Hospital Inpatient Charges for top 10 DRGs in the U.S.

Springboard's Foundations of
Data Science
Capstone Project Report

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Background

- Centers for Medicare and Medicaid Services (CMS) administers Medicare
- For payment purposes, inpatient stays for patients are divided into groups by means of a statistical classification system known as Diagnosis-related Groups(DRG)
- For every DRG assigned to a given patient, the hospitals are paid a fixed amount for the inpatient services involved by CMS

Client

- The CMS would potentially be interested in knowing whether certain hospitals are overcharging for the same diagnoses as compared to others
- Charges and payments may differ based on a variety of factors
- Based on the analysis of billing and payment information, the CMS would determine whether the payment rates need to be modified for particular providers

Data

Dataset is owned by the US government and is freely available on Data.gov. It is also available on Kaggle.com.

The dataset consists of the following information:

- DRG Code and definition
- Provider ID and Name
- Provider Street Address
- Provider City
- Provider State
- Provider Zip Code
- Hospital Referral Region Description
- Total Discharges
- Average Covered Charges
- Average Total Payments
- Average Medicare Payments

Goal and Objectives

Goal:

To gain insights into the inpatient billing and payment information so as to aid the CMS in making policy decisions related to payment rates assigned per DRG for each provider

Objectives:

1. To determine the distribution of charges for particular DRGs across states
2. Visualize the differences in charges for DRGs across states
3. To assess the differences in Medicare reimbursement for the top 10 billed DRGs across states

Data Wrangling

- Fairly clean dataset
- No missing values or outliers
- Variable names were trimmed
- Some character variables were converted to numeric

Summary information

Variable Name	Mean	Minimum Value	Maximum Value
Average Covered Charges	$36,134	$2,459	$929,119
Average Medicare Payments	$8,494	$1,149	$154,621
Average Total Payments	$9,707	$2,673	$156,158
Total Discharges	43	11	3383

10 Costliest DRGs

870 - SEPTICEMIA OR SEVERE SEPSIS W MV 96+ HOURS

207 - RESPIRATORY SYSTEM DIAGNOSIS W VENTILATOR SUPPORT 96+ HOURS

853 - INFECTIOUS & PARASITIC DISEASES W O.R. PROCEDURE W MCC

329 - MAJOR SMALL & LARGE BOWEL PROCEDURES W MCC

246 - PERC CARDIOVASC PROC W DRUG-ELUTING STENT W MCC OR 4+ VESSELS/STENTS

460 - SPINAL FUSION EXCEPT CERVICAL W/O MCC

238 - MAJOR CARDIOVASC PROCEDURES W/O MCC

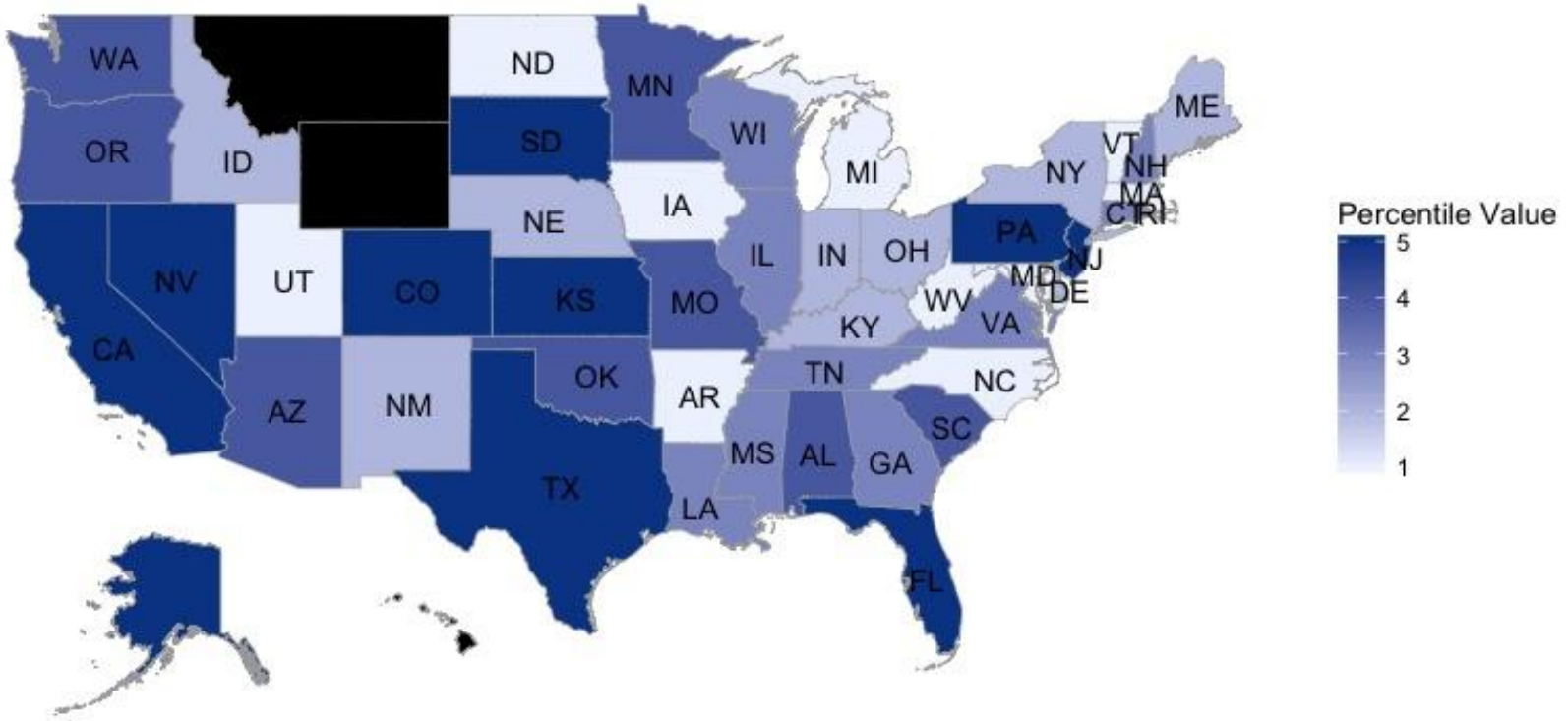
252 - OTHER VASCULAR PROCEDURES W MCC

469 - MAJOR JOINT REPLACEMENT OR REATTACHMENT OF LOWER EXTREMITY W MCC

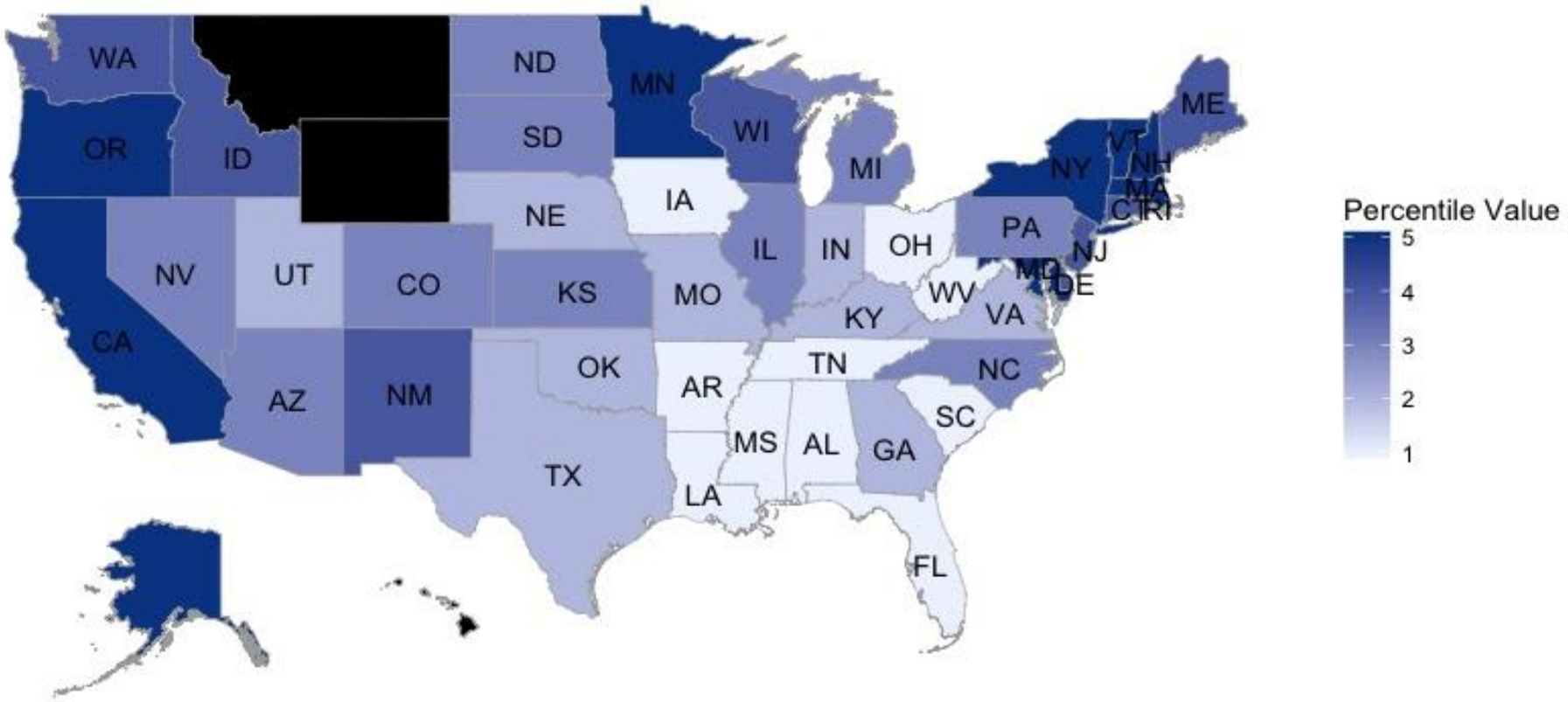
480 - HIP & FEMUR PROCEDURES EXCEPT MAJOR JOINT W MCC

Heat map displaying average covered charges by state for top billed DRGs

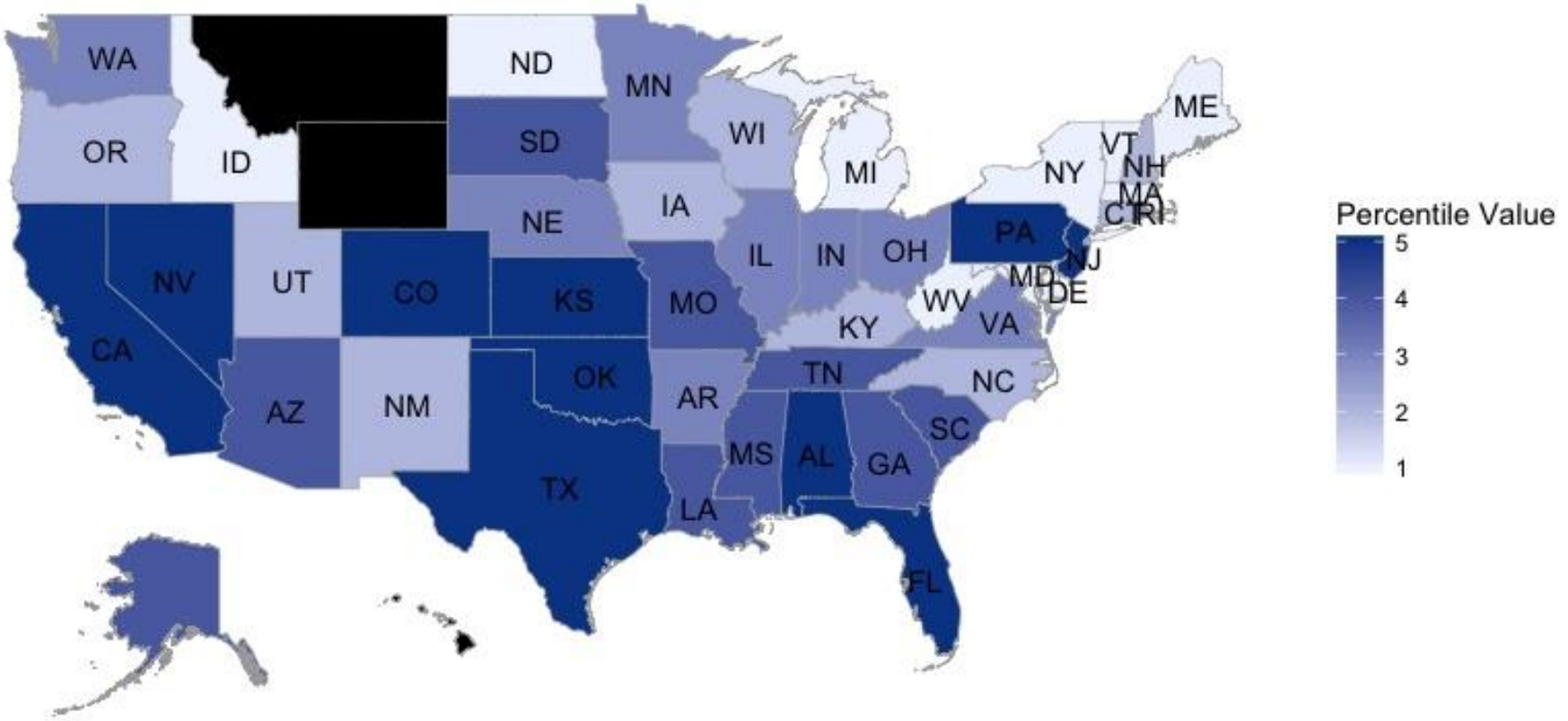
Mapping average covered charges by state for DRG 870



Mapping average medicare payments for top billed DRG (870)



Mapping percentage difference in covered charges and medicare payments for top billed DRG (870)



Limitations

- No information about characteristics of these hospitals, such as teaching hospital/ community hospital, primary/secondary/tertiary center, population served, etc.
- Cross-sectional data prevents the ability to trend the reimbursement discrepancy (or other outcomes) over time or the factors affecting such trends

Conclusions

- As the regulatory authority responsible for health care payments, CMS would be interested in the regional differences as well as differences across DRGs in billed charges and reimbursements.
- Mapping these differences using the above techniques provide an intuitive way of assessing such discrepancies and distributing resources appropriately.
- Such data can also inform policy decisions when deciding reimbursements for particular DRGs as well as healthcare budgets.

Future Work

- Additional data related to provider characteristics and trends will enable us to explain the variability in reimbursement using linear regression and time series analysis.
- This will help the CMS make more informed policy decisions.

Acknowledgements

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