# Analysis Report of NHS England

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## Background context

Escalating costs related to missed general practitioner (GP) appointments are being faced by the NHS in England. The reasons behind patient absences are not fully understood, necessitating a thorough investigation. The objective is to reduce or eliminate missed appointments for both financial and social benefits. A data-informed approach will be utilised to assess network capacity, resource utilisation, and identify trends that could inform strategies to reduce missed appointments, with the aim of providing actionable recommendations for the NHS.

## Analytical approach

The Python programming language was utilised in our analytical approach due to its power, simplicity, and various libraries (Institute of Data, 2022). The necessary libraries were initially imported. Pandas was utilised for data manipulation and analysis, numpy for mathematical calculation, matplotlib, and seaborn for data visualisation.

The data sets were started by being imported using the pandas 'read_csv' function. The structure and summary of data were explored once loaded, using the 'head', 'info', and 'describe' methods to understand the layout, data types, and statistics. Data types were checked and transformed if required, using the 'convert_dtypes' method, ensuring that each column was in its most suitable format for calculation and visualisation.

Exploratory data analysis was performed next to uncover patterns, trends, and outliers. The number of locations, service settings, context types, national categories, and appointment statuses were analysed using 'groupby' and 'value_counts' functions. The date range of the datasets and the service settings with most appointments were determined. The number of appointments and records per month were also calculated.

Time-series plots were created to identify temporal trends, using matplotlib and seaborn. The number of appointments per month was aggregated to track changes over time. Seasonal trends were examined by breaking the data down into yearly quarters.

Healthcare-related Twitter hashtags were also analysed to identify popular discussions around healthcare in the social media. Our attention was specifically drawn towards popular hashtags like #healthcare, as these served as valuable indicators of key themes dominating the healthcare discourse. However, our examination did not stop at identifying these trending topics; the engagement levels of associated tweets were also studied, providing further insight into the resonance of these themes amongst the public.

Throughout the process, a strive for concise and efficient python writing was maintained, with proper documentation for better understanding. The decisions made during the analysis were driven by data insights, with an aim at providing the most actionable intelligence for the NHS.

## Visualisation and insights

The provided data analysis outlines a comprehensive understanding of the healthcare system under England's National Health Services (NHS). A clear strategy was applied to dissect and analyse the data, focusing on key areas such as locations, service settings, context types, national categories, and appointment statuses. This give an insight of some regions, such as North West London, Kent and Medway, Devon, Hampshire and Isle Of Wight, and North East London, have high appointment counts, indicating potentially high healthcare demand in these areas.

Valuable insights were gleaned about appointment trends, including attendance rates, preferred modes, and fluctuations in volumes. These findings were contextualised with relevant factors such as the COVID-19 pandemic, which influenced a notable shift in appointment methods. Furthermore, the analysis incorporated a social media perspective by examining trending healthcare hashtags on Twitter, revealing '#healthcare' as the most prevalent as depicted on figure 1.

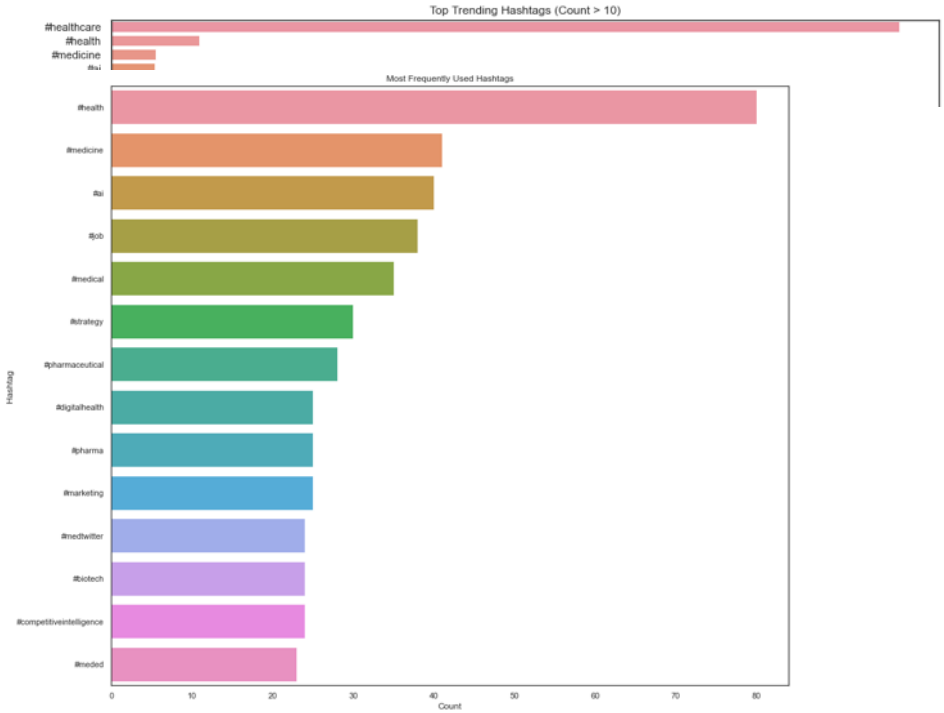


**Figure 1.** Twitter top hashtag

Visualisations were utilised effectively to convey complex information in a more understandable and digestible manner. They offered insights on various metrics, such as appointments per month concerning service settings, context types, and national categories, and showcased seasonal trends in service settings. Despite the visualisations' success in illustrating trends, they do have limitations. They depict an overall picture but may not capture all the nuances or details of the data. For example, outliers might not be easily identified due to missing data or inconsistent unmapped data.

Moreover, the healthcare professional types' differentiation over time was captured, giving a perspective on the workload distribution among the healthcare providers as depicted in figure 2. The analysis also addressed attendance trends for appointments, contributing to understanding patient adherence and engagement over time.

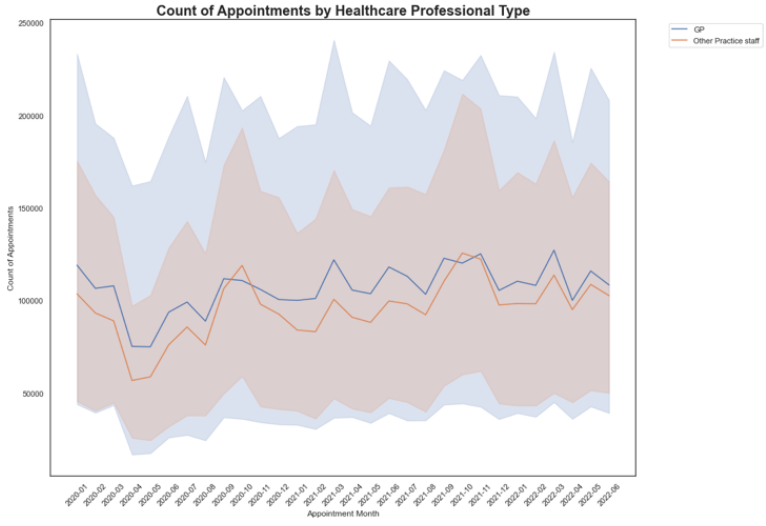


**Figure 2** Number of appointment on healthcare provider type

Lastly, the examination of time gaps between booking an appointment and the appointment date offered a perspective on patient scheduling preferences and habits. Furthermore, the distribution of service settings was analysed, highlighting the dominance of the General Practice setting as the fact that GP were the primary care service and it's been a top priority in NHS (NHS England, 2021).

## Pattern and Prediction

During the analysis of the NHS dataset, several noticeable patterns and trends emerged. The General Practice service setting consistently held a dominant position across different regions and seasons, indicating a sustained demand for primary care services as depicted on figure 3. It was discovered that across different seasons, the General Practice remained as the most popular service setting within the

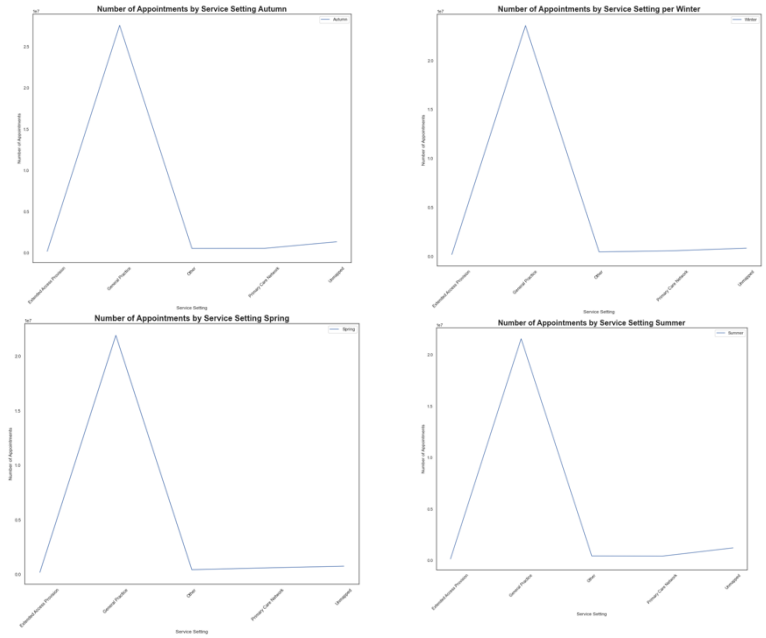


**Figure 3** service settings demand over seasons

NHS. This indicates a consistent demand for general practitioners and suggests that measures for reducing missed appointments should primarily focus on this service setting

There has been a significant shift in appointment modes, as the number of video/online appointments has decreased since November 2022 as depicted in figure 4. This suggests potential changes in patient preferences or challenges related to virtual consultations.

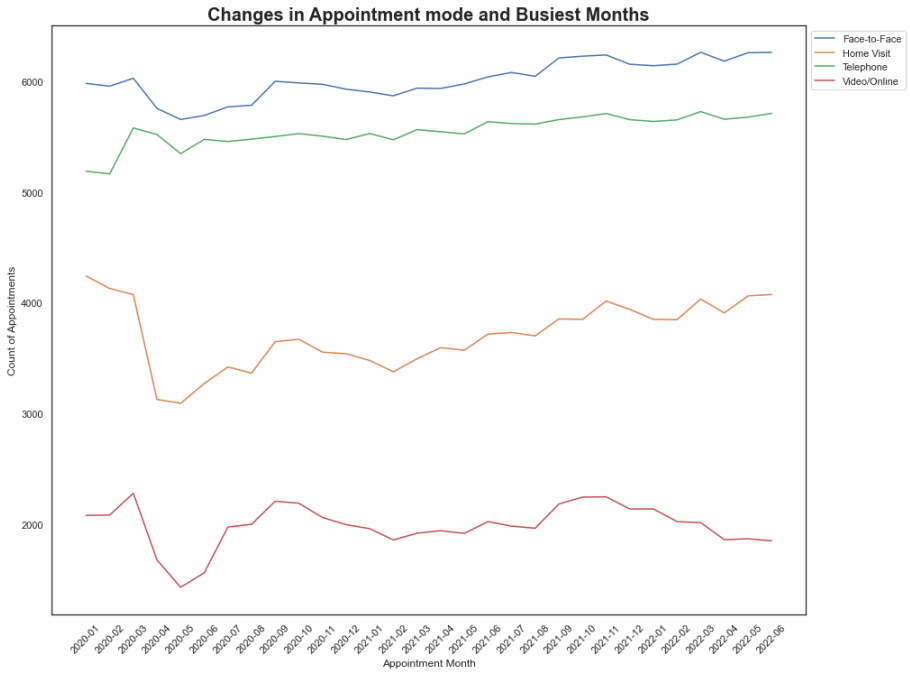


**Figure 4.** Changes in appointment mode

Another important finding is the indication that the healthcare system is operating at its maximum daily capacity. This observation raises some solution about utilising the online/video mode to leverage the number of appointments. While this still under the debated topic because online appointment could lead to duplicated their work, however for some minor illness and concern consultation could have an impact on this appointment mode (Farr et al., 2018).

## Conclusion

In conclusion, several crucial patterns and trends have been identified. A marked shift towards in-person appointments post-November 2022 has been observed, potentially signifying issues with virtual consultations which may could help to improving the GP appointment via online platform. Furthermore, it has been noted that the utilisation often operates below its maximum capacity, suggesting possibilities for service expansion or unmet patient needs. Insights from social media analysis have emphasized the importance of effective digital communication for public health discourse. While visualizations have proved useful, it should be noted that some data nuances might be missed, necessitating deeper analysis

**Reference**

Farr, M. *et al.* (2018) 'Implementing online consultations in primary care: A mixed-method evaluation extending normalisation process theory through service co-production', *BMJ Open*, 8(3). doi:10.1136/bmjopen-2017-019966.

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