Usage of Mental Health Services

Jonathon Bowyer

Metis Project 3

Motivations and Objectives

- Question: Are there people who need mental health help but aren't utilizing services?
  - Barriers: Stigma, Cultural, Monetary
- Modeling: Of the people who could benefit from mental health services, who's actually utilizing them?
  - Can we find predictive factors for utilization? Are there groups of people routinely underutilizing?
- Actionable Goal: Can we find at-need populations that aren't utilizing mental health services?

Data

- National Survey on Drug Use and Health
  - 55,000 people randomly sampled based on geographic density
  - ~2600 columns, ~5500 rows
  - 840 paged codebook!

- Each question was coded differently
  - Yes/No: 1 or 2
  - Bucketed: Age as 1 – 7,
  - Discrete particulars: Marital Status as 1 = married, 2 = widowed, 3 = separated, 4 = never married, 99 = skip

- All variables were dummied

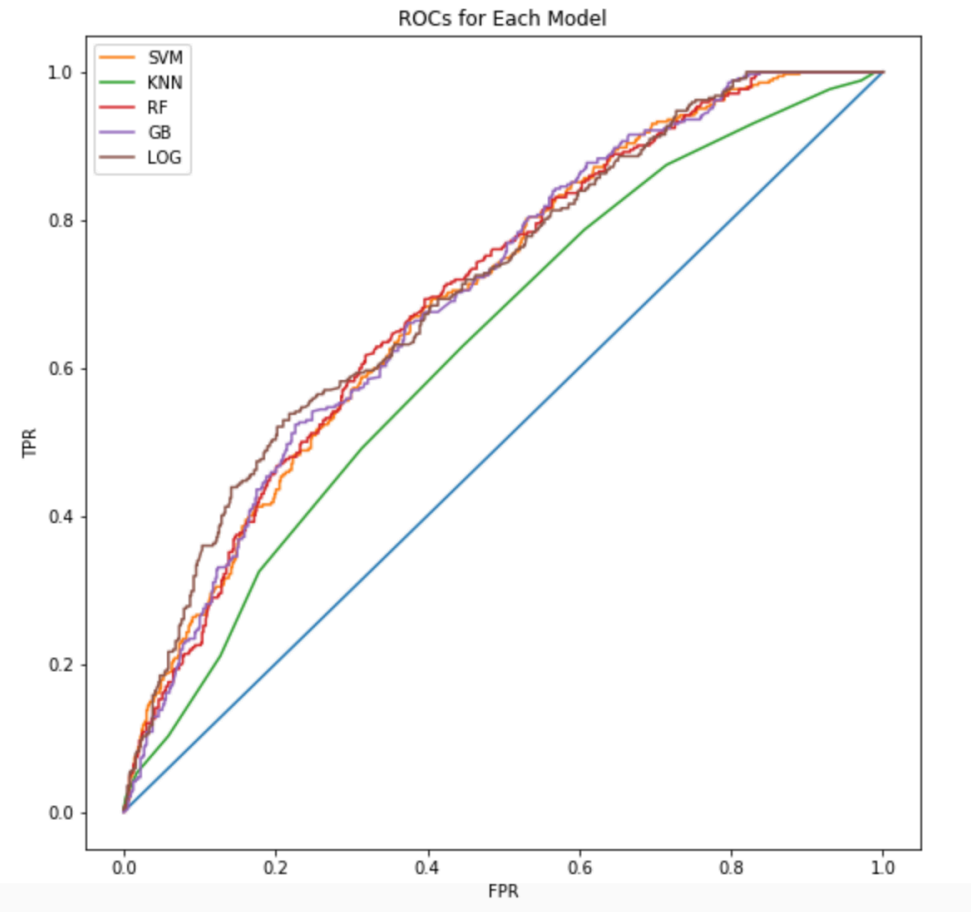
Data Continued

- Depressed criterion: focused on people who have had an MDE (major depressive episode) before in their life *and* who had one in the past year
- Output variable was whether they sought treatment in the past year
- Out of 55,000 people, only ~3,200 people met the 'depressed' criterion

```
TREATEDLY
0     2086
1     1146
dtype: int64
```

Negative (0) = didn't utilize treatment
Positive (1) = utilized treatment

Methodology



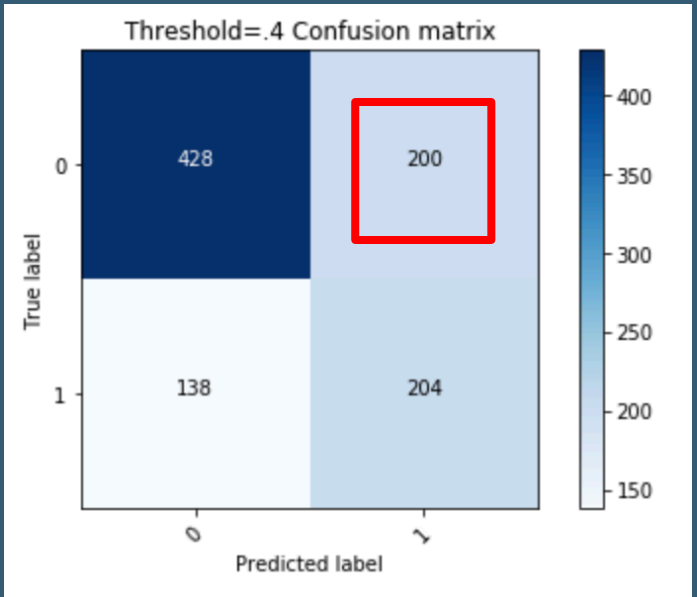
Ran many models and found similar ROC AUCs

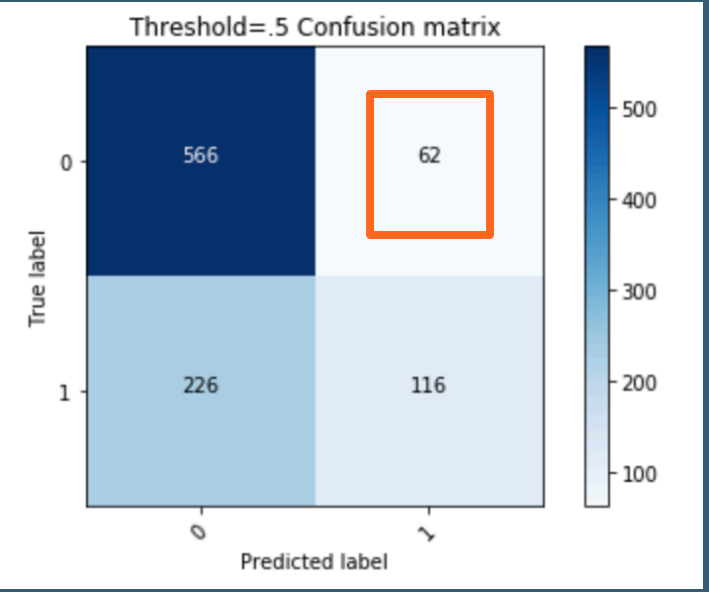
Chose Logistic

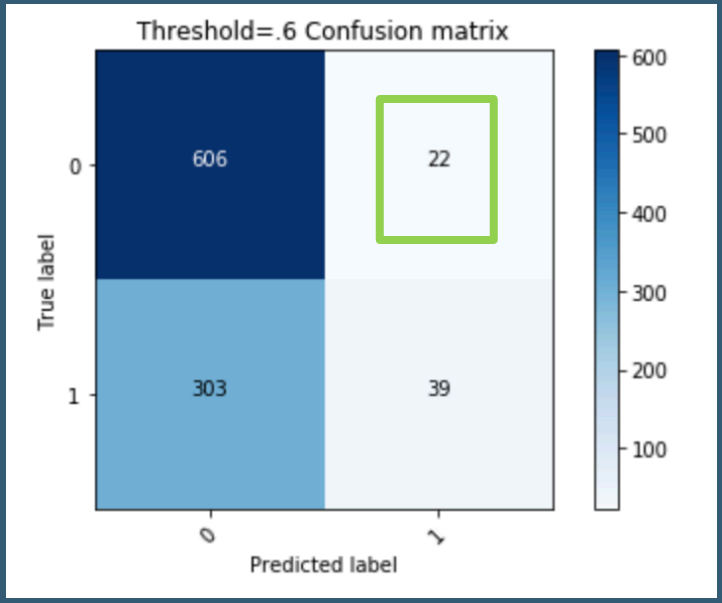
- Simplicity
- Ease of interpretation
- Minimize FPR (most left-kinked)

Model Selection

- When our model predicts, ensure that everyone who didn't utilize gets coded as such. We'd rather have redundancy and encourage people who utilized to continue utilizing than let someone who needs to use MHS go without help
- Statistically, we minimizing false positives, focus on very high recall







Insights

```
'MHSUITHK': 0.6839696488988033,
'NORELIGSERV': -0.13719513181385176,
'ALOTRELIGSERV': 0.053929283076624555,
'RELIGDEC': -0.20826031890604974,
'BISEXUAL': 0.0,
'GAY': -3.284937486874641,
'NTWORKING': 0.2068187942457114,
'PRVINSUR': 0.2525864461553032,
'POVERTY': 0.1989633126871807,
'WEALTHY': 0.010633082322827213,
'MARRIED': -0.14246726847916427,
'SEPARATED': 0.026501843944062218,
'WIDOWED': -0.6187166703097979,
'POORHEALTH': 0.37353152475060447,
'MOVEDONCE': 0.06853184990036704,
'MOVEDMORE': 0.278164431794485,
'YOUNGADULT': -0.44259814522500157,
'TWENTOTHIRT': -0.13842613103884463,
'FIFTOSIX': -0.08524784425920967,
'OVERSIXFIV': -0.5412842588524831,
'FEMALE': 0.5919847128202882,
'BLACK': -0.0771386825731016,
'NATIVE_AM_IS': -0.6102681211731446,
'ASIAN': -1.1109997951595627,
'MULTIRACIAL': -0.33425878592022407,
'HISPANIC': -0.38354753062756336}
```

<u>Target at-risk Groups</u>

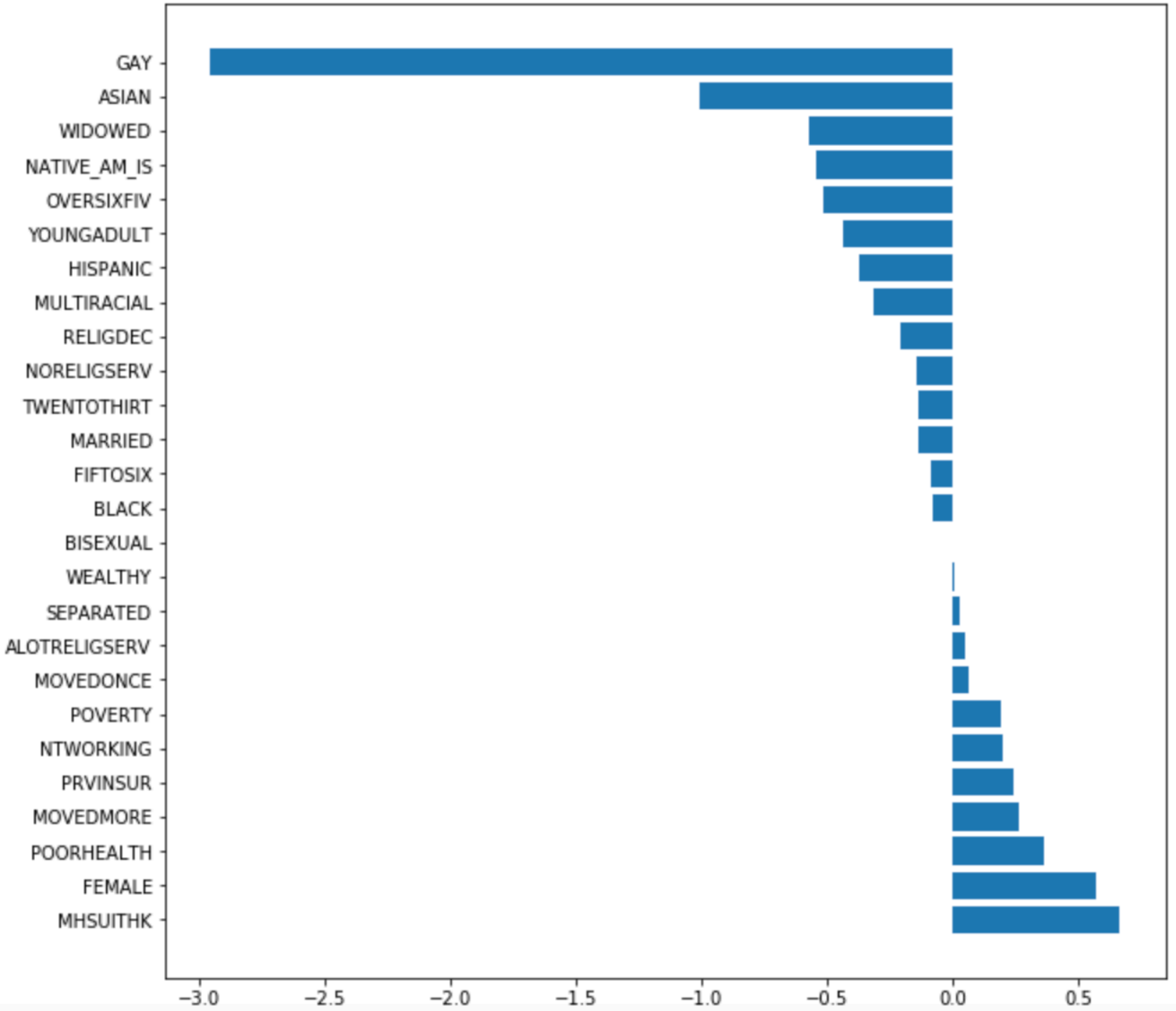
- Suicidal ideation → High utilization
- People who have moved multiple times → High utilization
- Widowed → Low utilization
- Young adults → Low utilization

<u>Access Check</u>

- People below the poverty line aren't less likely to utilize

<u>Social Group Usage</u>

- Men are way less likely to utilize services
- Most minority groups are drastically less likely to utilize, especially gay and asian people
- Confirms the hypothesis, we have actionable groups!


GAY
ASIAN
WIDOWED
NATIVE_AM_IS
OVERSIXFIV
YOUNGADULT
HISPANIC
MULTIRACIAL
RELIGDEC
NORELIGSERV
TWENTOTHIRT
MARRIED
FIFTOSIX
BLACK
BISEXUAL
WEALTHY
SEPARATED
ALOTRELIGSERV
MOVEDONCE
POVERTY
NTWORKING
PRVINSUR
MOVEDMORE
POORHEALTH
FEMALE
MHSUITHK
−3.0
−2.5
−2.0
−1.5
−1.0
−0.5
0.0
0.5

Future Work

- Greater sample sizes
  - Pull in previous years
    - Hard work, survey codes changed frequently
- Look at interactions (when more data available)
  - E.g. are Asian women more likely to utilize services than Asian men?
- Look at other mental health issues
  - Anxiety-based disorders might have an increased barrier to access

Appendix

Depression

- MDEs are defined by periods of at least 2 weeks characterized by low mood, low functionality, etc.
- Depression diagnosis relies on having multiple MDEs
- Have had multiple MDEs so likely to have depression, and had one in the past year so could have likely used treatment in the past year
- Survey asked about mood and functionality directly instead of asking if someone had been diagnosed with depression

Need for more data

FEMALE	TREATEDLY	
0	0	750
	1	308
1	0	1336
	1	838

dtype: int64

ASIAN	TREATEDLY	
0	0	2010
	1	1132
1	0	76
	1	14

dtype: int64

FEMALE	ASIAN	TREATEDLY	
0	0	0	722
		1	305
	1	0	28
		1	3
1	0	0	1288
		1	827
	1	0	48
		1	11

Need for more data cont.

TREATEDLY	0	1
MHSUITHK	610	448
NORELIGSERV	1011	509
ALOTRELIGSERV	352	204
RELIGDEC	1160	661
BISEXUAL	0	0
GAY	322	6
NTWORKING	684	497
PRVINSUR	1162	641
POVERTY	485	311
WEALTHY	1052	564
MARRIED	567	341
SEPARATED	297	224
WIDOWED	61	22
POORHEALTH	409	329
MOVEDONCE	445	239
MOVEDMORE	369	210
YOUNGADULT	857	360
TWENTOTHIRT	457	251
FIFTOSIX	190	126
OVERSIXFIV	68	32
FEMALE	1336	838
BLACK	208	101
NATIVE_AM_IS	35	19
ASIAN	76	14
MULTIRACIAL	107	45
HISPANIC	303	121

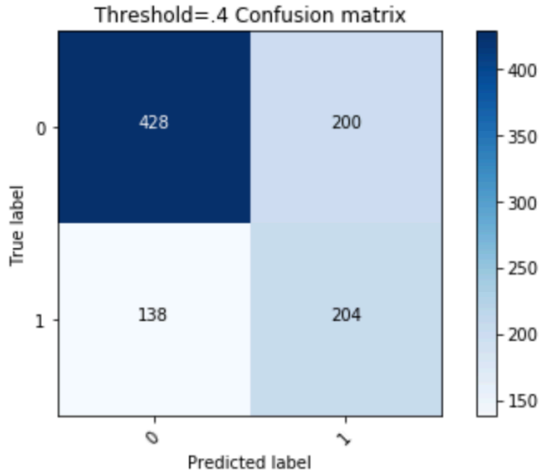
Ideal Log Regression

- $LR = B_0 + B_1x_1 + B_2x_2 + B_3x_3 + ...$
- We're already looking at people who should be getting treatment, so ideally everyone is and none of these groups/characteristics will change the treatment rate
- $LR = 1 + 0*x_1 + 0*x_2 + 0*x_3 + ...$

Recall

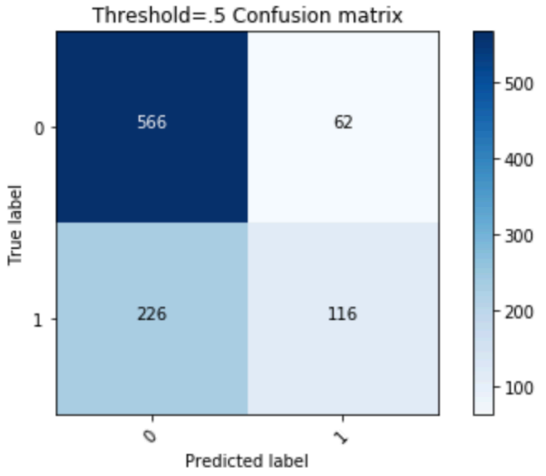
	precision	recall	f1-score	support
0	0.76	0.68	0.72	628
1	0.50	0.60	0.55	342
avg / total	0.67	0.65	0.66	970

```
Confusion matrix, without normalization
[[428 200]
 [138 204]]
```



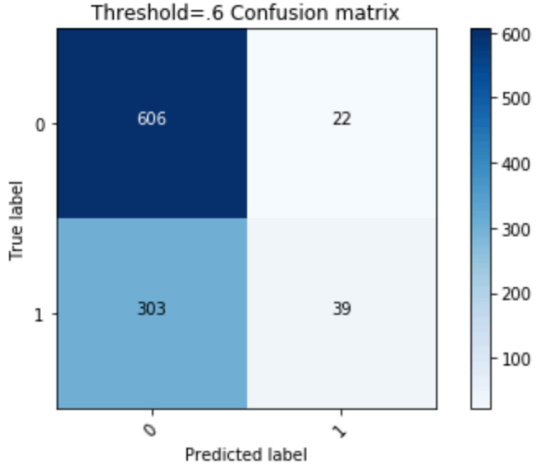
	precision	recall	f1-score	support
0	0.71	0.90	0.80	628
1	0.65	0.34	0.45	342
avg / total	0.69	0.70	0.67	970

```
Confusion matrix, without normalization
[[566  62]
 [226 116]]
```



	precision	recall	f1-score	support
0	0.67	0.96	0.79	628
1	0.64	0.11	0.19	342
avg / total	0.66	0.66	0.58	970

```
Confusion matrix, without normalization
[[606  22]
 [303  39]]
```



AUC

- Log = 0.68
- RF = 0.68
- GB = 0.68
- KNN = 0.62
- SMV = 0.68