NHS Hospital Waiting Times Analysis (April–July 2025)

Data-Driven Insights Using Python, SQL & Power BI

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1 - Executive Summary

Between **April and July 2025**, NHS England managed millions of elective care referrals under its *Referral to Treatment (RTT)* programme.

This project explores how patient waiting times evolved across major NHS trusts — using a fully automated data workflow from raw CSVs to visual insights.

The pipeline combined:

- **Python** for cleaning and aggregating 77M+ records,
- **SQL** for modelling reusable healthcare views, and
- **Power BI** for presenting national performance metrics.

The findings show:

- Most **classified patients** were treated within **18 weeks**,
- About **4%** faced waits longer than a year,
- Roughly **78%** of total records remained **unclassified**, highlighting data reporting gaps that affect performance visibility.

The goal was to demonstrate not just analysis, but **end-to-end analytical storytelling** — converting real NHS data into clarity, not complexity.

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2 - Data Source & Access

Dataset: NHS England – *Referral to Treatment (RTT) Waiting Times* (Consultant-Led Elective Care)

Coverage: April → July 2025

Publisher: NHS England & Department of Health and Social Care

Licence: Open Government Licence v3.0

Download Links

- [April 2025 RTT Dataset](#)

- [May 2025 RTT Dataset](#)

- [June 2025 RTT Dataset](#)

- [July 2025 RTT Dataset](#)

Each file contained full CSV extracts from NHS England's open data portal.

Combined, the four datasets represented **over 77 million rows (~7 GB)** of national hospital performance data.

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3 - Data Preparation (Python)

Workflow Steps

- Combined four monthly RTT CSVs into one dataset.
- Extracted the **Period** (e.g. "RTT-April-2025") from filenames.
- Selected essential columns:

  Period, Provider Org Name, WaitBand, and Patients.

- Melted the wide dataset into long format for analysis.
- Replaced missing Patients values with **0** (meaning no patients were reported, not missing data).
- Grouped raw "WaitBands" into four interpretable categories:
  - 0–18 Weeks
  - 18–52 Weeks
  - 52+ Weeks
  - Other (unclassified or incomplete entries)

Final Shape: 7.7 million rows × 4 columns

Clean Fields: Period | Provider Org Name | WaitCategory | Patients

Missing Values: 0
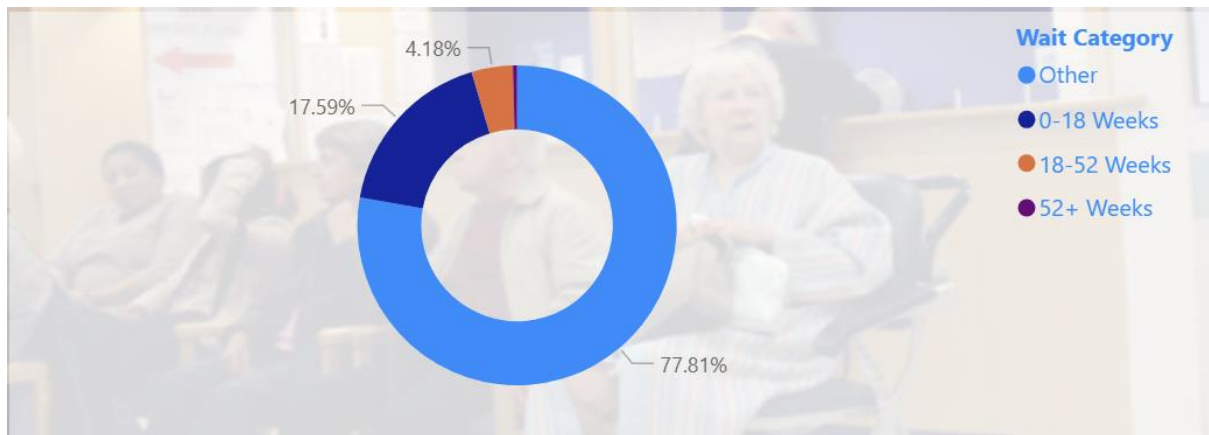
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4 - Visual Insights

Figure 1 — Total Patients by Waiting Time Band

Around **78%** of records fall into the *"Other"* category — unclassified due to incomplete categorization in the raw RTT data.

Among classified patients, **17.6%** were seen within **0–18 weeks**, **4.2%** between **18–52 weeks**, and fewer than **1%** waited beyond a year.

This suggests NHS performance remains strong where data is complete but reporting needs improvement.
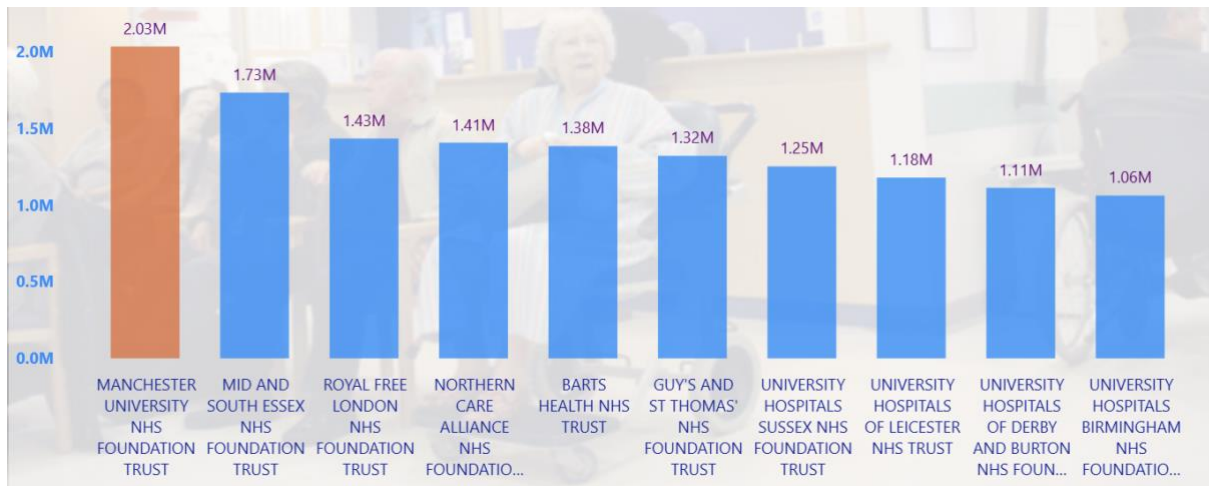

Figure 2 — Top 10 Providers by Total Patients

Major trusts like **Manchester University NHS Foundation Trust**, **Mid and South Essex**, and **Royal Free London** handled the highest patient loads — collectively accounting for about **20% of total national volume**.

These hubs play a critical role in maintaining service capacity and performance benchmarks.
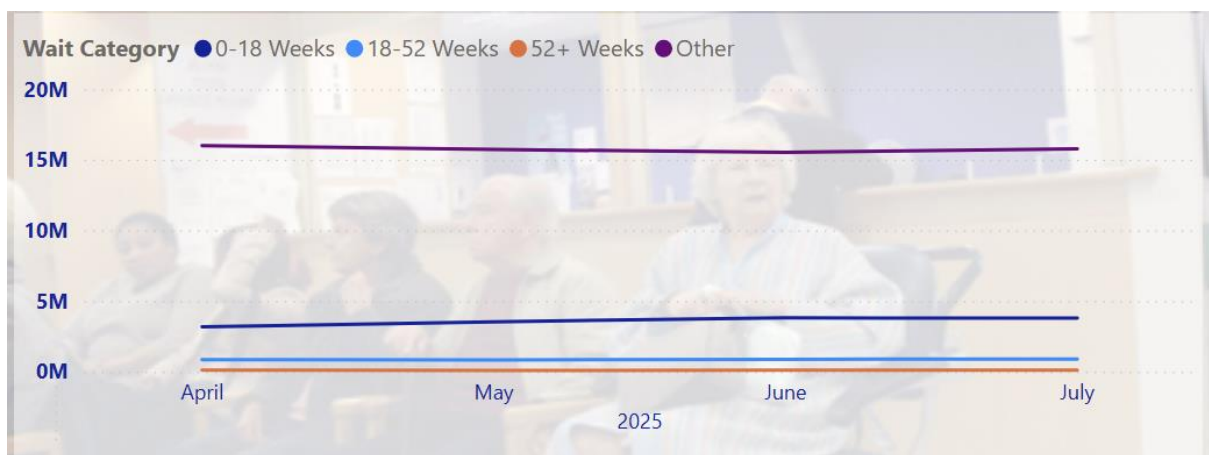

Figure 3 — Patient Trend by Waiting Category (Apr–Jul 2025)

Across April to July, patient volumes rose gradually, led by the **0–18 weeks** category.

The number of long-wait patients (>52 weeks) remained stable — a positive sign of throughput resilience despite seasonal demand increases.

5 - SQL Modelling (SQL Server Management Studio 2.0)

Created four key **SQL views** to build a relational model suitable for Power BI:

View	Purpose
vw_Fact_PatientWaits	Aggregates total patients by period, provider, and wait category
vw_Dim_Date	Extracts year, month, and formatted labels
vw_Dim_Provider	Provides unique list of provider organisations
vw_Dim_WaitCategory	Defines consistent wait-time dimensions

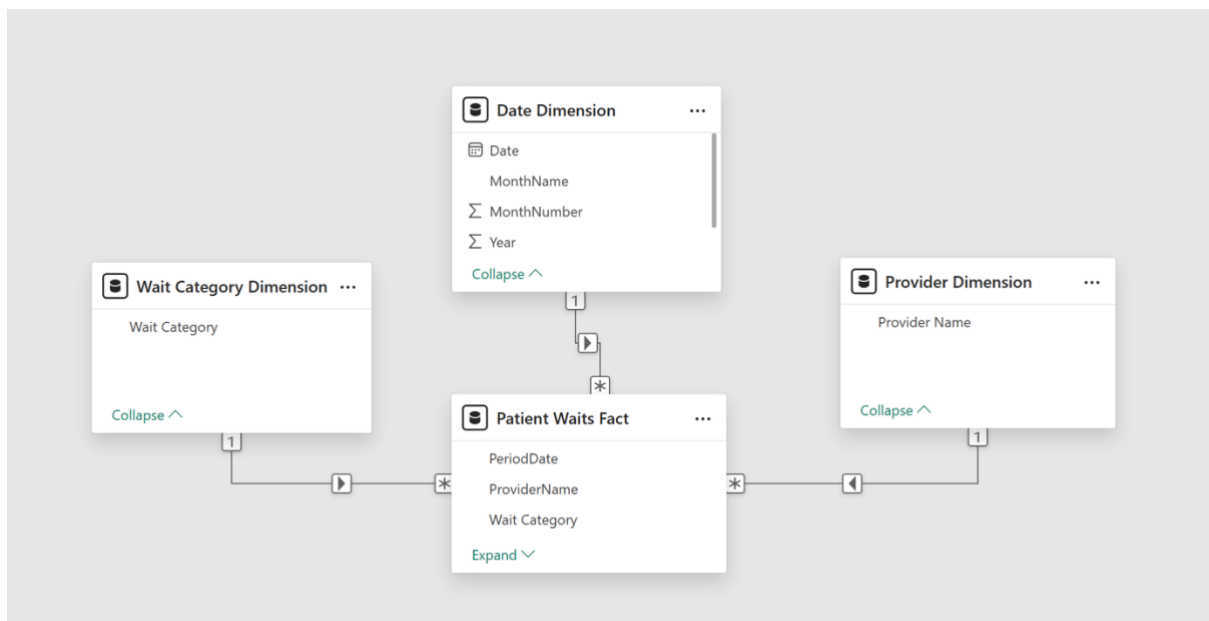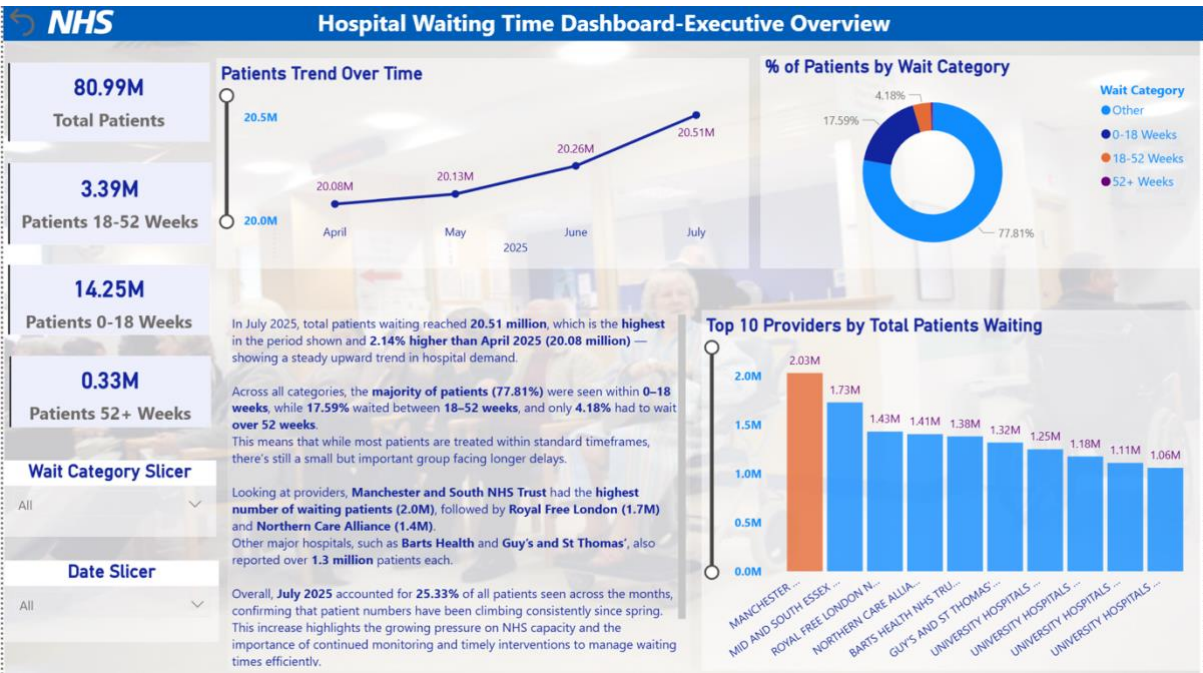Figure 3 — Power BI relationship Modelling with SQL created views

Fact and dimension views form a lightweight star schema — optimized for Power BI, enabling fast queries and filterable dashboards.
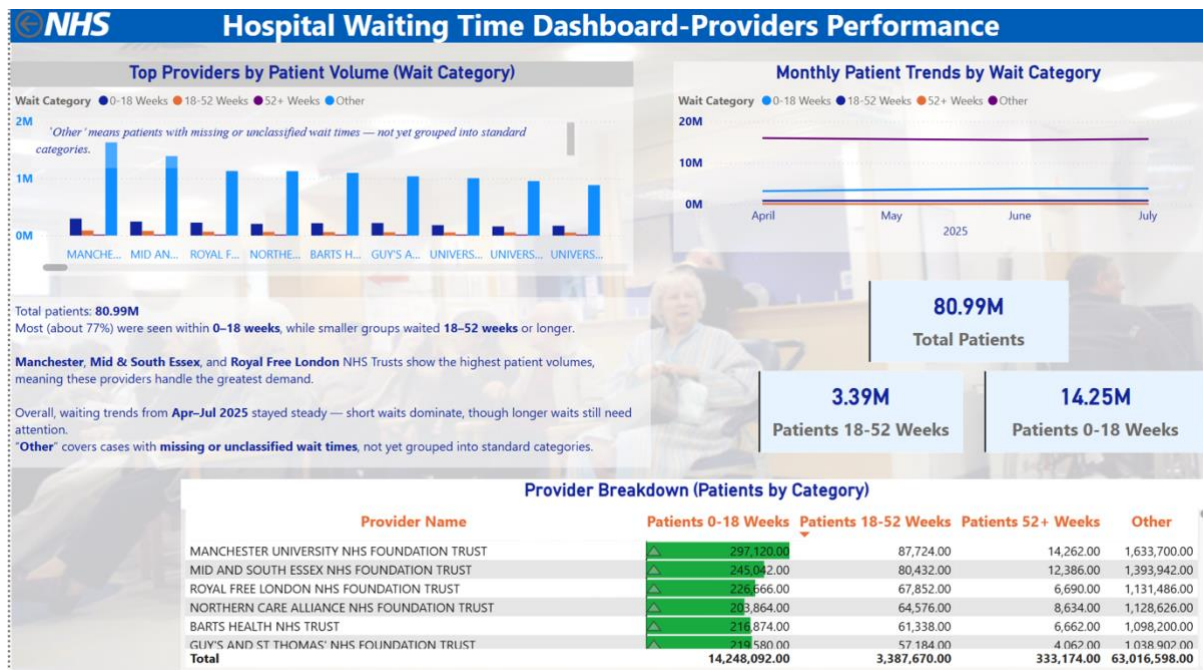
6 - Power BI Dashboard Overview

Executive Overview

High-level summary page showing national totals, category splits, and trends — giving decision-makers a quick grasp of system performance.
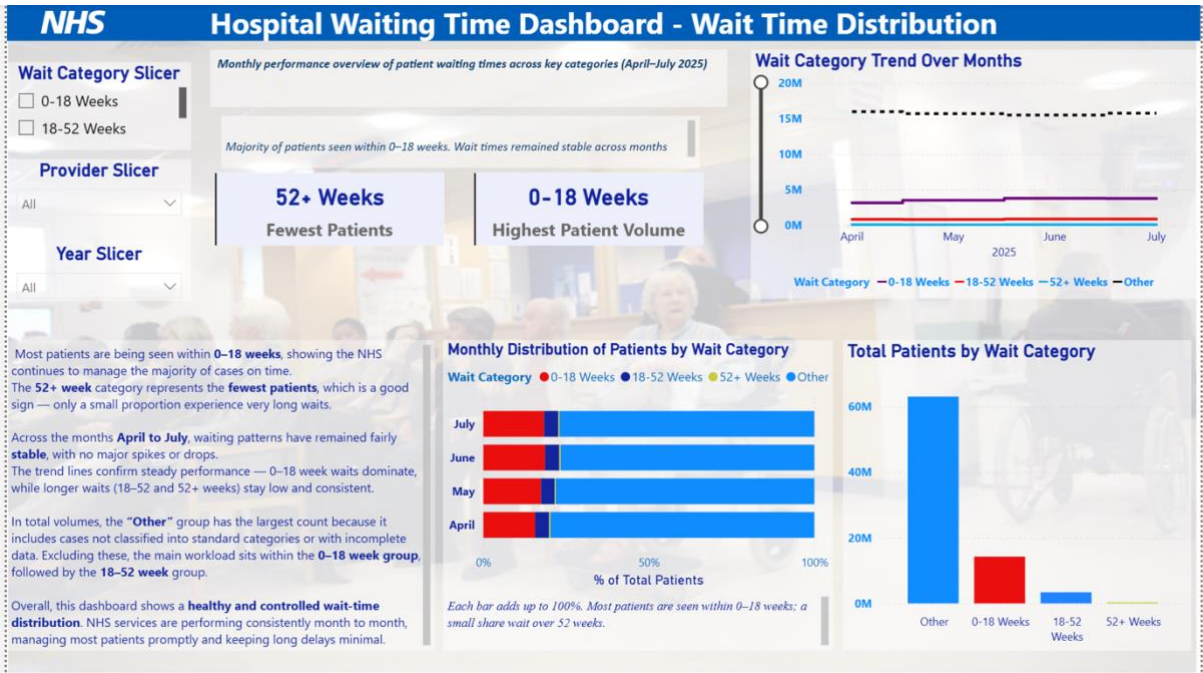
Provider Performance

Hospital Waiting Time Dashboard-Providers Performance

Top Providers by Patient Volume (Wait Category)

Wait Category ● 0-18 Weeks ● 18-52 Weeks ● 52+ Weeks ● Other

'Other' means patients with missing or unclassified wait times — not yet grouped into standard categories.

Providers: MANCHE... MID AN... ROYAL F... NORTHE... BARTS H... GUY'S A... UNIVERS... UNIVERS... UNIVERS...

Total patients: **80.99M**
Most (about 77%) were seen within **0–18 weeks**, while smaller groups waited **18–52 weeks** or longer.

Manchester, **Mid & South Essex**, and **Royal Free London** NHS Trusts show the highest patient volumes, meaning these providers handle the greatest demand.

Overall, waiting trends from **Apr–Jul 2025** stayed steady — short waits dominate, though longer waits still need attention.
"**Other**" covers cases with **missing or unclassified wait times**, not yet grouped into standard categories.

Monthly Patient Trends by Wait Category

Wait Category ● 0-18 Weeks ● 18-52 Weeks ● 52+ Weeks ● Other

Months: April, May, June, July (2025)

80.99M
Total Patients

3.39M
Patients 18-52 Weeks

14.25M
Patients 0-18 Weeks

Provider Breakdown (Patients by Category)

Provider Name	Patients 0-18 Weeks	Patients 18-52 Weeks	Patients 52+ Weeks	Other
MANCHESTER UNIVERSITY NHS FOUNDATION TRUST	297,120.00	87,724.00	14,262.00	1,633,700.00
MID AND SOUTH ESSEX NHS FOUNDATION TRUST	245,042.00	80,432.00	12,386.00	1,393,942.00
ROYAL FREE LONDON NHS FOUNDATION TRUST	226,666.00	67,852.00	6,690.00	1,131,486.00
NORTHERN CARE ALLIANCE NHS FOUNDATION TRUST	203,864.00	64,576.00	8,634.00	1,128,626.00
BARTS HEALTH NHS TRUST	216,874.00	61,338.00	6,662.00	1,098,200.00
GUY'S AND ST THOMAS' NHS FOUNDATION TRUST	219,580.00	57,184.00	4,062.00	1,038,902.00
Total	**14,248,092.00**	**3,387,670.00**	**333,174.00**	**63,016,598.00**

Displays the top 10 providers by patient volume and their relative contribution to national workload.

The concentration of cases in a few major trusts highlights operational dependency on key regions.
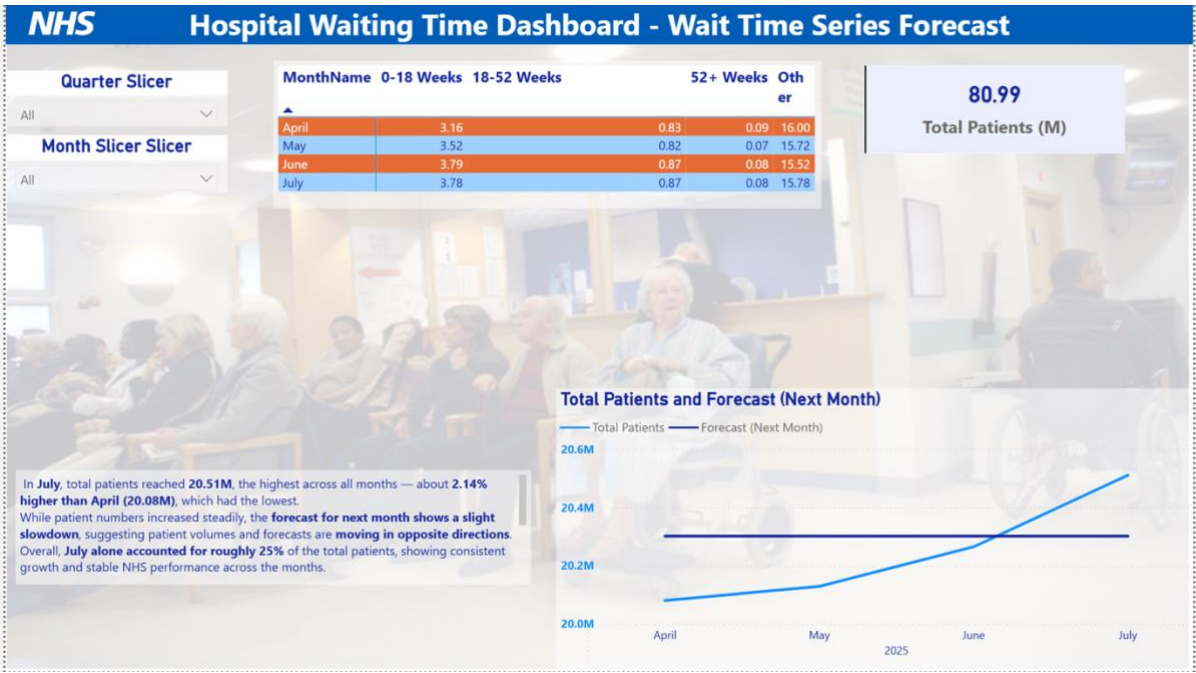
Wait-Time Distribution

Most classified patients were treated within 18 weeks, aligning with NHS RTT targets.

However, **78%** of overall entries remain "Other," showing incomplete classification at the data source.

Forecast / Time-Series

Short-term forecasting shows mild, steady growth through Q3 2025.

The proportion of long-wait patients remains stable, suggesting backlog control measures are effective.

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7 - Key Business Insights & Recommendations

Insight	Meaning	Recommendation
Most patients treated within 18 weeks	NHS continues to meet key RTT performance goals	Maintain efficiency and capacity planning
78% of data unclassified	Indicates data entry gaps in RTT reporting	Enhance digital reporting standards across trusts
4% of cases >1 year	Represents manageable backlog pockets	Prioritise high-wait categories for funding
Workload concentrated in major trusts	Heavy dependence on a few providers	Redistribute resources or expand regional support
Steady month-to-month performance	Reflects stable operations	Continue regular performance monitoring

8 - Conclusion

This project transformed massive raw NHS RTT data into a clear and data-driven narrative.

By combining **Python cleaning**, **SQL modelling**, and **Power BI storytelling**, the workflow demonstrates real-world analytical thinking — not just coding, but context, communication, and clarity.

The insights reveal both NHS strengths (meeting treatment targets) and systemic challenges (unclassified records).

This work showcases end-to-end data handling, ETL understanding, and effective visualization — exactly the skills expected from a modern data scientist.

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9 - Final Note

This project reflects my approach to transforming large, complex healthcare data into meaningful, actionable insight — the kind of clarity that supports better decisions in real-world NHS operations.