Cost Benefit Analysis

Data Source: https://diabetesjournals.org/care/article/41/5/929/36592/The-Cost-of-Diabetes-Care-An-Elephant-in-the-Room
For conducting the cost benefit analysis based on our predicted model and confusion matrix, we need to understand the cost and benefits associated to our model in the following details-

Incurs Cost/year:

Unnecessary test, treatments and follow-ups **costs** for each patient: We assume this cost would be approx. 20% of their each year costs.

- **Benefits**

Healthcare Savings (Indirect benefits): Reduced costs due to fewer hospitalizations, emergency room visits, and complications related to diabetes.
Productivity Gains (Indirect benefits): Improved workforce productivity due to better diabetes management.
Long-term Savings and contribution for USA economy (Direct benefits): Prevention of diabetes in high-risk individuals leading to long-term healthcare cost savings. As a result unnecessary test, treatments and follow ups money will directly contribute in USA economy from spending 20% of total required each patients cost.

- **Data Points**

From the confusion matrix, we got the following oberservations:
True Positives (TP): 26868 (correctly predicted as having diabetes)
False Positives (FP): 15595 (incorrectly predicted as having diabetes)
True Negatives (TN): 202739 (correctly predicted as not having diabetes)
False Negatives (FN): 8448 (incorrectly predicted as not having diabetes)

- **Assumptions**

Cost per Diabetes Patient: $16752 per year as mentioned in website source
FP Cost: Costs related to unnecessary test, treatment, stress, and follow-up tests.
TP Savings: Savings from early intervention and preventing complications.
Indirect Costs: Productivity loss, quality of life impacts, etc.

- **Calculations**

➢ **Total Costs without the Model**
Current Annual Cost: $ 16752 * 35346 = approx. $592.02 million for diagnosed patients.
➢ **Cost with the Model**

FP Costs: Also let's do an additional cost of $1,000 per FP due to unnecessary treatments and follow-ups.
TP Savings: Assume savings of 20% per TP due to early intervention ($16752 * 20% = $3350.40).

- **Benefit Analysis**

Total Cost Savings: No. of TPs * Savings per TP = 26898×3350.40=$92303814=$90.127 million
Total Additional Costs: No. of FPs * Additional cost per FP= 15595*1000 = 15.555 million

- **Net Benefit**

Net Benefit = Total Cost Savings - Total Additional Costs = $90.127 million - 15.555 million
= approx. $74.532 million

➢ **Total Costs with the new Model** : $592.02-$90.127+15.555 = $517.488 million

Summary:

- Total Annual Cost without the Model: approx. $592.02 million
- Net Benefit of Implementing the Model: approx. $74.532 million

And then Total Annual Cost with the Model: approx. $517.488 million

So if we implement the predictive model for type 2 diabetes, it will reduce the annual cost for diabetes from $592.02 million to $517.488 million, resulting in annual savings of $74.532 million.