Design a model for Community pharmacy workforce with open source data

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For NHS R and Python Community Open Source Conference (RPySOC) 2025

Introduction – Today's session

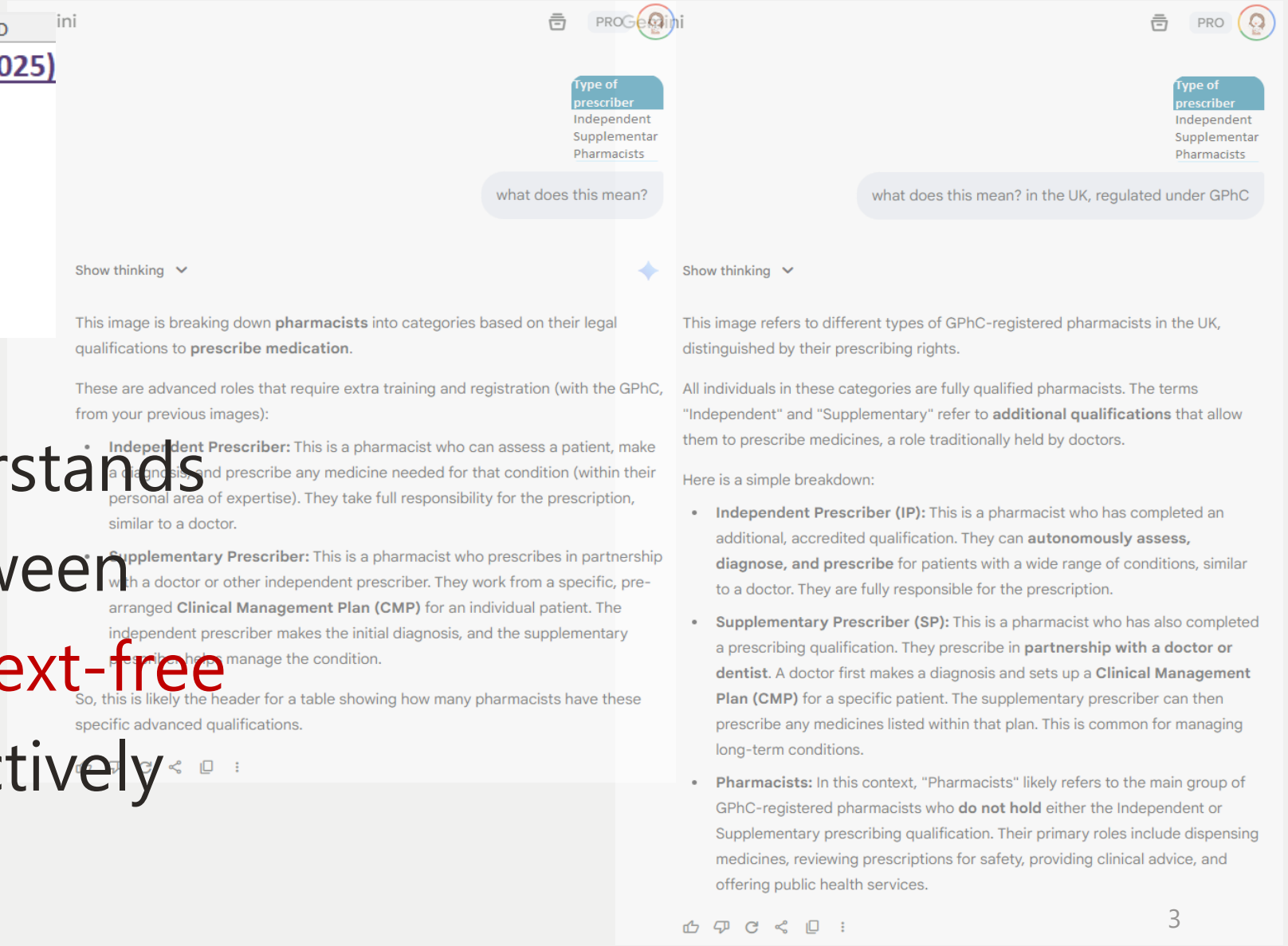
This session outlines a simplified python model of the community pharmacy workforce supply.

1) Some practical guidance pointing what publicly available sources are.
2) How to construct a python data pipeline with several datasets directly from publicly available sources.
3) It includes AI generated codes (human in the loop).

Clarification – human in the {AI} loop?

	A	B	C	D
1	**Prescribers on the GPhC register (August 2025)**			
2				
3	**Total prescribers**			
4	**Type of prescriber**	**No of pharmacists**	**% of pharmacists**	
5	Independent prescriber	23,471	35.2%	
6	Supplementary prescriber only	201	0.3%	
7	Pharmacists with no annotations	43,025	64.5%	
8	**TOTAL prescribers**	**23,672**	**35.5%**	
9	**TOTAL pharmacists**	**66,697**	**100%**	

GPhC registers data (Register data professionals – August 2025)



A *human* who understands the distinctions between contextual and context-free processing can effectively govern *AI*.

Community pharmacy workforce modelling

- Excel <-> Python
- The model *was* built to inform workforce planning for NHS services delivered in high-street pharmacy premises,
- Focusing on two key professions regulated by the General Pharmaceutical Council (GPhC); pharmacists and pharmacy technicians.

Limitation

This session introduces:

1) General Pharmaceutical Council (GPhC) registers data
2) Community Pharmacy Workforce Survey (CPWS) data
3) Consolidated Pharmaceutical List

NB – This session does not cover the full scope of NHS long term workforce planning.

List of data

For today's session:

General Pharmaceutical Council (GPhC) registers data

Community Pharmacy Workforce Survey (CPWS)

NHSBSA Consolidated Pharmaceutical List

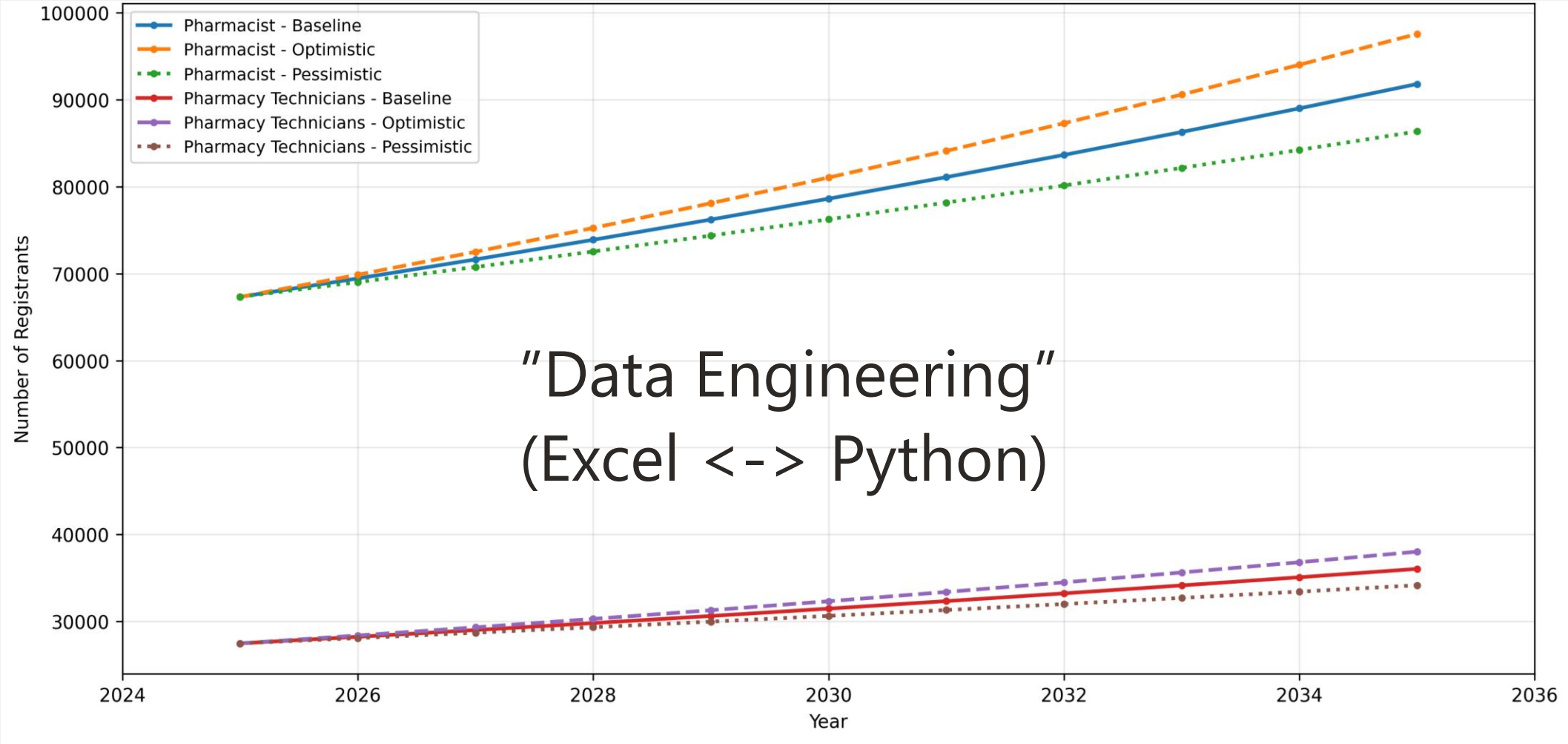
In future sessions:

NHSBSA Hospital Prescribing Dispensed in the Community

ONS nomis - Census 2021 estimates that classify usual residents in England and Wales by single year of age

Initial workforce model – based on Sep25 actuals

Source: General Pharmaceutical Council



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Initial workforce model – based on Apr25 actuals

Forecasts dynamically adjust to new historical actual data, with fixed growth rates.

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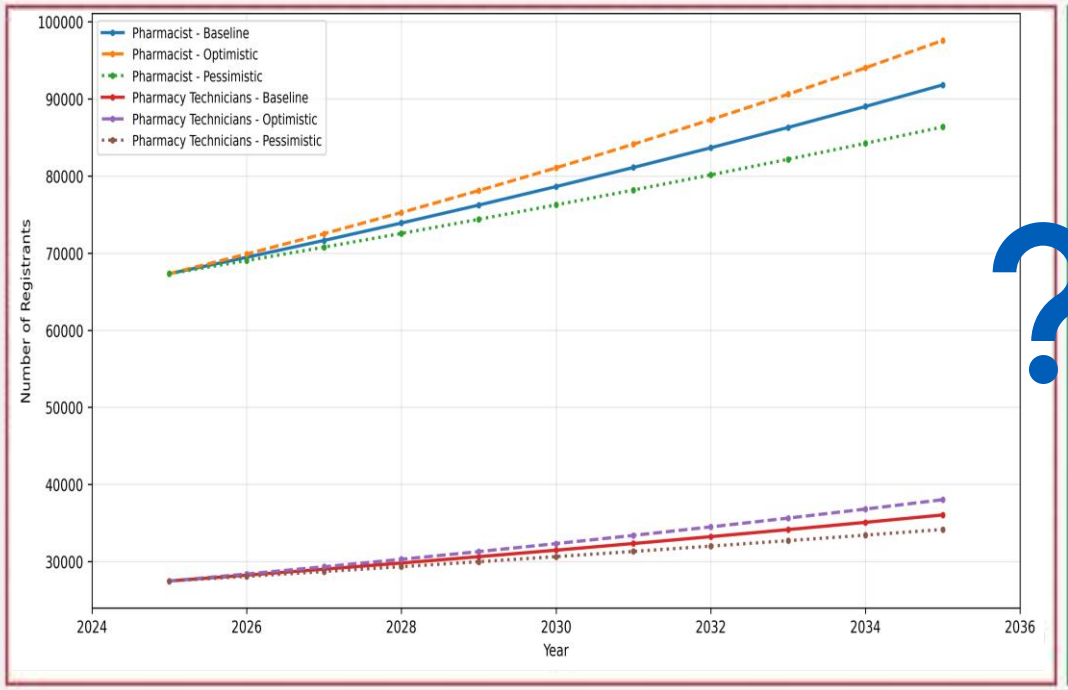
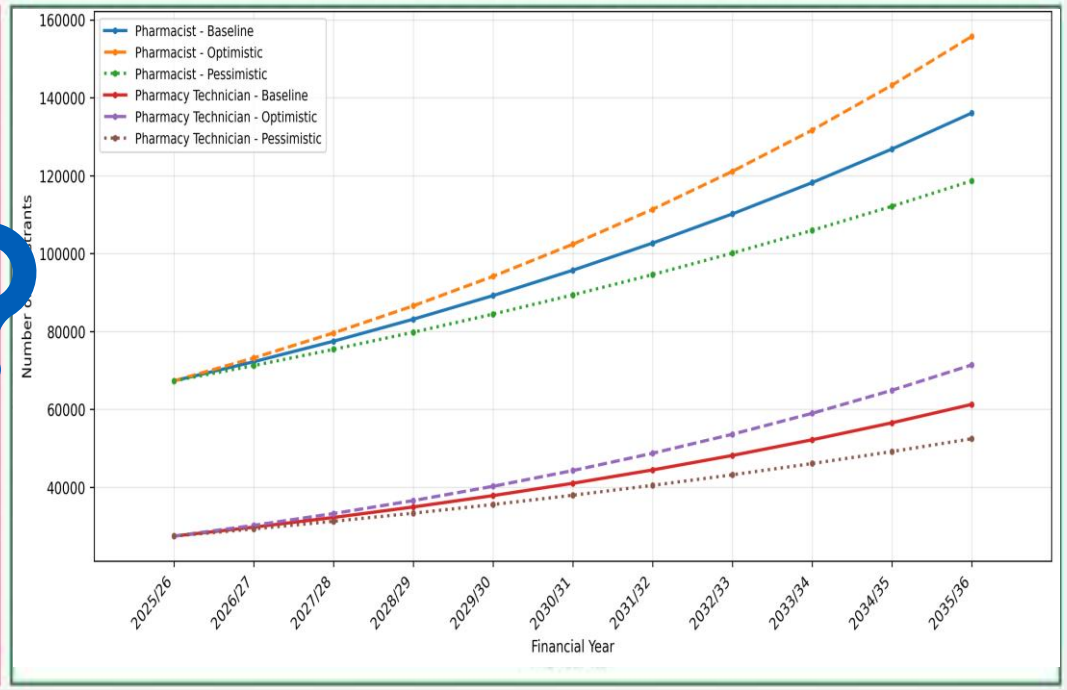


?

Added



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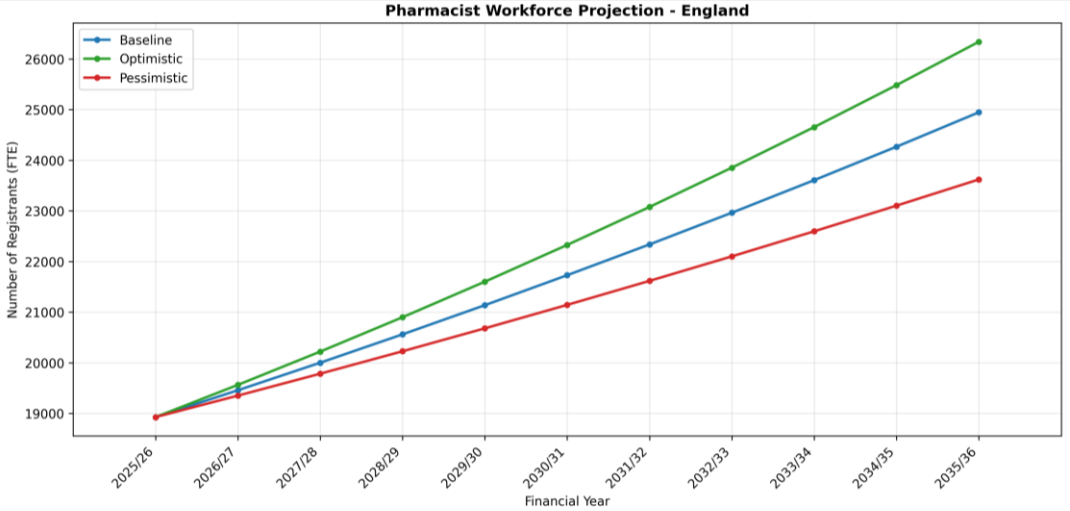
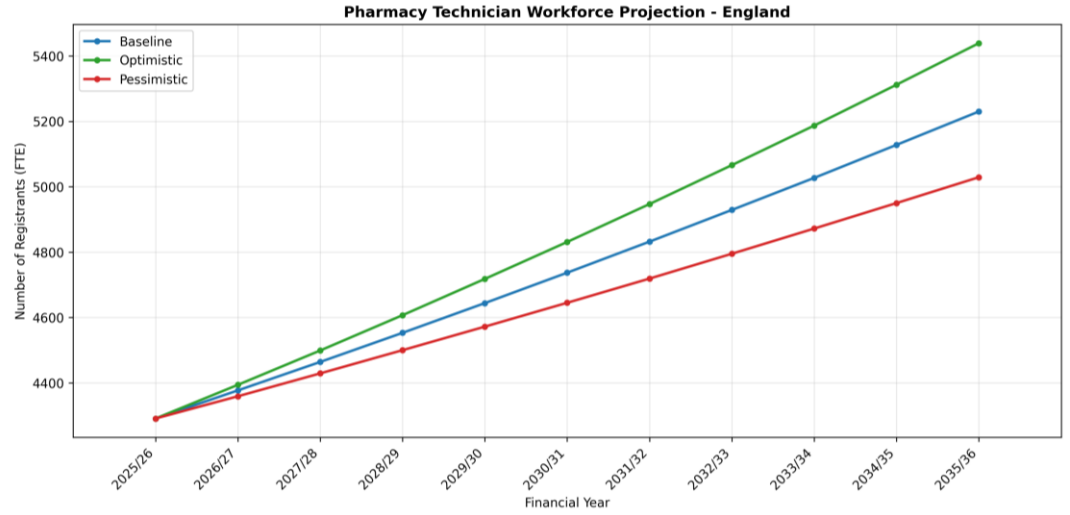
Setting the baseline (starting point for projection)

- England
- Community pharmacy workforce
- Full-Time Equivalent (FTE)

```
============================================================
Baseline and Annual Growth Rates (CAGR)
============================================================
Growth Rate Calculation Period: 7 year(s) (2018-2025)
Projection Period: 10 years
Note: Annual Growth Rate = Compound Annual Growth Rate (CAGR)

Pharmacist:
  Baseline: 18,926.58922
  CAGR (Average Annual Growth Rate): 2.80%
  Annual Change Estimate: 1,399 registrants/year
Pharmacy Technician:
  Baseline: 4,290.735455
  CAGR (Average Annual Growth Rate): 2.00%
  Annual Change Estimate: 414 registrants/year
============================================================
```





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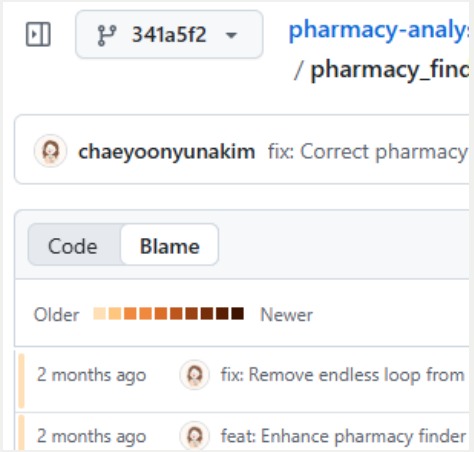
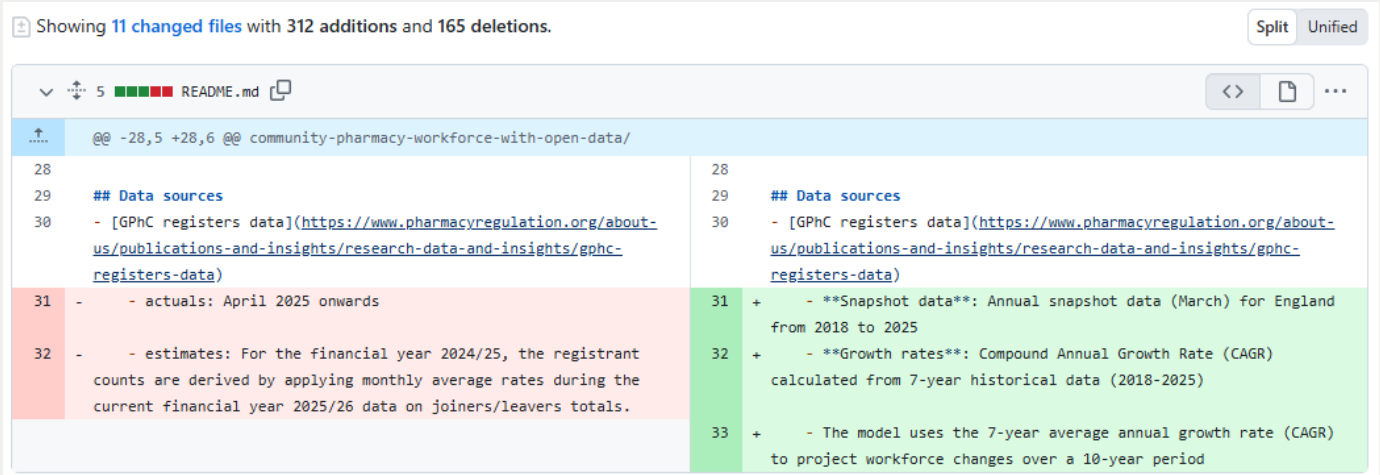
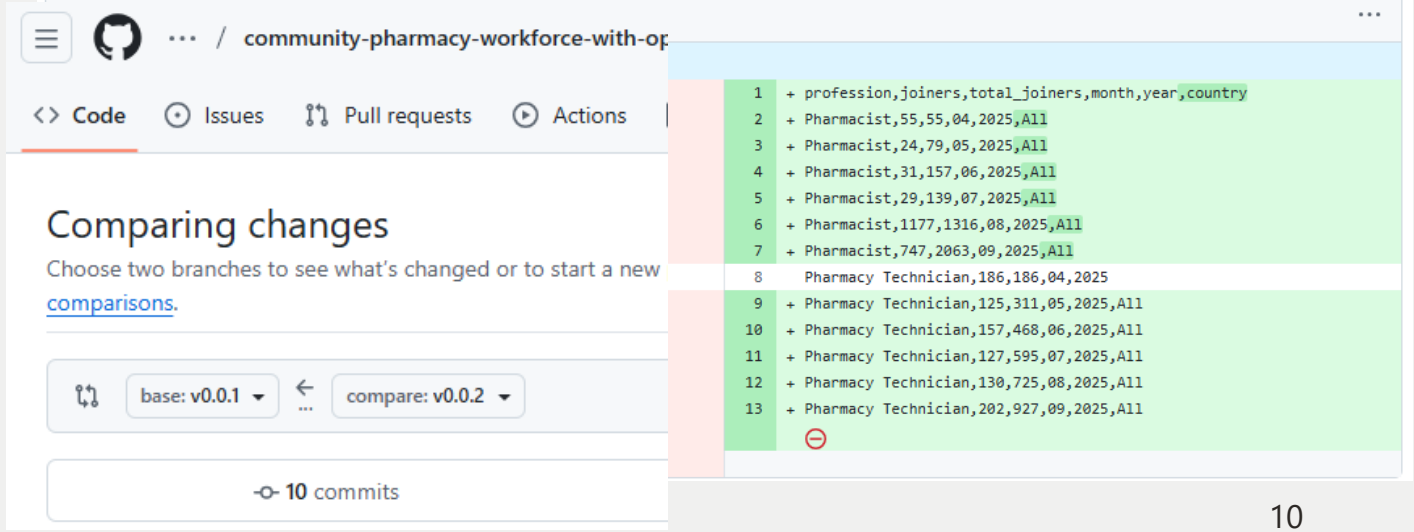
Advantages of working on GitHub

- Essential for version history

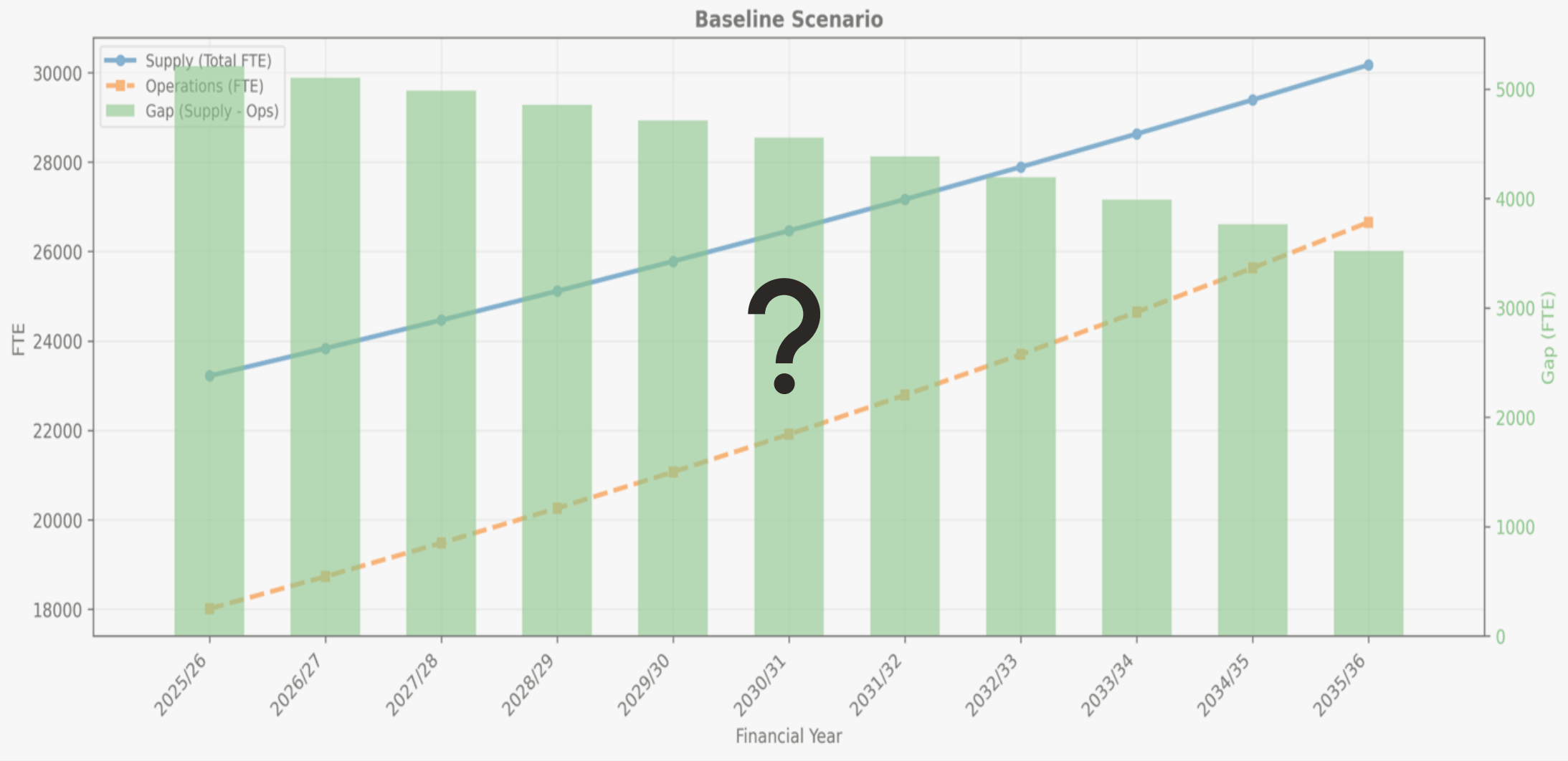




- Using GitHub Release Tags (e.g., v0.0.1, v0.0.2)
  GitHub automatically provide Full Changelog in between (e.g., [v0.0.1 and v0.0.2])



Comparing projections – supply validation



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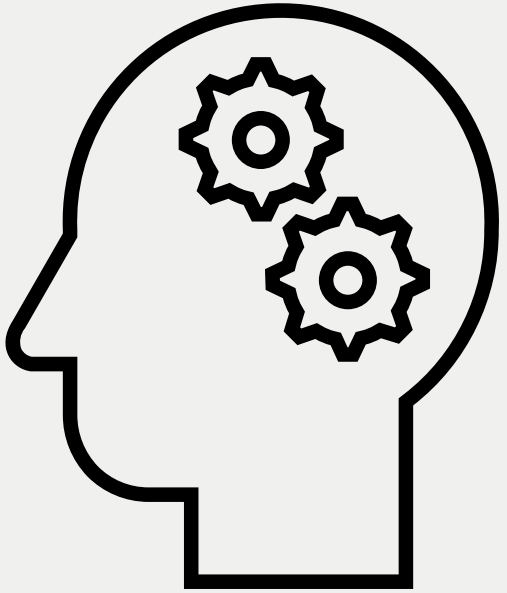
Reminder – human in the {modelling} loop!



Participation rates

"NHS" Service contract

Regulations

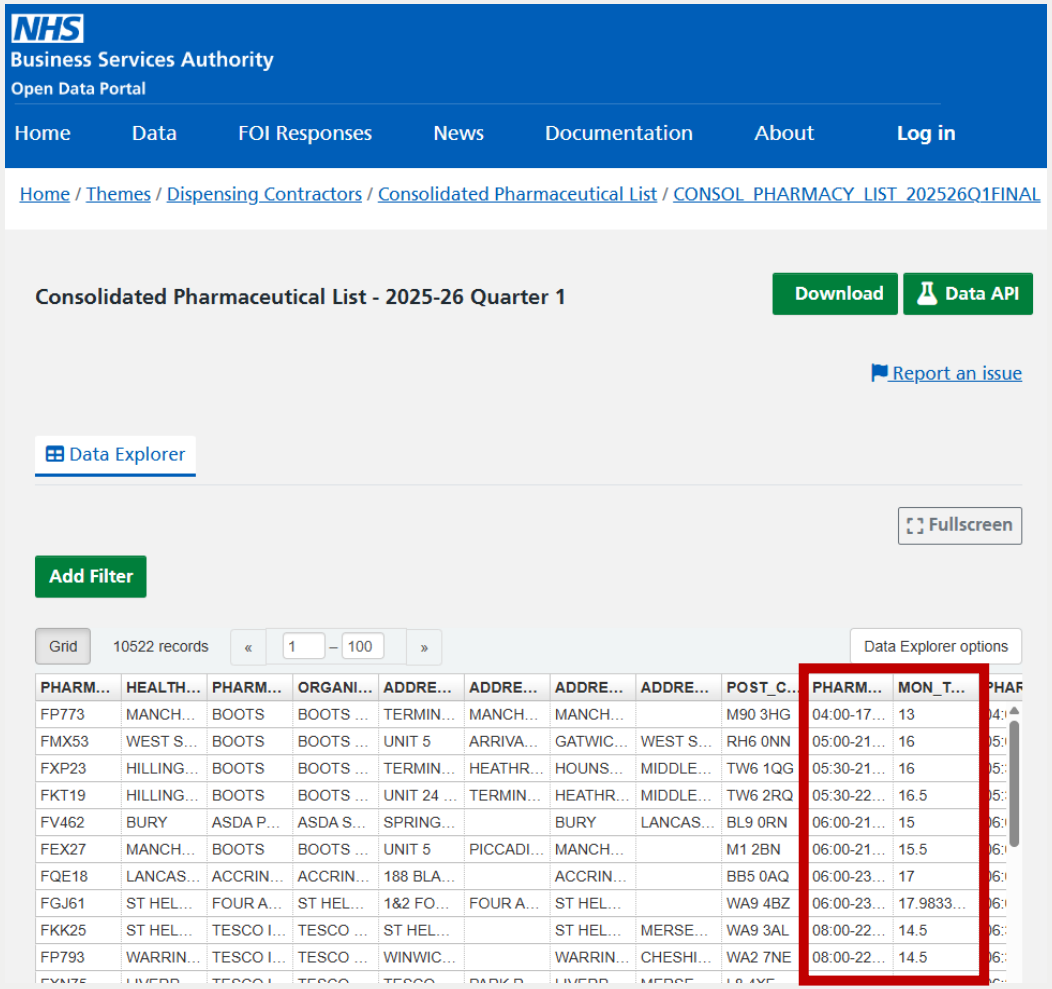
Role redefinition

Training places capacity

A *human* who understands the distinctions between contextual and context-free processing can effectively govern *modelling*.

Useful Data API for scalable analysis with Python

Source: NHSBSA Consolidated Pharmaceutical List



A simple request to the data API using Python.

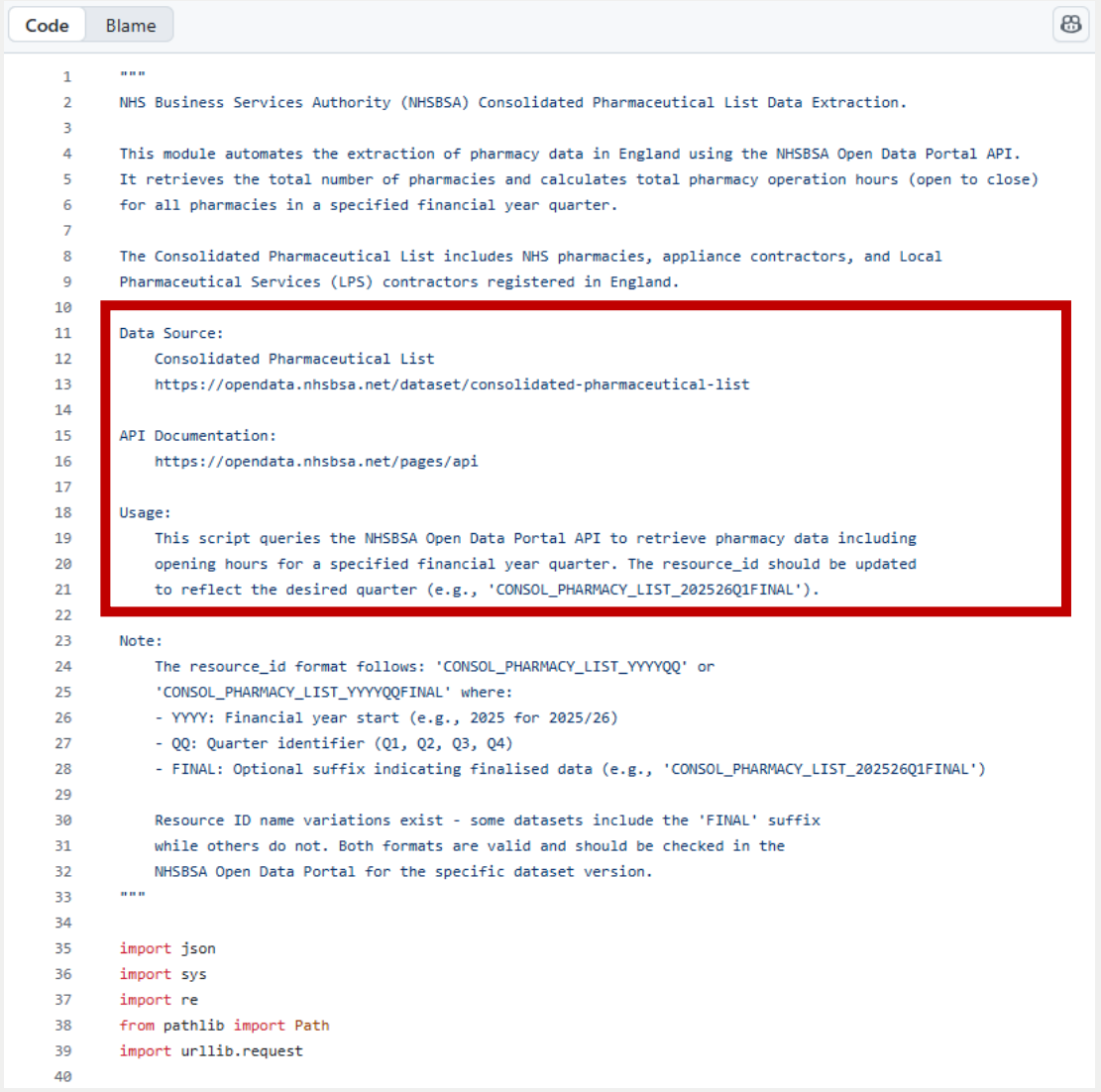
```
import urllib.request
import json

url = 'https://opendata.nhsbsa.net/api/3/action/datastore_search?resource_id=CONSOL_PHARMACY_LIST_

with urllib.request.urlopen(url) as response:
    data = response.read().decode('utf-8')
    result = json.loads(data)
    print(json.dumps(result, indent=2))
```

Query example (first 5 results)	https://opendata.nhsbsa.net/api/3/action/datastore_search?resource_id=CONSOL_PHARMACY_LIST_202526Q1FINAL&limit=5
Query example (results with the 'WED_TOTAL' field contains the letter "a")	https://opendata.nhsbsa.net/api/3/action/datastore_search?resource_id=CONSOL_PHARMACY_LIST_202526Q1FINAL&q=%7B%22WED_TOTAL%22:%22a%22%7D
Query example (via SQL statement)	https://opendata.nhsbsa.net/api/3/action/datastore_search_sql?resource_id=CONSOL_PHARMACY_LIST_202526Q1FINAL&sql=SELECT * from `CONSOL_PHARMACY_LIST_202526Q1FINAL` limit 5

Using the API with this Web Browser »

Getting Started with the NHSBSA API

1. Visit the dataset page
2. Browse available resources (quarters) and note the resource_id
3. Update the resource_id variable in this example script (line 236) to match your desired quarter
4. Run the script: nhsbsa-pharmacy-england-hrs.py
5. The script automatically handles pagination to retrieve all records



Example output and sample python function

Demo use only

- Results are printed to console

```
print(f"\nTotal number of pharmacies in {financial_year}: {total_pharmacies:,}")
print(f"Total pharmacy operation hours (weekly) in {financial_year}: {total_weekl
print(f"Average weekly hours per pharmacy: {average_weekly_hours:.2f} hours")
```

```
Problems  Output  Debug Console  Terminal  Ports  Prompt flow  GitLens

chaey@chaeyoona MINGW64 ~/Desktop/OneDrive/Documents/GitHub/community
$ C:/Users/chaey/AppData/Local/Microsoft/WindowsApps/python3.12.exe c
pharmacy-workforce-with-open-data/data/nhsbsa-pharmacy-england-hrs.py

Total number of pharmacies in 2025/26: 10,522
Total pharmacy operation hours (weekly) in 2025/26: 546,264.13 hours
Average weekly hours per pharmacy: 51.92 hours

chaey@chaeyoona MINGW64 ~/Desktop/OneDrive/Documents/GitHub/community
$
```

- The output can serve as the required input in subsequent modelling stages

```
376  def calculate_workforce_ops_fte(average_weekly_hours, total_pharmacies,
377                                  fte_weekly_hours=config.FTE_WEEKLY_HOURS,
378                                  utilisation_rate=config.UTILISATION_RATE):
379      """
380      Calculate total workforce operation FTE based on pharmacy operation hours.
381
         Calculates the total Full-Time Equivalent (FTE) workforce required for operations
         to cover all pharmacy operation hours across all pharmacies. This represents
         the minimum workforce needed to keep pharmacies operational during opening hours.

         Formula: Workforce Ops FTE = FTE_per_pharmacy * total_pharmacies
387      Where: FTE_per_pharmacy = average_weekly_hours / (fte_weekly_hours * utilisation_rate)
388
389      Args:
390          average_weekly_hours: Average weekly operation hours per pharmacy (from NHSBSA data)
391          total_pharmacies: Total number of pharmacies (from NHSBSA data)
392          fte_weekly_hours: Standard FTE working hours per week (default: config.FTE_WEEKLY_HOURS)
393          utilisation_rate: Workforce utilisation rate (default: config.UTILISATION_RATE)
394
395      Returns:
396          dict: Workforce operation calculation with keys:
397              - 'fte_per_pharmacy': float - FTE required per pharmacy
398              - 'workforce_ops_fte': float - Total workforce operation FTE across all pharmacies
399      """
400
401      # Calculate effective FTE working hours per week (accounting for utilisation)
402      effective_weekly_hours = fte_weekly_hours * utilisation_rate
403
404      # Calculate FTE per pharmacy
405      fte_per_pharmacy = average_weekly_hours / effective_weekly_hours
406
407      # Calculate total workforce operation FTE across all pharmacies
408      workforce_ops_fte = fte_per_pharmacy * total_pharmacies
409
410      return workforce_ops_fte
```

(e.g, 10522 if querying API 2025/26 1Q)

List of data

Essential

General Pharmaceutical Council (GPhC) registers data

Community Pharmacy Workforce Survey (CPWS)

NHSBSA Consolidated Pharmaceutical List

Potential

NHSBSA Hospital Prescribing Dispensed in the Community

ONS nomis - Census 2021 estimates that classify usual residents in England and Wales by single year of age

Q&A

Email:
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GitHub repository:
https://github.com/chaeyoonyunakim/community-pharmacy-workforce-with-open-data

Thank you, NHS England

Chaeyoon Kim

Data Scientist | Python/PySpark, Tableau |
Building communities for knowledge sharing