

Which children are suicidal in the Western Pacific?

By Karen Ouyang



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Youth Suicides Sound Alarm Across the Pacific

By Catherine Wilson

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Children sit outside an informal housing settlement in Vanuatu. Experts say a lack of economic opportunities is contributing to a wave of youth suicides in the Pacific Islands. Credit: Catherine Wilson/IPS

SYDNEY, Aug 12 2014 (IPS) - Suicide rates in the Pacific Islands are some of the highest in the world and have reached up to 30 per 100,000 in countries such as Samoa, Guam and Micronesia, double the global average, with youth rates even higher.

Goal

Identify **suicidal school-age children** in given Western Pacific countries to improve interventions



Methodology

Data Collection & Cleaning

- World Health Organization Global School Based Student Health Survey
- Wikipedia Country Facts
- SQL to combine tables

Data Analysis

- Pairplots
- Analyze distribution of target
- ~80,000 data points

Baseline Model

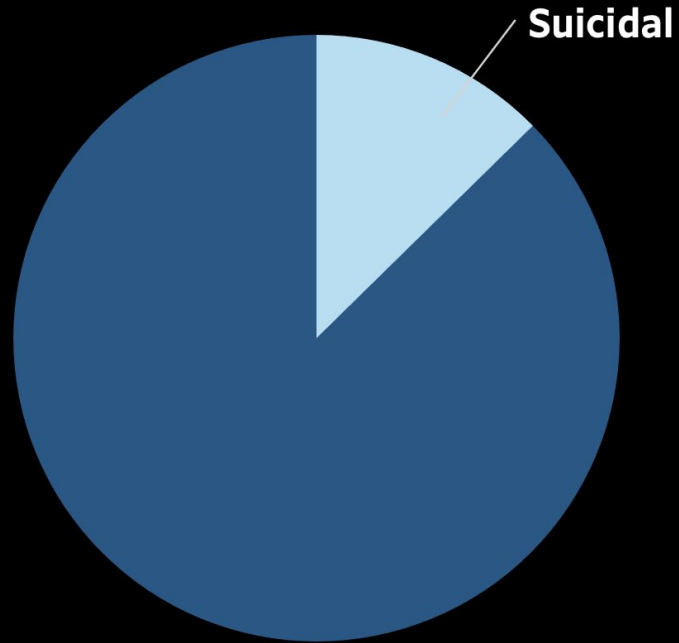
- Logistic Regression with few features

Refine Model

- Logistic Regression vs XGBoost
- Class Weights
- Change decision threshold

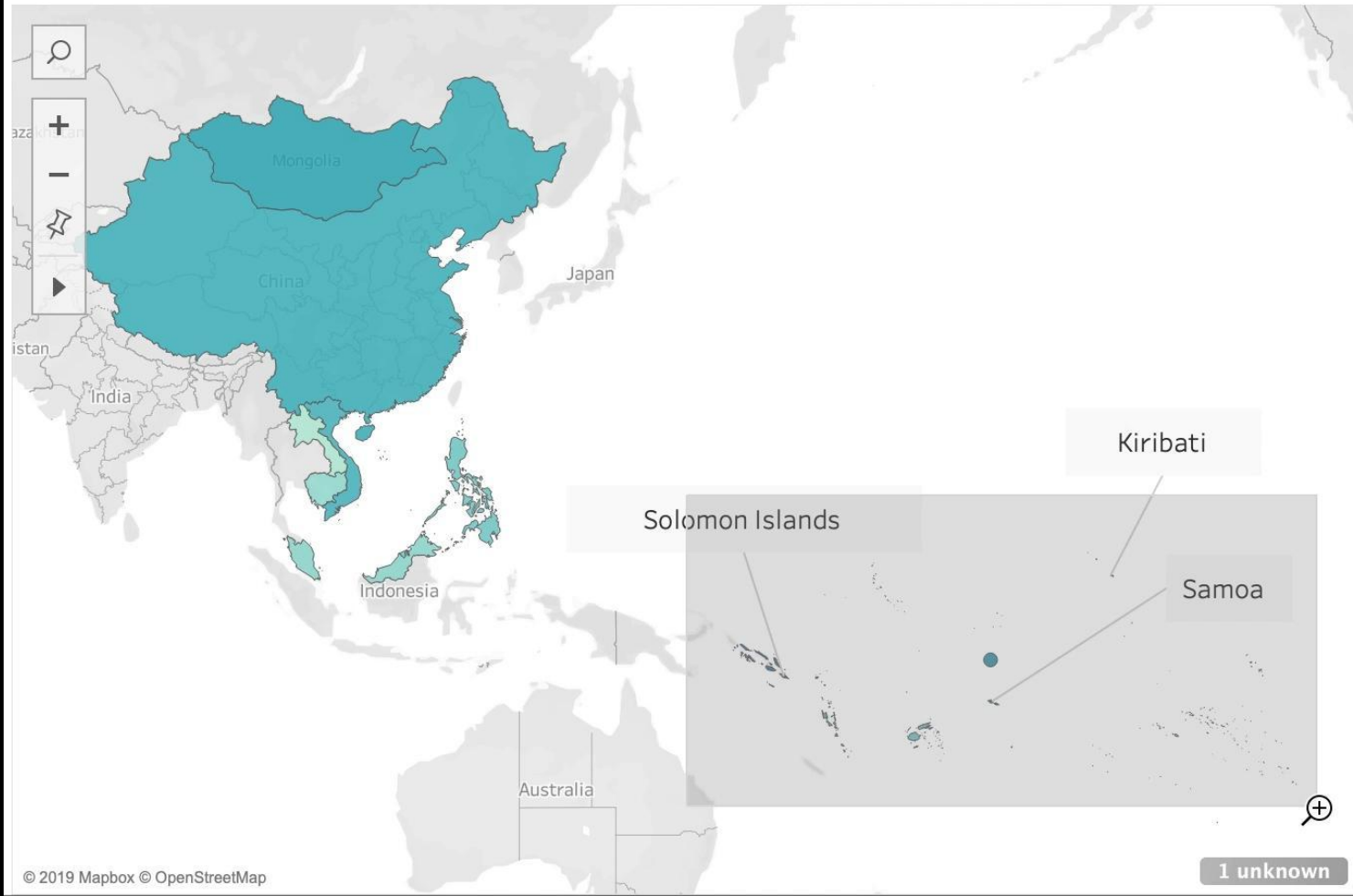


About 13% of Children Surveyed Have Seriously Considered Attempting Suicide



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Top Three High Risk Countries are Islands



Logistic Regression

Class Weights- Suicidal Class weighed 5x as much as Non- Suicidal Class

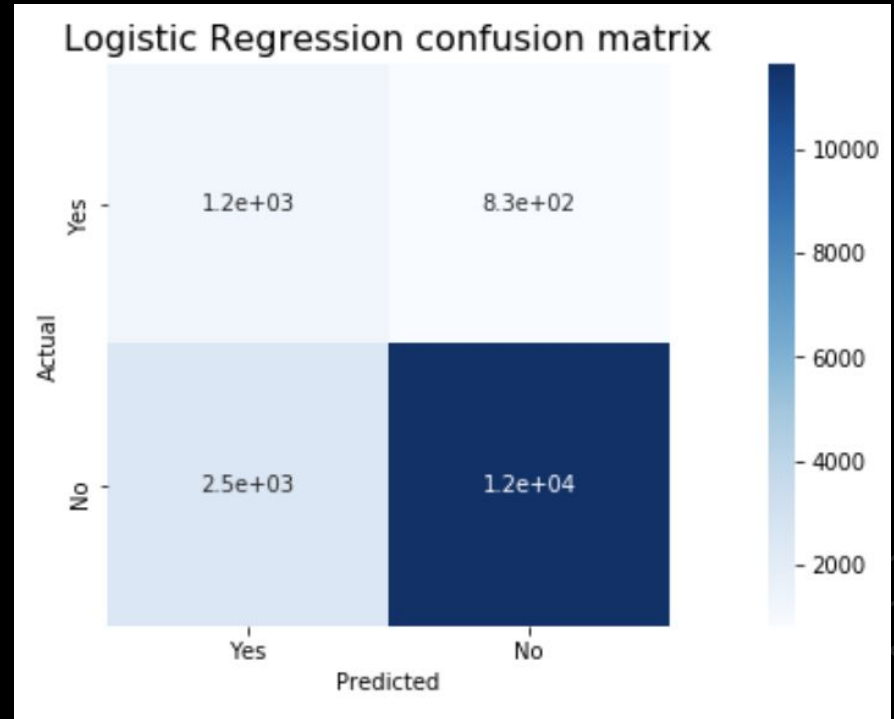
Decision Threshold = .5

F1 score = .42
(on hold out set)

Precision = .33

Recall = .60

62 features included



XGBoost

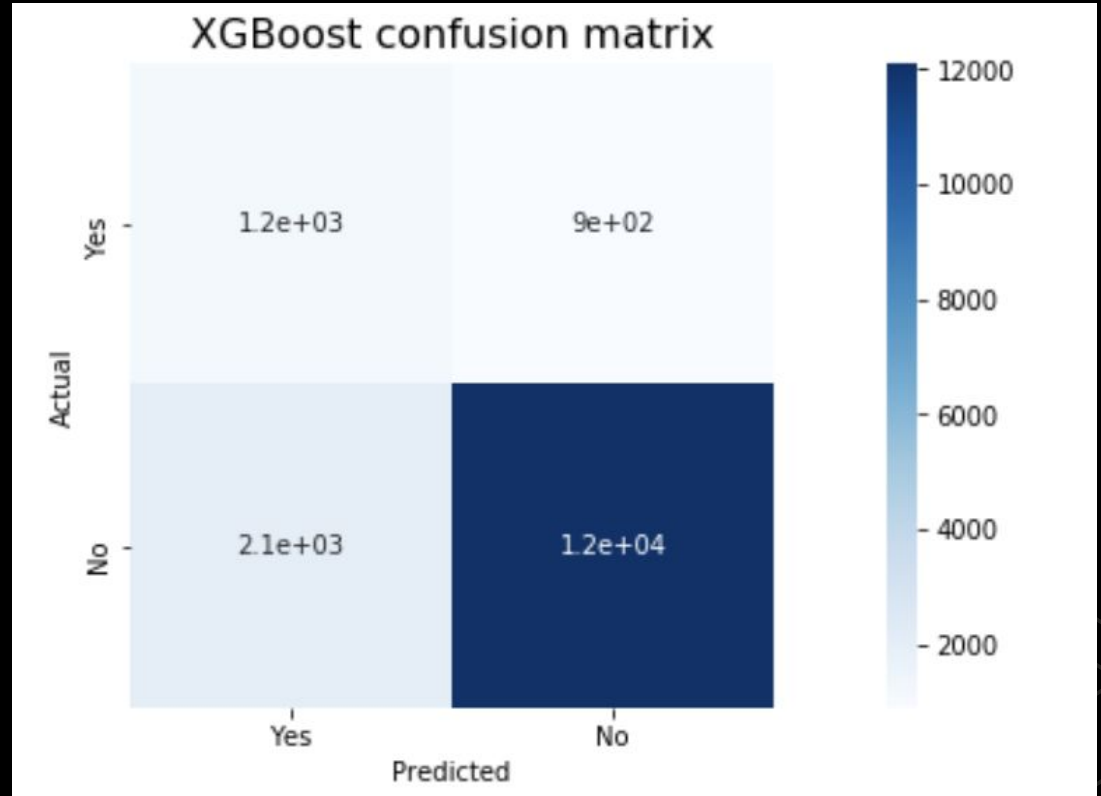
Decision Threshold = .19

F1 score = .44
(on hold out set)

Precision = .36

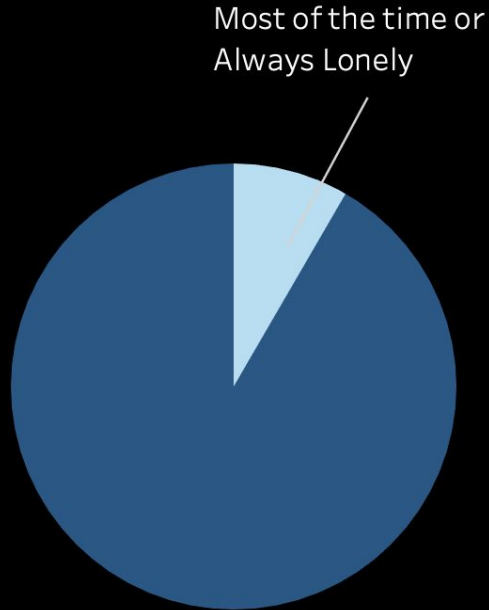
Recall = .56

62 features included at the end.

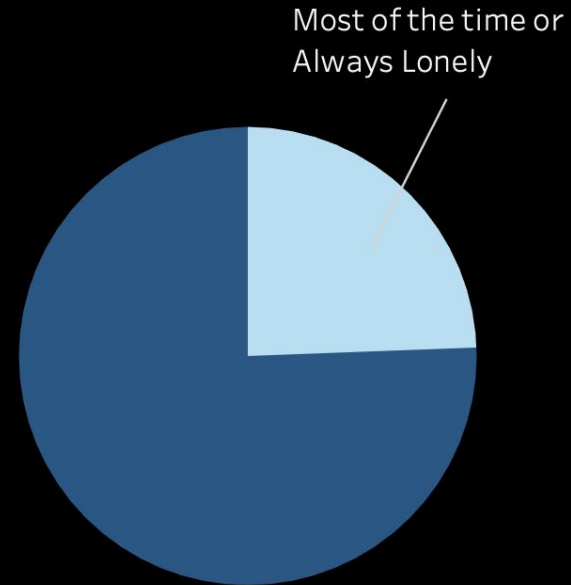


Suicidal Children are 3x as Likely to Have Experienced Extreme or Moderate Loneliness

Non-Suicidal



Suicidal

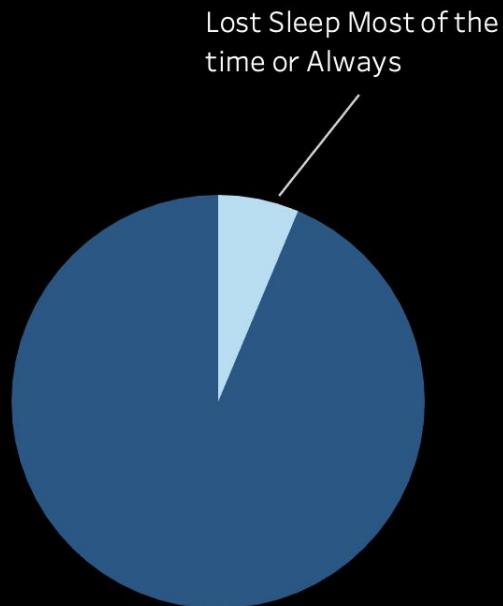


Top Ten in LR

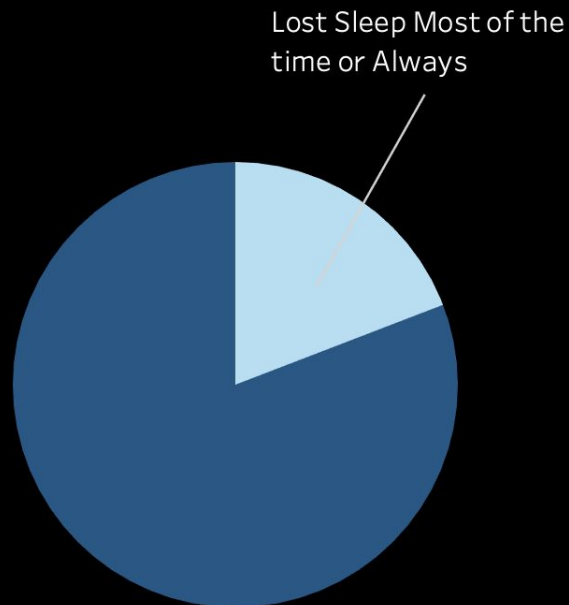


Suicidal Children are 3x as Likely to Have Lost Sleep over Excessive Worrying

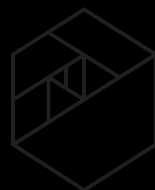
Non-Suicidal



Suicidal

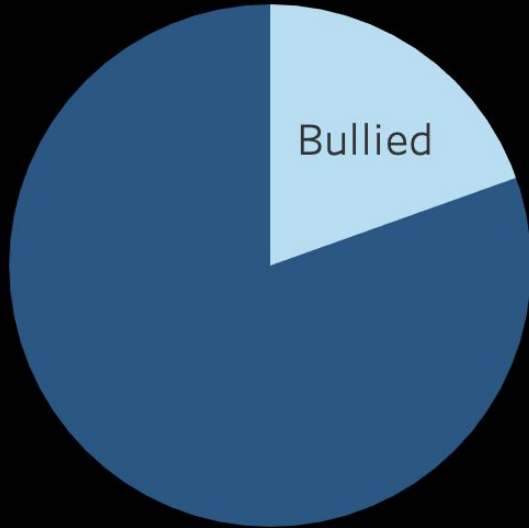


Top Ten in LR

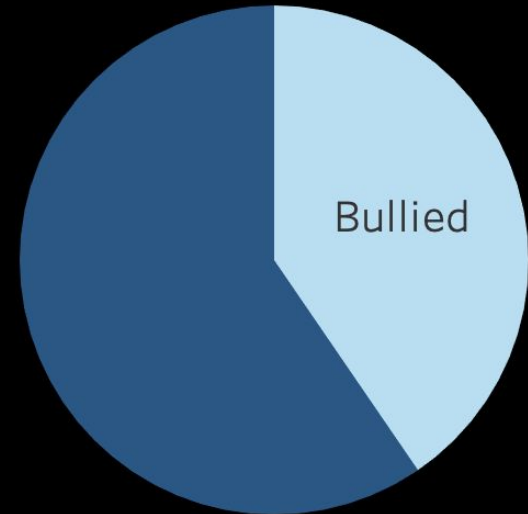


Suicidal Children are 3x as Likely to Have Been Bullied

Non-Suicidal

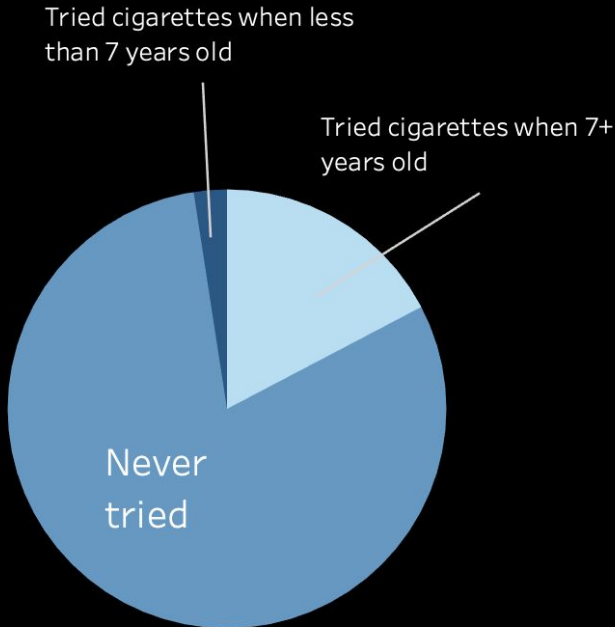


Suicidal

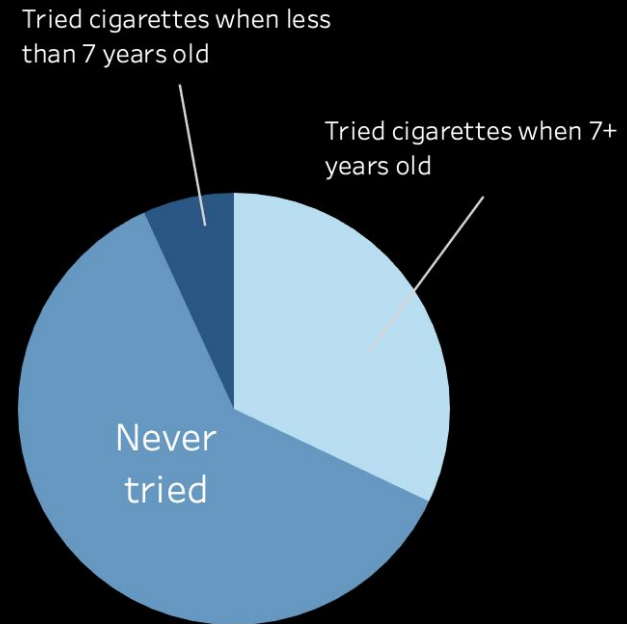


Suicidal Children are More Likely to Have Tried Cigarettes and at a Younger Age

Non-Suicidal



Suicidal



Takeaways

- Top conditions that may cause children to become suicidal (most gains from XGBoost): **loneliness, bullying, worrying & insomnia, cigarette use**
- More **attention** should be given to children who have those experiences
- Other considerations- **population, colonial history, child's sex, perception on how much parents understand the child's problems**



Thank you

Questions & Comments

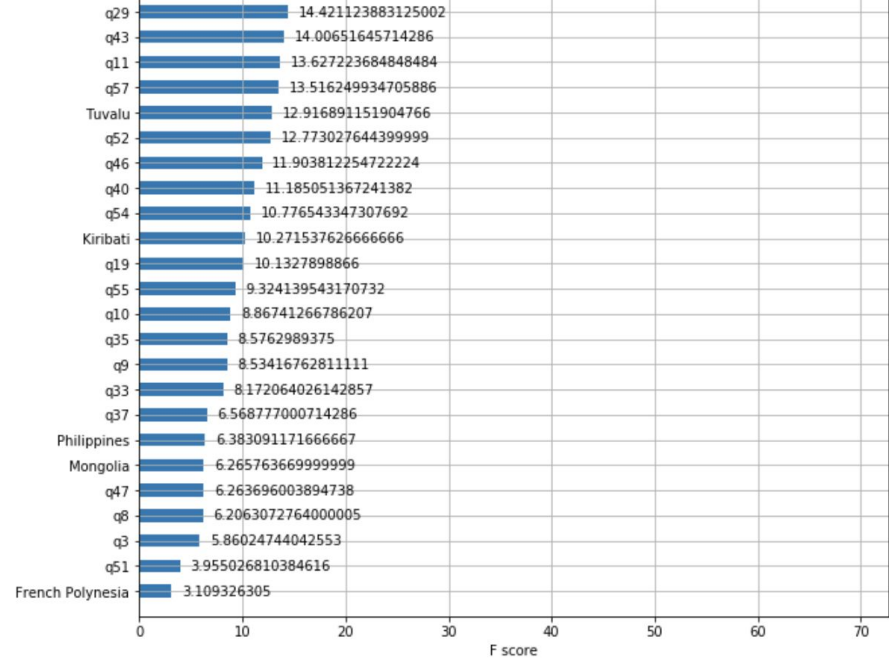
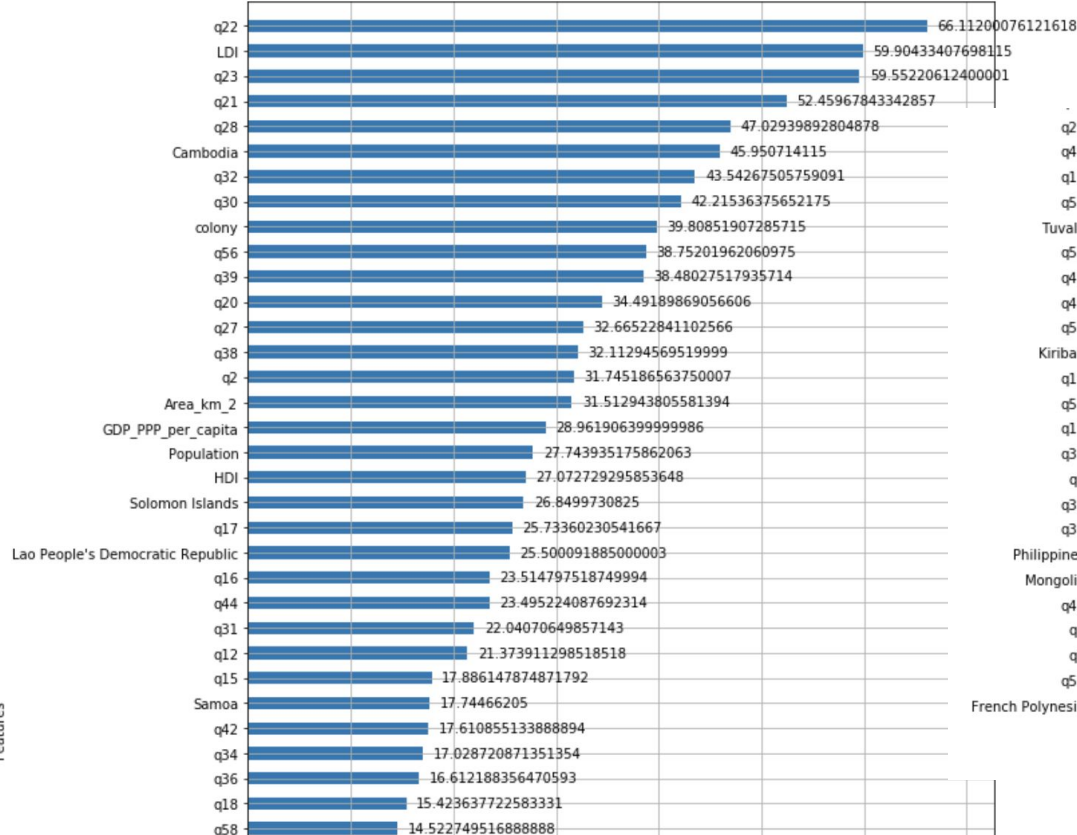


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Appendix A

Features

Feature importance



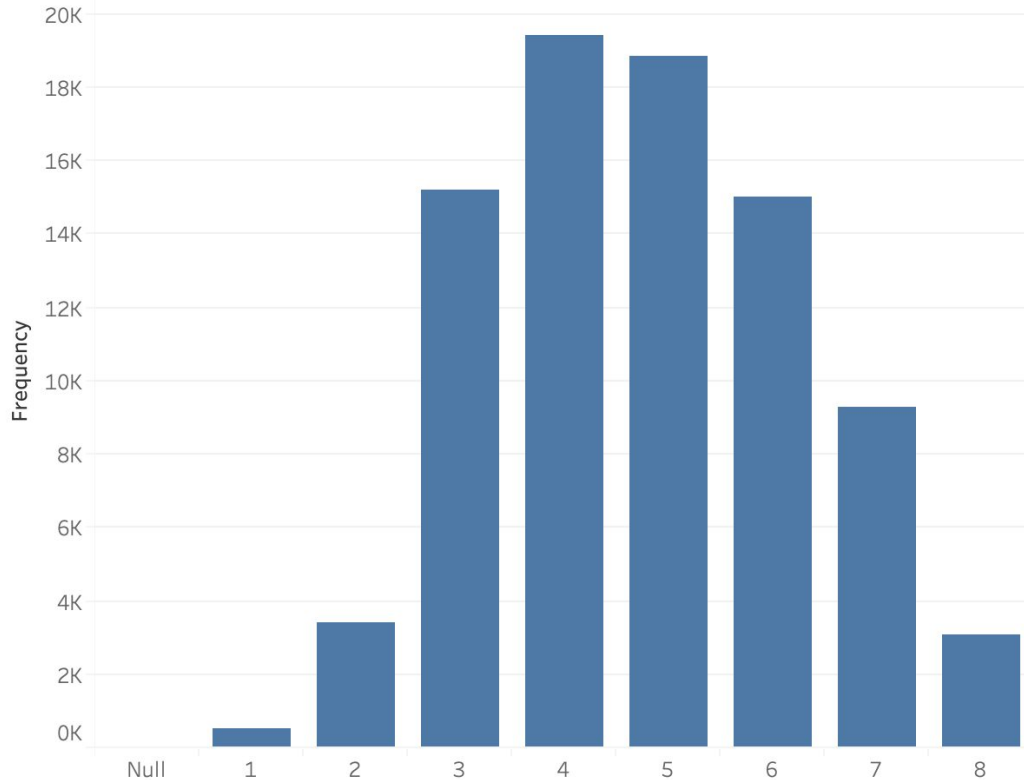
Appendix B

```
gbm = xgb.XGBRegressor(  
    n_estimators=1000,  
    max_depth=3,  
    objective="binary:logistic",  
    learning_rate=.1,  
    subsample=1,  
    min_child_weight=1,  
    colsample_bytree=.8,  
)  
  
eval_set=[(X_train,y_train.values-1),(X_val,y_val.values-1)]  
fit_model = gbm.fit(  
    X_train, y_train.values-1,  
    eval_set=eval_set,  
    eval_metric='auc',  
    early_stopping_rounds=20,  
    verbose=False  
)
```



Appendix C

Age Distribution of Children



1 = 11 yrs or younger

2 = 12

3 = 13

4 = 14

5 = 15

6 = 16

7 = 17

8 = 18 + years



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Appendix D

Decision Tree Classifier & Random Forest

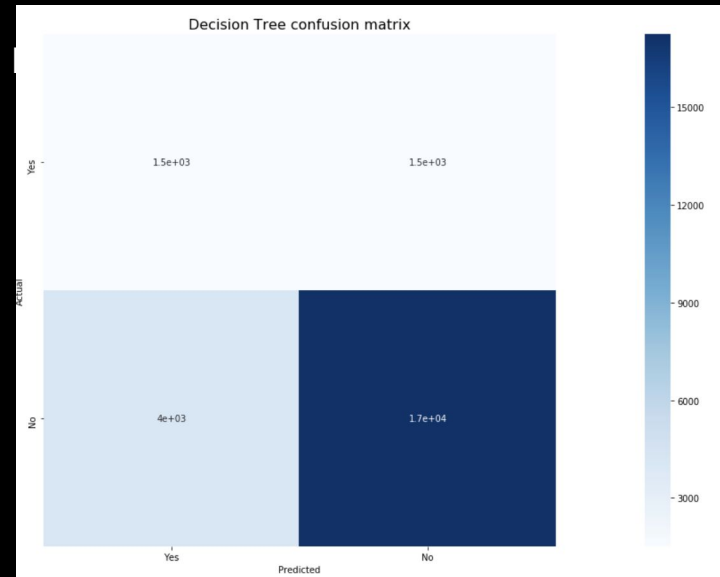
Class Weights- Suicidal Class weighed 5x as

Split into Training Set and Test Set

Decision Tree F1 score = .35

Random Forest F1 score = .41

52 features included.



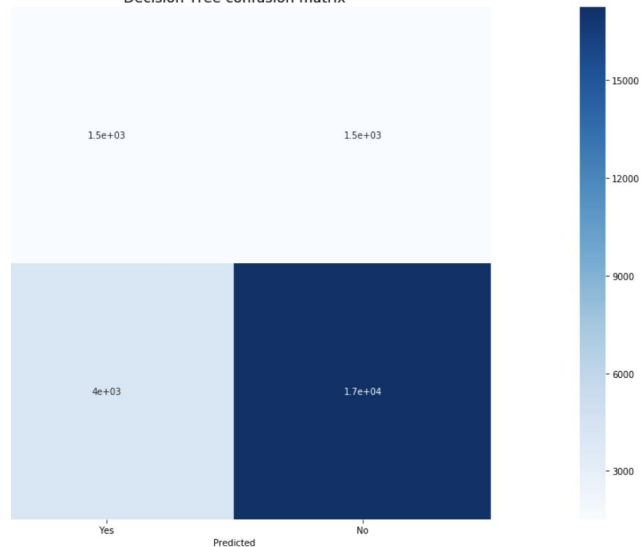
Appendix E

```
sorted(list(zip(lr_5x.coef_[0], X_train.columns)))
```

executed in 8ms, finished 19:34:27 2019-08-05

```
[(-0.5670940498809413, 'Population'),
 (-0.2772237537176481, 'China'),
 (-0.25407829748359595, 'q2'),
 (-0.24709396701497566, 'q23'),
 (-0.24179150121329104, 'q22'),
 (-0.1254444677071483, 'q58'),
 (-0.12340668072871795, 'q20'),
 (-0.09972410462105506, 'Kiribati'),
 (-0.09762378494039324, 'q17'),
 (-0.09723053596050792, 'q34'),
 (-0.09357438637763876, 'q38'),
 (-0.08643743493495494, 'q15'),
 (-0.08329060520488957, 'q21'),
 (-0.08286211550719647, 'q52'),
 (-0.08043413300749612, 'q28'),
 (-0.06850956464105125, 'q32'),
 (-0.0658620107029933, 'q31'),
 (-0.0654980684214627, 'Mongolia'),
 (-0.06128266357302304, 'q10'),
 (-0.06068045475621782, 'q16'),
 (-0.0446684214599444, 'q9'),
 (-0.03771891426530106, 'q43'),
 (-0.03417554108152934, 'q30'),
 (-0.03140309670937188, 'q19'),
 (-0.029421089178221917, 'q39'),
 (-0.02409003502649672, 'q33'),
 (-0.02293218534232346, 'q35'),
 (-0.022764078513761478, 'Brunei'),
 (-0.021282875113126307, 'q36'),
 (-0.019588602820808952, 'Solomon Islands'),
 (-0.017679097279709365, 'q37'),
 (-0.009804435385645275, 'Tokelau'),
 (0.005551871298687678, 'q18'),
 (0.0066085875594806874, 'q8'),
 (0.010605849438277859, 'q47'),
 (0.011334473055479934, 'Niue'),
 (0.015578142070080443, 'q42'),
 (0.022987643683986238, 'q46'),
 (0.025806075729203837, 'q51'),
 (0.038193548721766606, 'q40'),
 (0.041651210693279594, 'q29'),
 (0.04701333475178999, 'Samoa'),
 (0.05115741590741718, 'q11'),
 (0.05690466036359413, 'French Polynesia'),
 (0.05850555479206586, 'q55'),
 (0.06392566927351147, 'q3'),
 (0.06697802968170541, 'GDP_PPP_per_capita'),
 (0.06720694271330681, 'q54'),
 (0.09004741223977525, 'q12'),
 (0.107621997524831, 'BDI'),
 (0.11487283783947855, 'q57'),
 (0.1215800991454532, 'LDI'),
 (0.15575967104297708, 'q44'),
 (0.1685706533338123, 'Philippines'),
 (0.17900484564962654, 'q27'),
 (0.18057616020096988, 'Cambodia'),
 (0.18462706069452967, 'Tuvalu'),
 (0.1936329012322532, 'q56'),
 (0.27130631725908017, 'colony'),
 (0.29675399066376507, 'Lao People's Democratic Republic'),
 (0.8852264481655364, 'Area_km_2')]
```

Decision Tree confusion matrix



Appendix F

<http://www.ipsnews.net/2014/08/youth-suicides-sound-alarm-across-the-pacific/>

