Nopioid: Identifying High-Residual Opioid Prescription Providers

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Introduction

The Center for Disease Control and Prevention estimates that around 68% of the more than 70,200 drug overdose deaths in 2017 involved an opioid. Studies estimate that opioid related harm costs the US about $78 billion annually. Therefore, it is important to minimize the risks involved in opioid related medication.

Existing public visualizations show opioid prescription trends at the **county and state level**. These visualizations fail to offer insight at the **provider level**.

Objectives

1) Determine which US medical providers are writing above expected levels of opioid prescriptions

2) Provide insights into what factors are driving provider prescription rates

Data

- 1.1 million providers (rows)
- High cardinality attributes (50+ levels)
- Managing many data sources
  - Center for Medicare and Medicaid Services
  - Census Bureau
  - NPI National Registry

Goals / Outcomes

- ✓ Targeted efforts in education and awareness
- ✓ Efficient provider audits
- ✓ Reduce opioid prescriptions

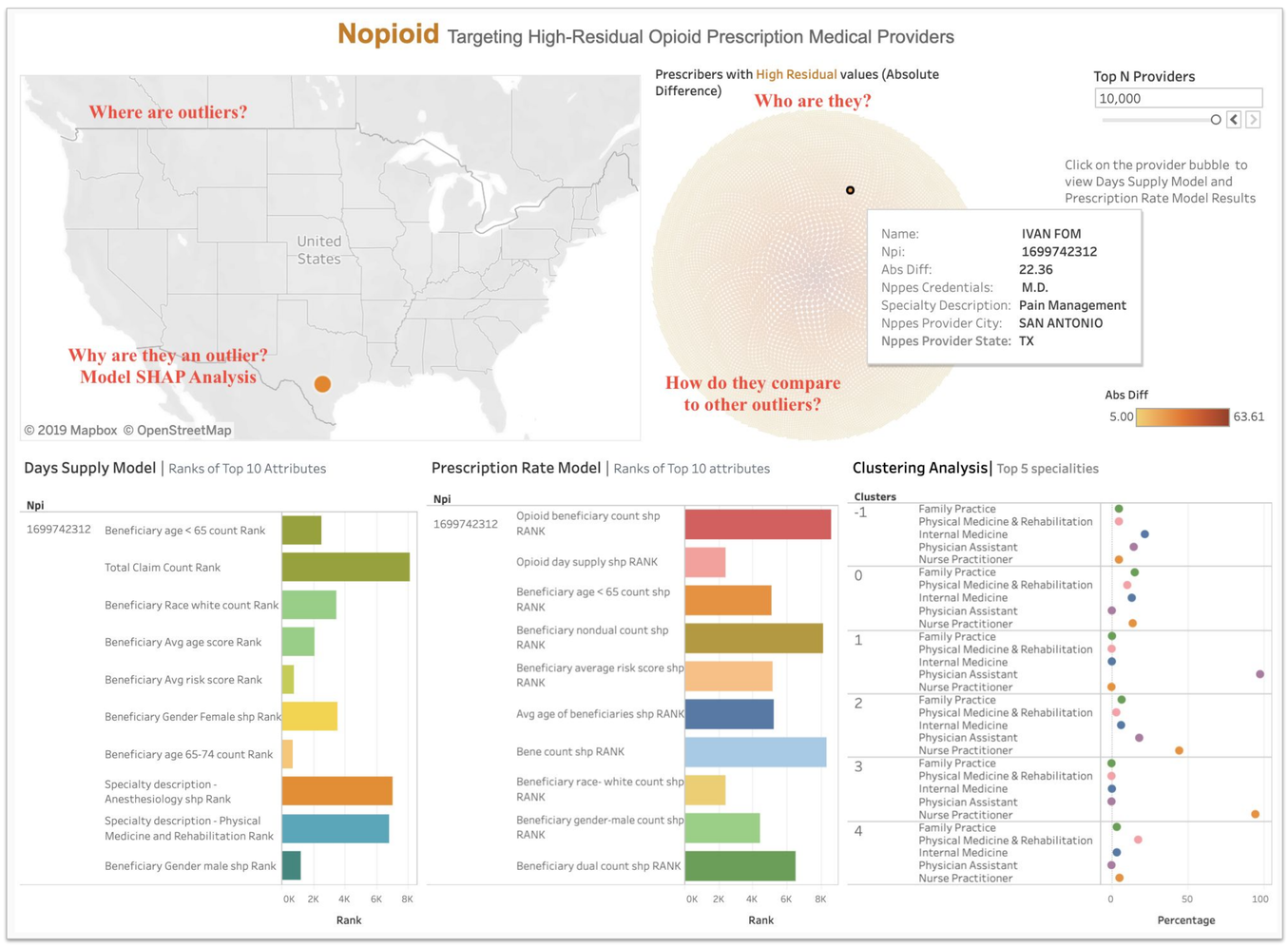
Approach

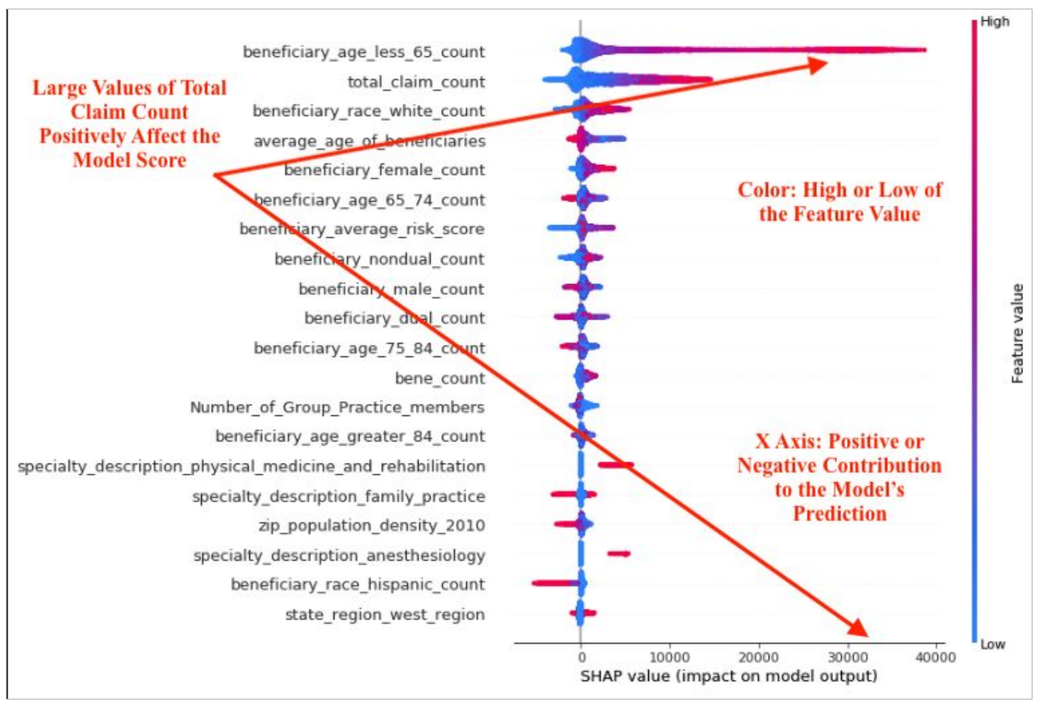
1. Acquire data via download + API. Clean and store in sqlite database
2. Model both provider opioid days supply and prescription rate using Gradient Boosting Trees Regression
3. Calculate SHAPLEY values for each prediction
4. Tableau visualization for easy user consumption

Results

Innovative visualization

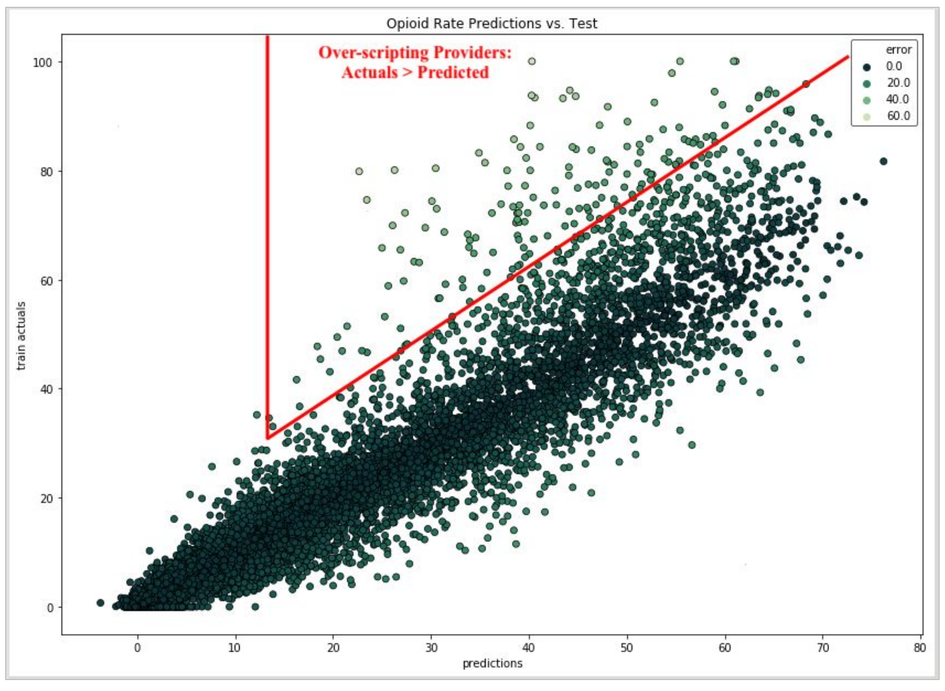
- High residual outliers across multiple dimensions
- All results pivot and filter interactively
  - Who are the outliers
  - Where the outliers are located
  - Why do we think they are outliers (model inference)
  - How do they compare to like peers in the outlier dataset (clustering)





Identifying impactful attributes

- SHAPLEY contributions allow for provider level inference into why the model is giving its individual prediction.
- Gains and costs of each prediction are spread across each feature in the feature-set.
- SHAPLEY interpretation goes a long way to demystify the results of our models traditionally thought of as "black boxes".



Summary

- The opioid insights dashboard expands on existing public visualization of the opioid prescribing trends by offering insights on across complex, multi-dimensional data that covers over a million providers
- Mean Absolute Error: 1.5% for opioid rate model. Higher error in some specialties
- This data product will enable exploration of outliers, and build trust in our solutions by exposing the "why" of our model's predictions