

B235979_Assessment_Final

April 1, 2024

1 B235979_Final Assignment

Final assignment for Introduction to software development in health and social care (2023-2024)

1.0.1 Data given in two datasets describing boards (areas) of NHS Scotland:

- Covid across the boards
- NHS boards in Scotland information

1.0.2 Starting code

```
[1]: # the usual imports
from plotly.subplots import make_subplots
import plotly.graph_objects as go
```

```
[2]: import pprint as pp
from datetime import datetime, timedelta, date, timezone
import json
```

```
[3]: # this function just loads the data from files, there is no need to understand
    ↪ how it does it.
def load_json_file_named(file_name):
    try:
        loaded_data = []
        file_location = f"../data/{file_name}"
        with open(file_location, 'r') as file: # or f"data/{file_name}"
            ↪ depending on your files
        loaded_data = json.load(file)
    except OSError as e:
        print(f"Error. Does the file exist in this folder? {file_location}\n\n{e}")
    ↪ {e}
    return loaded_data

boards_info = load_json_file_named('nhs_boards_24_FIXED.json')
covid_days = load_json_file_named('scotland_covid_days24.json')
```

1.0.3 End of starting code!

2 Report 1: Pattern of Covid Positives in Lothian

2.1 Business Question: Following Christmas vacation, How should *Hogwarts* tighten its grip on ‘foreign’ *wizards*?

2.2 Hogwarts Code:

Studying the datasets, “covid_days” containing disease burden and “boards_info” to identify under which NHS board lies the University of Edinburgh.

```
[4]: # Opening the catalogue! Identifying the number of boards and the information
      ↪ of all boards
print(f"Boards: {len(covid_days)}")

# simplifying the dataset, to identify the keys
covid_days[0].keys()
```

Boards: 749

```
[4]: dict_keys(['date', 'boards', 'scotland'])
```

```
[5]: #from the dataset, 'boards_info', find out where is the city of Edinburgh where
      ↪ the University of Edinburgh lies
city_edinburgh = boards_info[9]['geo']['locations']
edinburgh_board_name = boards_info[9]['name']
print(f"The cities, '{city_edinburgh}' are covered by {edinburgh_board_name}.")
```

The cities, 'City of Edinburgh, East Lothian, Midlothian, West Lothian' are covered by NHS Lothian.

```
[6]: # Track the positive covid cases in the region where Edinburgh lies in December
      ↪ 2021
edinburgh_2021 = [day ['boards']['NHS Lothian']['positive']
                  for day in covid_days
                  if day ['date']['year']== 2021 and
                     day ['date']['month']==12
                  ]
```

```
[7]: # Track the positive covid cases in the region where Edinburgh lies in January
      ↪ 2022
edinburgh_2022 = [day ['boards']['NHS Lothian']['positive']
                  for day in covid_days
                  if day ['date']['year']== 2022 and
                     day ['date']['month']==1
                  ]
```

```
[8]: # Measure the overall positive covid cases in January 2022 in Scotland
scotland_2022 = [
    day ['scotland']['positive']
    for day in covid_days
    if (day ['date']['year']== 2022 and
        day ['date']['month']==1)
]
```

```
[9]: # Measure the overall positive covid cases in December 2021 in Scotland
scotland_2021 = [
    day ['scotland']['positive']
    for day in covid_days
    if day ['date']['year']== 2021 and
        day ['date']['month']==12
]
```

2.3 Hogwarts Visualisation:

Creating a graph comparing positive cases in Lothian with Scotland

```
[10]: # Comparing the postive covid cases before christmas vacation and after,
      ↪between Edinburgh and the entire Scotland

import plotly.graph_objects as go
from plotly.subplots import make_subplots
fig = make_subplots(rows=2, cols=2)
fig.add_trace(go.Scatter(y= scotland_2022, mode="lines",name = "Positive cases in Scotland in January 2022"),row=1, col=2)
fig.add_trace(go.Scatter(y= scotland_2021, mode="lines",name = "Positive cases in Scotland in December 2021"),row=1, col=1)
fig.add_trace(go.Bar(y=edinburgh_2022,name = "Positive cases in Edinburgh in January 2022"),row=1, col=2)
fig.add_trace(go.Bar(y=edinburgh_2021,name = "Positive cases in Edinburgh in January 2022"),row=1, col=1)

fig.update_layout(xaxis_title="Measure of Days", yaxis_title="Number of positive covid cases")

fig.show('notebook')
```

2.4 Hogwarts mini-report:

Reporting patterns and recommendations to the University of Edinburgh The University of Edinburgh(Hogwarts) received a letter from the UK Health Department, providing recommendations about the reopening of the University after Christmas vacation,2021.

Comparing the positive cases before Christmas vacation in the December 2021 and after Christmas

in January 2022, the Health department analysed the positive covid cases in the Scotland and reported it to be alarmingly high with a **corresponding high in the Lothian region where the city of Edinburgh lies**. Therefore, the letter presents recommendations to the University of Edinburgh which has a high number of international students(‘foreign’ wizards), either matriculated or here for a short period as external students.

Recommendations is/are: 1.The University to take measures that no two Schools within the University re-open their academic year on the same week of January 2022. Example, Law school may re-open later than the Health School.

2.The University may also consider rearranging the External Students admissions to the University after the 15th of January, where the number of positive cases prove to fall within controllable limits.

It is on the University to further stringent it’s covid regulations among the students of the University as there is a surge in the number of positive covid cases after the Christmas 2021, as recorded in the first 10 days of January 2022.

(205 words)

3 Report 2: Universal Health in Scotland

3.1 Business Question: Do you think Scotland will attain United Nations Sustainable Development Goal 3: Universal Health Coverage by 2030?

3.2 Universal_Health_Scotland Code:

Studying the dataset, “boards_info”, to identify which NHS boards are understaffed and unable to reach UN SDG: 3: Good Health and Wellbeing

```
[11]: # Loading dataset and seeing the length and types of data in it
boards_info = load_json_file_named('nhs_boards_24_FIXED.json')
print(f'All files loaded. Data length: {len(boards_info)}')
print("Data point:")
pp.pprint(boards_info)
```

All files loaded. Data length: 14

Data point:

```
{'budget_mil': {'2020': 694.9, '2021': 720.0, '2022': 762.4},
 'geo': {'area_km2': 2924,
         'locations': 'East Ayrshire, North Ayrshire, South Ayrshire'},
 'name': 'NHS Ayrshire and Arran',
 'people': {'patients': 369670, 'staff': 9491}},
{'budget_mil': {'2020': 200.6, '2021': 207.7, '2022': 219.8},
 'geo': {'area_km2': 4732, 'locations': 'Scottish Borders'},
 'name': 'NHS Borders',
 'people': {'patients': 115270, 'staff': 2627}},
{'budget_mil': {'2020': 289.1, '2021': 299.1, '2022': 316.1},
 'geo': {'area_km2': 6216, 'locations': 'Dumfries and Galloway'},
 'name': 'NHS Dumfries and Galloway',
 'people': {'patients': 148790, 'staff': 3832}},
{'budget_mil': {'2020': 636.6, '2021': 661.4, '2022': 701.5},
```

```

'geo': {'area_km2': 1235, 'locations': 'Fife'},
'name': 'NHS Fife',
'people': {'patients': 371910, 'staff': 7683}},
{'budget_mil': {'2020': 506.8, '2021': 527.0, '2022': 558.7},
'geo': {'area_km2': 2643, 'locations': 'Clackmannanshire, Falkirk, Stirling'},
'name': 'NHS Forth Valley',
'people': {'patients': 306070, 'staff': 5419}},
{'budget_mil': {'2020': 920.6, '2021': 957.9, '2022': 1013.5},
'geo': {'area_km2': 8736,
'locations': 'Aberdeenshire, City of Aberdeen, Moray'},
'name': 'NHS Grampian',
'people': {'patients': 584550, 'staff': 12952}},
{'budget_mil': {'2020': 2154.5, '2021': 2231.2, '2022': 2364.7},
'geo': {'area_km2': 1106,
'locations': 'City of Glasgow, East Dunbartonshire, East '
'Renfrewshire, Inverclyde, Renfrewshire, West '
'Dunbartonshire'},
'name': 'NHS Greater Glasgow and Clyde',
'people': {'patients': 1174980, 'staff': 38000}},
{'budget_mil': {'2020': 604.3, '2021': 627.5, '2022': 666.0},
'geo': {'area_km2': 32566, 'locations': 'Highland, Argyll and Bute'},
'name': 'NHS Highland',
'people': {'patients': 321800, 'staff': 8564}},
{'budget_mil': {'2020': 1156.1, '2021': 1199.3, '2022': 1268.1},
'geo': {'area_km2': 4732,
'locations': 'North Lanarkshire, South Lanarkshire'},
'name': 'NHS Lanarkshire',
'people': {'patients': 659200, 'staff': 11641}},
{'budget_mil': {'2020': 1384.3, '2021': 1441.5, '2022': 1540.1},
'geo': {'area_km2': 1471,
'locations': 'City of Edinburgh, East Lothian, Midlothian, West '
'Lothian'},
'name': 'NHS Lothian',
'people': {'patients': 897770, 'staff': 21921}},
{'budget_mil': {'2020': 47.7, '2021': 49.6, '2022': 52.6},
'geo': {'area_km2': 989, 'locations': 'Orkney Islands'},
'name': 'NHS Orkney',
'people': {'patients': 22190, 'staff': 565}},
{'budget_mil': {'2020': 48.7, '2021': 50.6, '2022': 53.9},
'geo': {'area_km2': 1467, 'locations': 'Shetland Islands'},
'name': 'NHS Shetland',
'people': {'patients': 22990, 'staff': 598}},
{'budget_mil': {'2020': 734.8, '2021': 762.9, '2022': 808.5},
'geo': {'area_km2': 7527,
'locations': 'Angus, City of Dundee, Perth and Kinross'},
'name': 'NHS Tayside',
'people': {'patients': 416080, 'staff': 11460}},
{'budget_mil': {'2020': 73.0, '2021': 75.7, '2022': 80.0},

```

```
'geo': {'area_km2': 3070, 'locations': 'Outer Hebrides'},
'name': 'NHS Western Isles',
'people': {'patients': 26830, 'staff': 821}}}]
```

```
[12]: # Finding the NHS boards having the Staff:Patient ratio greater than 2.5(as per
↳ the report)
def compare_staff_patients(boards):
    boards_percent = {}
    # Loop through each NHS board in the data
    for board in boards:
        name = board['name']
        staff = board['people']['staff']
        patients = board['people']['patients']

        # Calculate percentage of staff in the patients
        percentage = round((staff / (staff + patients)) * 100, 2)
        # Referring to FAQ about assuming 'Patients' includes 'Staff'
        boards_percent[name] = percentage
    return boards_percent

ratios = compare_staff_patients(boards_info)

# Create the table header
header = f"| {'NHS Board':^35} | {'Staff:Patient Ratio':^15} |"
print(header)
print("-" * len(header)) # Print a separator line

# Iterate through ratios and print each staff-ratio pair in a formatted row
for staff_name, patient_ratio in ratios.items():
    row = f"| {staff_name:^35} | {patient_ratio:^15} |"
    print(row)

print("-" * len(header)) # Print a closing separator line
```

NHS Board	Staff:Patient Ratio
NHS Ayrshire and Arran	2.5
NHS Borders	2.23
NHS Dumfries and Galloway	2.51
NHS Fife	2.02
NHS Forth Valley	1.74
NHS Grampian	2.17
NHS Greater Glasgow and Clyde	3.13
NHS Highland	2.59
NHS Lanarkshire	1.74
NHS Lothian	2.38
NHS Orkney	2.48
NHS Shetland	2.54

	NHS Tayside		2.68	
	NHS Western Isles		2.97	

3.3 Universal_Health_Scotland Visualisation:

Envisaging the status of NHS boards as against the WHO target.

```
[14]: import plotly.graph_objects as go
import plotly.io as pio
pio.renderers.default='notebook'
import pprint as pp

Percentage_Healthcareworkers = list(ratios.values())
names_boards = list(ratios.keys())
vertical_line = go.Scatter(x=[2.5,2.5],y=['NHS Ayrshire and Arran', 'NHS_
↳Western Isles'],
                           mode='lines', name='2.5 HealthWorker Threshold_
↳of WHO', line=dict(color='red', dash='dash'))

fig = go.Figure(
    data=[go.Bar(y=names_boards,
                 x=Percentage_Healthcareworkers,
                 marker_color='blue', orientation='h', name='Healthcare Workers_
↳available' ),vertical_line ],
    layout=go.Layout(
        title=go.layout.Title(text="% of Healthcare Workers")
    )
)

fig.update_layout(xaxis_title="Availability of Healthcare Workers",_
↳yaxis_title="NHS Scotland")

fig.show('notebook')
```

3.4 Universal_Health_Scotland mini-report:

Accounting on the Universal Health status in the interview to a journalist on the occasion of ‘World Health Day’ A Journalist(J) interviews a Junior Data Analyst (JA) at NHS Scotland:

J: Hello Mr.Analyst! Today, April 7th, on the occasion of World Health Day, our *NewspaperHealth* poses this question to the NHS. JA: It is estimated in the report, ‘*Health workforce requirements for universal health coverage and the Sustainable Development Goals*’ by the WHO that **2.5 Healthcare workers / 1000 population** are required to attain Universal Health by the year 2030. From the data clean-up, we have arrived at, which of the Scottish NHS boards will not be able to reach this limit.

J: We are happy to publish the results. Which of them will be able to attain ‘Health for All’ by 2030? JA: Sure. NHS Greater Glasgow and Clyde will be the quickest to reach the goal, even before 2030. There are 8 boards that seem to show more than required staff.

J: Which board witnesses the least staff:patient ratio? JA:NHS Lanarkshire and NHS Forth Valley show the least and is below the prescribed threshold. Therefore it is unlikely to reach Universal Health Coverage by 2030.

J:What are your final words? JA: We strongly suggest the Scotland Government to allocate more funding and personnel to the regions with NHS boards scoring below 2.5.

(205 words)