

Predicting offending on bail

Felix Leung, BOCSAR

Outline

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1. Aim: to explore the potential use of predictive modelling to better inform bail decisions

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2. Predictive modelling

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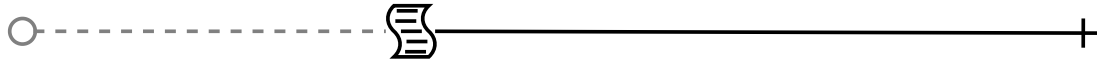
1. Aim: to explore the potential use of predictive modelling to better inform bail decisions
2. Predictive modelling
3. Results

1. Aim

Bail outcomes

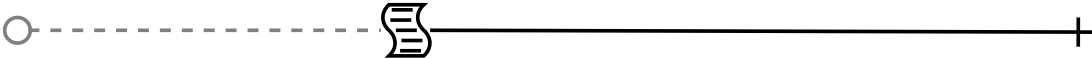
Bail outcomes

1. Bail dispensed with

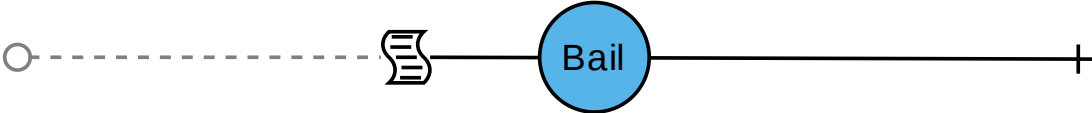


Bail outcomes

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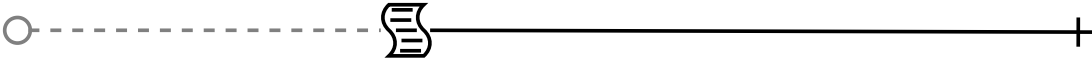


2. Bail granted

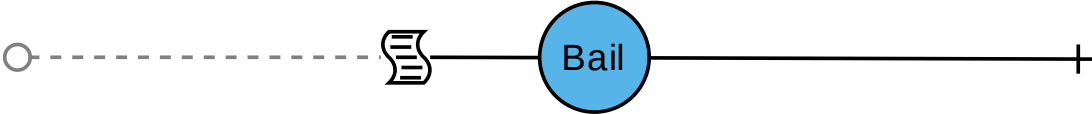


Bail outcomes

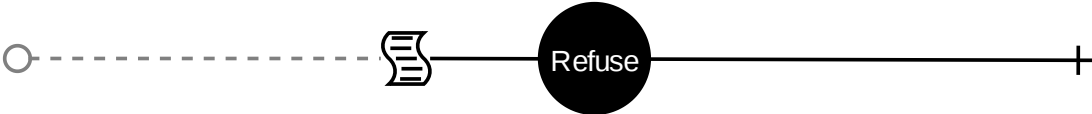
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2. Bail granted

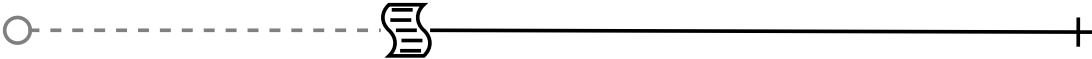


3. Bail refused

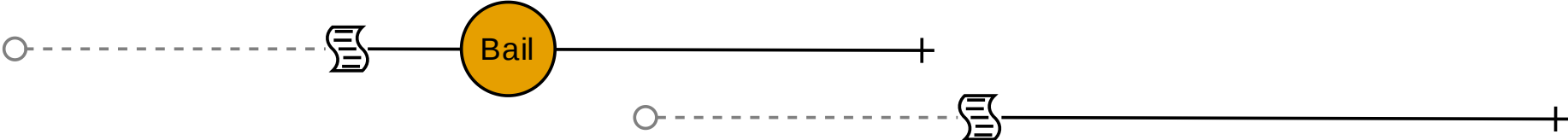


Bail outcomes

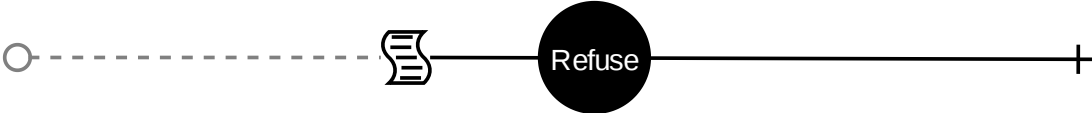
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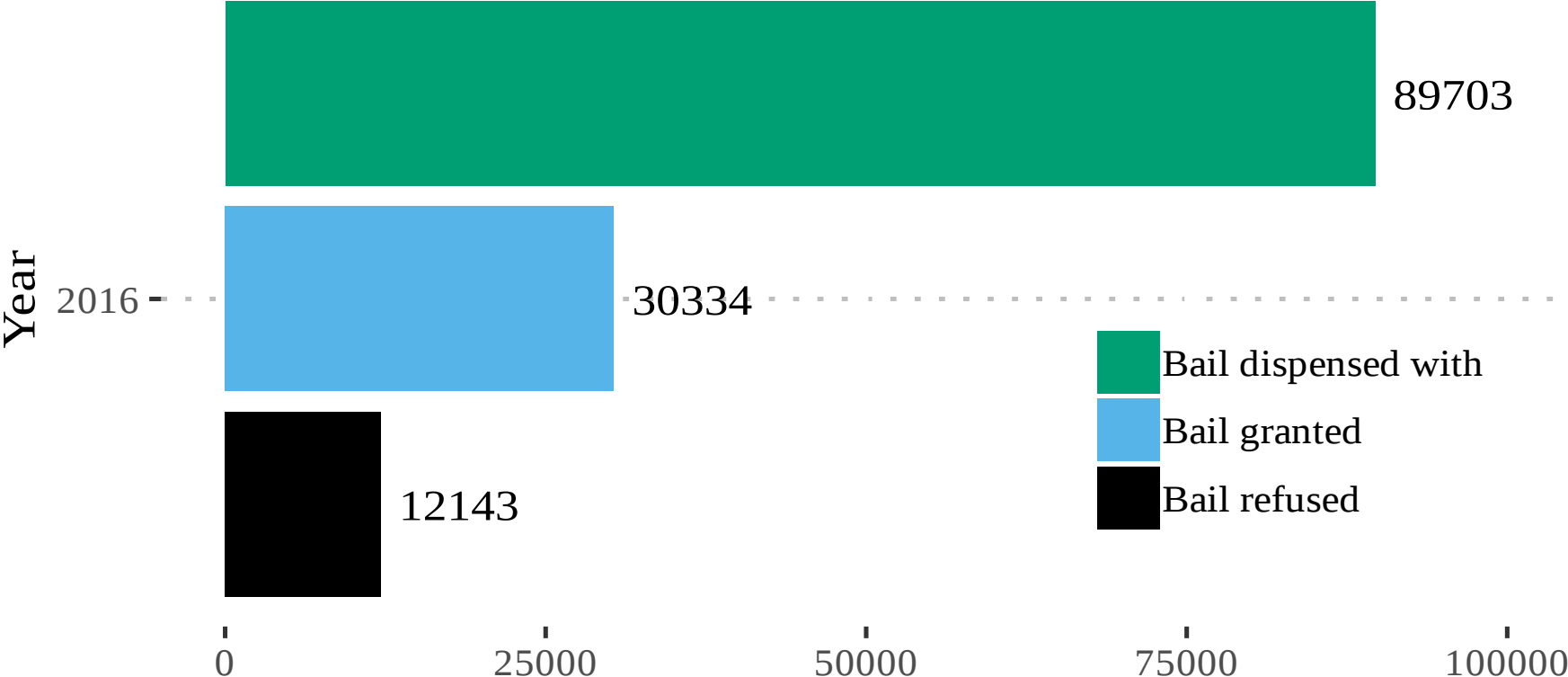
2. Bail granted



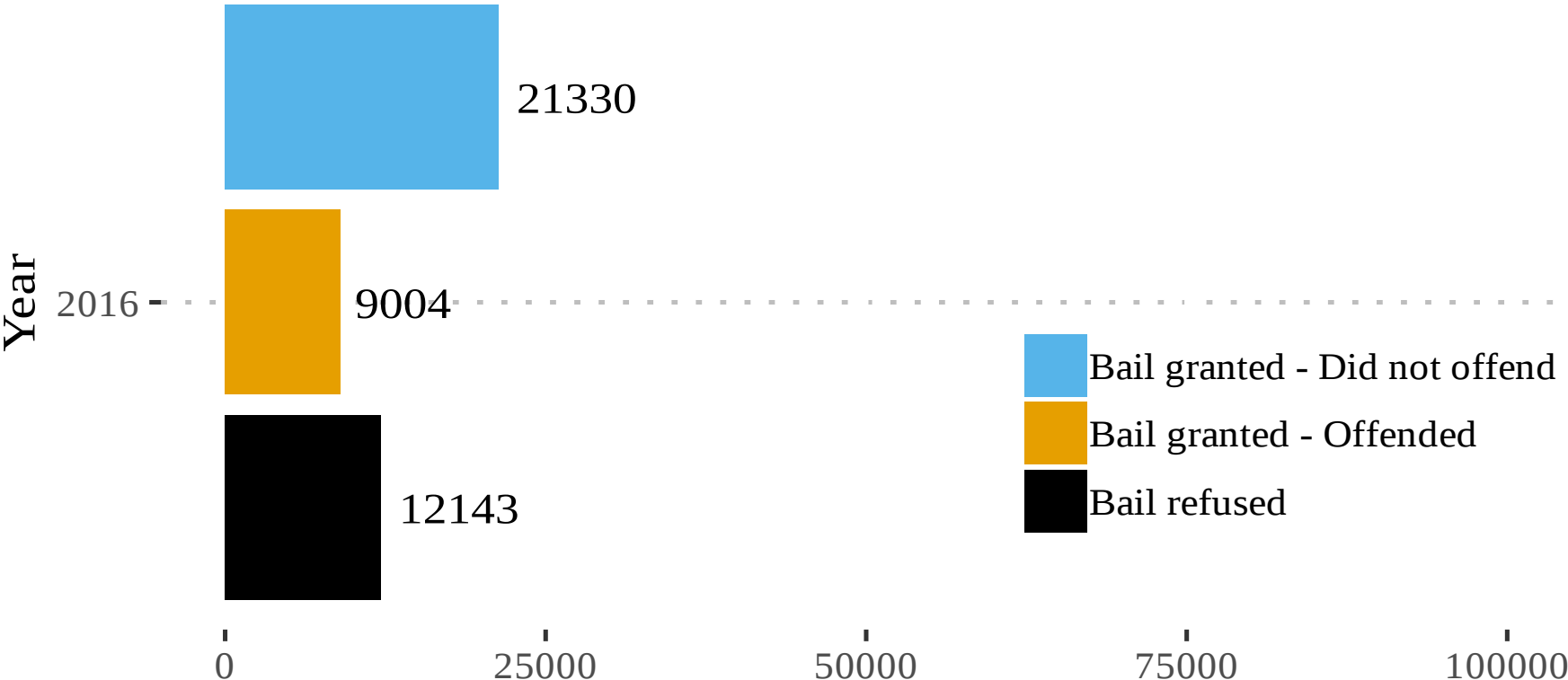
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Bail outcomes in 2016



Bail outcomes in 2016



Aim

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1. Reduce **offending on bail** (without increasing **bail refusals**)?

Aim

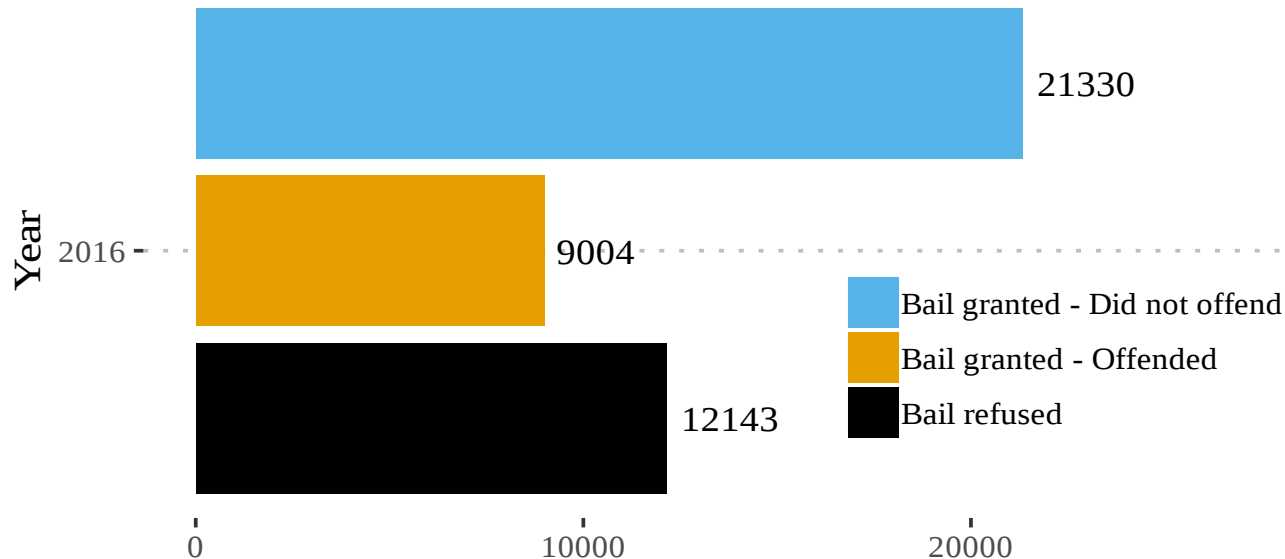
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2. Predictive modelling

Data

- NSW Reoffending Database

Data

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- Include:
 - Defendants charged between 2011 and 2016

Data

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- Include:
 - Defendants charged between 2011 and 2016
- Exclude:
 - ANZSOC subdivision 152 Breach of community-based order
 - ANZSOC group 1569 Offences against justice procedures, nec

(ANZSOC: Australian and New Zealand Standard Offence Classification)

Some terminology

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- **Predictors:** variables available before charge date
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- **Training data:** between 2011 and 2015
- **Test data:** 2016

Predictors

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- e.g. age, gender, socio-economic index (SEIFA)

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- ANZSOC divisions and subdivisions

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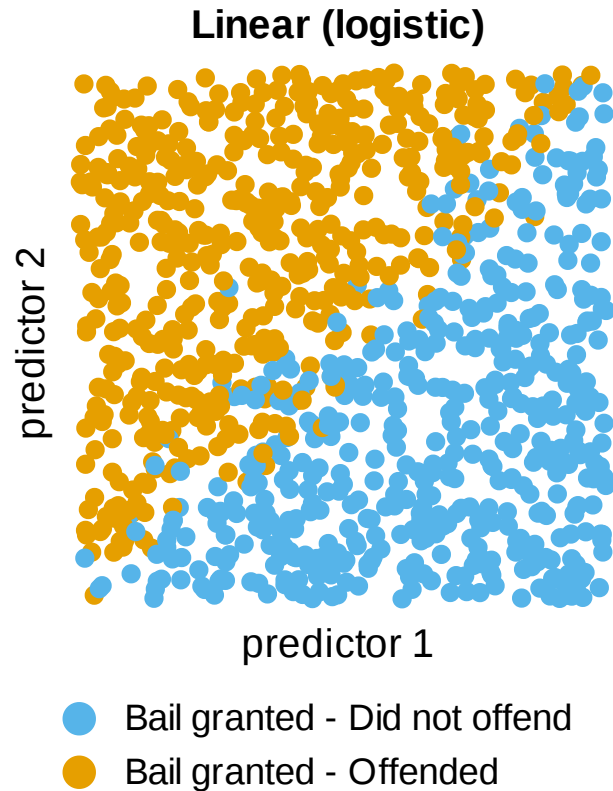
- e.g. whether offence indictable, summary, DV-related
- ANZSOC divisions and subdivisions

3. Criminal history:

- Age at first criminal justice contact, no. guilty charges
- Previous penalty: prison, fine, bond, etc
- and more

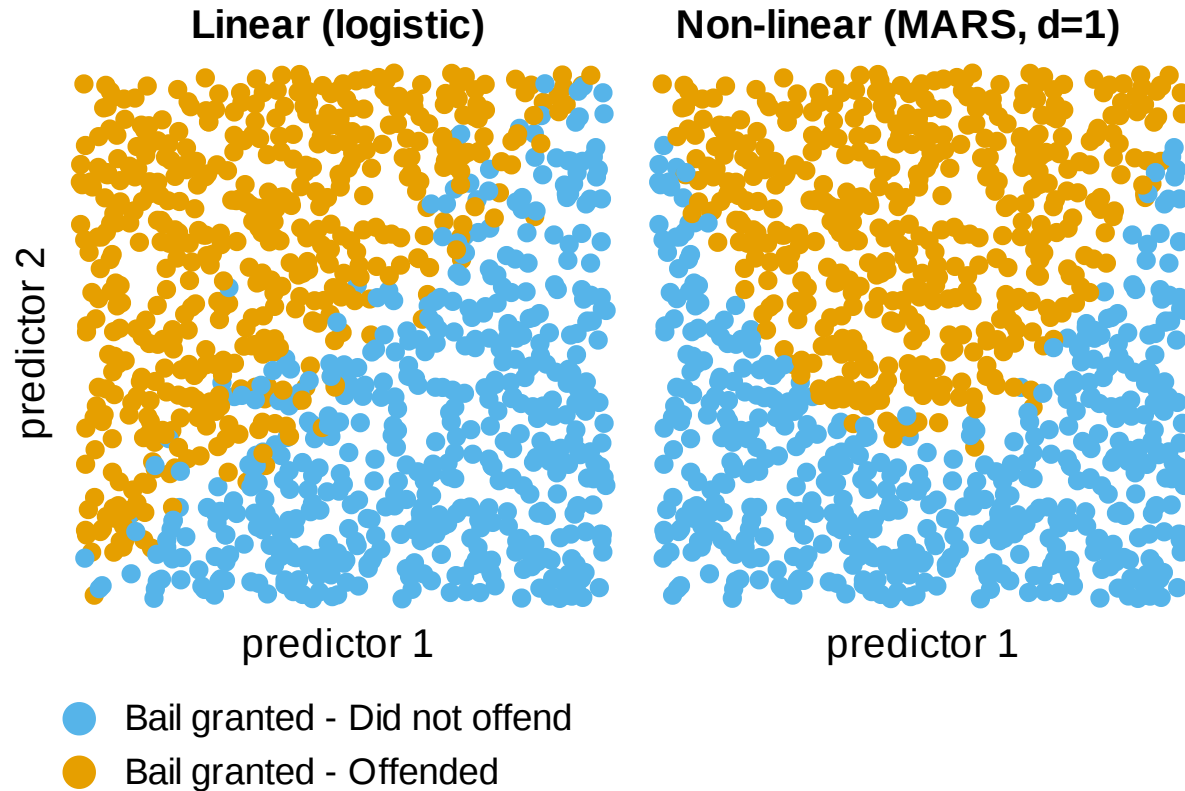
3 Models compared

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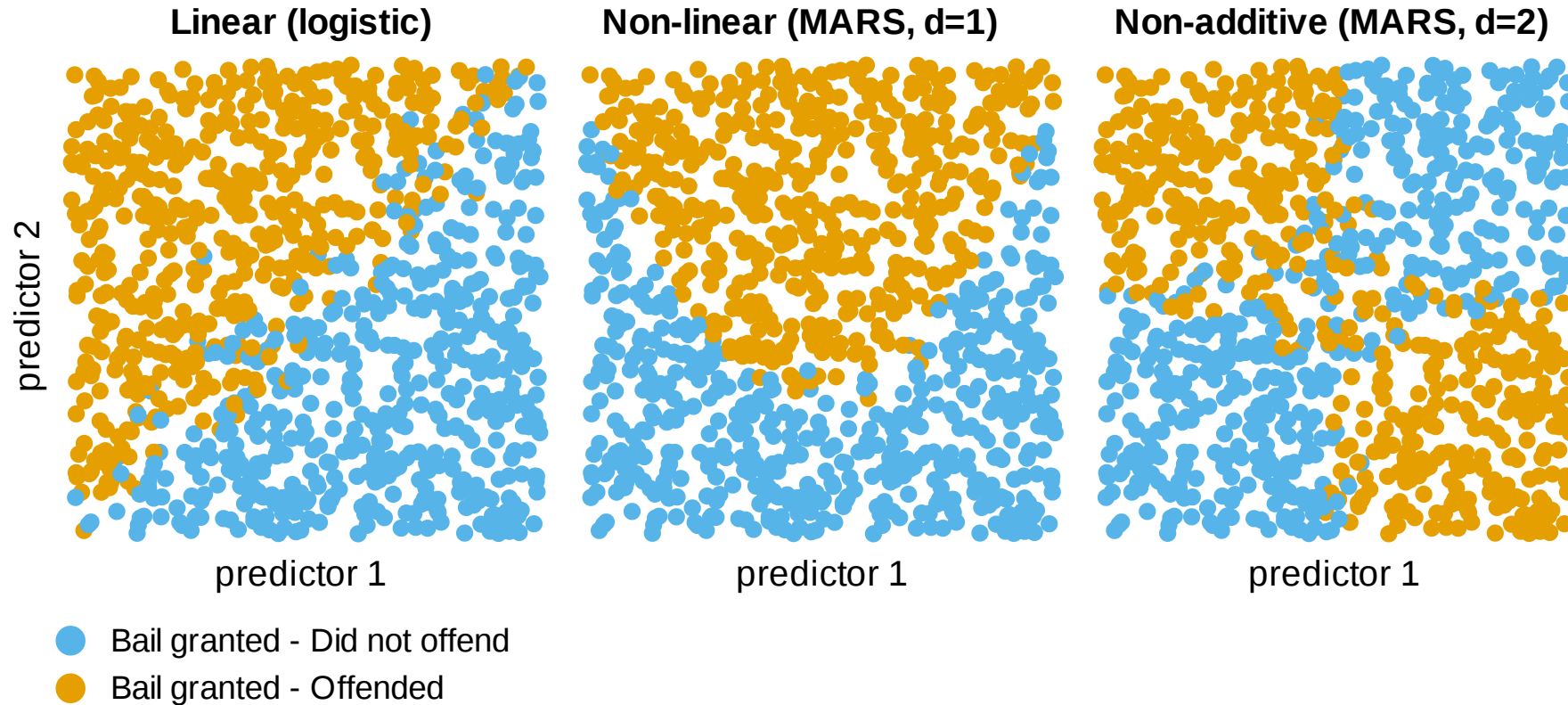
(MARS: multivariate adaptive regression splines (Friedman, 1991))

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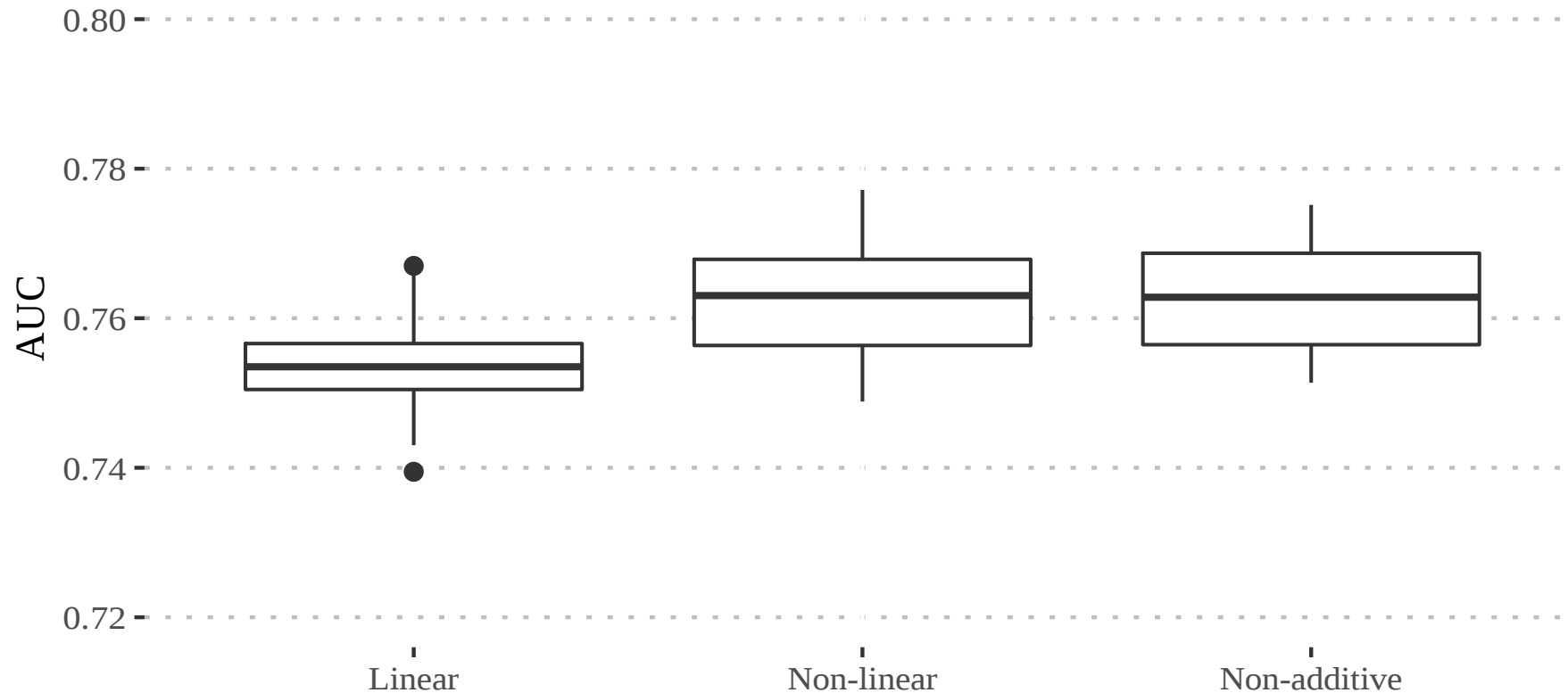
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Model selection

based on AUC (area under curve)

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2. Variables on index offence:

- Median Severity Ranking of most serious offence charged
- Most serious offence in ANZSOC 03 (Sexual assault)
- Most serious offence in ANZSOC 08 (Theft)
- Most serious offence in ANZSOC 151 (Breach custodial order)

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- Most serious offence in ANZSOC 151 (Breach custodial order)

3. Criminal history:

- Age at first criminal justice contact
- No. of prev. charges
- No. of prev. prison
- Proportion of prev. bail with new proven offence
- Time since prev. charge

3. Results

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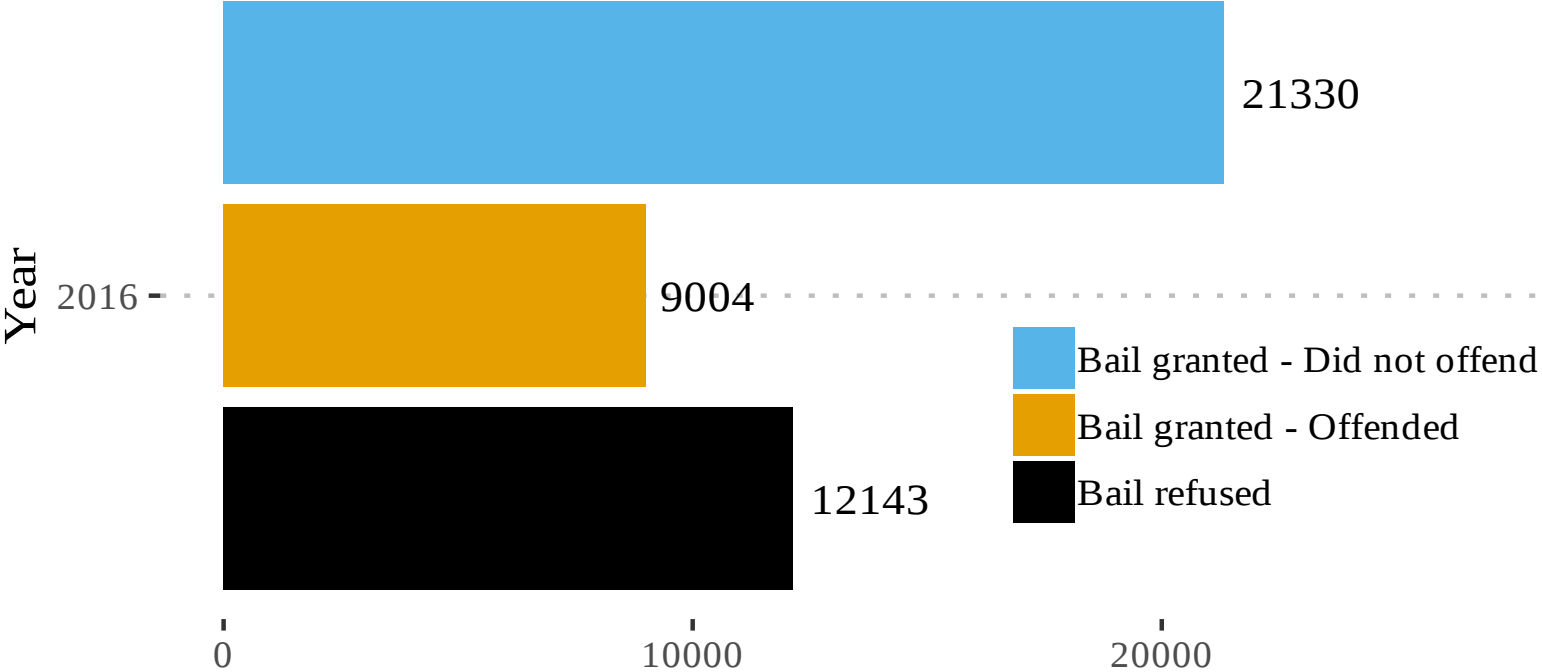
Some remarks

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3. Here we assume *hypothetically*:
 - individual **above** the threshold would be refused bail
 - individual **below** the threshold would be granted bail

Some remarks

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2. To compare model predictions with 2016 figures, some threshold is needed
3. Here we assume *hypothetically*:
 - individual **above** the threshold would be refused bail
 - individual **below** the threshold would be granted bail
4. Method originated from Kleinberg, Lakkaraju, Leskovec, Ludwig, and Mullainathan (2017)

Bail outcomes in 2016



Model Predictions

21330

Bail granted - Did not offend

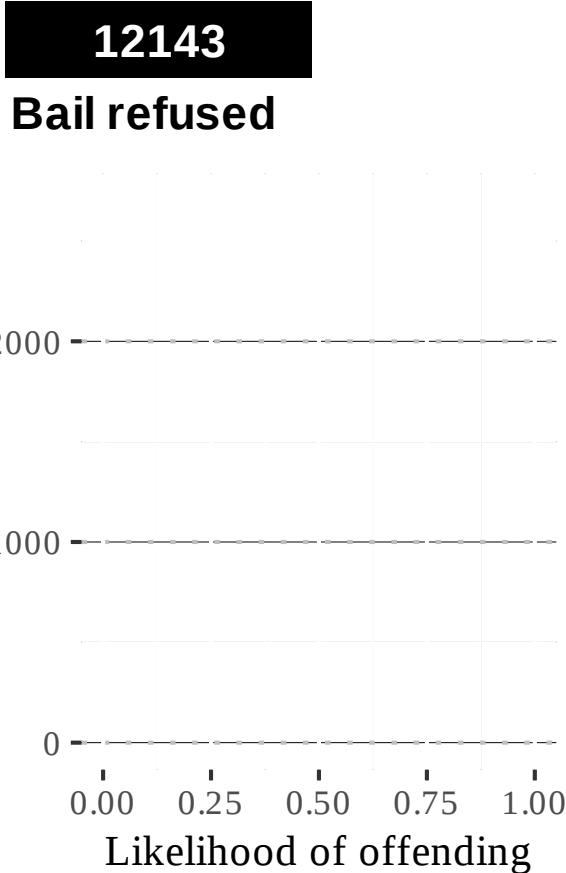
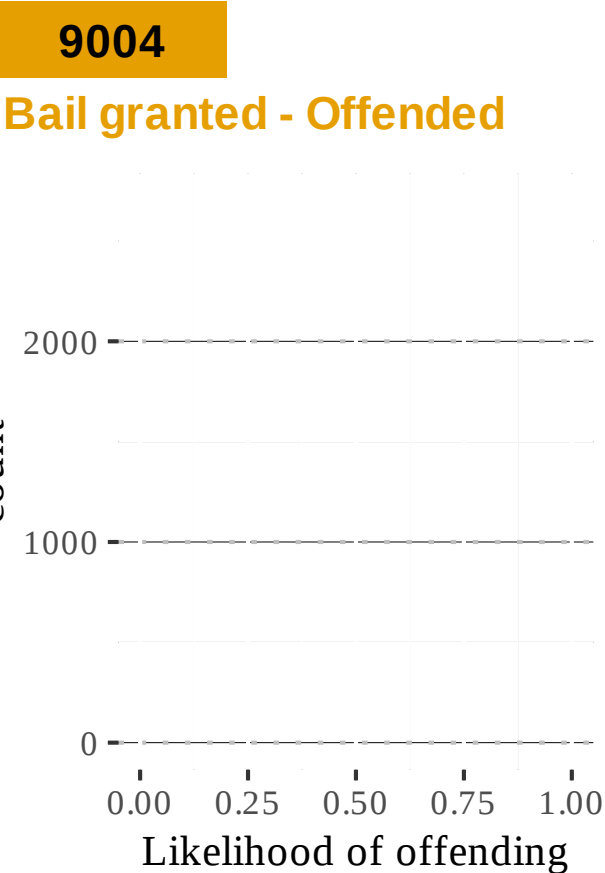
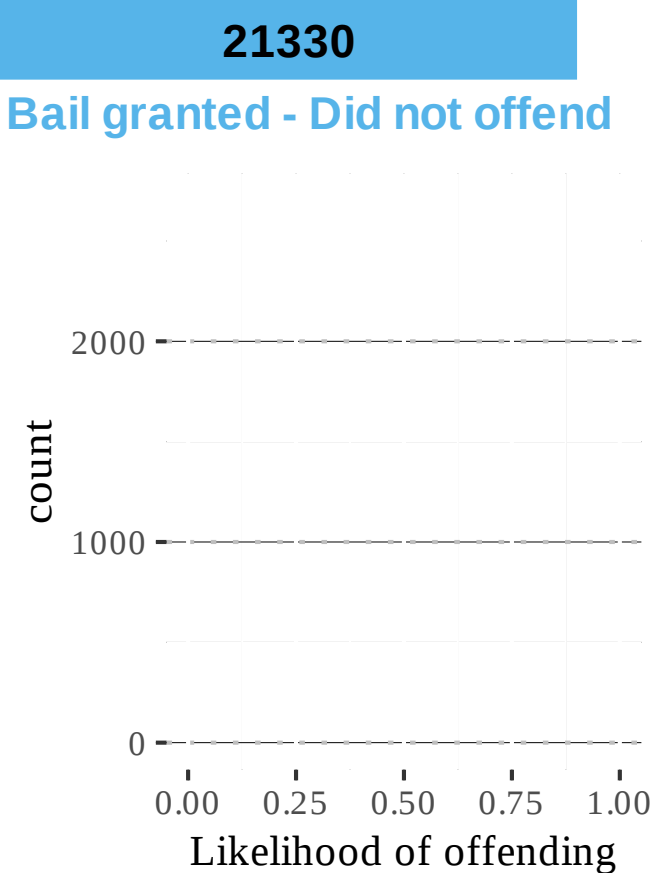
9004

Bail granted - Offended

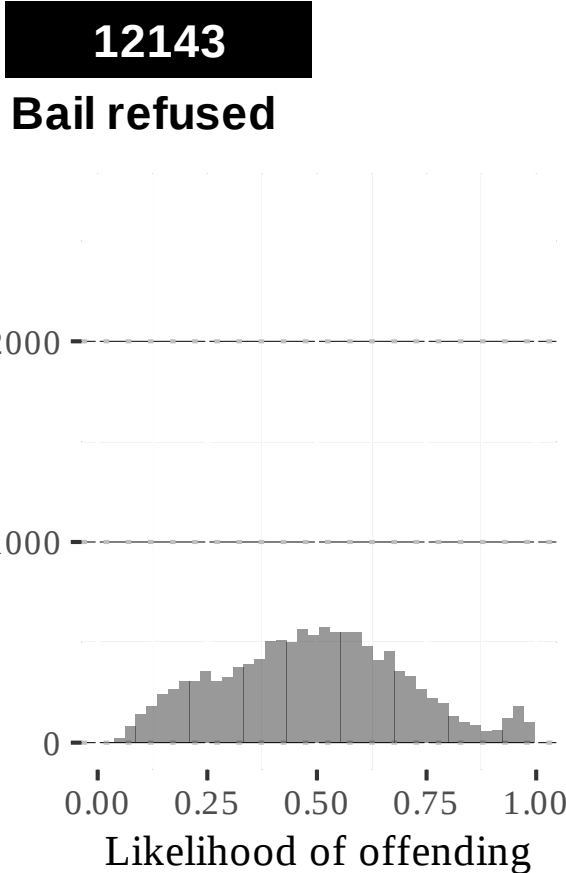
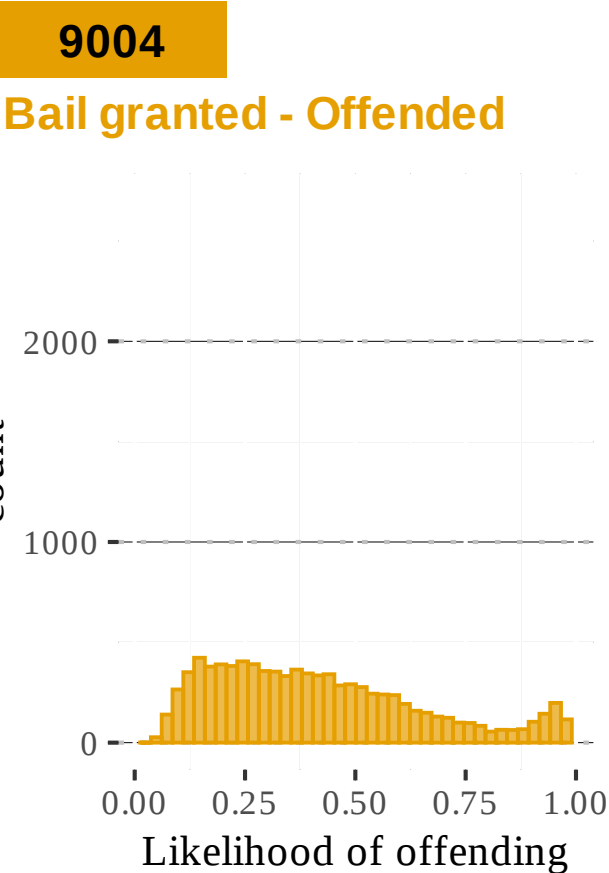
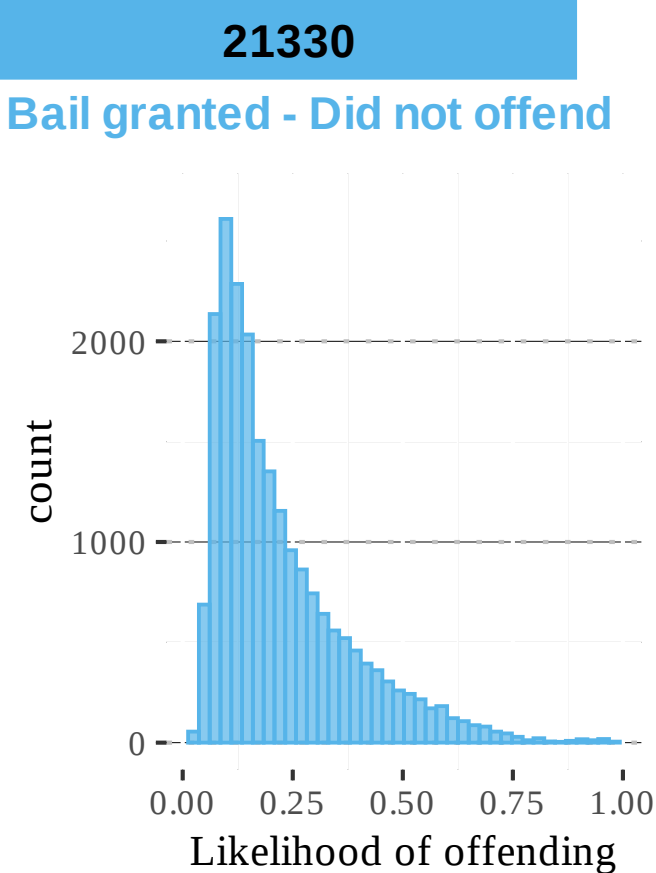
12143

Bail refused

Model Predictions



Model Predictions



Aim

Could we:

1. Reduce **offending on bail** (without increasing **bail refusals**)?
2. Reduce **bail refusals** (without increasing **offending on bail**)?

1. Reduce **offending on bail**

21330

Bail granted - Did not offend

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Bail granted - Offended

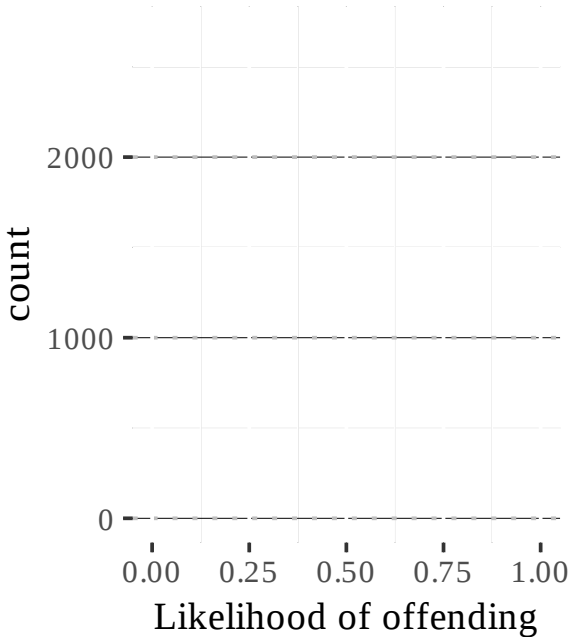
12143

Bail refused

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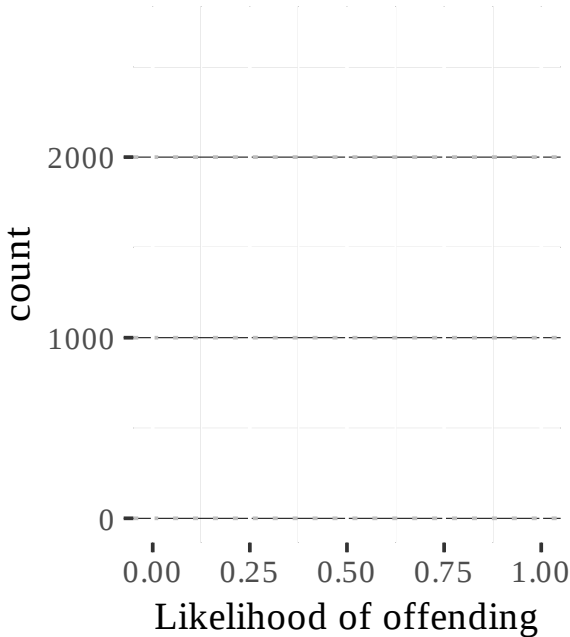
21330

Bail granted - Did not offend



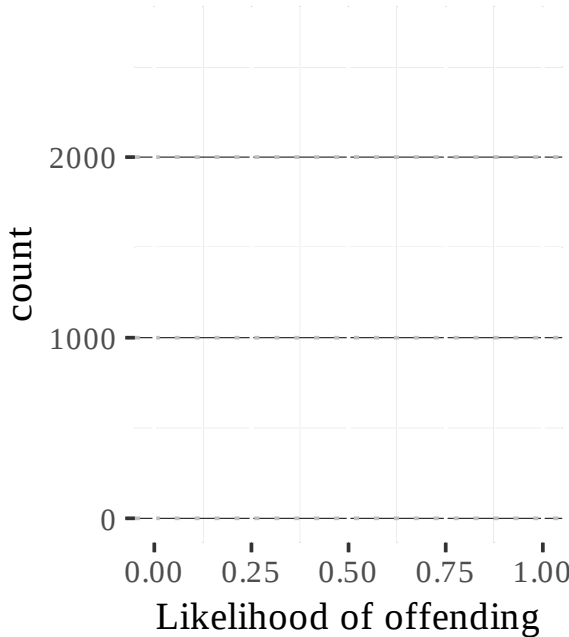
9004

Bail granted - Offended



12143

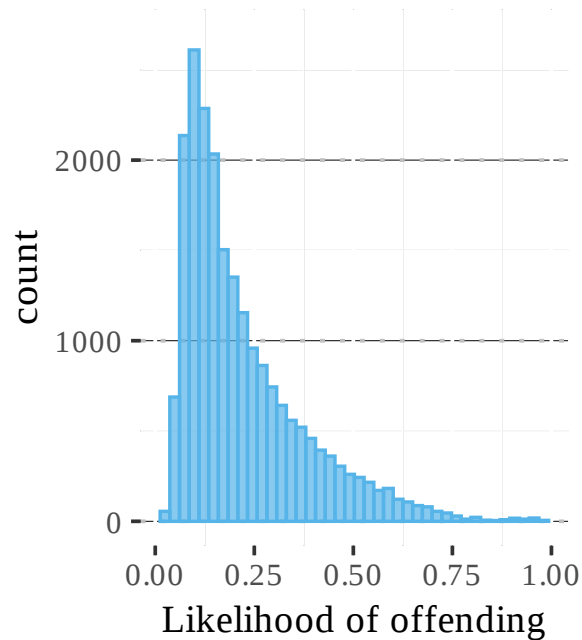
Bail refused



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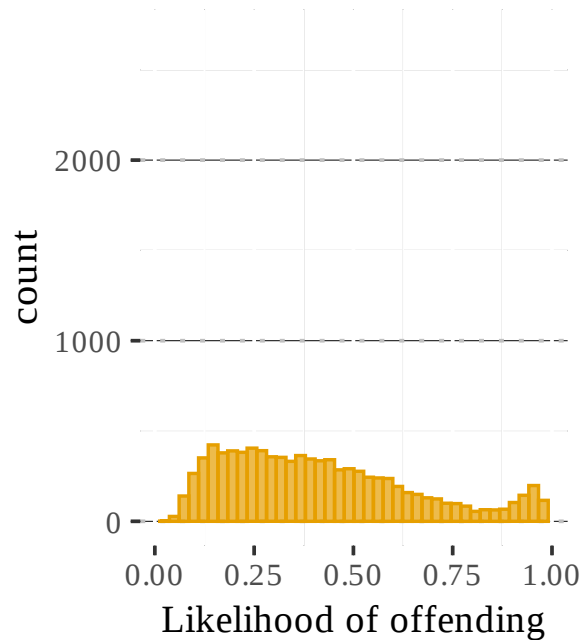
21330

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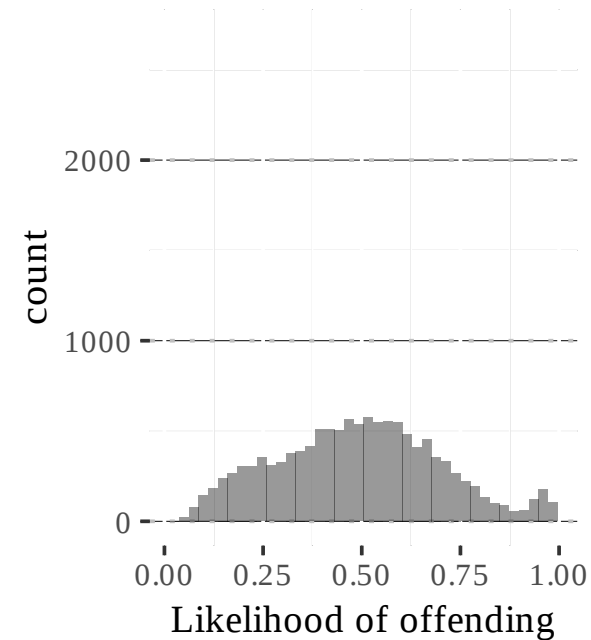
9004

Bail granted - Offended



12143

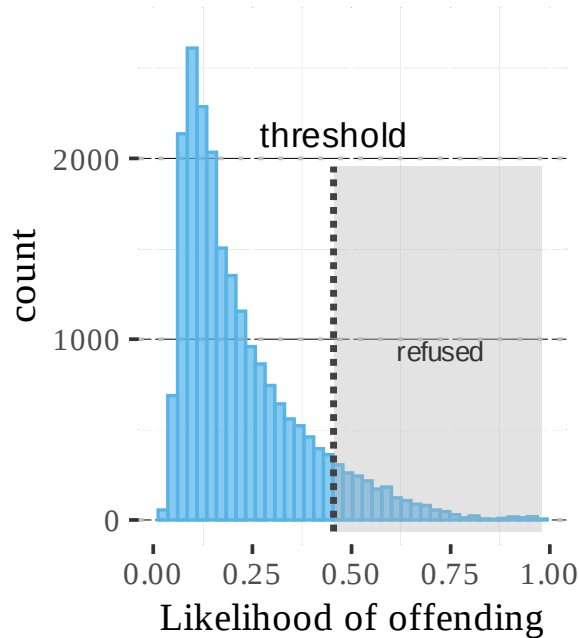
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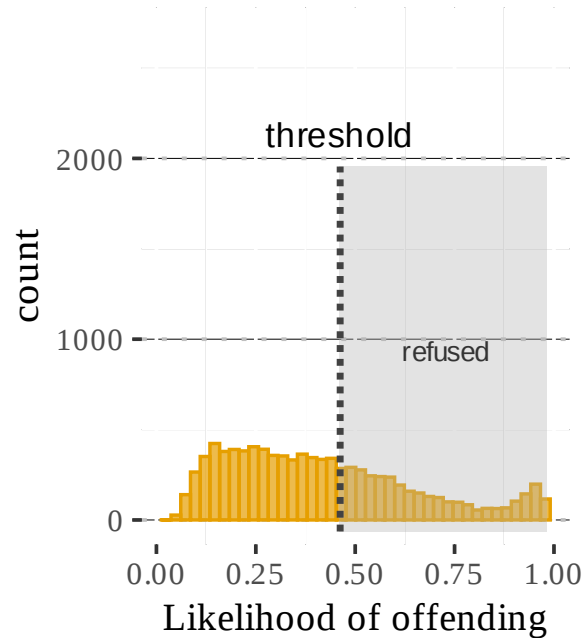
21330

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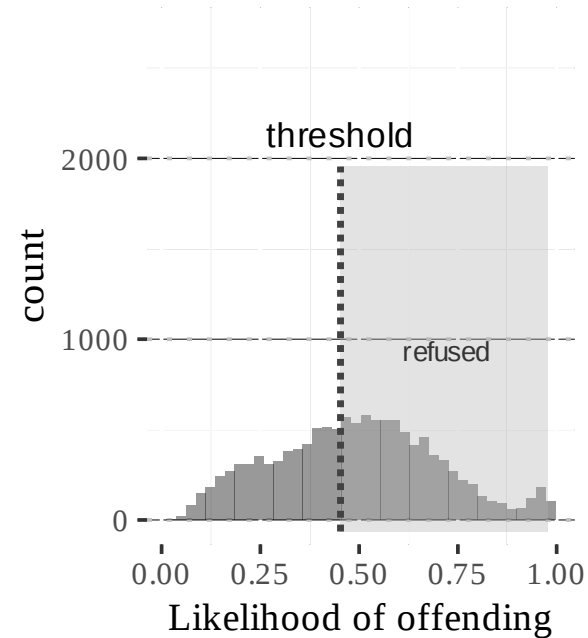
9004

Bail granted - Offended



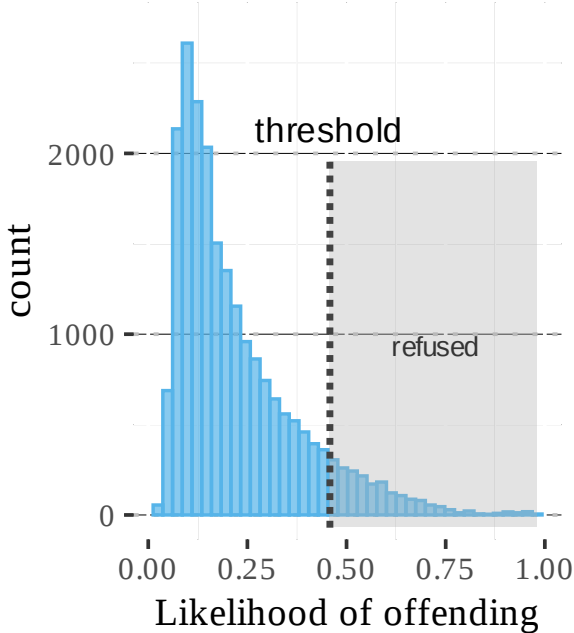
12143

Bail refused

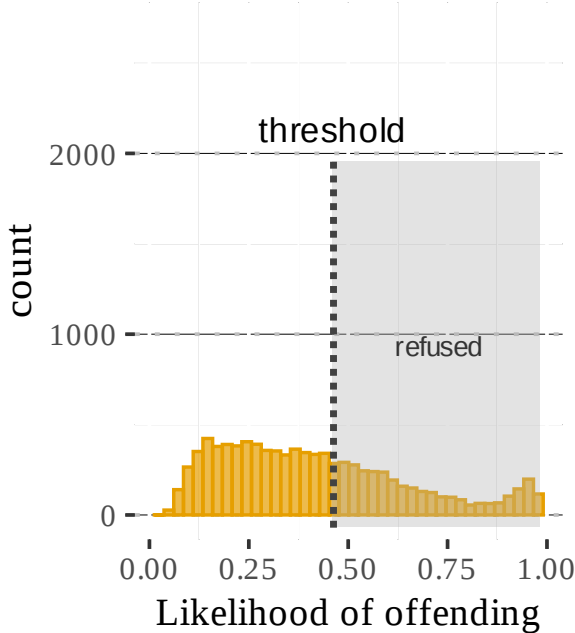


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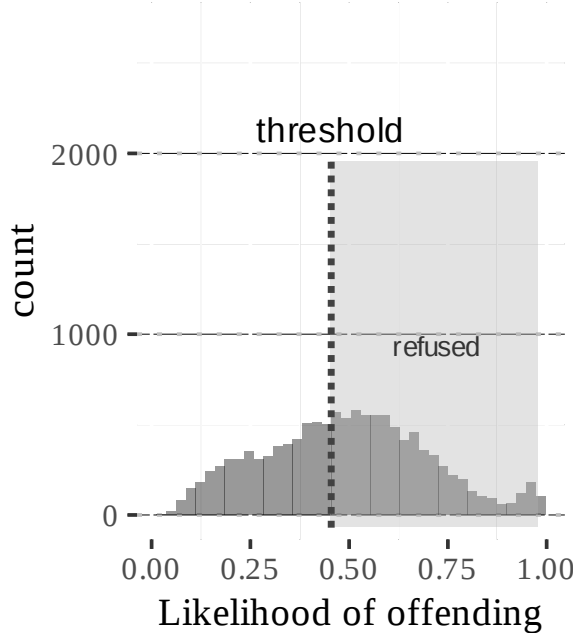
21330
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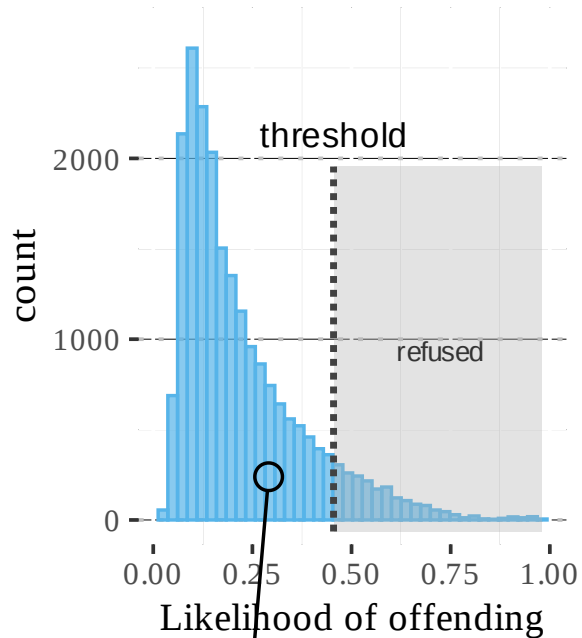
12143
Bail refused



Hypothetically bail refused: 12140

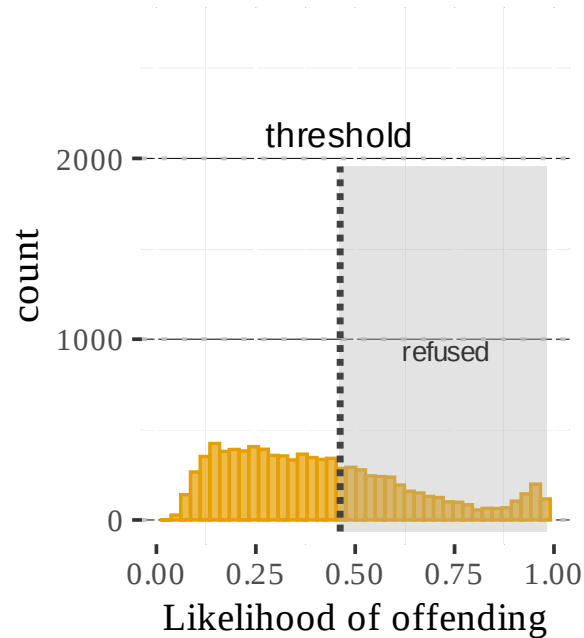
1. Reduce offending on bail

21330
Bail granted - Did not offend



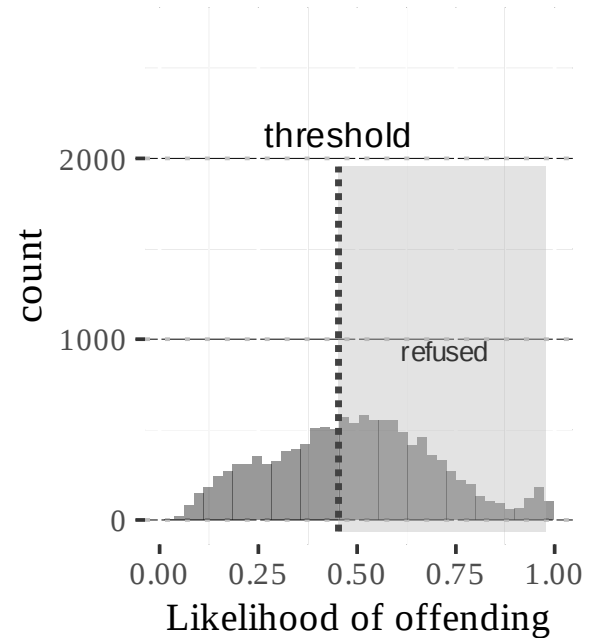
Below: 19377
Offended: 0

9004
Bail granted - Offended



Hypothetically bail refused: 12140

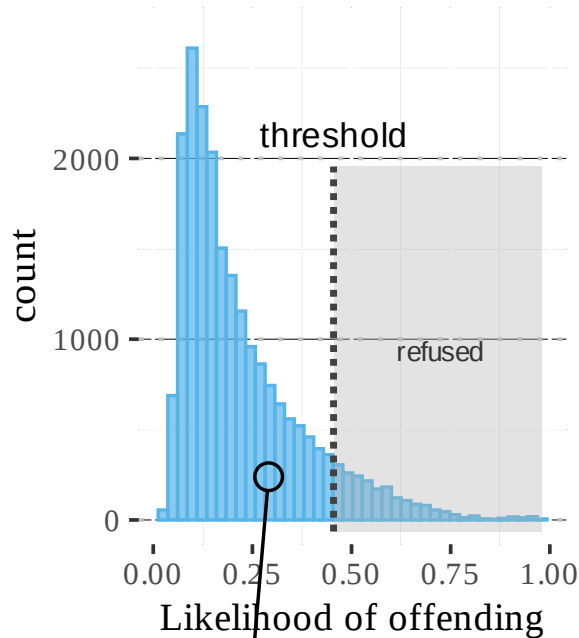
12143
Bail refused



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21330

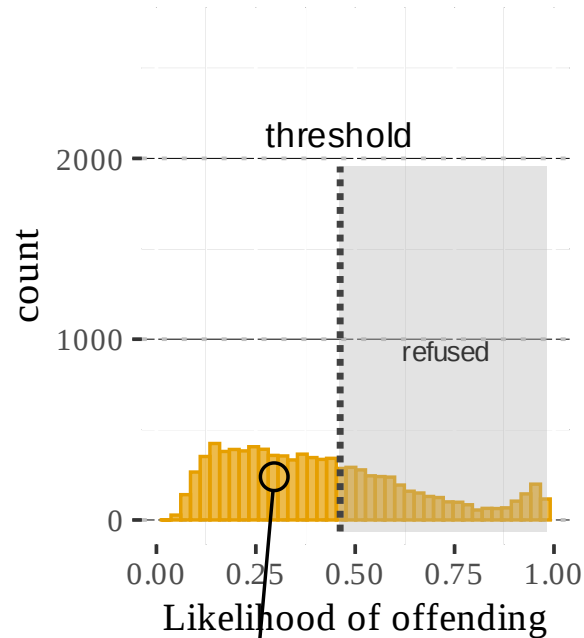
Bail granted - Did not offend



Below: 19377
Offended: 0

9004

Bail granted - Offended

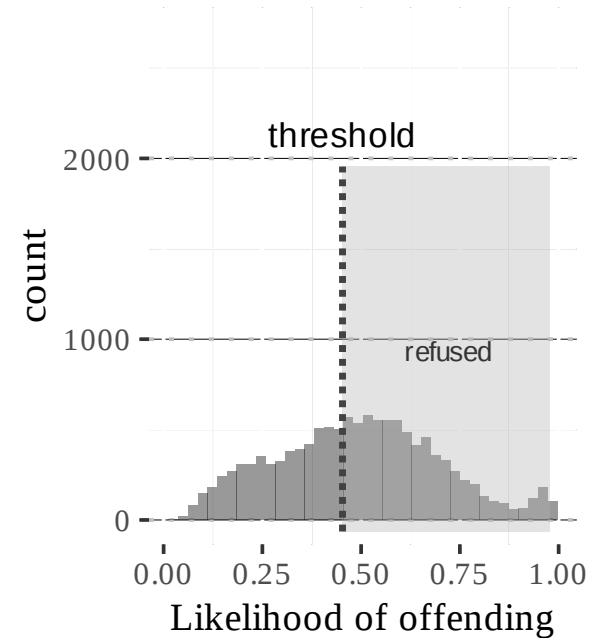


Below: 5648
Offended: 5648

Hypothetically bail refused: 12140

12143

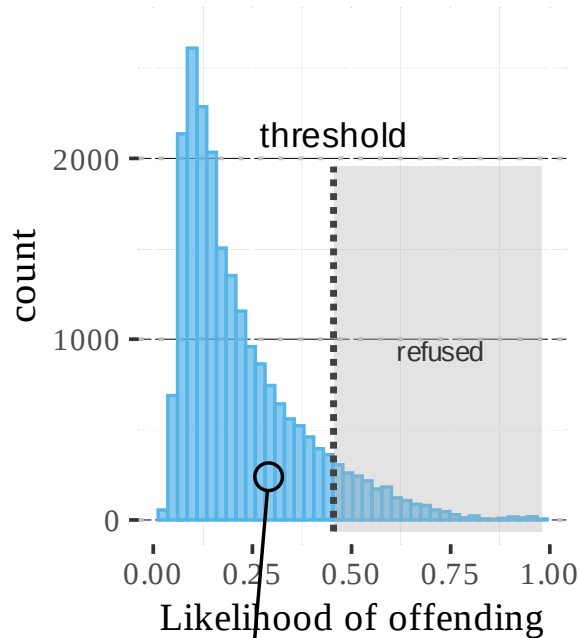
Bail refused



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21330

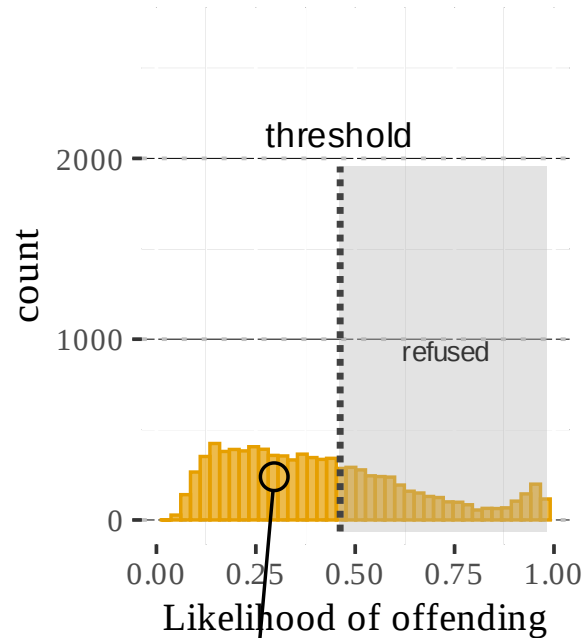
Bail granted - Did not offend



Below: 19377
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9004

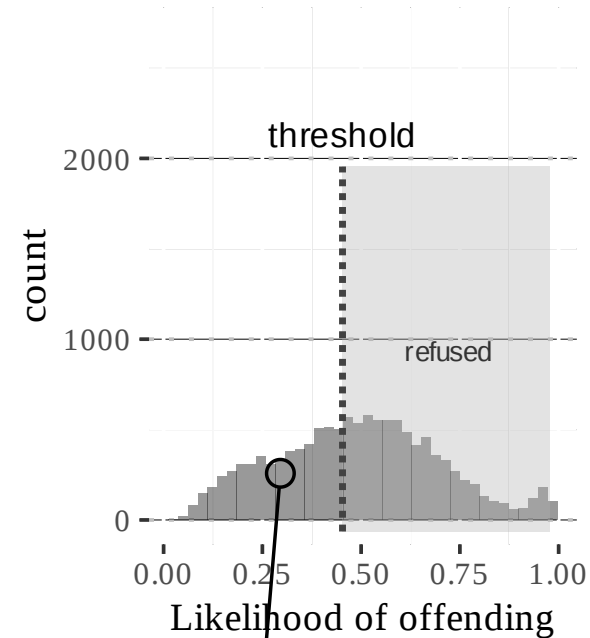
Bail granted - Offended



Below: 5648
Offended: 5648

12143

Bail refused



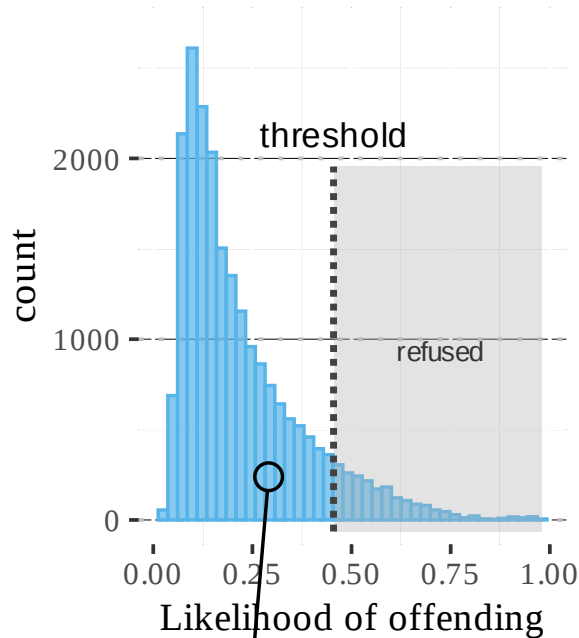
Below: 5312
Offended: ?

Hypothetically bail refused: 12140

1. Reduce offending on bail

21330

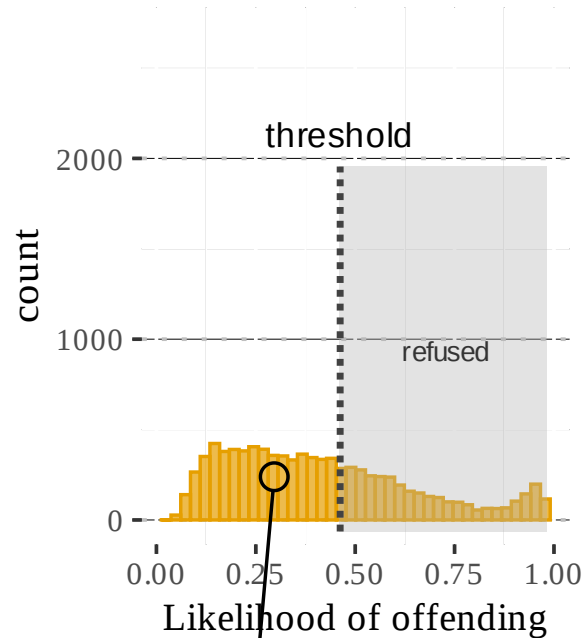
Bail granted - Did not offend



Below: 19377
Offended: 0

9004

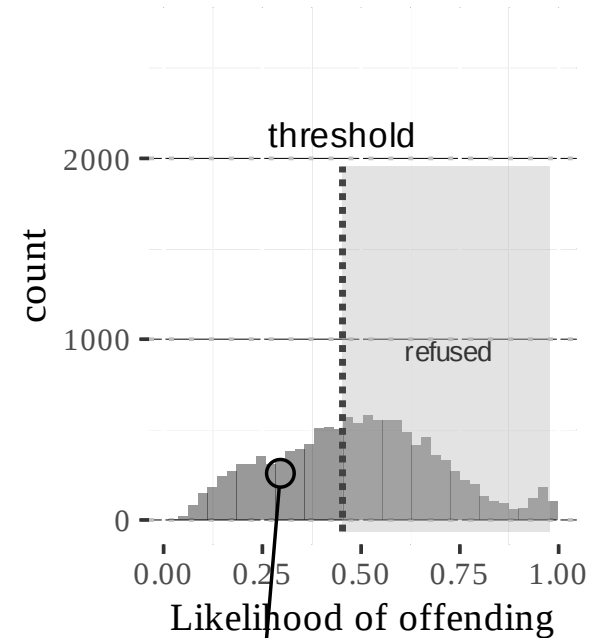
Bail granted - Offended



Below: 5648
Offended: 5648

12143

Bail refused



Below: 5312
Offended: 2656

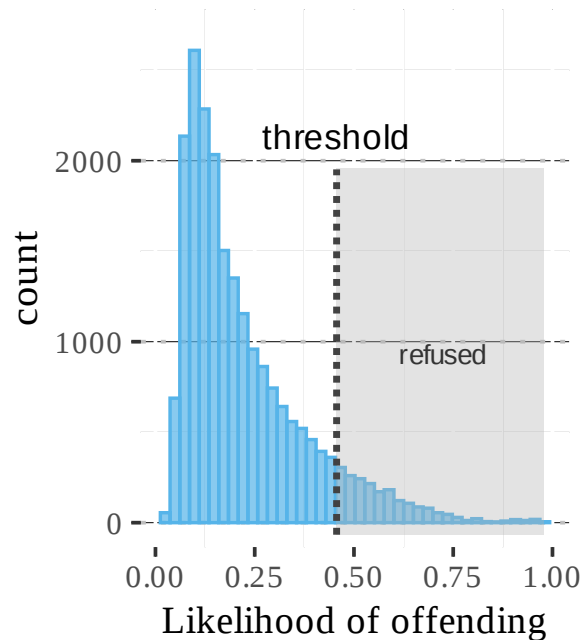
Hypothetically bail refused: 12140

(assumed 50% would have)

1. Reduce offending on bail

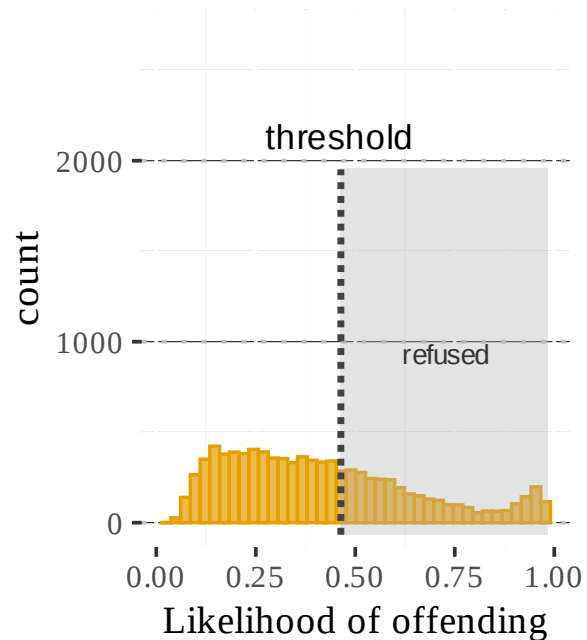
21330

Bail granted - Did not offend



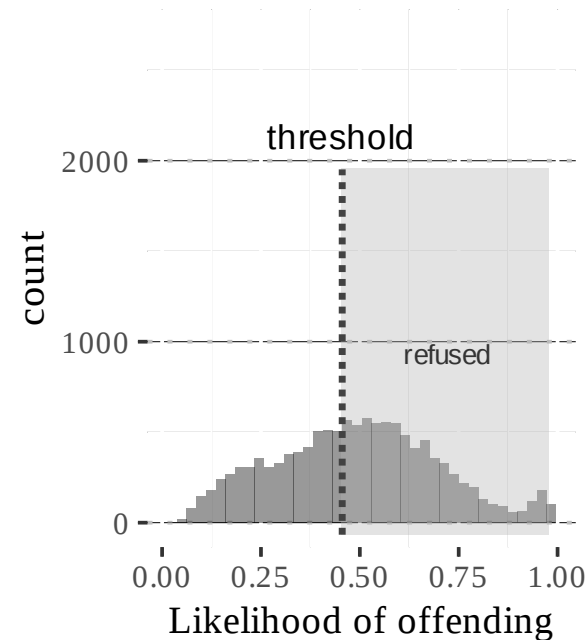
9004

Bail granted - Offended



12143

Bail refused



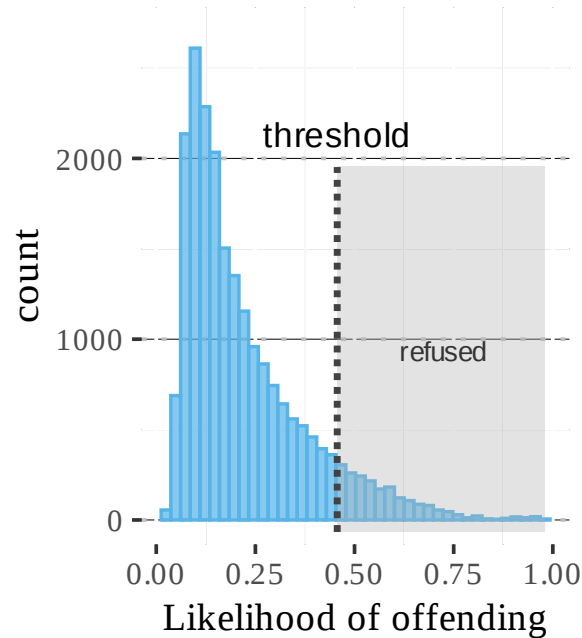
Hypothetically bail refused: 12140

Hypothetically bail granted - offended: $5648 + 2656 = 8304$

1. Reduce offending on bail

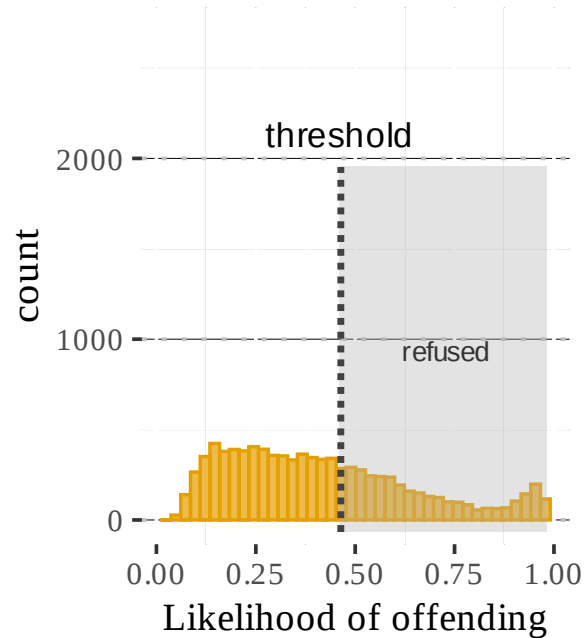
21330

Bail granted - Did not offend



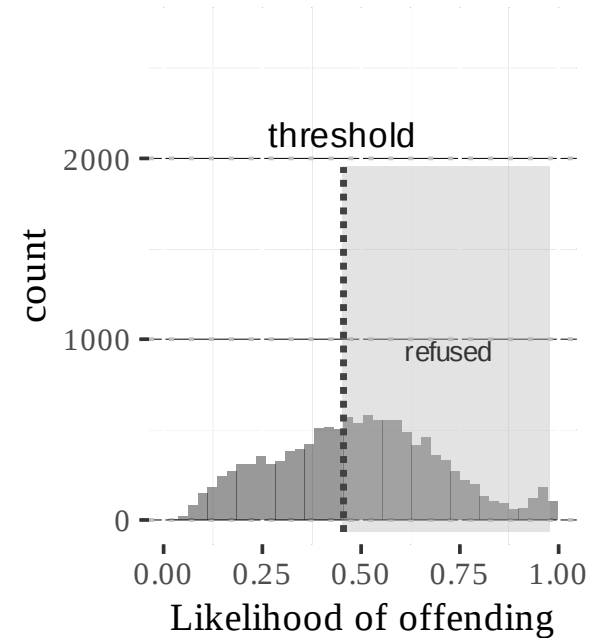
9004

Bail granted - Offended



12143

Bail refused



Hypothetically bail refused: 12140

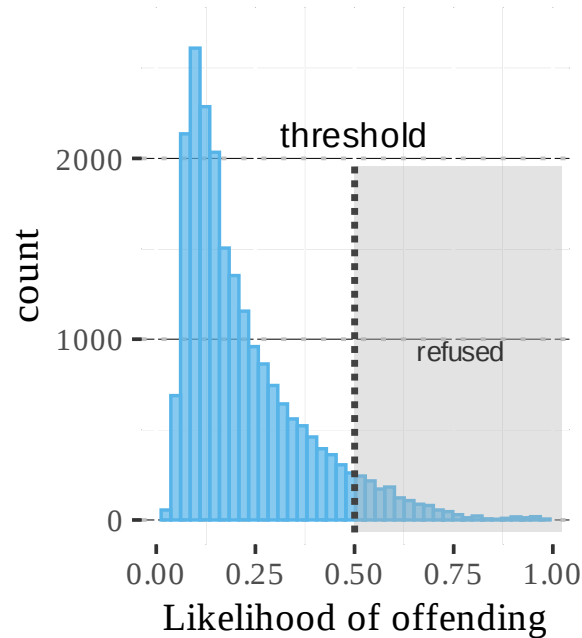
Hypothetically bail granted - offended: $5648 + 2656 = 8304$

(a reduction of 700 or 7.8%)

2. Reduce bail refusals

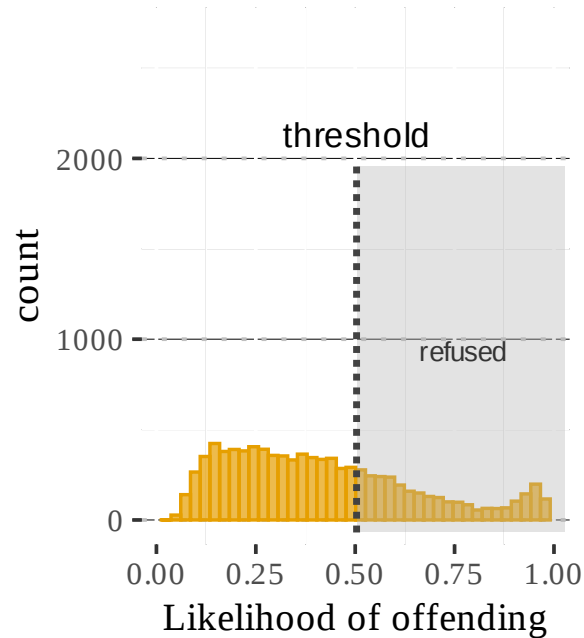
21330

Bail granted - Did not offend



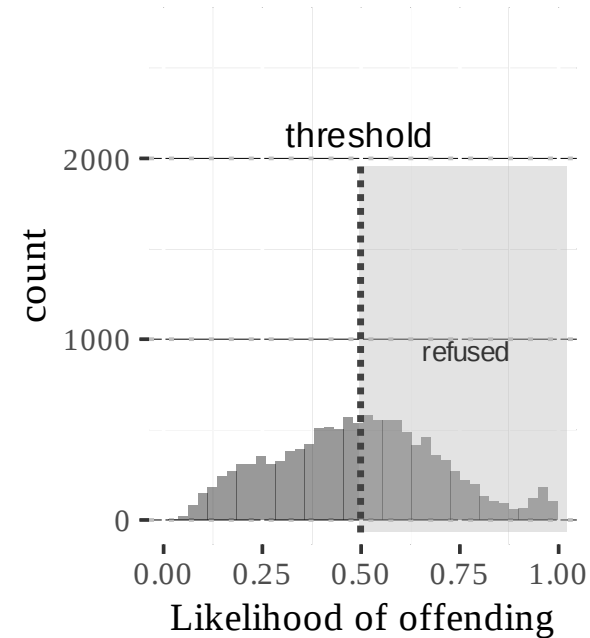
9004

Bail granted - Offended



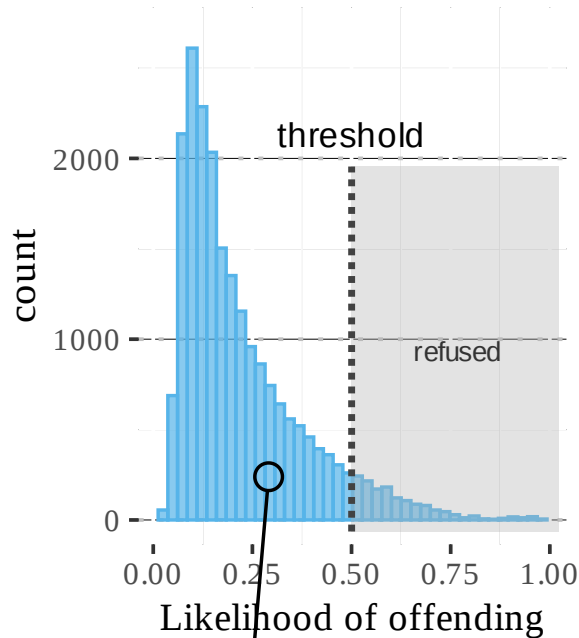
12143

Bail refused



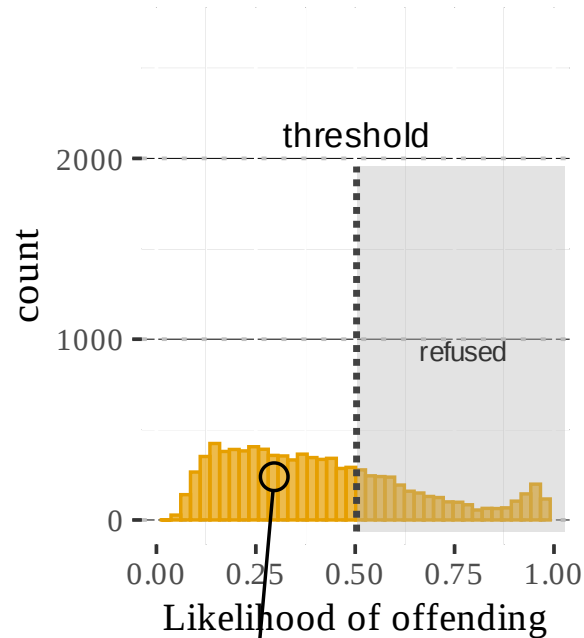
2. Reduce bail refusals

21330
Bail granted - Did not offend



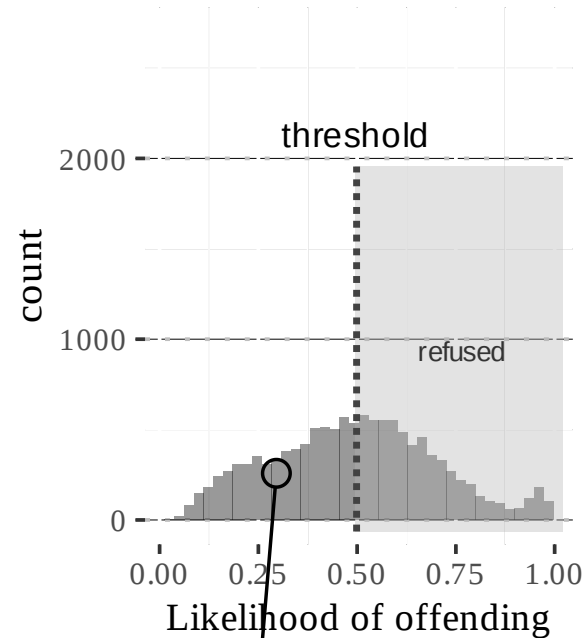
Below: 19377
Offended: 0

9004
Bail granted - Offended



Below: 6010
Offended: 6010

12143
Bail refused



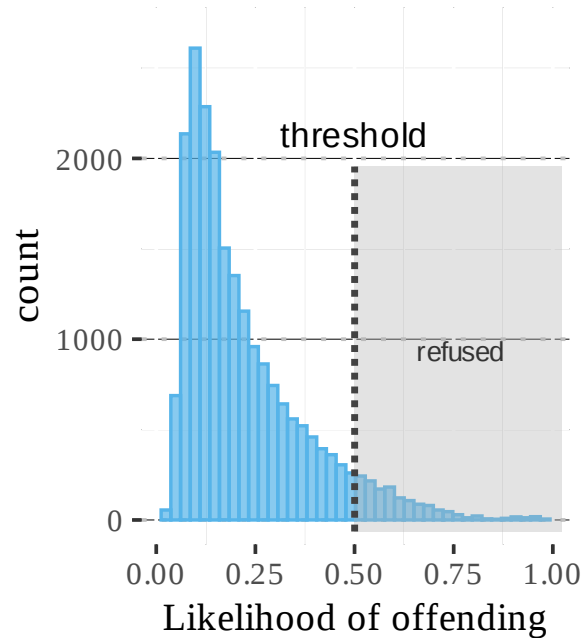
(assumed 50% would have)

Below: 5988
Offended: 2994

2. Reduce bail refusals

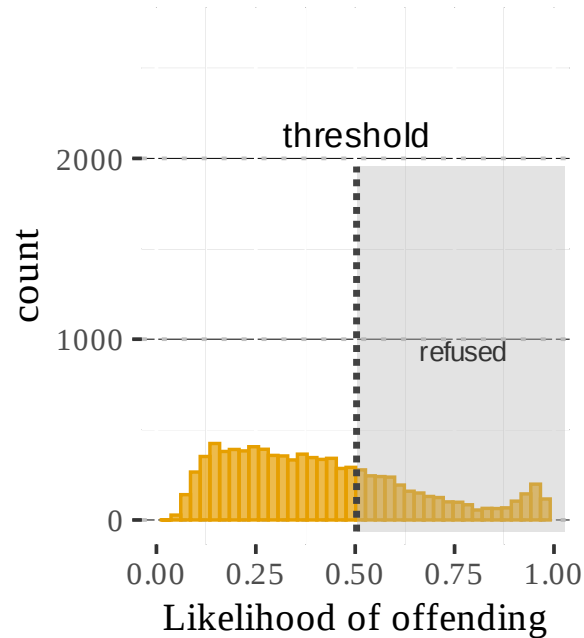
21330

Bail granted - Did not offend



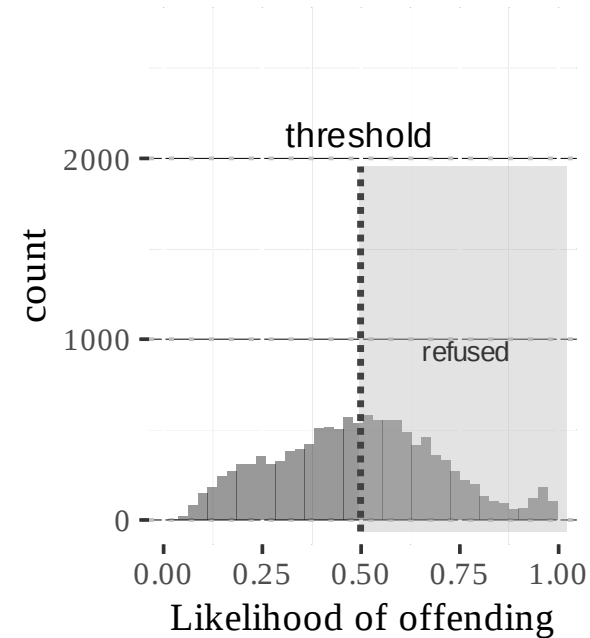
9004

Bail granted - Offended



12143

Bail refused

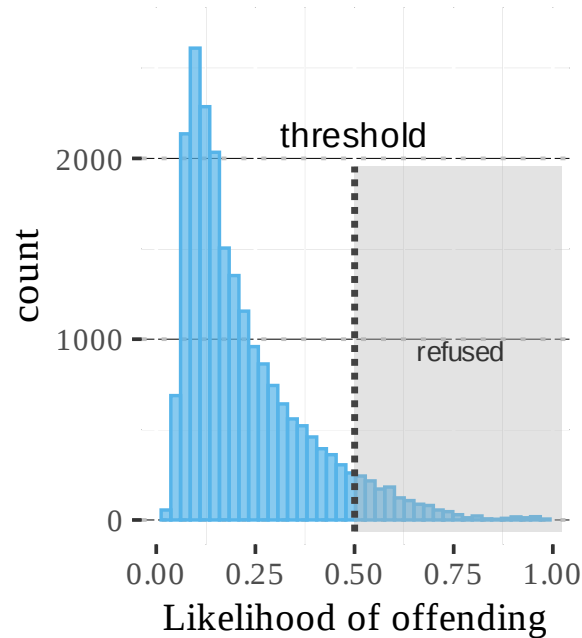


Hypothetically bail granted - offended: $6010 + 2994 = 9004$

2. Reduce bail refusals

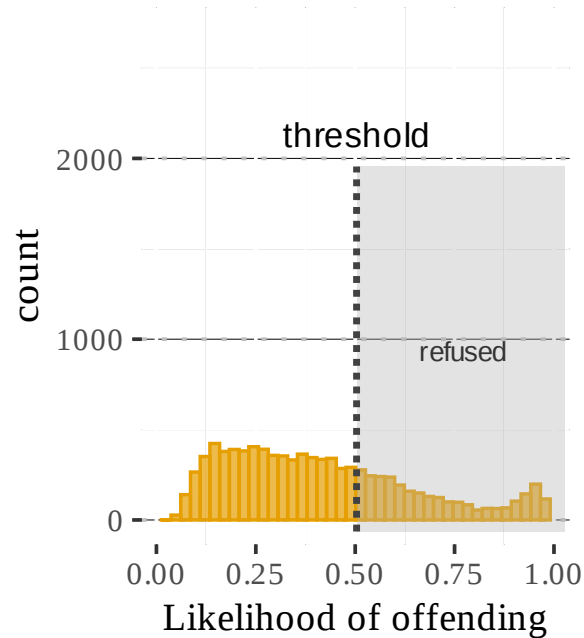
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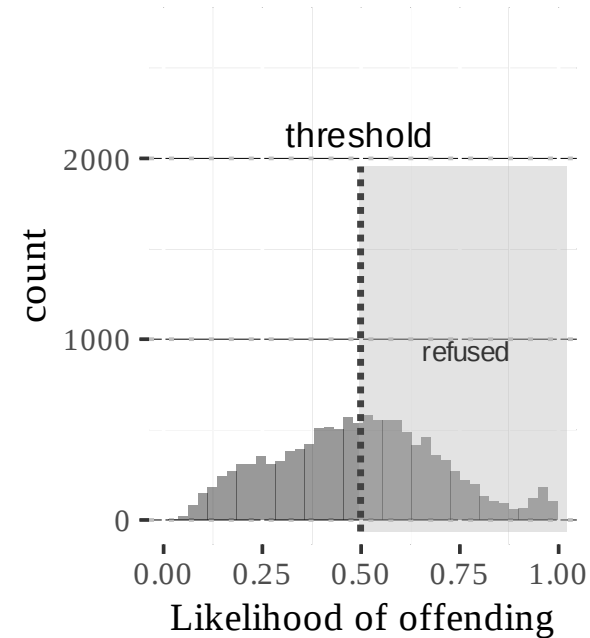
9004

Bail granted - Offended



12143

Bail refused



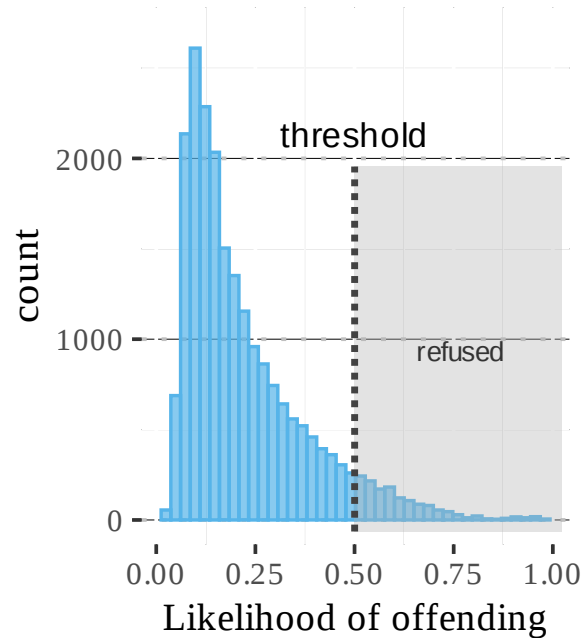
Hypothetically bail refused: 10750

Hypothetically bail granted - offended: $6010 + 2994 = 9004$

2. Reduce bail refusals

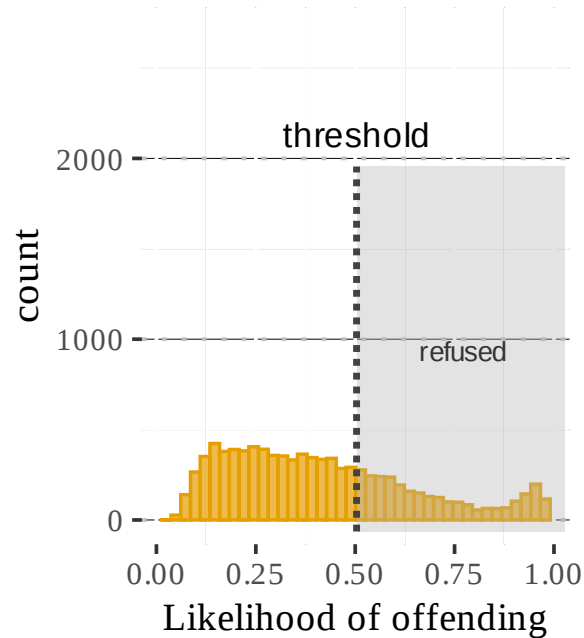
21330

Bail granted - Did not offend



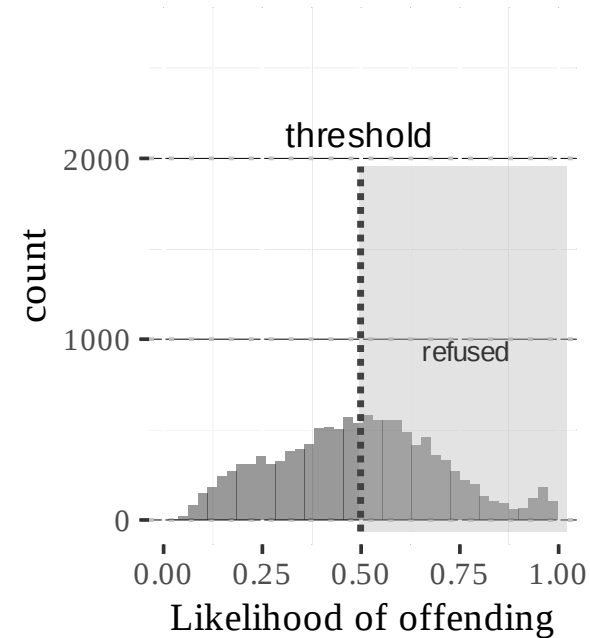
9004

Bail granted - Offended



12143

Bail refused



Hypothetically bail refused: 10750

Hypothetically bail granted - offended: $6010 + 2994 = 9004$

(a reduction of 1393 or 11.5%)

Summary

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Could we:

1. Reduce **offending on bail** (without increasing **bail refusals**)?
2. Reduce **bail refusals** (without increasing **offending on bail**)?

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2. Reduce **bail refusals** (without increasing **offending on bail**)?

What we found:

1. **offending on bail**: 700 or 7.8% reduction
2. **bail refusals**: 1393 or 11.5% reduction

(this is assuming 50% of those **bail refused** but below the threshold would have offended if granted bail.)

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2. Offending is measured crudely; some of the offending predicted would not be serious enough to change a bail decision
3. Other important concerns such as fairness, non-representative data are not addressed

References

[1] J. H. Friedman. "Multivariate adaptive regression splines". In: *The annals of statistics* (1991), pp. 1-67.

[2] J. Kleinberg, H. Lakkaraju, J. Leskovec, et al. "Human decisions and machine predictions". In: *The quarterly journal of economics* 133.1 (2017), pp. 237-293.