National Health Service Data Analysis

Introduction

Purpose of the Project

- This study leverages NHS data to uncover insights and propose data-driven strategies to reduce the number of missed patient appointments — a challenge that significantly increases costs for the healthcare system.

Main Goals

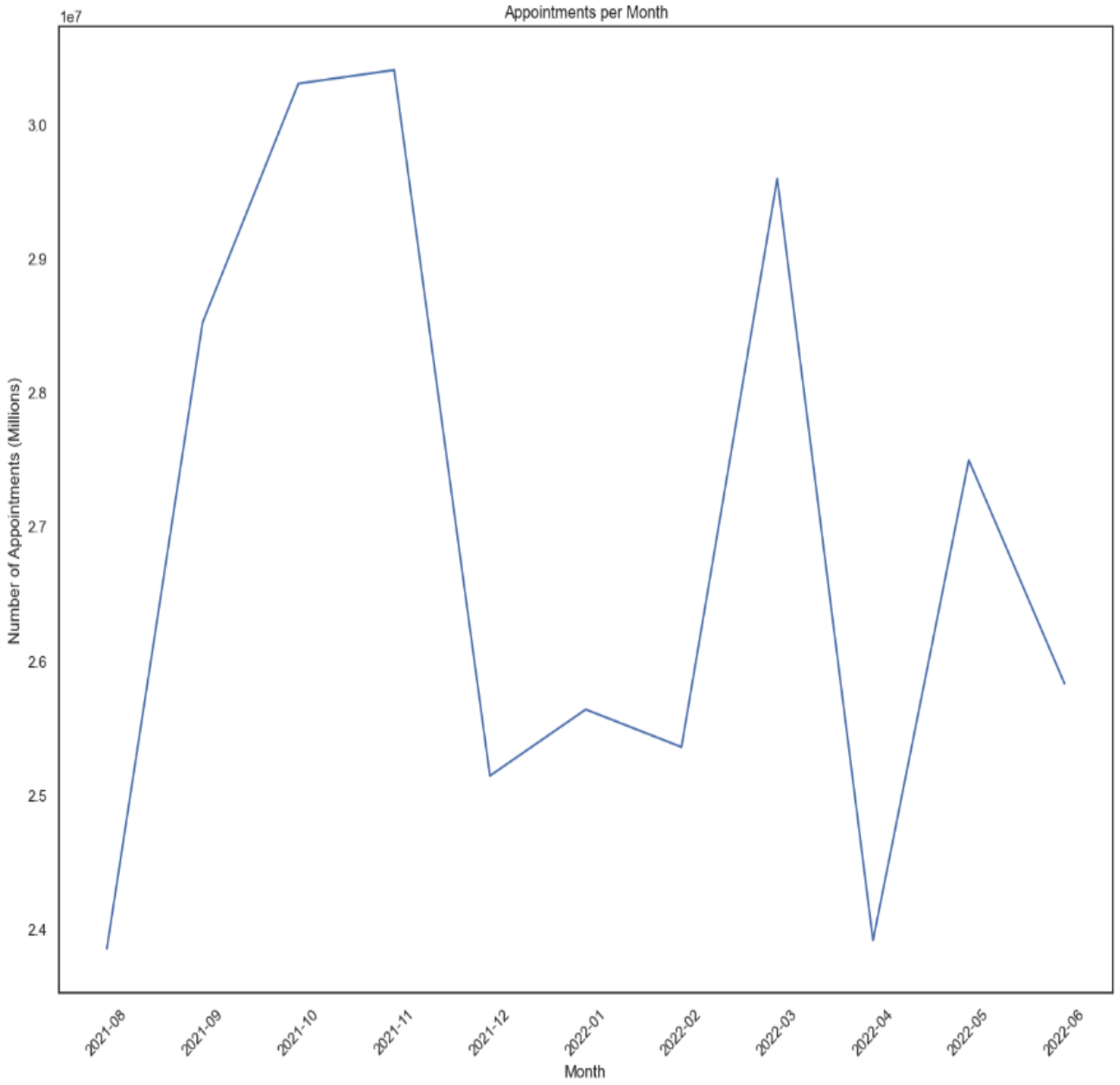
- Review staffing levels and capacity to ensure smooth and effective appointment management.
- Analyze how NHS resources are currently utilized in order to pinpoint areas that could benefit from better efficiency and optimization.

Tools & Methods

- Data analysis was conducted using Python, with complementary libraries including Pandas for data handling, Matplotlib for visualizations, and Seaborn for statistical graphics.

Data Exploration

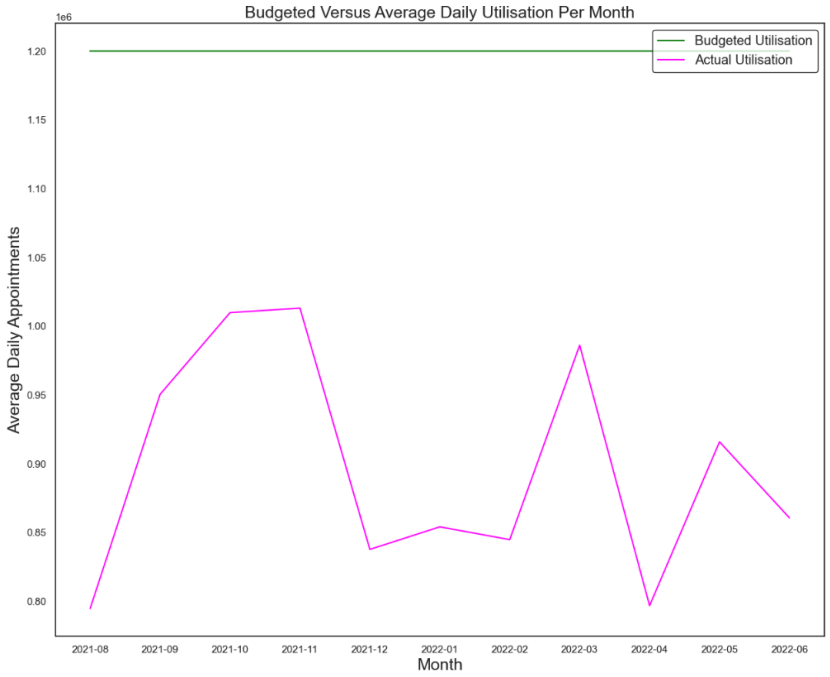
- We began the analysis by importing relevant data collected from a variety of sources.
- Data accuracy and integrity were assessed, with attention given to identifying missing values, duplicates, and outliers.
- Different analytical methods were applied to uncover data patterns and characteristics, helping us derive insights for better decision-making.
- Charts, graphs, and other visualizations were used to communicate complex findings in a clear and meaningful way.
- Our overall aim was to provide valuable insights to support NHS priorities.



Appointments Per Month

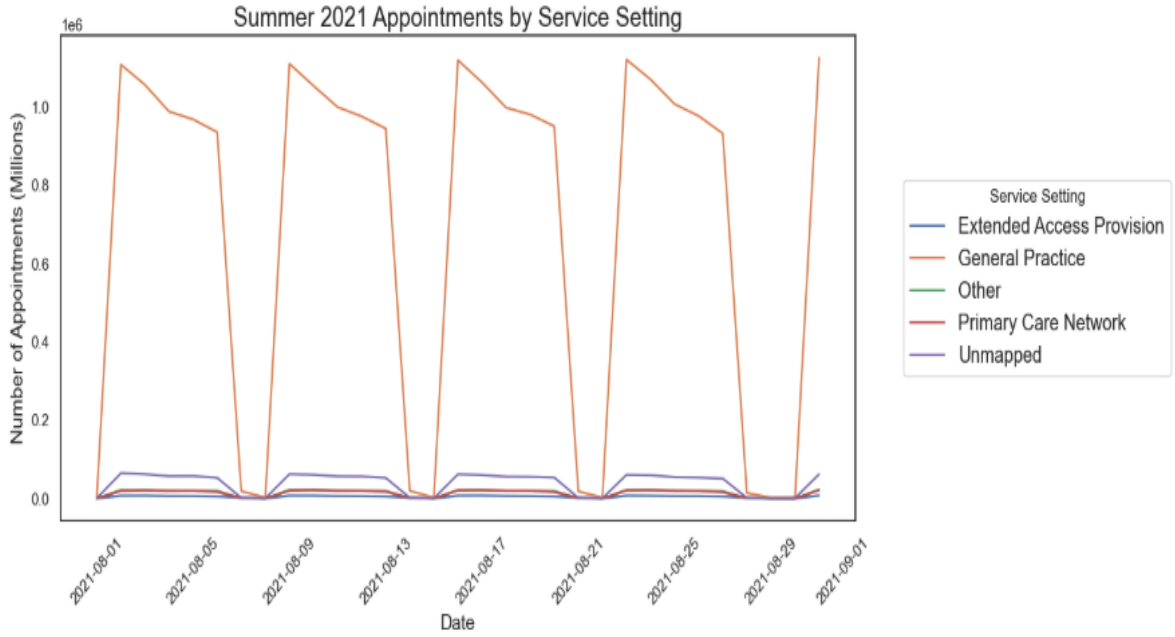
- From August 2021 to June 2022, monthly appointments varied between 24 million and just over 30 million, showing a fluctuation of about 25%.
- Appointment volumes peaked in Autumn, with both October and November surpassing 30 million visits.
- The lowest monthly total was recorded in April, at around 24 million visits.
- Analysis highlighted clear seasonal patterns and noticeable shifts in appointment numbers across the year.

Capacity Utilisation vs. Benchmark



- Capacity utilisation fluctuated significantly during the observed period, ranging from **65% to 85%**.
- Despite these shifts, the **average utilisation remained below the NHS benchmark** of 1.2 million daily appointments.
- Findings indicate that, on a monthly average, the NHS's capacity was generally sufficient to meet appointment demand.
- However, several months showed **underutilisation**, highlighting opportunities for **resource reallocation** to improve efficiency and balance workloads.

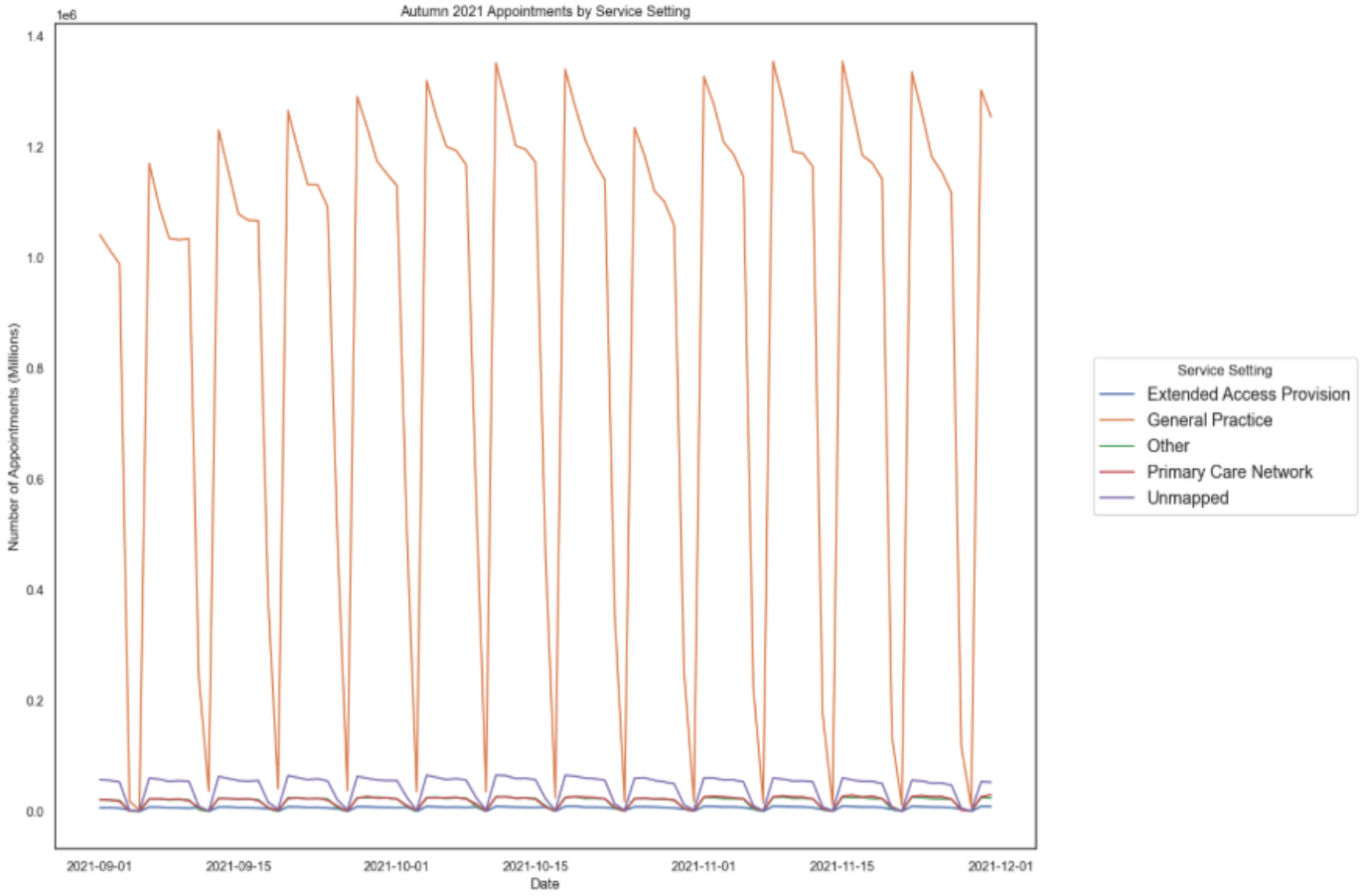
Summer Seasonal and Weekly Trends



- In **August, over 90% of appointments stayed below the NHS's daily capacity**.
- **Mondays saw the highest demand**, with appointment volumes dropping by about **10% by Wednesday** and a further **5% by Friday**.
- **Saturdays recorded minimal activity**, while **Sundays and bank holidays had none**.

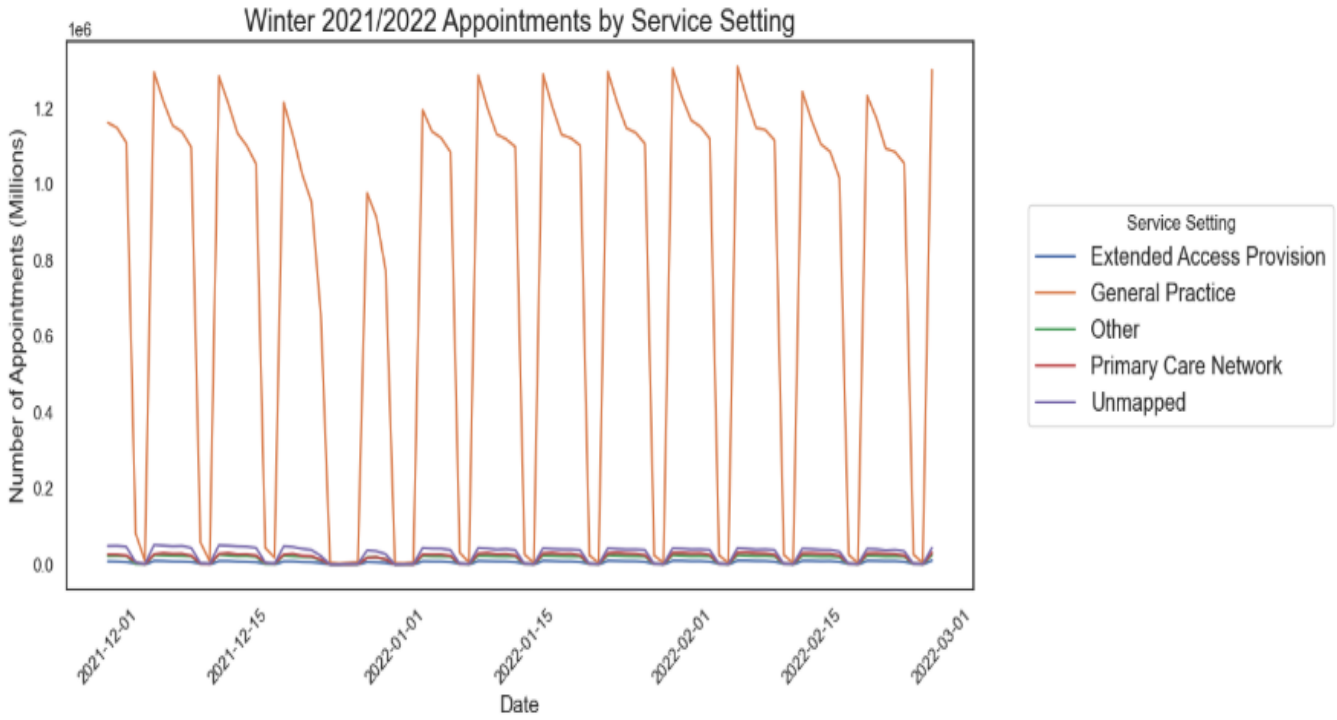
Autumn Seasonal and Weekly Trends

- Appointment volumes were **higher compared to summer levels**.
- **Early-week demand frequently surpassed NHS daily capacity**, with Mondays peaking.
- **Saturday appointments rose noticeably**, showing an upward trend.
- **Cumulative monthly totals exceeded NHS thresholds**, indicating sustained high demand.



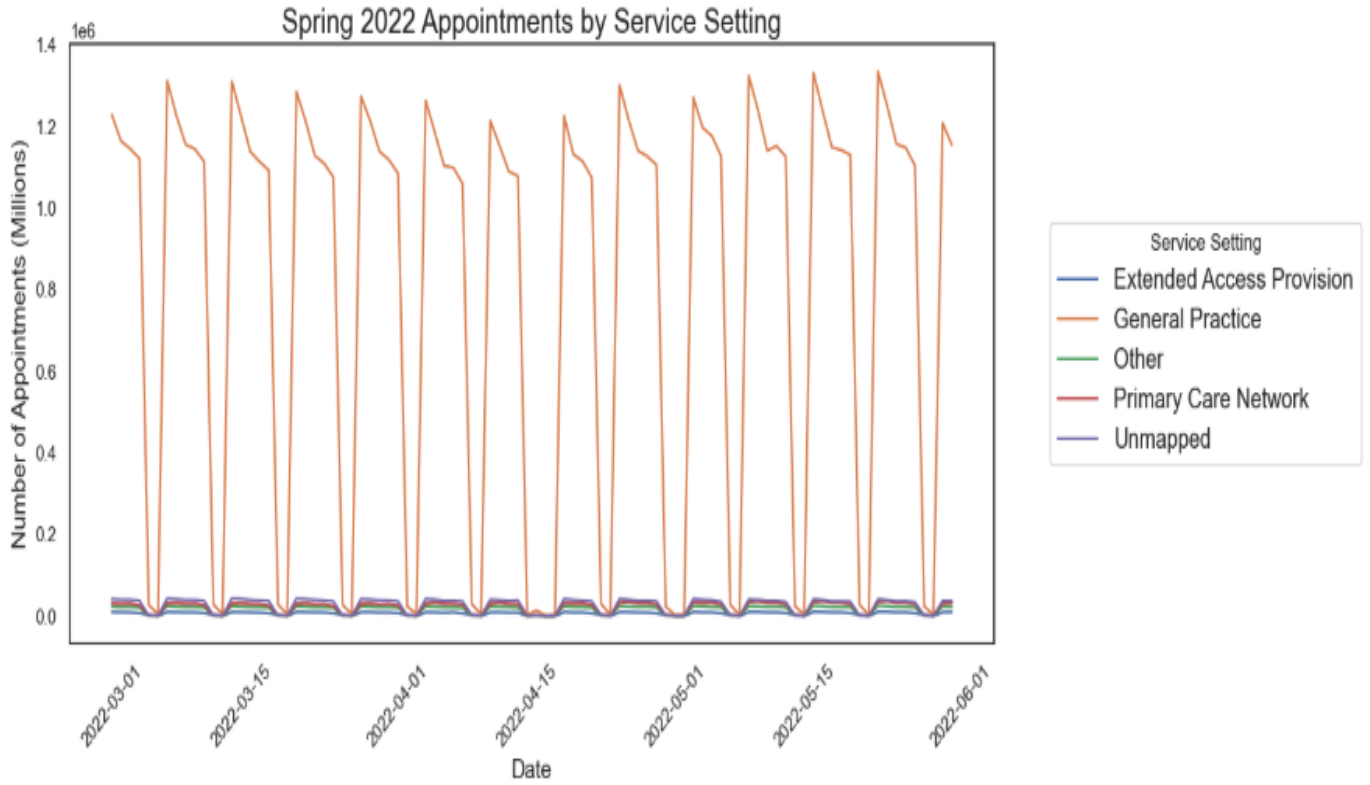
Winter Seasonal and Weekly Trends

- **Mondays consistently recorded the highest appointment volumes**, often breaching NHS daily capacity.
- **Volumes gradually declined through the week**, reaching their lowest levels by Friday.
- **January reflected the added strain of seasonal illness**, contributing to sustained high demand.
- Overall, the **trend mirrored autumn**, with many months where appointments across services surpassed NHS thresholds.

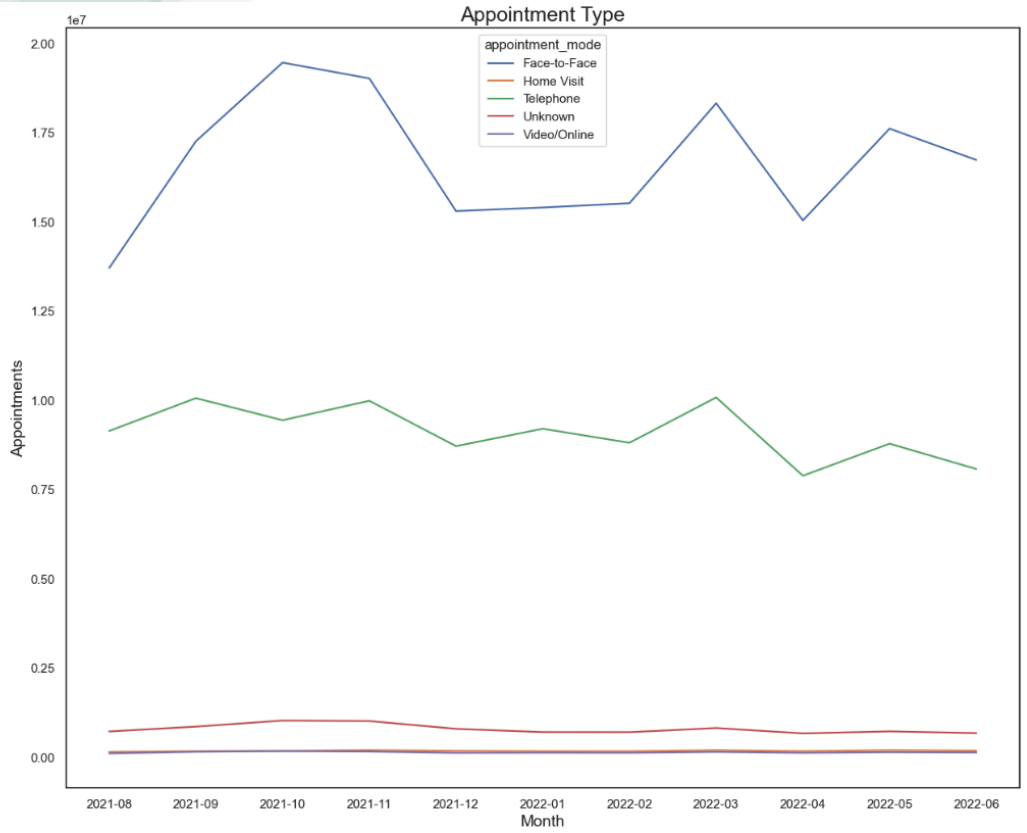


Spring Seasonal and Weekly Trends

- **Overall volumes were slightly lower**, yet the **weekly pattern remained consistent**.
- **Total appointments exceeded NHS capacity by around 10% on average**, highlighting sustained demand.



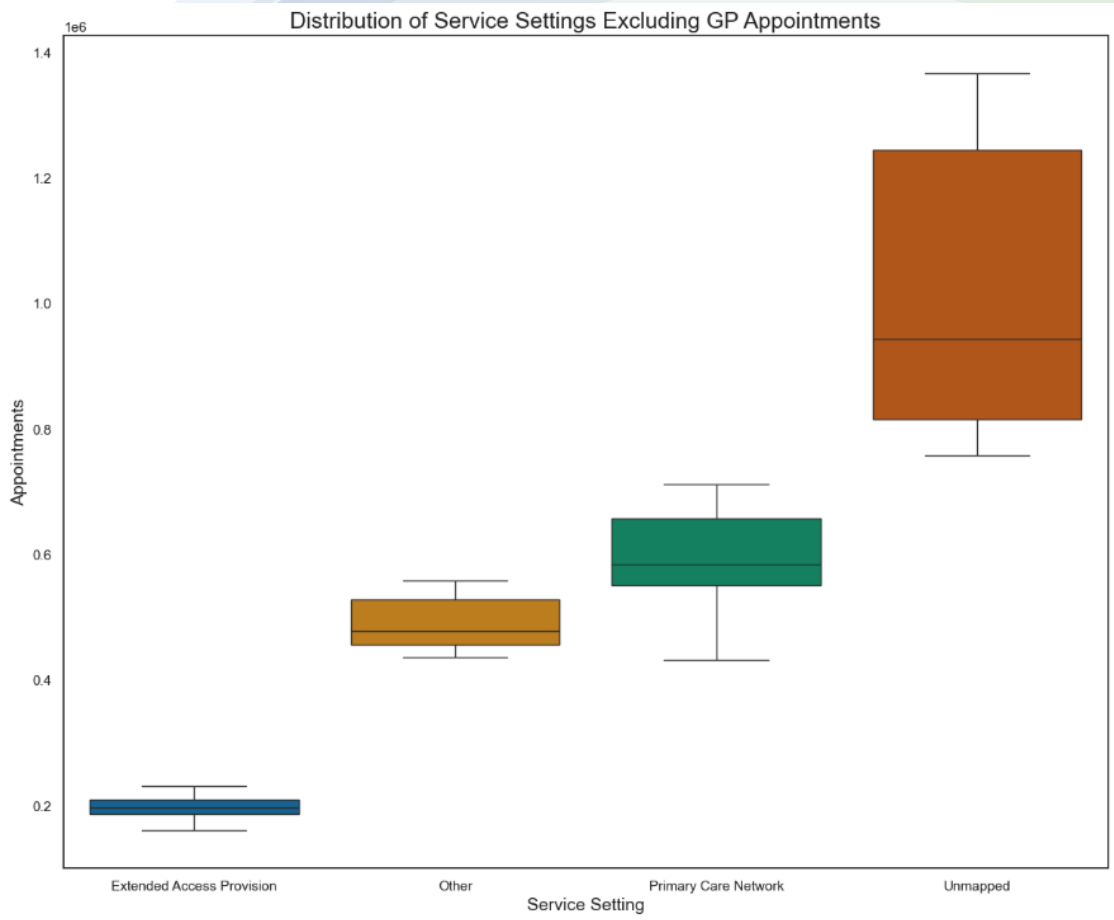
Trends in Appointment Types Over Time.



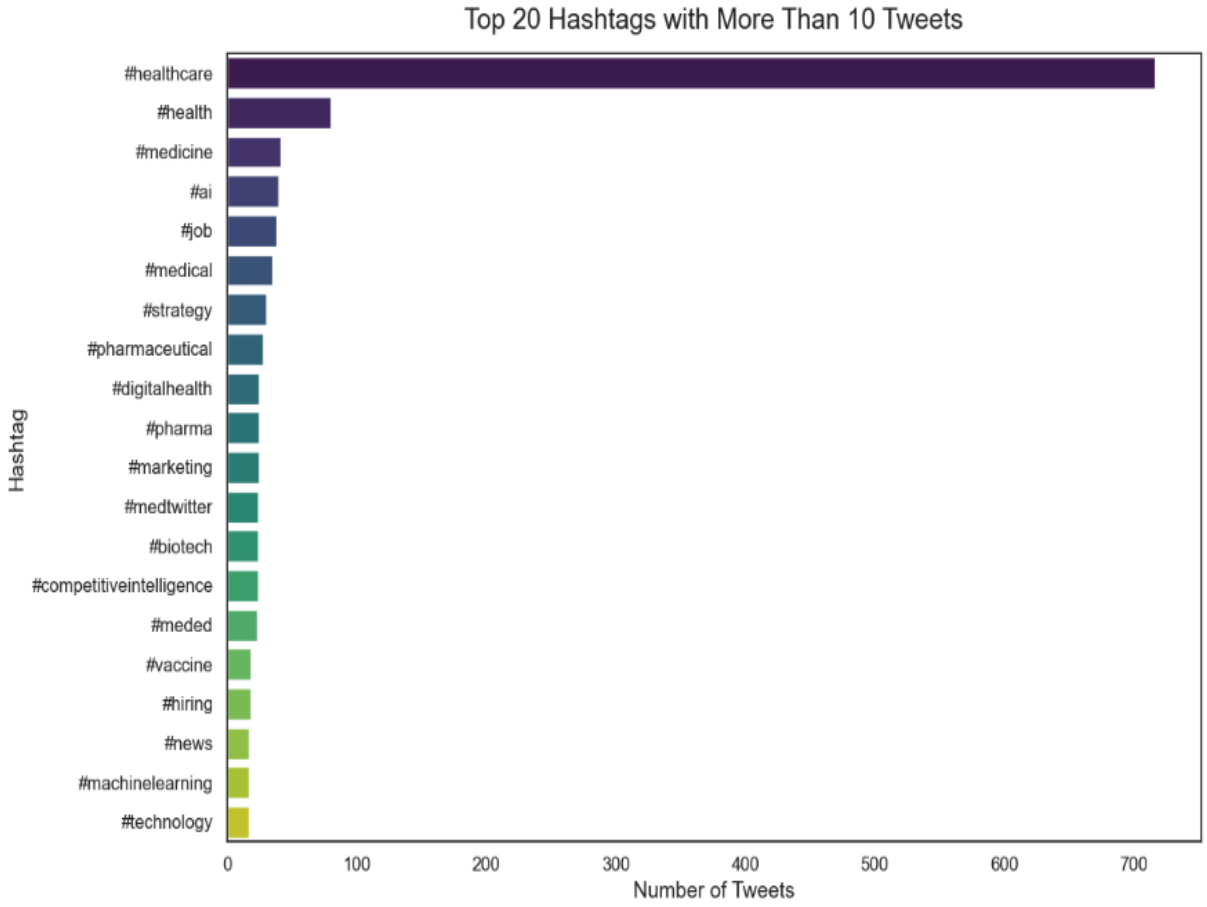
- **Face-to-face appointments** made up the largest share (~60%), with numbers ranging between **14 million and 19 million**.
- **Home visits and online/video appointments** together accounted for **less than 10%** of total appointments.
- Increasing the use of home and online consultations is recommended, possibly through **targeted campaign awareness** to broaden healthcare accessibility.
- **Telehealth adoption** shows consistent growth, suggesting post-COVID care shifts.

Service settings without GP appointments

- Excluding **General Practice**, the most frequently occurring category is **‘Unmapped’**, which indicates inconsistencies in how the data has been classified. This suggests that the NHS would benefit from improving its data management processes, ensuring that appointments are accurately mapped to the correct service settings. Enhancing data quality in this way would provide more reliable insights and support better-informed decision-making.
- Removing GP data via boxplots highlighted variability in specialist services, suggesting uneven demand distribution.



Twitter Insights



Dominant Hashtag:
#healthcare is overwhelmingly the most used hashtag.
Reflects broad public interest but overshadows more specific concerns.

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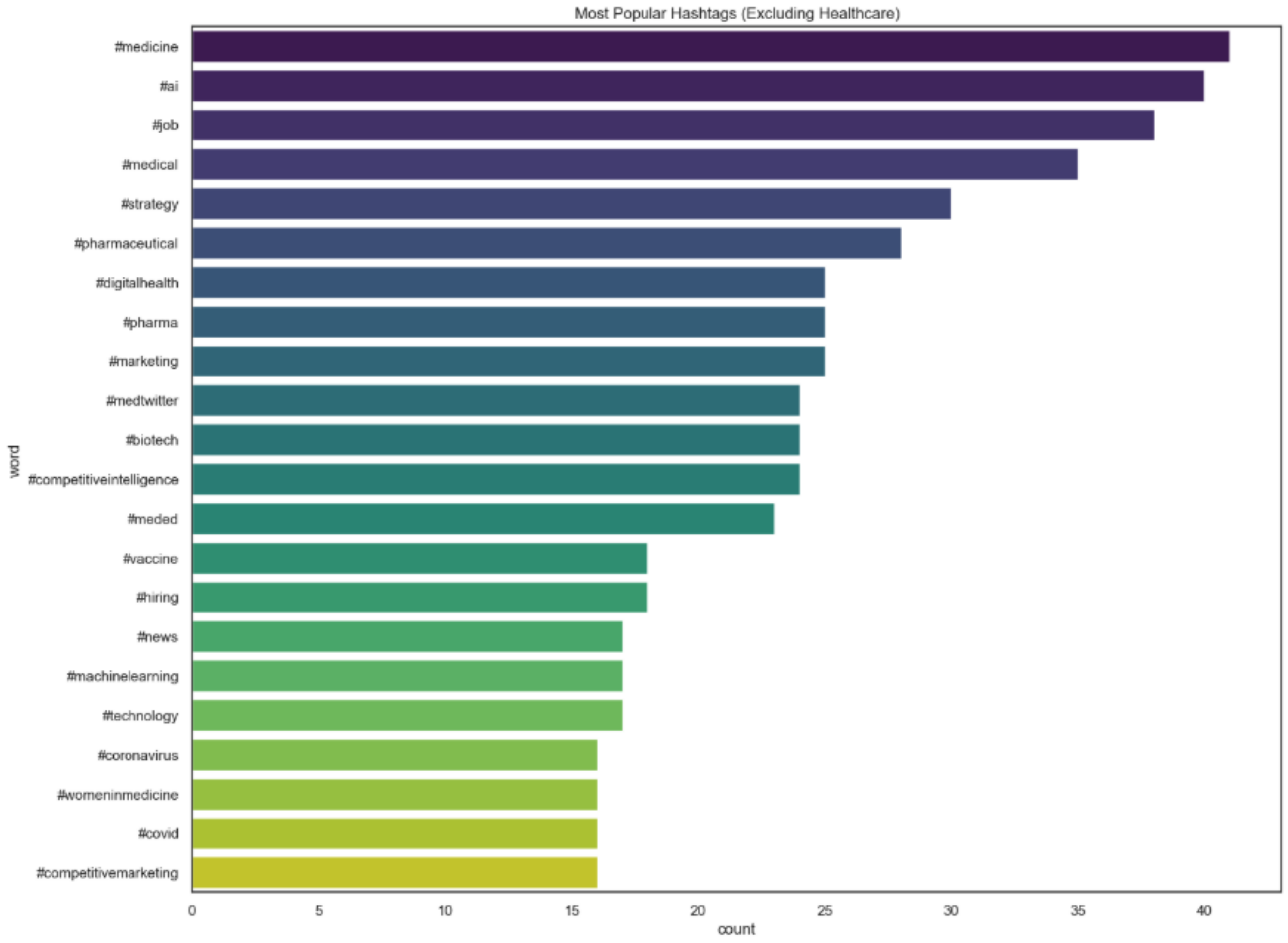

Balanced View (without #healthcare):

Digital Transformation & Innovation

Popular hashtags: #ai, #digitalhealth, #machinelearning, #technology

Strong focus on technology and AI in modern healthcare.

Workforce & Career Issues

Hashtags: #job, #hiring, #womeninmedicine, #medtwitter

Highlights concerns about staffing, recruitment, and diversity.

Clinical & Medical Discussions

Hashtags: #medicine, #medical, #pharma, #biotech

Shows interest in treatment advances and biomedical innovation.

Public Health & Crisis Response

Hashtags: #covid, #coronavirus, #vaccine

Continued engagement with pandemic-related topics.

Key Takeaway:

Public focus spans beyond general healthcare to key areas like technology adoption, workforce challenges, and pandemic recovery.

Social media insights can guide NHS planning, workforce strategies, and communication efforts.

Key Patterns Identified

- **Weekly Rhythm:** Mondays peak across all seasons; demand drops steadily during the week.
- **Seasonal Surges:** Autumn and winter consistently push utilisation beyond capacity.
- **GP Appointment Dominance:** Skews overall distribution; specialist services show more variability.
- **Telehealth Growth:** A continuing trend with long-term planning implications.
- **Missed Appointments:** Represent a significant, avoidable cost.

Recommendations

- **Expand Flexible Capacity in Autumn/Winter:**
  Scale up staffing and appointment slots to match predictable seasonal peaks.
- **Promote Telehealth Services:**
  Invest in digital infrastructure to absorb excess demand and increase patient access.
- **Leverage Social Media Monitoring:**
  Use hashtag/sentiment analysis (#mentalhealth, #GPcrisis) to anticipate patient concerns and adapt communications.
- **Reallocate Underutilised Resources:**
  During off-peak months, redirect resources toward preventive care and outreach to balance utilisation.
- **Improve Data Quality:**
  Address ‘Unmapped’ service settings for more reliable insights and effective planning.
- **Reduce Missed Appointments:**
  Implement targeted communication strategies (SMS reminders, user-friendly booking, awareness campaigns) and communicating the value of NHS’ resources to the public.


THANK
YOU