data. As these made up less than 4% of the entire dataset, I decided that their removal wouldn't materially impact the integrity of the data, I saved the cleaned data to ***ar_clean***. I then looked at outliers. While there were several outliers in the data, the Metadata states that it had been previously cleaned, therefore I left them in.

Once cleaned, I interrogated the data to get an understanding of the different variables that might be helpful in carrying out my analysis. These variables were:

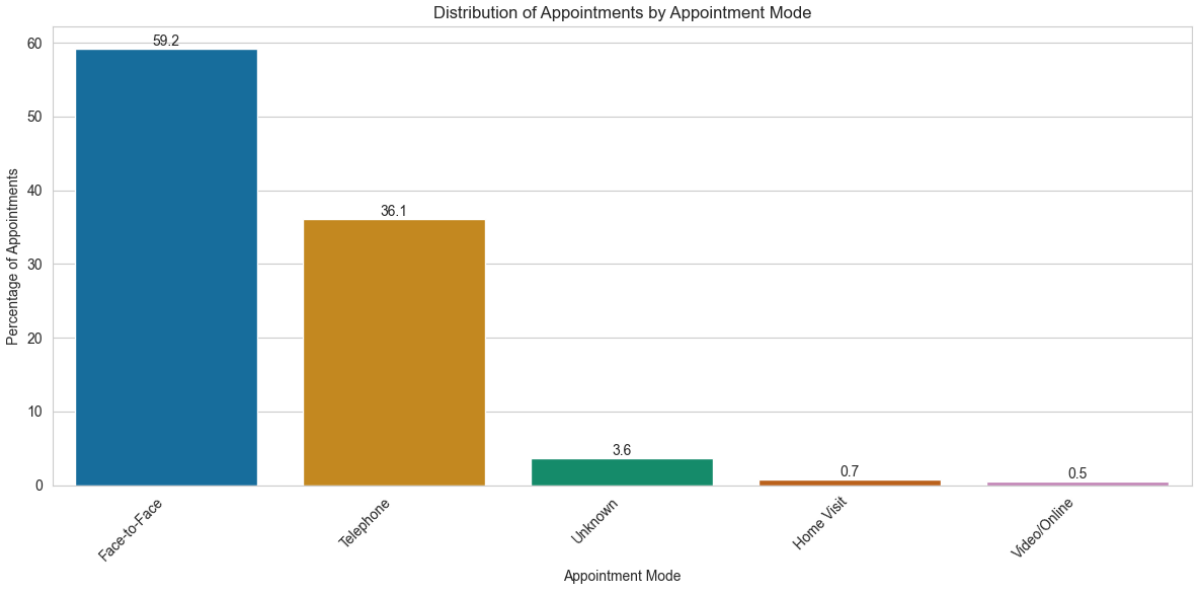
- The service settings, context types, national categories, and appointment statuses.
- The healthcare professional types, appointment modes, length of appointments, and time between booking and appointment.
- The number of integrated Care Boards and locations.

Once I had a familiarised myself with the data, I initiated my analysis by investigating the duration of the data, starting with the *ar_clean* DataFrame given its substantially longer duration than the other data provided. I then went on to look at each variable I thought important in answering the questions posed by the NHS. Particular attention was given to the attendance of appointments, which mode of appointment was most/least attended and how these trends changed over time. Following that I looked more closely at the capacity utilisation of the NHS and how this changed over time and the over and underutilisation given the extreme circumstance in which the UK found itself during Covid. Finally, I used the findings from the analysis of capacity utilisation to understand where the NHS might resolve any over capacity issues. This came in the form of analysing trends in Twitter/X hashtags. This analysis then led to my final insights and recommendations for the NHS as it relates to their initial questions. After interrogating the actual duration dataset, I decided against exploring further as I didn't feel I could draw any high conviction recommendations from its contents.

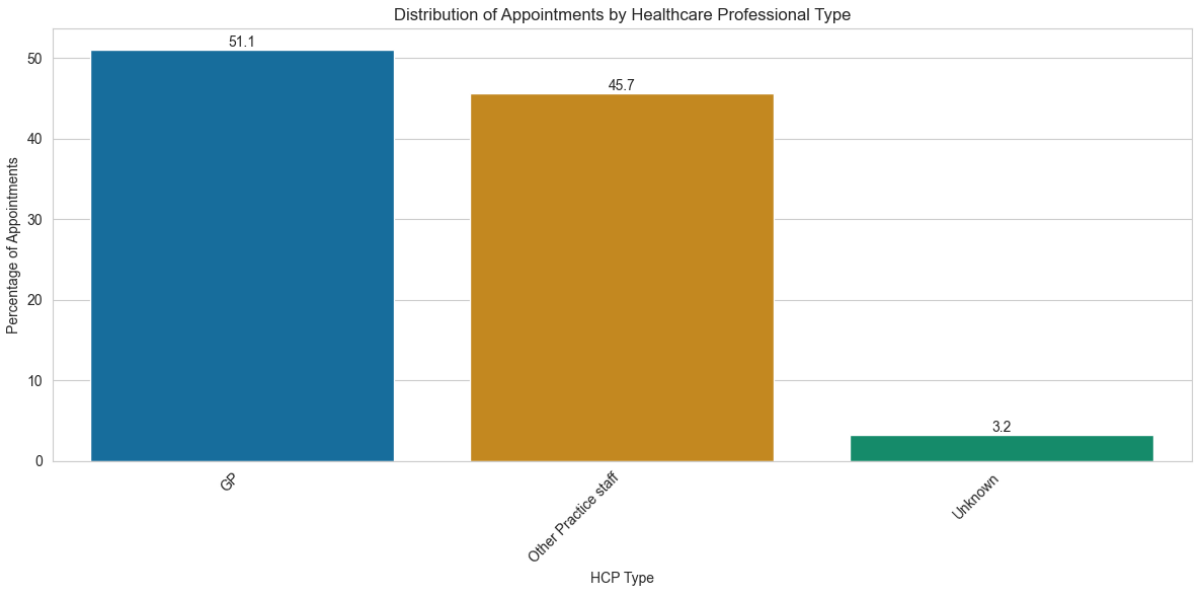
3.0 Findings and Insights

I continued with analysis using visualisations to highlight the trends in the data, to help answer the questions posed. Each of the visualisations uses a '*colorblind*' palette where appropriate to make them as accessible as possible.

3.1 Appointment mode & HCP Type



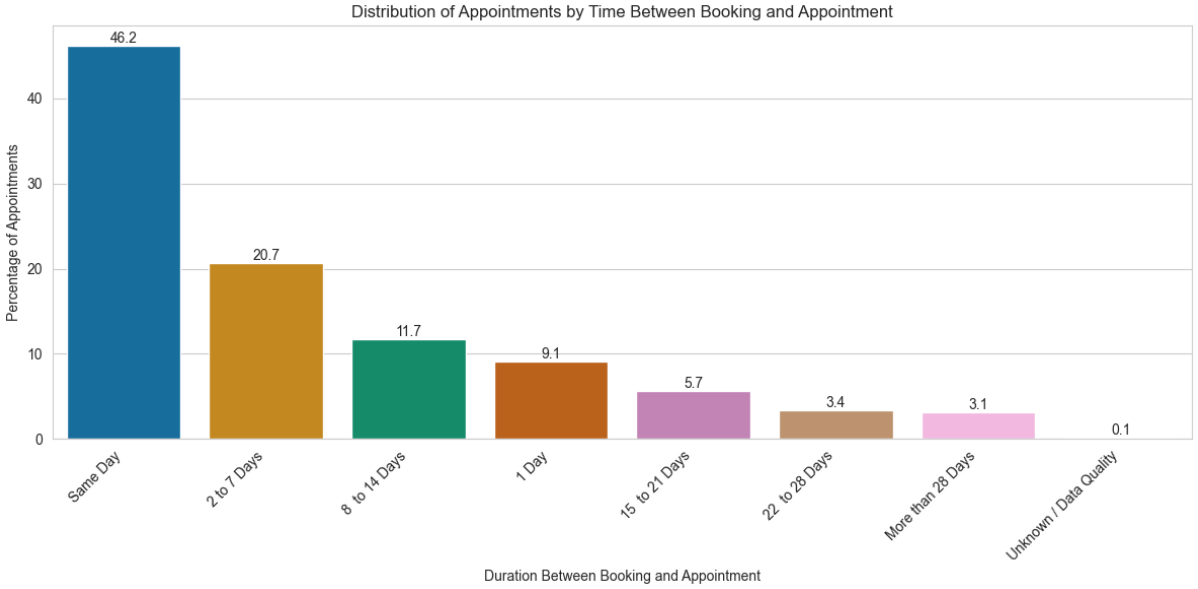
Face to face and telephone appointments are the most common appointment type making up 59% and 36% respectively therefore any further analysis of the appointment mode will focus on these two specifically.



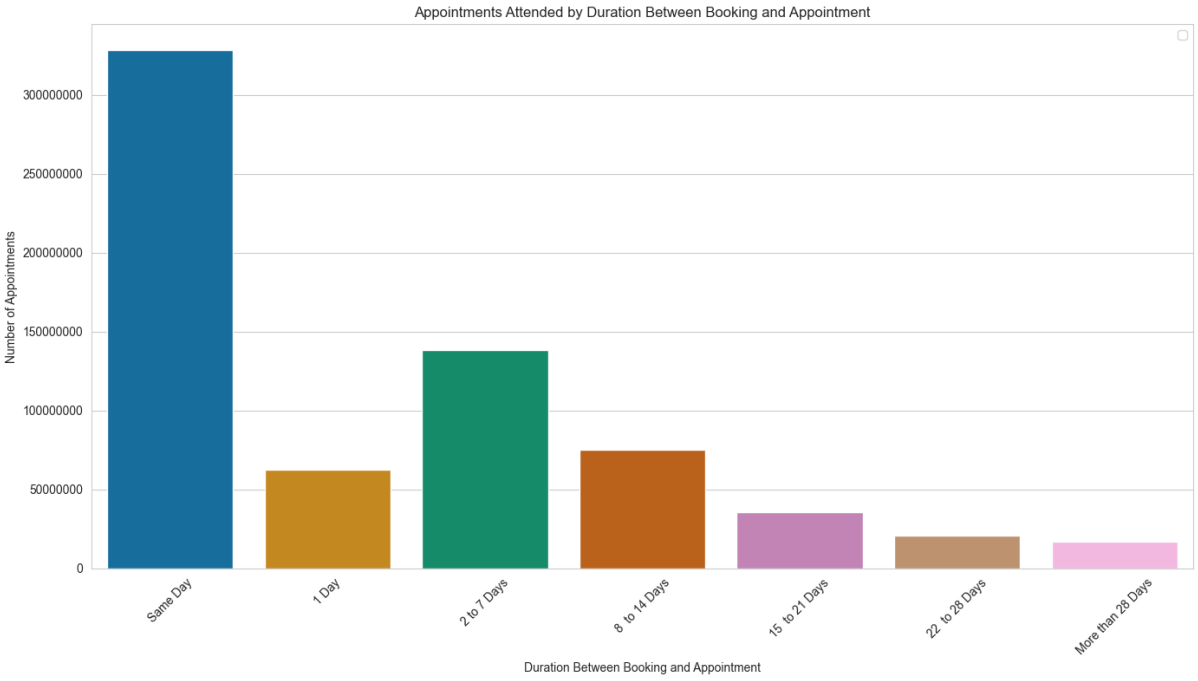
GPs make up most of these 51% of all appointments while other staff make up 45%.

3.2 Wait Time and Attendance

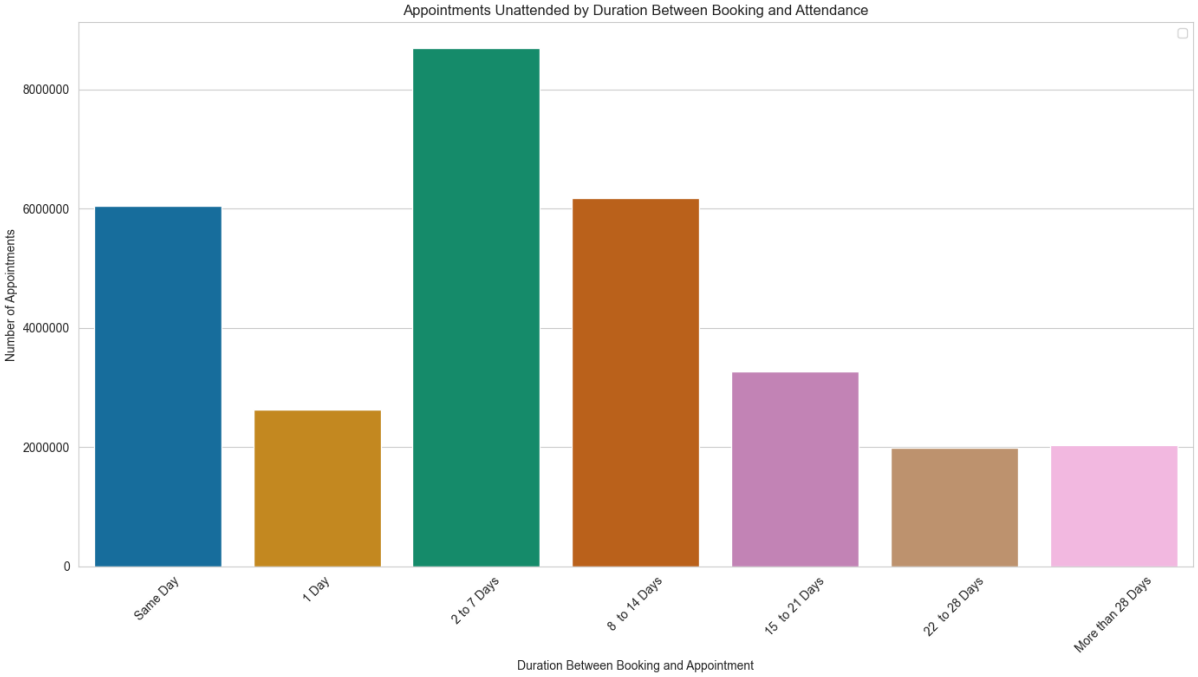
Same day appointments made up 46% of all appointments and 88% of patients were seen within 14 days.



As duration between booking and appointment date increases, so too does the level of attendance decrease. Same day appointments have the greatest attendance.

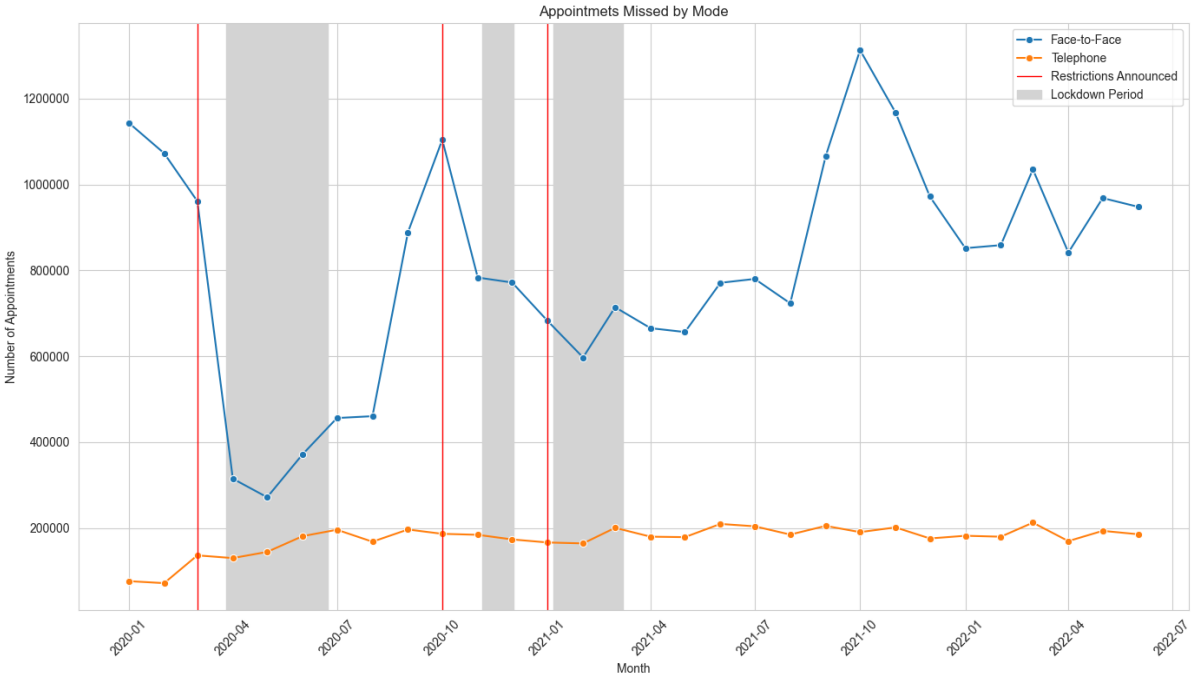


While it is the between 2 and 14 days wait time that has the worst attendance.

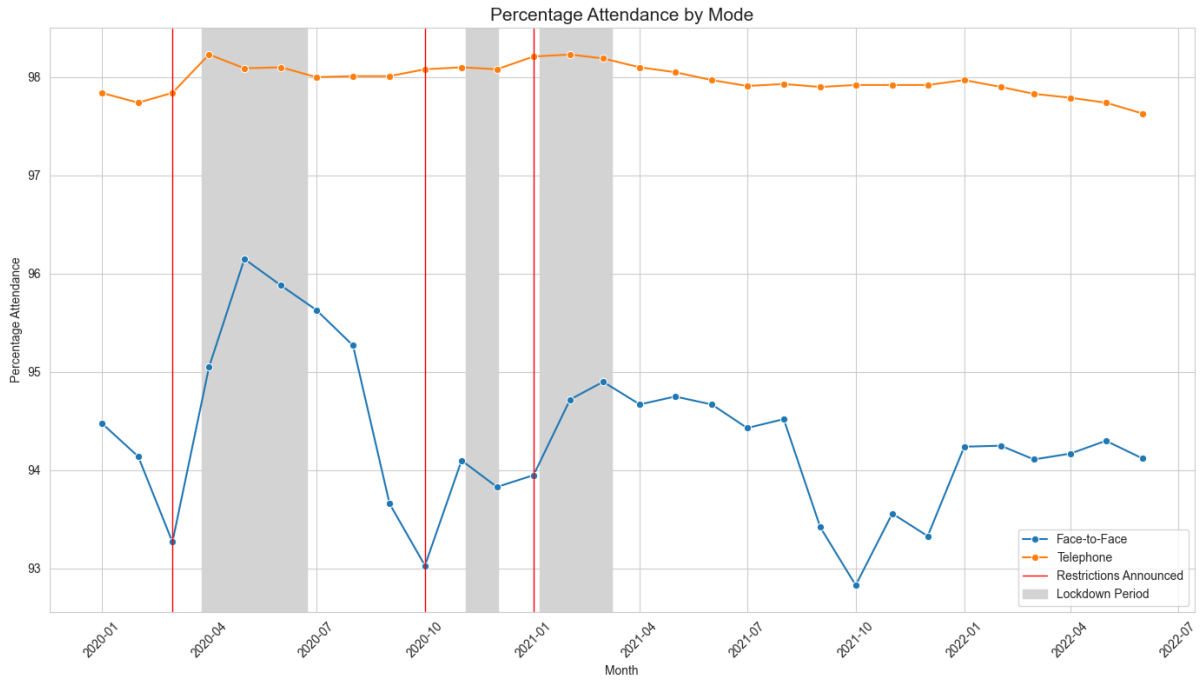


Face-to-face appointments suffer the most with their attendance dropping to 89% with a wait time of 22-28 days whilst telephone appointments stay consistent around a 96% attendance rating regardless of wait time.

3.3 Appointment Mode and Attendance

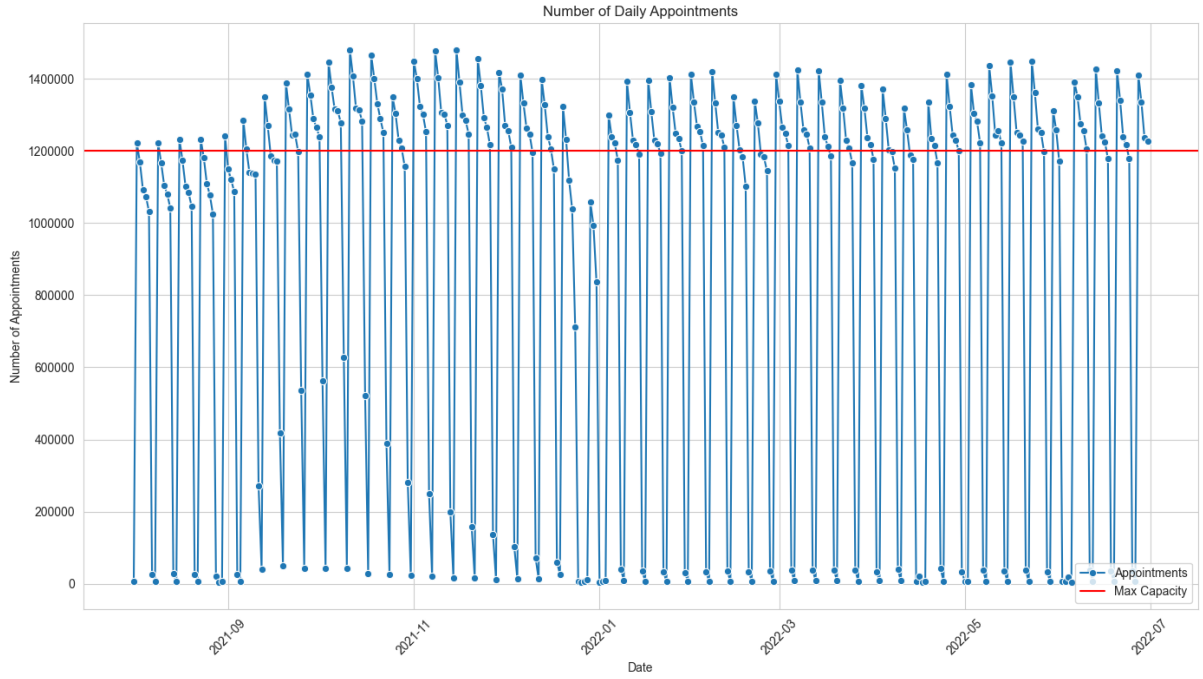


The level and variation in missed telephone appointments is consistently much lower than face-to-face. Telephone appointments have a consistently high attendance percentage while face-to-face attendance is much more variable.

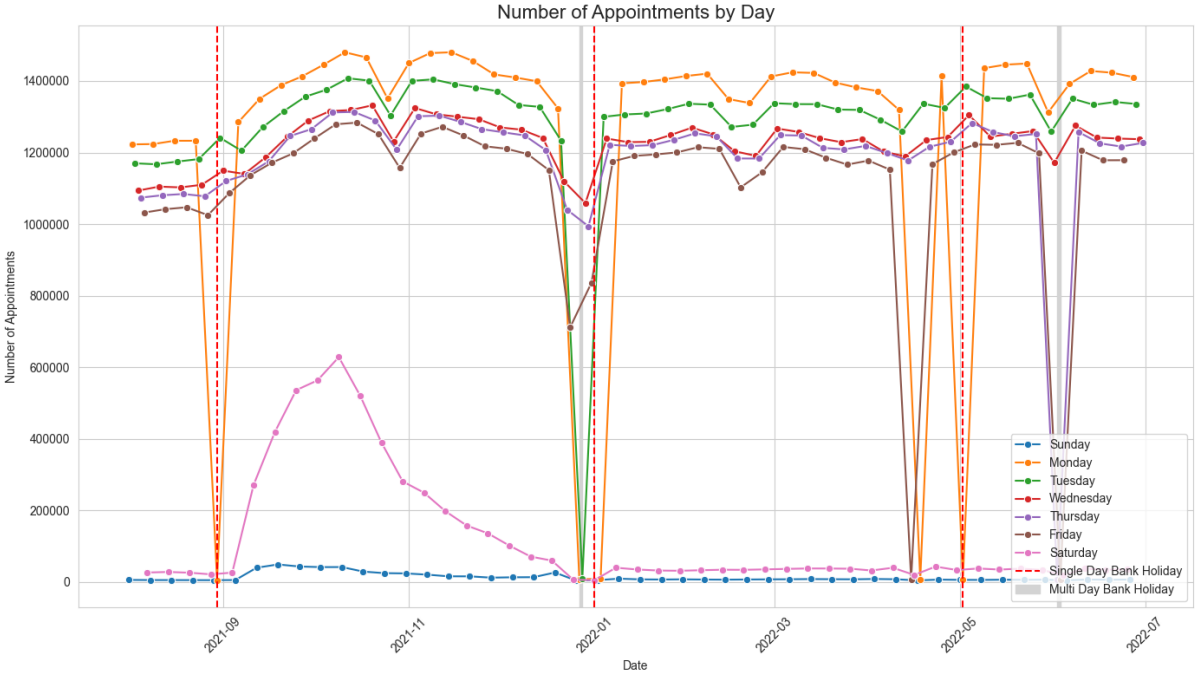


3.4 Time Component

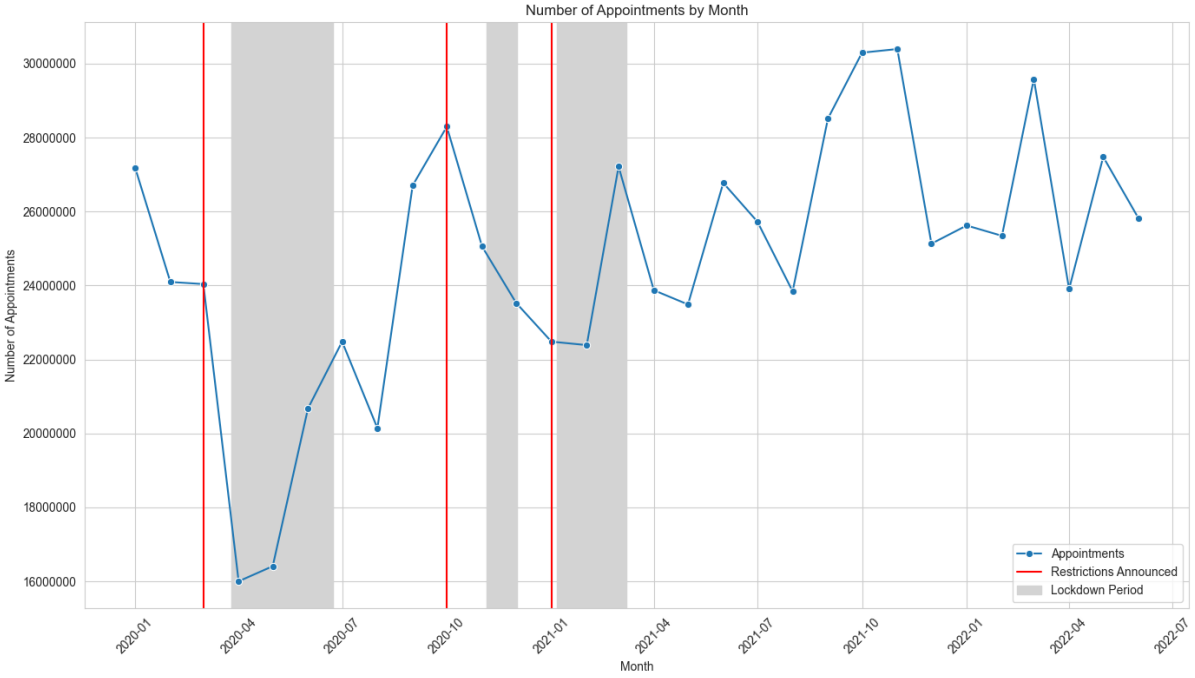
From the outset, it was clear that there were daily trends in number of appointments with severe peaks and troughs.



It is apparent that Mondays were the busiest days of the week following a weekend closure.



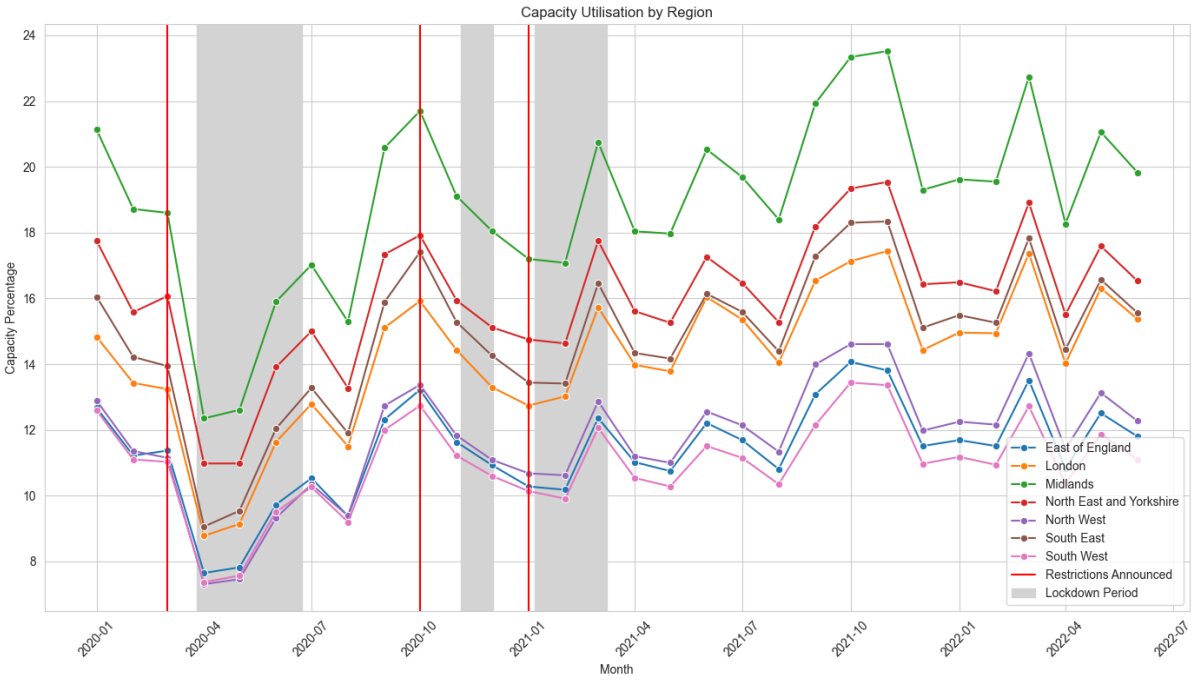
3.5 The Impact of Covid



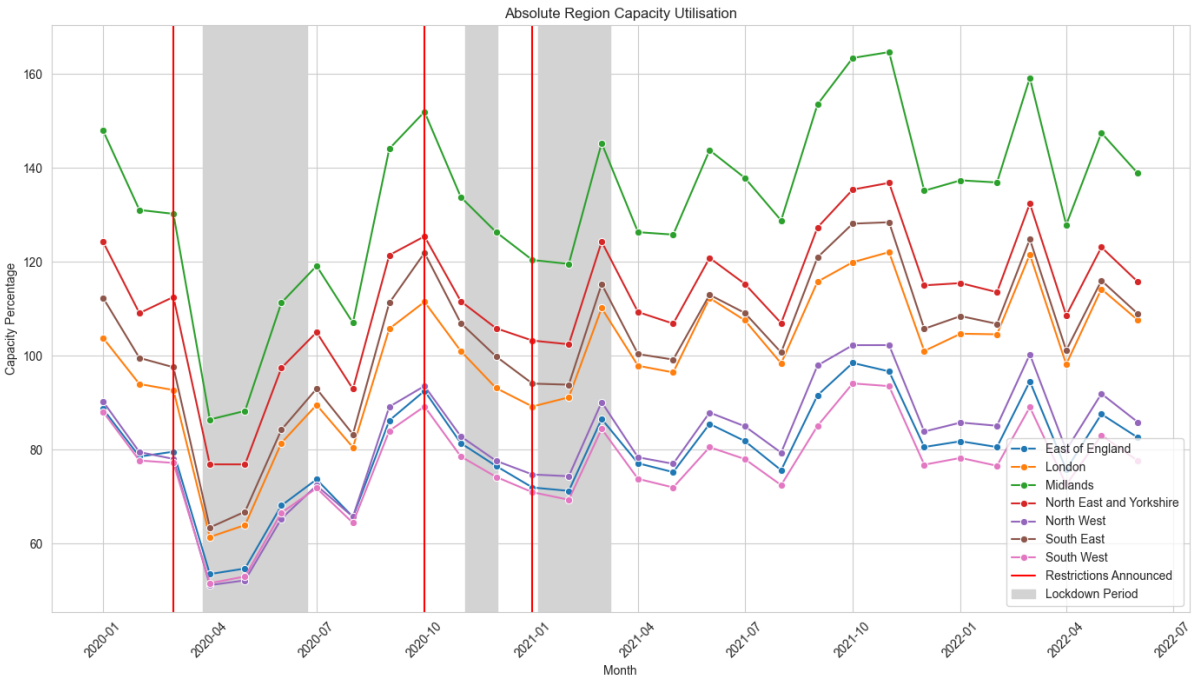
Total appointments significantly dropped following the announcement of lockdown measures during the Covid period.

3.6 Capacity and Utilisation

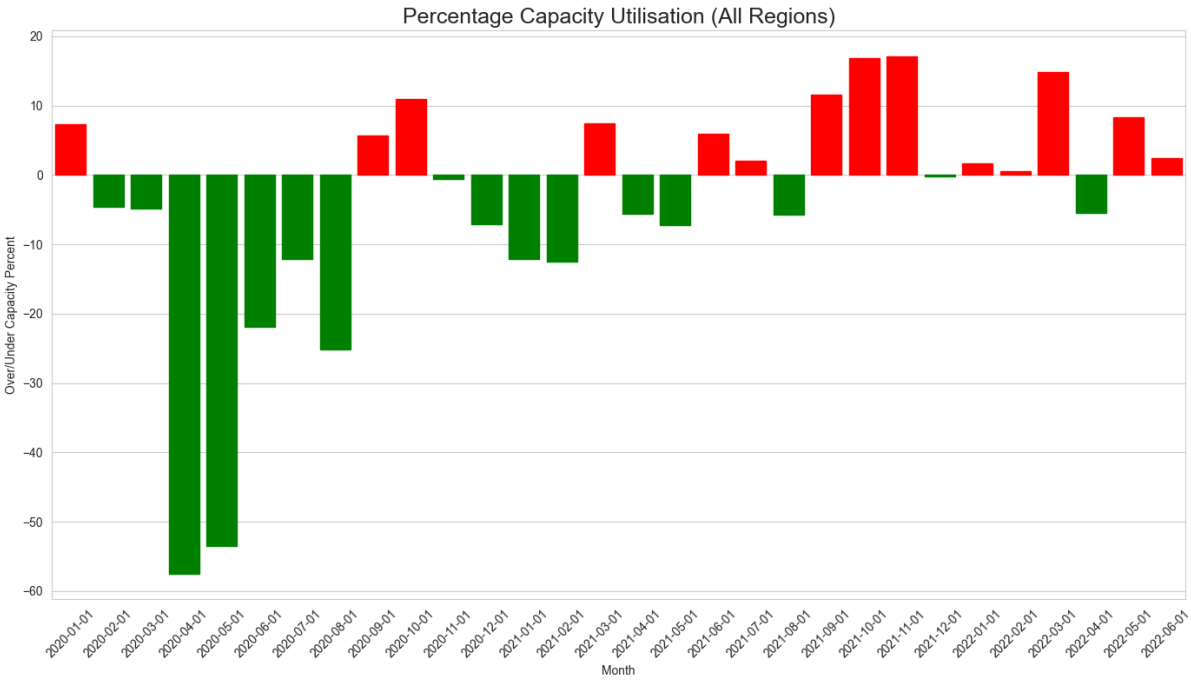
We can see that some regions account for a larger share of capacity utilisation than do others.



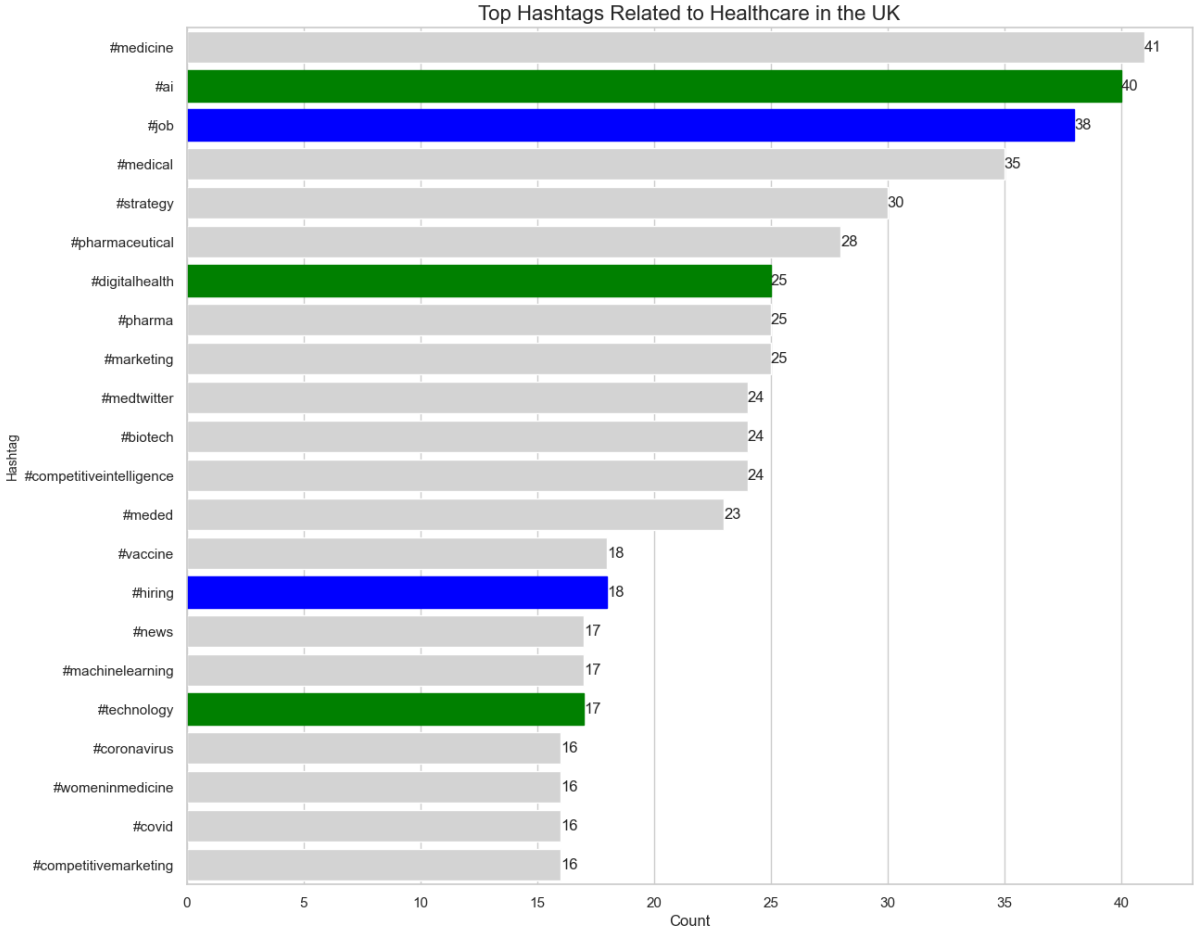
This becomes more obvious when looking at the absolute capacity utilisation by region.



The NHS operated with spare capacity during lockdown months but faced severe capacity issues during other periods[1].



3.6 Easing Capacity Issues



Hashtags related to jobs, hiring and technology featured heavily in the data.

4.0 Conclusions

Following this analysis, I would conclude that the NHS doesn't have the human capital to adequately deal with the demands placed on it. I would also suggest that the resource it does have is being poorly allocated, and changes could be made to better service patients and reduce the number of missed appointments.

5.0 Recommendations

Longer wait times means more missed appointments. Keep patients with face-to-face appointments waiting no longer than 2 days. Beyond that, book telephone appointments.

Adopt a telephone first approach. While face-to-face and telephone appointments are both well attended, the variation in telephone appointment attendance is much lower, meaning fewer missed appointments.

The busiest days are Mondays. Either devise a monthly rota for staff allowing the provision of weekend appointments or allocate more resource to earlier in the week to cover this increase in appointments.

Reallocate resources. Reallocating resources from regions that account for a lower share of utilisation to regions that have a higher share will ease pressure on capacity across the NHS.

Use Job Boards and AI. Use other sources (job boards, LinkedIn etc.) to understand appetite for jobs in the NHS and act on this as capacity reaches its maximum. Make use of technology – there is an obvious interest in AI and technology, introduce a standardised telehealth service leveraging AI to expand capacity.

6.0 Considerations and Areas for Further Analysis

The key consideration about this data is that it is collected during an extraordinary time. While this may aid the NHS in establishing a disaster response plan, it would be wise to reconduct this analysis during pre and/or post covid times to be able to extrapolate the data out.

The NHS may want to further investigate why telephone appointments dropped off following the end of the Covid measures. Is this something driven by the ICBs or is this driven by patient behaviour?

I recommend the NHS break down 'Other Practice Staff' further to get a more granular understanding of how these resources are allocated.

Additional data on ICB and sub ICB capacity would add an extra layer of granularity and would aid the NHS in understanding where it is that resource is being used and if this is the most efficient use of resource.

References

NHS England (2019) *Missed GP appointments costing NHS millions*. Available from: https://www.england.nhs.uk/2019/01/missed-gp-appointments-costing-nhs-millions/ [Accessed 08 February 2025].

Office for National Statistics (2022) *NHS England (Region) (July 2022) Names and Codes in EN*. Available from: https://geoportal.statistics.gov.uk/documents/46b634b42ceb45cbbfbe9c960fb77ec9/about [Accessed 08 February 2025].

Notes & Appendices

All capacity numbers based on 1.2million appointments per working day with an average of 21 working days per month[1].