

National Health Service

GP Appointment Utilisation Report

**Scenario Overview**

The National Health Services (NHS) is the publicly funded healthcare system in England. Each year the NHS incurs significant costs due to patients missing general practitioner (GP) appointments. Missed appointments have both a financial and social well-being cost, and the government wishes to investigate strategies to minimise missed appointments.   
  
This project report investigates and provides insight into the reasons why appointments are missed across service settings, context types and national categories and recommendations for how to reduce the number of missed appointments.

**Analytical approach**

Three publicly available datasets detailing historical appointment information for GP surgeries across England have been analysed for this project. Each dataset provides a breakdown of the number of appointments by location and date and the information outlined below.

* **Appointments Regional** – dataset provides detail on appointments by appointment status, healthcare professional type, appointment mode and the time between booking and the appointment occuring
* **National Categories** – dataset provides detail on appointments by service settings, type of contexts and national categories
* **Actual Duration** – dataset provides detail on duration of appointments

A metadata file was also provided with details of the data set, data quality, and the cleaning processes already undertaken. The file did note that there are variations in data quality as there is no standards for how appointment data entry should be completed leading to variations in approaches.

The datasets were first reviewed for completeness and accuracy using Python, before being wrangled and transformed into visualisations. As part of these process datatypes were checked and dates were converted using the datetime library to assist with analysis. The describe () function was used to view the descriptive statistics for each dataset and aggregation performed to group the data into appointments by month to view monthly statistics.

Please note the following assumptions were made about the data provided:

* Data is assumed to be accurate as of September 2022
* Prior review and cleaning of datasets was undertaken accurately including aggregation of daily appointment counts
* All NULL/Missing Data has been classified as Unknown as no datasets have missing values

A dataset was also provided with a snippet of tweets related to healthcare in the UK scraped from Twitter. The tweets dataset was analysed for trends related to the public’s perception of the NHS, by creating a series of the hashtags associated to the tweets. The tweets were then aggregated by sum and grouped into a DataFrame. The popular hashtags were reviewed for outliers such as ‘#Healthcare’ with 716 mentions by creating a boxplot. User-defined functions were created to review tweets containing the popular hashtags to assist with trend analysis.

All dataset files and Jupyter Notebook containing the code used for analysis have been saved to the NHS GitHub repository to facilitate collaboration and access between the project team.

**Insights and visualisations**

Both Seaborn and Matplotlib were imported and used for visualisation of the datasets due to the breath of features available in each library.

There are 106 different locations in the data set, 5 service settings, 3 context types and 18 national categories represented by the datasets.

Each dataset covered a different timeframe and for consistency the data was filtered from 1 August 2021 to 30 June 2022 to see seasonality trends and analysis. Exploratory visualisations were created using each dataset to investigate trends by month, appointment duration, mode of appointment and type of healthcare professional.

Most appointments are face to face appointments with a general practitioner, as demonstrated in the graph below.

Chart, bar chart

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In this timeframe, November 2021 was the busiest month with a total of 23,852,171 appointments or an average daily appointment count of 1013502.

**Utilisation of NHS GP Services**

The NHS has a capacity of 1,200,000 appointments available daily, however as demonstrated by the graph below there is no month where the average daily appointments scheduled is close to the maximum number available.

Chart, line chart

Description automatically generatedThere could be several reasons for this such as inadequate staffing levels or an unrealistic daily appointment capacity level. Further investigation into the causes of the discrepancy between the actual number of appointments and available appointments is recommended.

Appointments were grouped and aggregated by the count of their duration using the Actual Duration dataset. Most appointments which take place are very brief only between 1-5 or 6-10 minutes, as demonstrated by the graph below. Further investigation into how these appointments occur (face to face, telephone etc) and with which healthcare provider type is recommended so efficiencies can be investigated.

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**Did Not Attend Appointments**

There are 13318384 (4.5%) did not attend appointments in the *Appointments Regional* dataset between 1 August 2021 and 30 June 2022, and 12070692 (4.1%) unknown appointment statuses.

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A subset of *Appointments Regional* DataFrame filtered to the did not attend appointments was created for further analysis, removing all appointments where the status was either attended or unknown. The unknown appointments were removed so not to skew the appointment data as there is no evidence these appointments did not occur.

Most of the appointments which did not occur are face-face appointments with Other Practice staff scheduled to take place within 2 to 7 days followed by between 8 to 14 after being booked as demonstrated by the graph below. This suggests there may be a lack of patient knowledge about the appointment, problems with the referral process or a change in patient circumstances. Video and telephone appointments have a high success rate of taking place.

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**Tweets Analysis**

The graph below demonstrates the tweets trending in the United Kingdom related to healthcare with the extreme outliers removed. The Jupyter notebook has a user function defined to filter and present the tweets associated hashtag if further investigation is required.

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**Key Patterns and predictions**

This project has identified actionable insights and topics for investigation to improve the successful attendance rate of GP appointments. The recommendations are summarised below:

* Introduce standardised reporting tools for GP practices to facilitate the collection of accurate appointment data and reduce ‘Unknown’ variables.
* Undertake detailed analysis to investigate why daily scheduled GP appointments are lower than the maximum number of appointments available and where additional appointments can be scheduled
* Further analysis to investigate why the majority of missed appointments are those which are booked for 2 to 7 days later. Does this highlight patients’ lack of information regarding an appointment? For example, how are patients notified of an appointment being scheduled and could administrative practices be improved?