

QMSS Final Project

The Physician Compare website was created by the Centers for Medicare & Medicaid Services (CMS) in December 2010 as required by the Affordable Care Act (ACA) of 2010 to help patients assess and find doctors and hospitals. This dataset contains the information supplied to patients via that website, including patient satisfaction surveys and performance scores across over 100 metrics.

Looking at individual physician scores:

- MIPS
- Performance by measure category
- Organization MIPS

Possible problems to solve:

- Prediction of whether to see a physician based on threshold
- Predict physician score based on all factors (predict MIPS?)
 - classification of whether you should go to a doctor based on MIPS score
 - train on several classification methods to analyze best approach for this data

```
dr_scores <- read.csv("full_doctor_scoring.csv", sep = ",", na = "NA")
head(dr_scores)
```

```
##      PAC_id Professional.Enrollment.ID last_name first_name Gender
## 1 4385734086          I20071219000090   KANTER    DAVID      F
## 2 7214189315          I20121219000307  GOTESMAN  ALEXANDER    M
## 3 6507956612          I20071213000113  HARTMAN   MATTHEW      M
## 4 8325134752          I20110720000797  NASAJPOUR HOSSEIN      M
## 5 8325216575          I20180518001359  MCCOPPIN  HOLLY        F
## 6 9133275274          I20090915000481   JOHN     JAYASHREE F
##      Credential                                Medical.school.name
## 1          <NA>                                           OTHER
## 2          <NA>                                           OTHER
## 3          <NA>          UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE
## 4          <NA>          UNIVERSITY OF FLORIDA COLLEGE OF MEDICINE
## 5          <NA> UNIVERSITY OF MISSOURI, COLUMBIA SCHOOL OF MEDICINE
## 6          <NA>                                           OTHER
##      Graduation.year          Primary.specialty Num.Secondaries
## 1          1998 PHYSICAL MEDICINE AND REHABILITATION          0
## 2          1999                                UROLOGY          0
## 3          2002                DIAGNOSTIC RADIOLOGY          0
## 4          2003    PLASTIC AND RECONSTRUCTIVE SURGERY          0
## 5          2006                                DERMATOLOGY          0
## 6          1984                                PSYCHIATRY          0
##      Group.Practice.PAC.ID State
## 1          8123911500    NY
## 2          9032293709    NJ
## 3          8426364738    PA
## 4          4385876655    MS
## 5          1456329655    CO
## 6          8729381033    GA
```

| ## | Organization.legal.name | Score_Source_Org | | | |
|------|--|-------------------------------|-----------------------------|----------------|---------------|
| ## 1 | PHYSICAL MEDICINE and REHAB MEDICAL SERVICE GROUP | group | | | |
| ## 2 | LAKEWOOD UROLOGY LIMITED LIABILITY COMPANY | group | | | |
| ## 3 | ALLEGHENY CLINIC RADIOLOGY | group | | | |
| ## 4 | SOUTH CENTRAL CLINICS, INC | group | | | |
| ## 5 | LAKE LOVELAND DERMATOLOGY PC | group | | | |
| ## 6 | ST FRANCIS PHYSICIAN PRACTICES LLC | group | | | |
| ## | Quality_Score_Org | ACI_Score_Org | IA_Score_Org | MIPS_Score_Org | |
| ## 1 | 100 | 100 | 40 | 100.00 | |
| ## 2 | 0 | 0 | 0 | 0.00 | |
| ## 3 | 100 | 0 | 40 | 100.00 | |
| ## 4 | 0 | 0 | 20 | 7.50 | |
| ## 5 | 0 | 0 | 0 | 0.00 | |
| ## 6 | 0 | 0 | 10 | 3.75 | |
| ## | Score_Source_Dr | Quality_Score_Dr | ACI_Score_Dr | IA_Score_Dr | MIPS_Score_Dr |
| ## 1 | group | 100.0 | 100 | 40 | 100.0 |
| ## 2 | individual | 67.0 | 0 | 0 | 40.2 |
| ## 3 | group | 100.0 | N/A | 40 | 100.0 |
| ## 4 | individual | 69.2 | 100 | 40 | 81.5 |
| ## 5 | individual | 72.6 | 100 | 40 | 83.6 |
| ## 6 | individual | 22.9 | N/A | 0 | 19.5 |
| ## | Age.Related.Macular.Degeneration..AMD. | Biopsy.Follow.Up | Care.Plan | | |
| ## 1 | | NA | NA | | |
| ## 2 | | NA | NA | | |
| ## 3 | | NA | NA | | |
| ## 4 | | NA | NA | | |
| ## 5 | | NA | NA | | |
| ## 6 | | NA | NA | | |
| ## | Colorectal.Cancer.Screening | Coronary.Artery.Disease..CAD. | Diabetes | | |
| ## 1 | NA | | NA | | |
| ## 2 | NA | | NA | | |
| ## 3 | NA | | NA | | |
| ## 4 | NA | | NA | | |
| ## 5 | NA | | NA | | |
| ## 6 | NA | | NA | | |
| ## | Diabetes.Mellitus | Diabetic.Retinopathy | | | |
| ## 1 | NA | NA | | | |
| ## 2 | NA | NA | | | |
| ## 3 | NA | NA | | | |
| ## 4 | NA | NA | | | |
| ## 5 | NA | NA | | | |
| ## 6 | NA | NA | | | |
| ## | Documentation.of.Current.Medications.in.the.Medical.Record | e.Prescribing | | | |
| ## 1 | | NA | | | |
| ## 2 | | 100 | | | |
| ## 3 | | NA | | | |
| ## 4 | | NA | | | |
| ## 5 | | NA | | | |
| ## 6 | | NA | | | |
| ## | Falls | Functional.Outcome.Assessment | Health.Information.Exchange | | |
| ## 1 | NA | | NA | | |
| ## 2 | NA | | NA | | |
| ## 3 | NA | | NA | | |
| ## 4 | NA | | NA | | |

| | | | |
|------|---|--|----|
| ## 5 | NA | NA | NA |
| ## 6 | NA | NA | NA |
| ## | Medication.Reconciliation | Medication.Reconciliation.Post.Discharge | |
| ## 1 | | NA | NA |
| ## 2 | | NA | 67 |
| ## 3 | | NA | NA |
| ## 4 | | 64 | NA |
| ## 5 | | NA | NA |
| ## 6 | | NA | NA |
| ## | Melanoma Nuclear.Medicine | Pain.Assessment.and.Follow.Up | |
| ## 1 | NA | NA | NA |
| ## 2 | NA | NA | 96 |
| ## 3 | NA | NA | NA |
| ## 4 | NA | NA | NA |
| ## 5 | NA | NA | NA |
| ## 6 | NA | NA | NA |
| ## | Patient.Specific.Education | | |
| ## 1 | | NA | |
| ## 2 | | NA | |
| ## 3 | | NA | |
| ## 4 | | 78 | |
| ## 5 | | 88 | |
| ## 6 | | NA | |
| ## | Pneumococcal.Vaccination.Status.for.Older.Adults | | |
| ## 1 | | NA | |
| ## 2 | | NA | |
| ## 3 | | NA | |
| ## 4 | | NA | |
| ## 5 | | NA | |
| ## 6 | | NA | |
| ## | Post.Anesthetic.Transfer.of.Care.Measure | | |
| ## 1 | | NA | |
| ## 2 | | NA | |
| ## 3 | | NA | |
| ## 4 | | NA | |
| ## 5 | | NA | |
| ## 6 | | NA | |
| ## | Prevention.of.Central.Venous.Catheter..CVC....Related.Bloodstream.Infections | | |
| ## 1 | | | NA |
| ## 2 | | | NA |
| ## 3 | | | NA |
| ## 4 | | | NA |
| ## 5 | | | NA |
| ## 6 | | | NA |
| ## | Prevention.of.Post.Operative.Nausea.and.Vomiting..PONV....Combination.Therapy | | |
| ## 1 | | | NA |
| ## 2 | | | NA |
| ## 3 | | | NA |
| ## 4 | | | NA |
| ## 5 | | | NA |
| ## 6 | | | NA |
| ## | Preventive.Care.and.Screening Primary.Open.Angle.Glaucoma..POAG. | | |
| ## 1 | | 74 | NA |
| ## 2 | | 80 | NA |

| | | |
|------|---|-----|
| ## 3 | NA | NA |
| ## 4 | NA | NA |
| ## 5 | NA | NA |
| ## 6 | 99 | NA |
| ## | Provide.Patient.Access Radiation.Consideration.for.Adult.CT Radiology | |
| ## 1 | NA | NA |
| ## 2 | NA | NA |
| ## 3 | NA | 100 |
| ## 4 | 85 | NA |
| ## 5 | 54 | NA |
| ## 6 | NA | NA |
| ## | Screening.for.Osteoporosis.for.Women.Aged.65.85.Years.of.Age | |
| ## 1 | | NA |
| ## 2 | | NA |
| ## 3 | | NA |
| ## 4 | | NA |
| ## 5 | | NA |
| ## 6 | | NA |
| ## | Secure.Messaging Tobacco.Use.and.Help.with.Quitting.Among.Adolescents | |
| ## 1 | NA | NA |
| ## 2 | NA | NA |
| ## 3 | NA | NA |
| ## 4 | 2 | NA |
| ## 5 | 24 | NA |
| ## 6 | NA | NA |
| ## | Urinary.Incontinence View..Download..or.Transmit..VDT. avg.perf | |
| ## 1 | NA | NA |
| ## 2 | 95 | NA |
| ## 3 | NA | NA |
| ## 4 | NA | 5 |
| ## 5 | NA | 17 |
| ## 6 | NA | NA |

Potential Methods for Binary Classification:

Using overall MIPS for individuals where MIPS ≥ 75 , the positive payment adjustment threshold.

- could apply spline to other MIPS, ACI scorings since they're somewhat discrete in nature.
 - ACI ≥ 0 : clinician reported ACI category
 - ACI ≥ 50 : clinician achieved base score for ACI
 - MIPS < 30 : Negative Payment Adjustment
- Predictive MIPS ≥ 75 , essentially.
- Methods to try:
 - glmnet for binary classification (elastic model/penalized logit)
 - glm logit model with polynomials?
 - tree model if we can make it work? (Single Tree, Random Forest, Boosting, Dbarts???)
 - PLSDA or LDA
- PCA to look at similar variables? like an inverted version