Hospital Readmission Reduction Program

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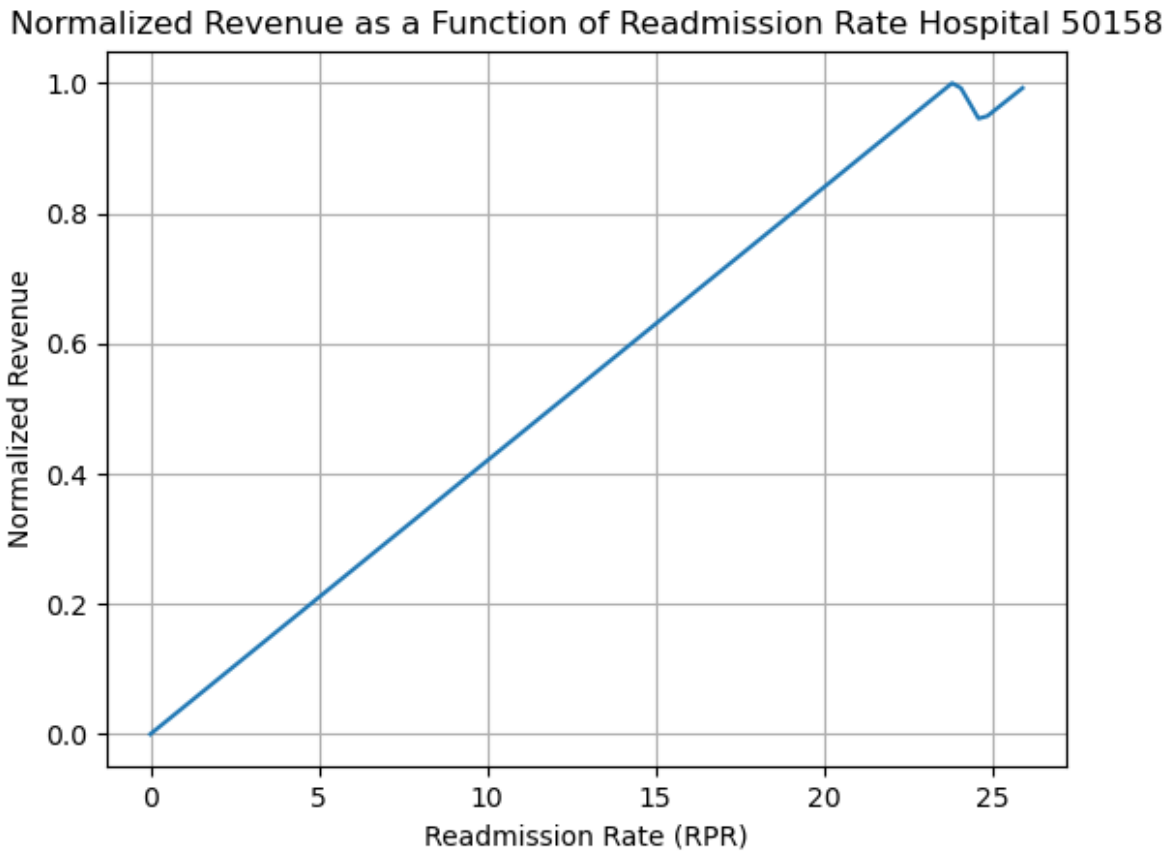
1.

$$Revenue = 1 + RPR - I(RPR > RER) * min(RPR/RER - 1, 0.03) * (1 + RPR) * MedicareFr$$

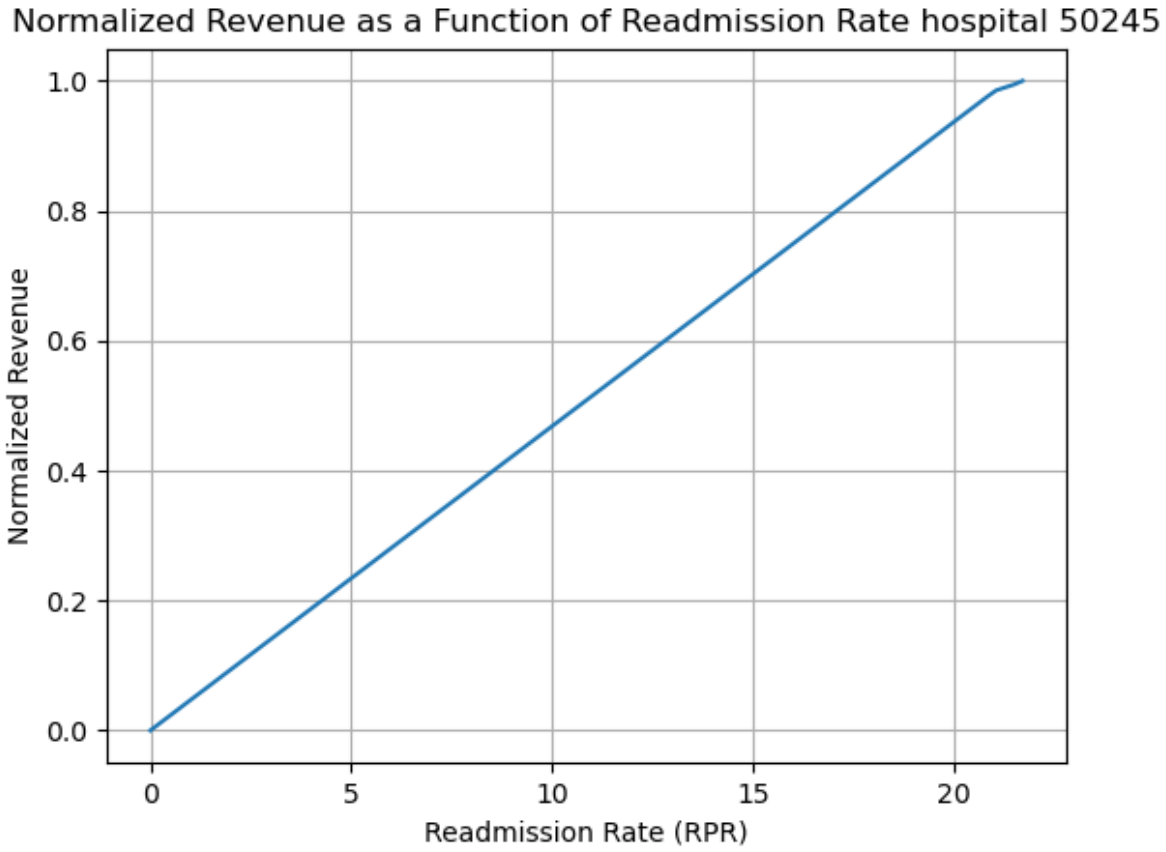
2.

2.1 - 50158



Max Revenue Readmission Rate : 23.82

2.2 - 50245



Max Revenue Readmission Rate : 21.70

Whether the hospitals would be incentivized by the HRRP to reduce readmissions depends on Max Revenue Readmission Rate. It is the readmission rate where hospital can get maximum revenue. When Max Revenue Readmission Rate is lower than RPR, the hospital would reduce readmissions. While not, the hospital would not reduce readmissions.

By graphing hospital 50158's normalized revenue as a function of readmission rate, we can see that the readmission rate for maximum revenue is at 23.82% for 50158. Therefore, it incentivized to reduce actual readmissions (RPR) from 25.91% to 23.82%.

Hospital 50245 is not incentivized by the HRRP penalty to reduce readmissions. The readmission rate of hospital-50245 is at 21.70%, which is already at the maximum revenue point. For 50245, the RPR exceeds RER at a very small margin, as an result, the penalties does not outweigh the revenue loss caused by lesser readmissions.

Hospitals are incentivized to cut down on readmissions only if the money saved from lower HRRP penalties outweighs the increase in revenue due to more readmissions.

3.

In the submitted file, incentivized column indicates whether a hospital is incentivized or not. Totally, there are 41 hospitals would reduce readmissions.

Hospitals with RPR lower than RER provide high-quality care and effective post-discharge support. Data shows that none of the 183 hospitals have achieved this. Therefore, all 183 hospitals have quality problems and require additional support. This statement is also supported by their ERR, which are all greater than one.

Overall, riverside, on average, has the biggest difference in RPR and RER, while hospitals in San Diego performed relatively better than hospitals in other counties.

To see the programme's impact on these filtered hospitals, the effectiveness must be greater than 0, and the larger the number, the more successful the HRRP is. Based on data, only 9 out of 183 hospitals had a positive effect. There was no clear pattern between county and effectiveness. However, 2 out of 4 hospitals in San Diego had a positive impact, and the other two are close to neutral.

In conclusion, hospitals in San Diego generally perform better and are more impacted by the programme.

Appendix

2.

The code of graphing 50245 is the same as 50158, so just append one.

```
import matplotlib.pyplot as plt
import numpy as np

# Constants
MedicareFr = 0.601114273
RER = 23.93809509

# Generate RPR values
RPR_values = np.linspace(0, 25.91125488, 100)

# Calculate normalized revenue for each RPR value
revenue_values = []

for RPR in RPR_values:
    # Formula
    revenue = 1 + RPR/100 - (1 if RPR > RER else 0) * min(RPR / RER - 1, 0.03) * (1
+ RPR/100) * MedicareFr
    revenue_values.append(revenue)

# Normalize revenue values
normalized_revenue_values = (revenue_values - min(revenue_values)) /
(max(revenue_values) - min(revenue_values))

# Plotting the graph
plt.plot(RPR_values, normalized_revenue_values)
plt.xlabel('Readmission Rate (RPR)')
plt.ylabel('Normalized Revenue')
plt.title('Normalized Revenue as a Function of Readmission Rate Hospital 50158')
```

```
plt.grid(True)
plt.savefig('50158.png')
plt.show()

# Find the maximum revenue point and readmission rate
max_revenue_index = np.argmax(normalized_revenue_values)
max_revenue = normalized_revenue_values[max_revenue_index]
corresponding_RPR = RPR_values[max_revenue_index]
print(f"Max Revenue Readmission Rate (RPR): {corresponding_RPR:.2f}")
```

3.

```
import csv
import pandas as pd
data = pd.read_csv('Data.csv')
data['ERR'] = data['RPR']/data['RER']
data['penalty'] =  0
data.loc[data['ERR']>1, 'penalty'] = 1
data['penalty_cap'] = 0
data.loc[(data['penalty']==1) & (data['ERR']-1 < 0.03), 'penalty_cap'] = 1
data['effectiveness'] = 0
data.loc[(data['penalty']==1) & (data['penalty_cap']==1),'effectiveness'] =
data['RER']/100/2 + data['RER']/(2*100*data['MedicareFr']) - 1/2
data['incentivized'] = 0
data.loc[data['RPR']/100 > data['effectiveness'], 'incentivized'] = 1
data.loc[data['effectiveness'] == 0,'incentivized'] = 0
data1 = data[data['incentivized'] == 1]
len(data1)
```