AI Boot Camp Project 1 | Team: Phoenix Rising

Medicare Manufacturing: Diabetes Medication

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Project Overview

Project Objective & Scope

Objective: To understand Medicare reimbursement costs for beneficiaries who accessed benefits for Insulin medication covering a period from 2019-2021, viewing this from the vantage point of dosage distribution and how beneficiaries and costs are correlated with cost of living.

Scope: The data set specifically looks at Medicare Part D Spending by Drug from 2019 through 2021. We looked at trends in Insulin distribution costs, beneficiaries, dosage amounts for the top four insulin medications. ['Insulin Glulisine','Insulin Lispro', 'Insulin Aspart','Insulin Regular, Human']

Project Overview

Goals/Questions to be addressed

- Who distributed the most insulin through medicare? Top 5 Insulin Producers
- Which manufacturer(s) spent the most on insulin production? Who's insulin costs the least?
- How much did Medicare spend on insulin for recipients from 2019-2021? How many people were beneficiaries of insulin? What are the differences in the charges to beneficiaries? Have beneficiaries increased or decreased over time? Is the number of beneficiaries going up or down correlated to the cost going either higher or lower?
- Does the spending on insulin variate or not when the cost of living/inflation rises?

Project Overview

Overview of data collection, cleanup and exploration process

- Data sourced from Data.CMS.gov
- Explored what information was in the data, arrived at Insulin as a good set of data to explore
- Why this is important?
- Created dataframes, explored the columns, cut down the years from 2017-2021 to only look at 2019-2021 [Due to missing data for the years in 2017 & 2018 for manufacturers]
- Cleaned up NA's, obtained the dtypes, transformed the data to more user friendly numbers, renamed columns.

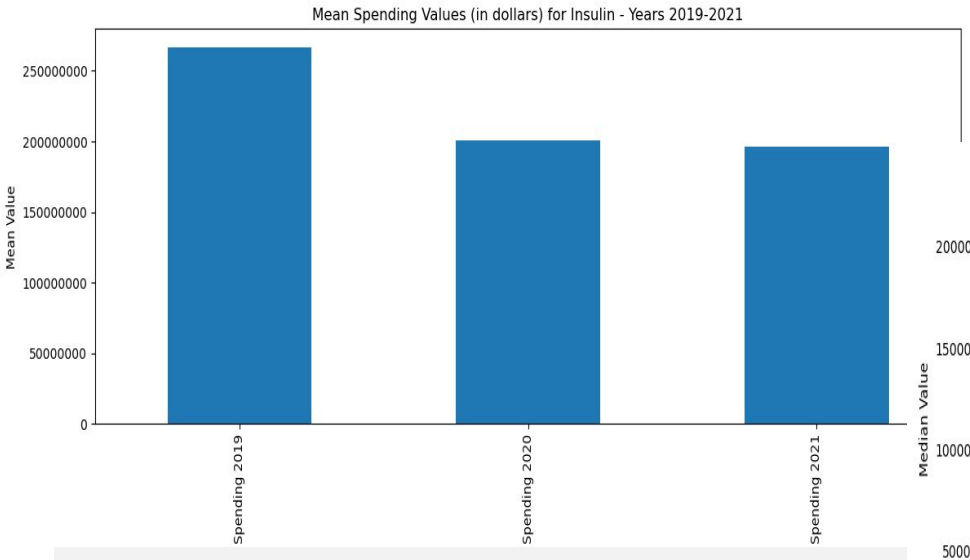
Project Overview

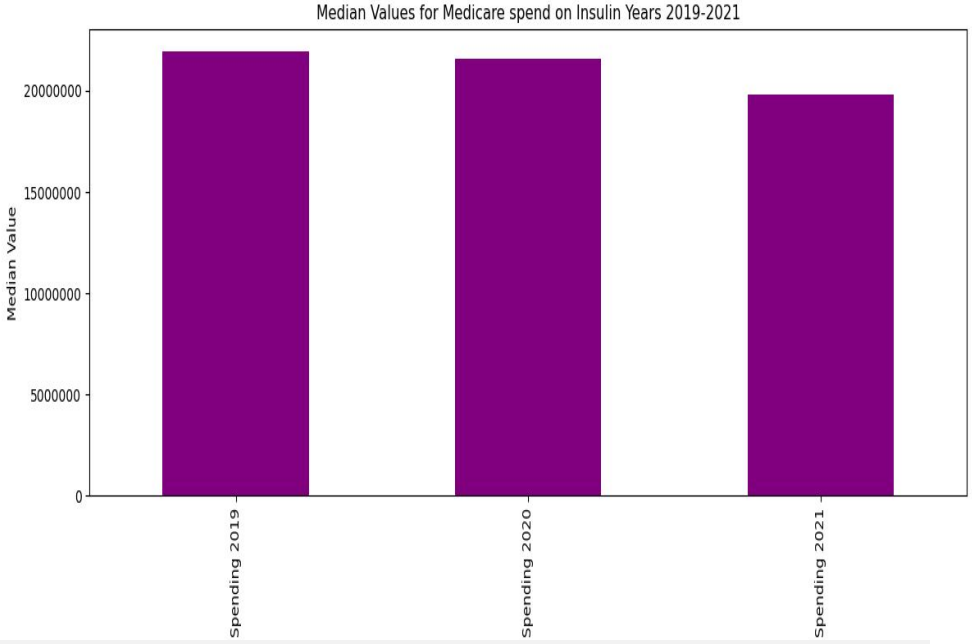
Approach taken to achieve goals

Each year the Pharmaceutical Industry develops a variety of new drugs that provide valuable medical benefits. Many of these drugs are considered expensive and contribute to rising health care costs for the private sector and the federal government. Policymakers have considered policies that would lower drug prices and reduce federal drug expenditures. Such policies have the grave potential to reduce the industry's incentive to develop new drugs.

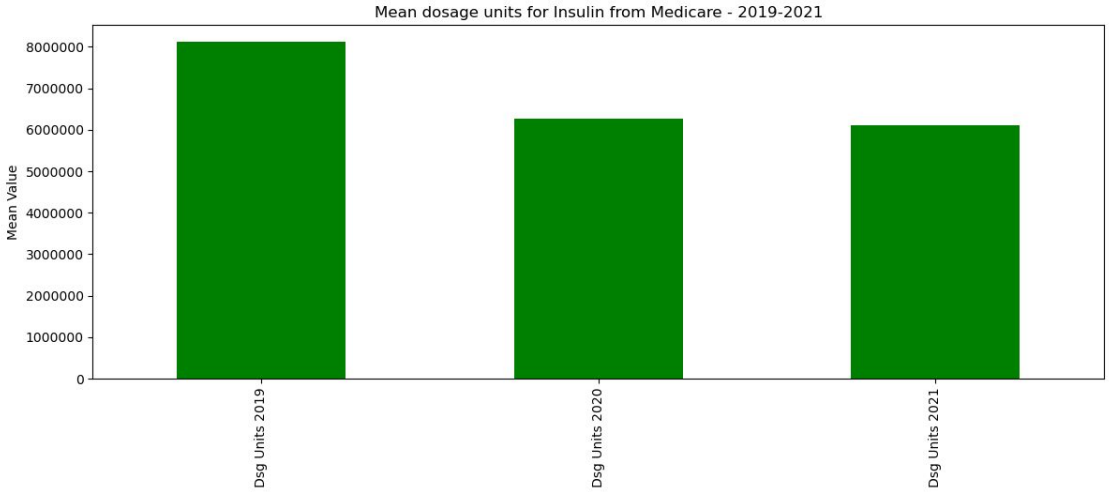
Machine Learning has the ability to address various challenges in the HealthCare Industry and one being Manufacturing and Distribution Cost. Drug discovery has long been one of the most major challenges for Pharmaceutical and Biotech Companies. The expected cost to develop a new drug has been estimated to range from more than $1 to $2 billion.

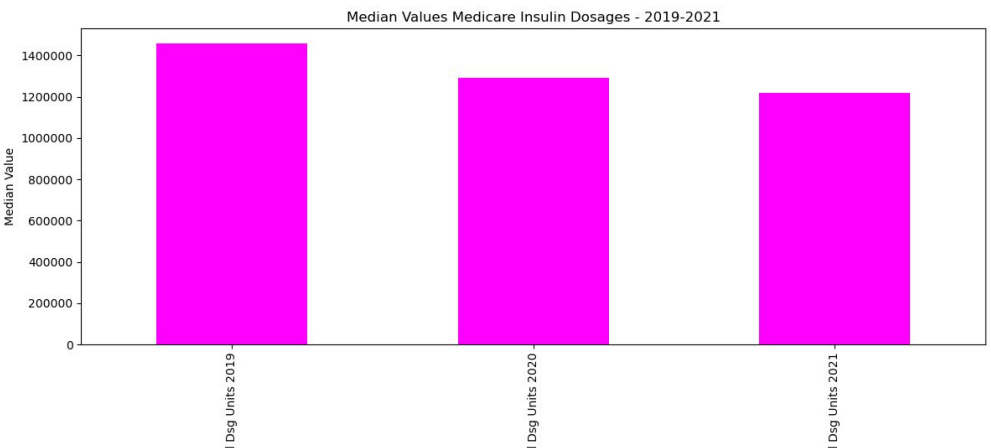
Mean & Median Spending Values



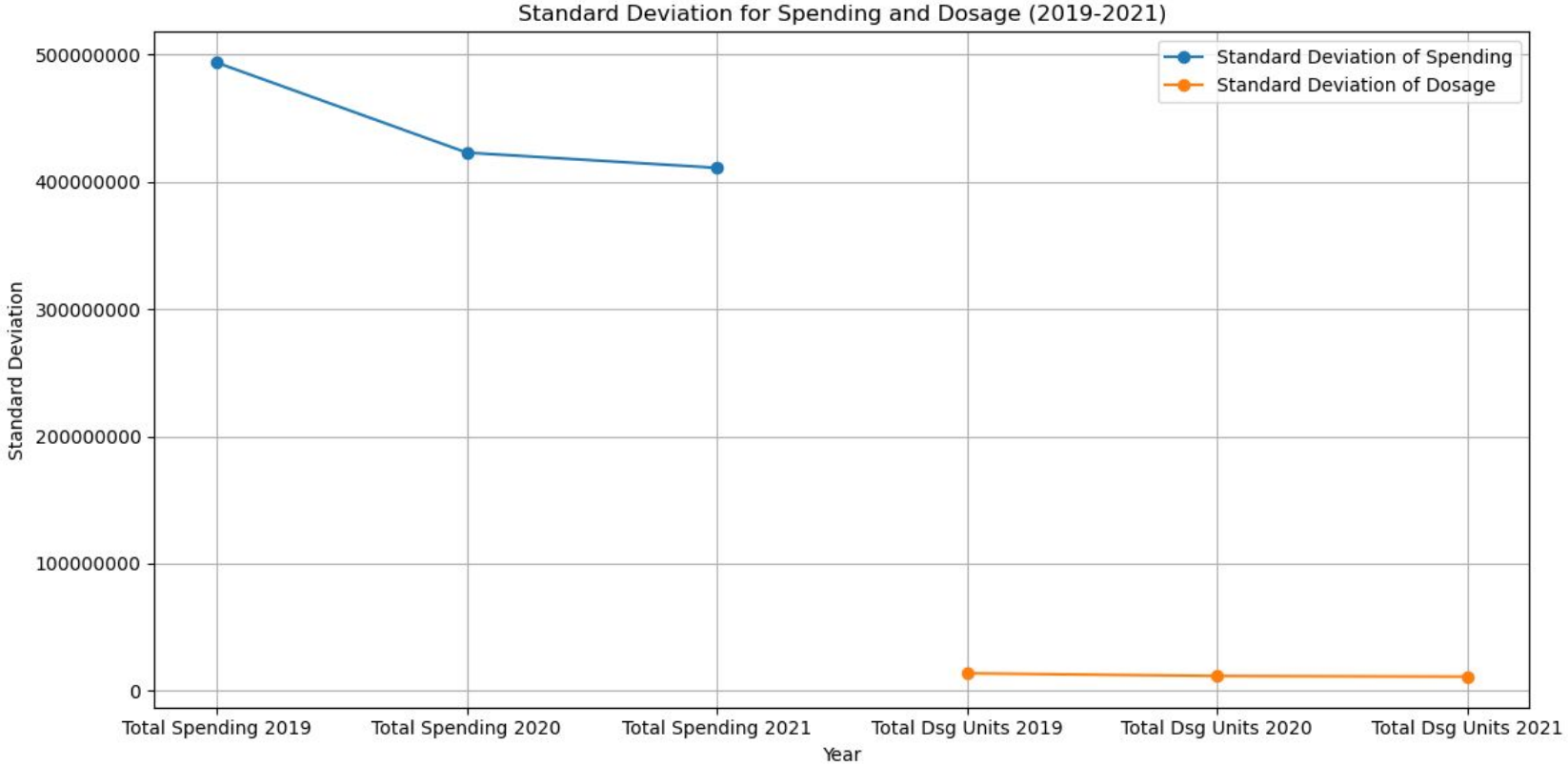


Mean & Median Dosage Values



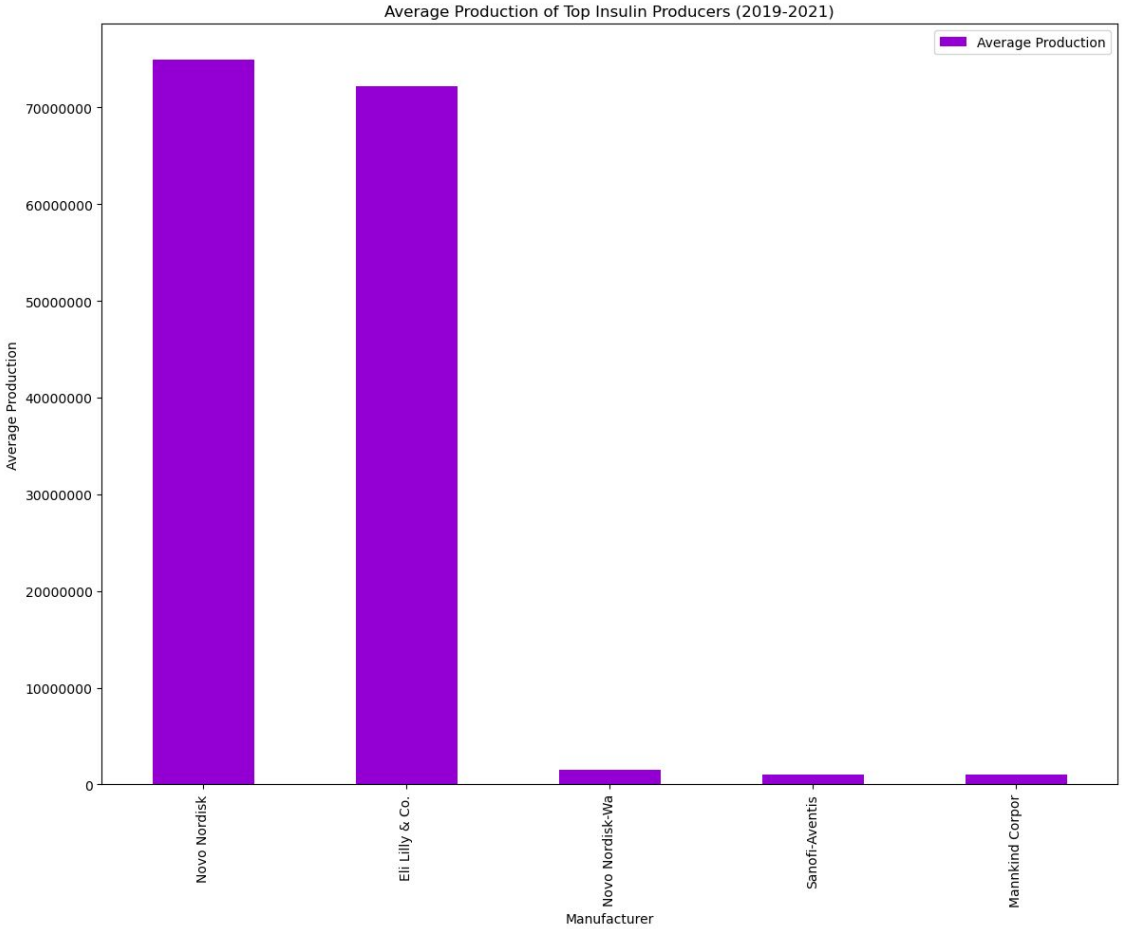


Standard Deviation



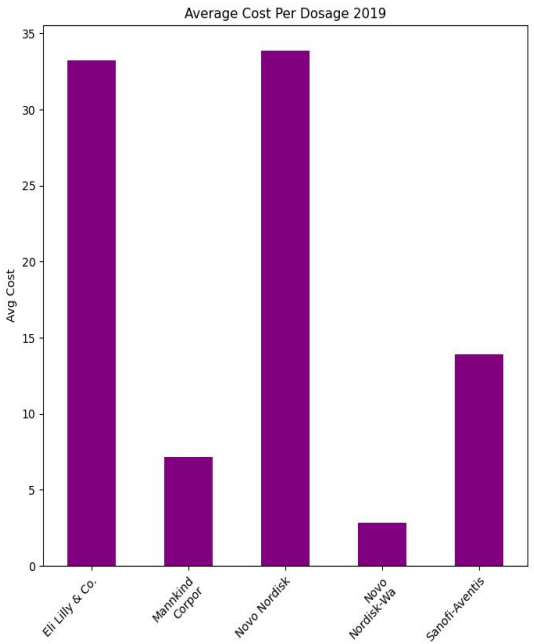
Top Insulin Producers

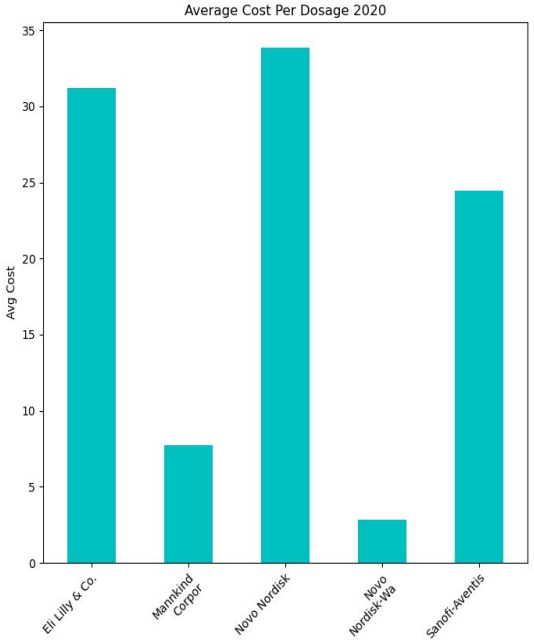
Do Manufacturers benefit from economies of scale to provide cheaper dosage costs?

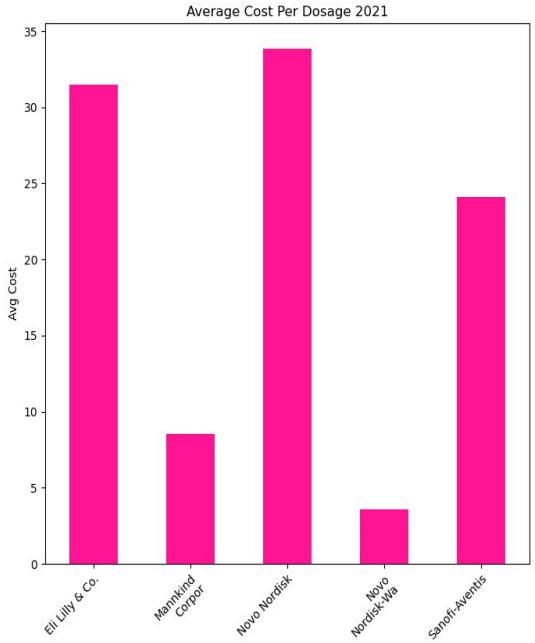


Most & Least Costly Insulin Manufacturer

Most Costly Manufacturers: Eli Lilley & Novo Nordisk
Least Costly Manufacturer: Novo Nordisk-Wa

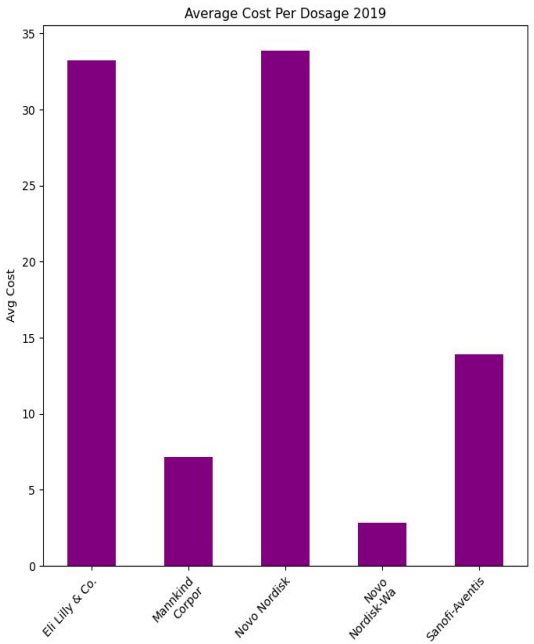


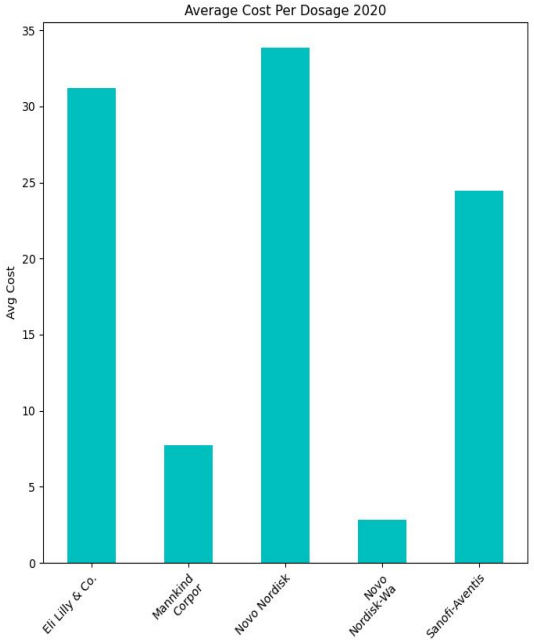


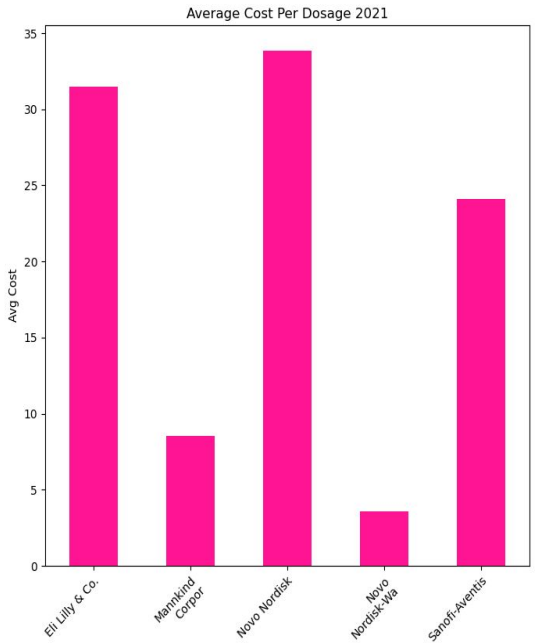


Most and Least Costly Insulin Manufacturer

Most Costly Insulin: Insulin Lispro & Insulin Aspart
Least Costly Insulin: Regular human insulin

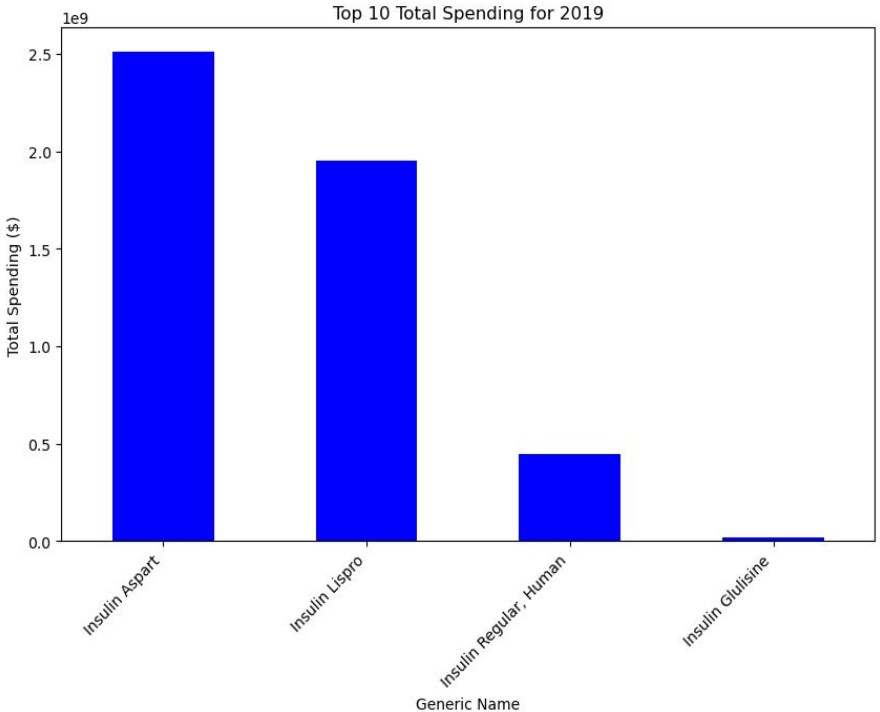


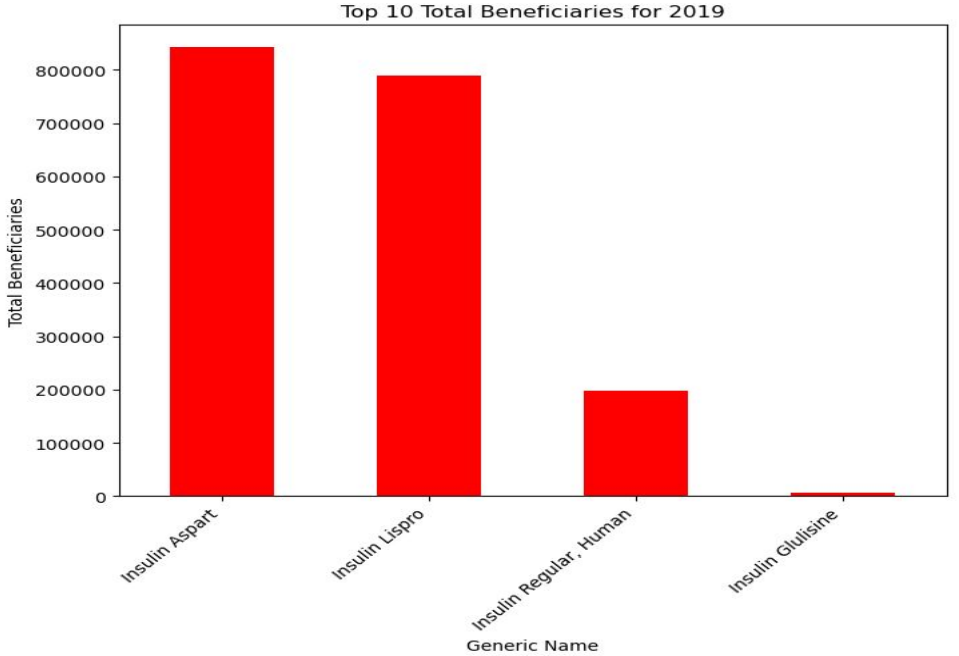




Spending by Insulin type

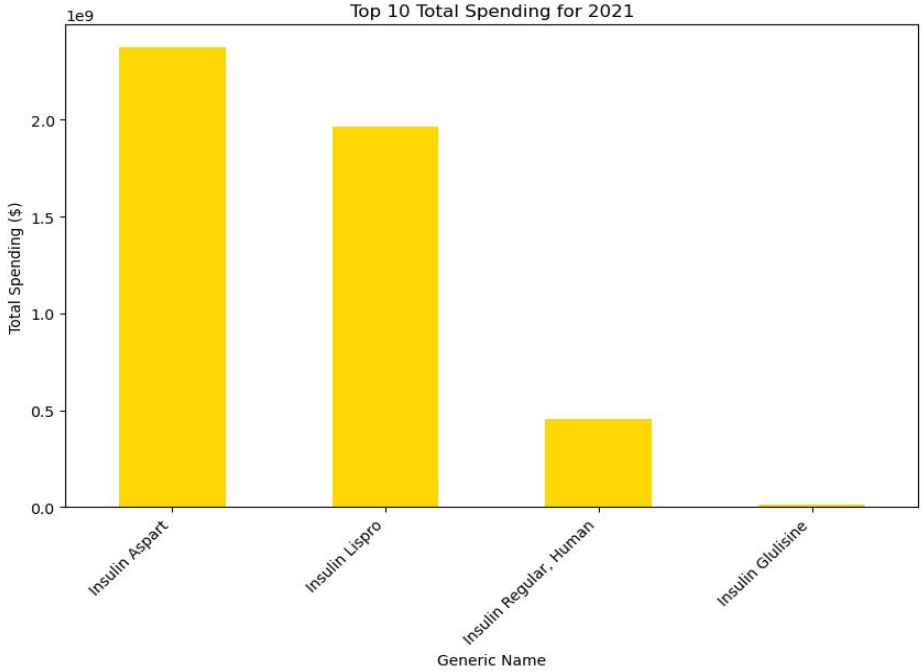
2019 Charts

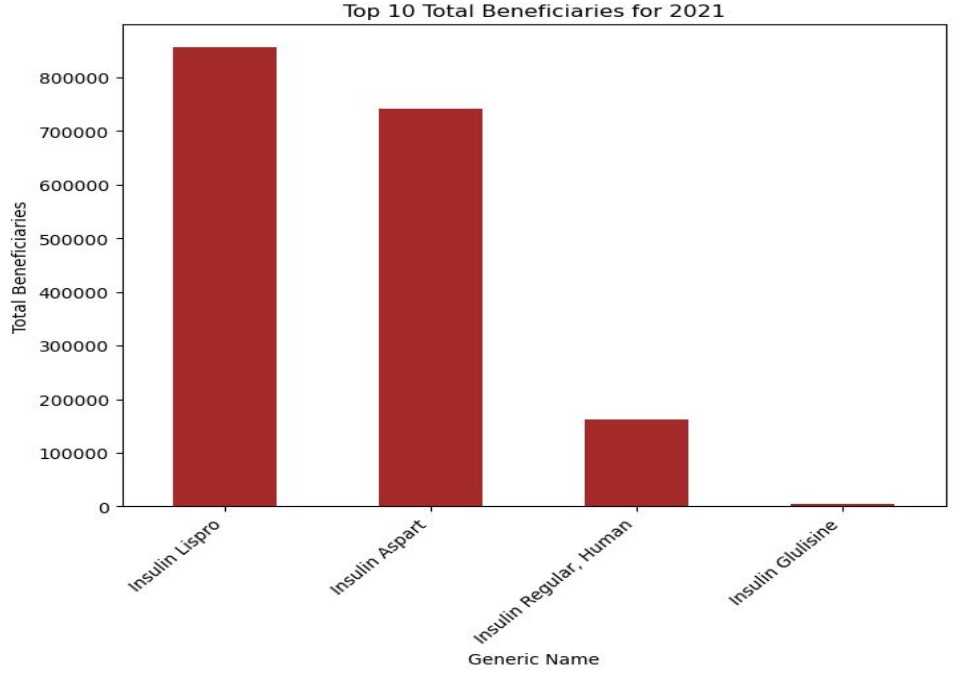




Spending by Insulin type

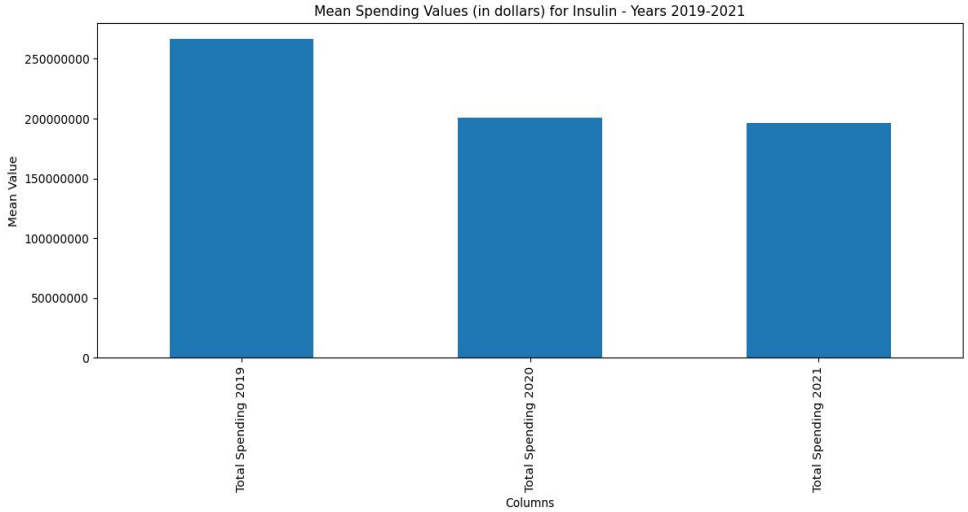
2021 Charts

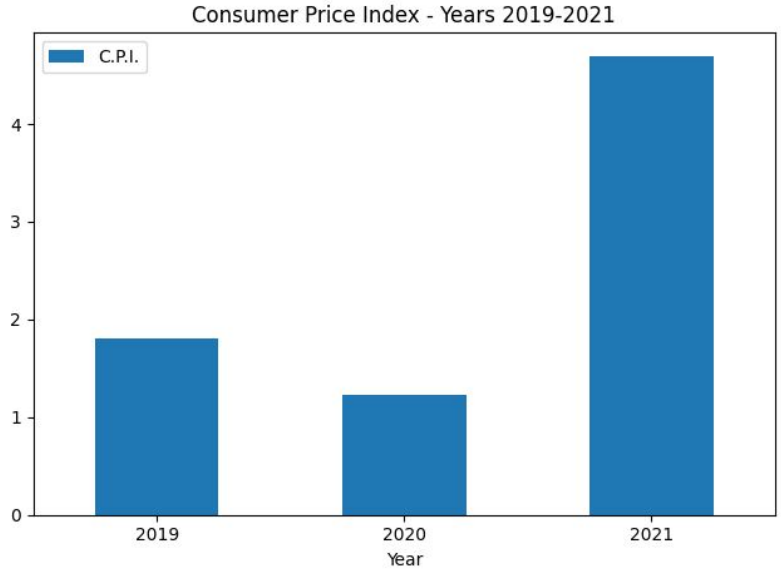


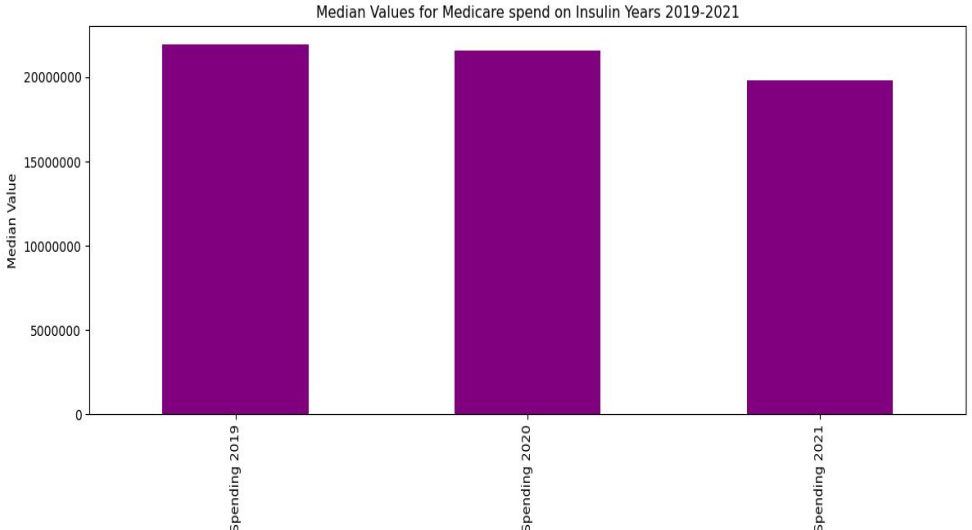


Inflation index data

We can see from plotted data that while inflation rise the spending with insulin decrease.

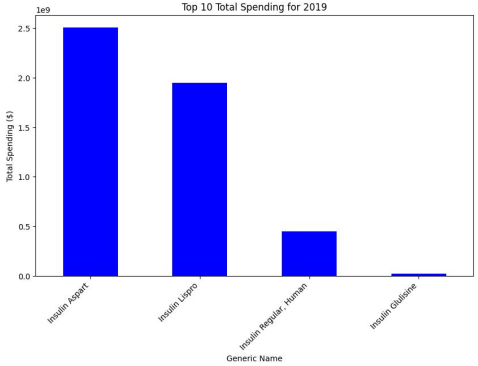


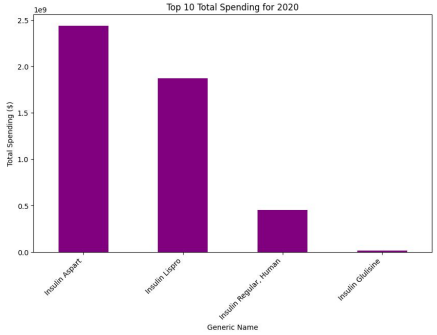


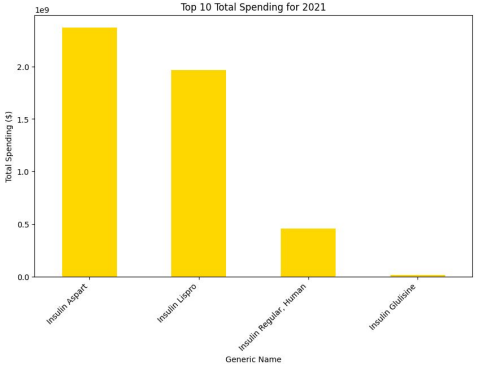


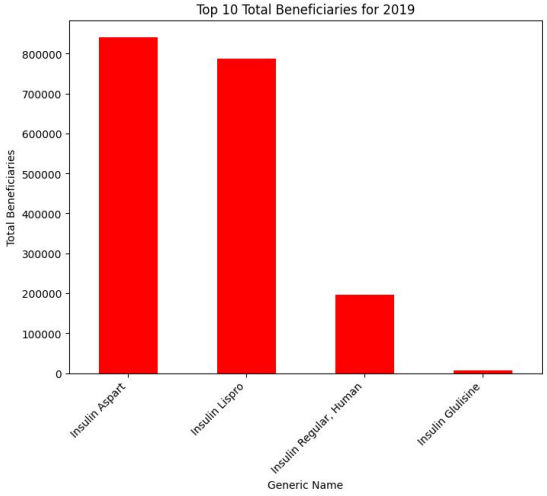
Inflation index data

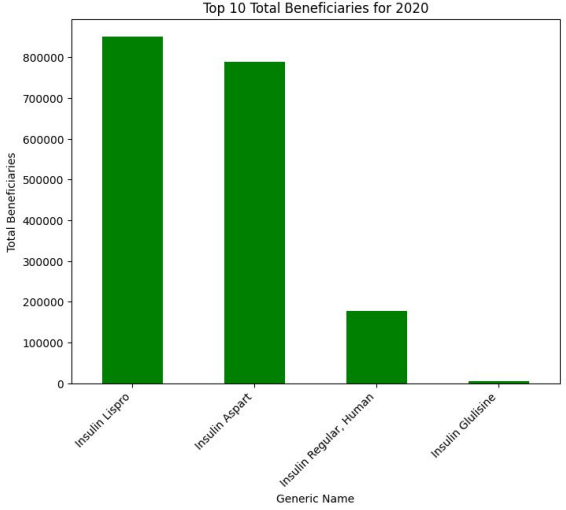
Total beneficiaries decrease between 2019 and 2021. This seem to be the cause for the decrease in spending.

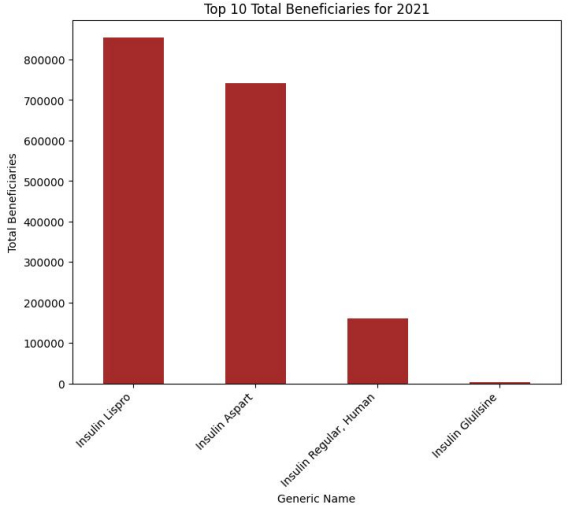












Summary

- The Inflation Reduction Act was signed into Law in 2022 setting annual caps on prescription drugs at $2000 for seniors. This has consequences on the development of and access to medical advances that are critical to addressing unmet needs for patients. Pharma Companies are now rethinking how they invest in R&D leaving those with unmet needs out in the lurch for better and more effective treatment.

- Pricing setting policies are now changing the way that Physicians are administering medications and seniors who were once satisfied with their choices are now facing fewer choices and less robust access to medicines. The results are access barriers to care. Machine learning has the potential to assist Pharma Companies to manufacture and produce newer more advanced medicines in a much more efficient way thereby allowing cost to decrease and fit the needs of government spending.

Problems Encountered

Finding a dataset

Narrowing down the questions

Size of the dataset & endless insulin types

Accurate comparison

Future Considerations

- Cost projections - what would manufacturing costs look like 1 year down the line based on historical data
- Covid impact - based on covid cases what impact did that have on manufacturing costs for insulin production, potentially how many years would it take to recover
- If artificial intelligence can accelerate research for manufacturing costs, what impact would that have on costs to government and customers.
- More data is need in order to explore why there is a decrease in spending while there is a rise of inflation, other than decrease of total beneficiaries.