

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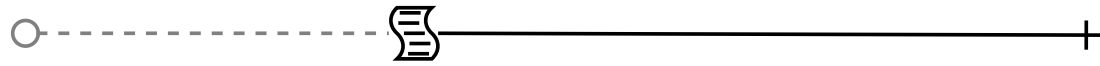
1. Aim: to explore the potential use of predictive modelling to better inform bail decisions
2. Predictive modelling
3. Results

# 1. Aim

# Bail outcomes

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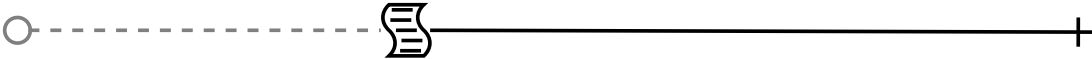
1. Bail dispensed with



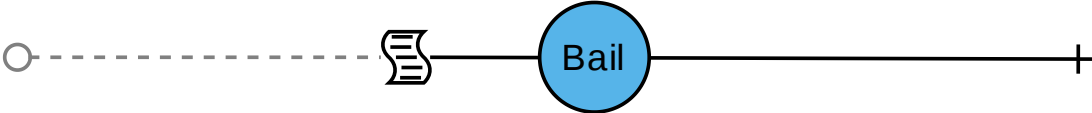


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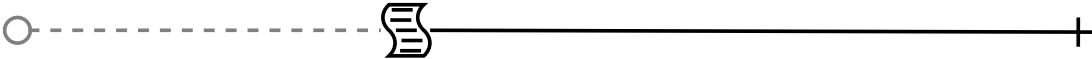


2. Bail granted

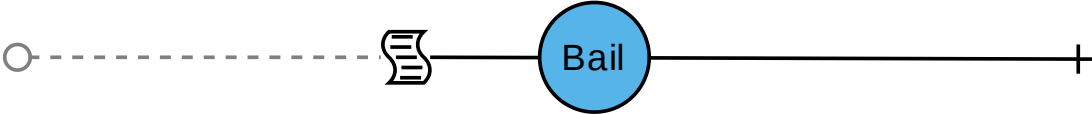


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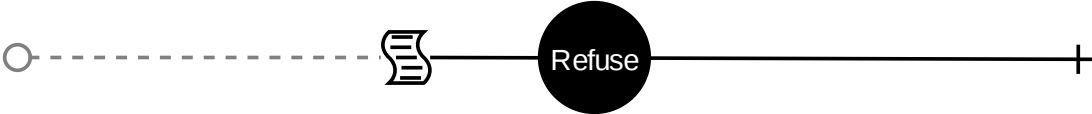
1. Bail dispensed with



2. Bail granted

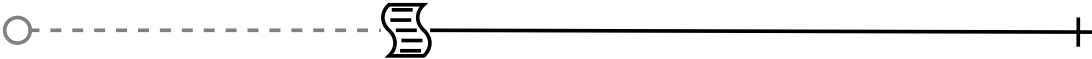


3. Bail refused

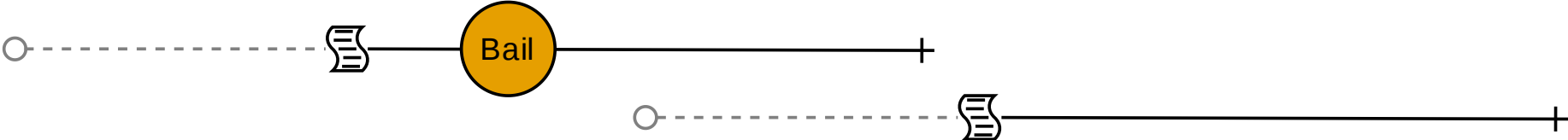


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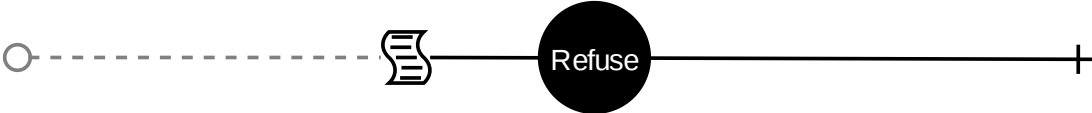
1. Bail dispensed with



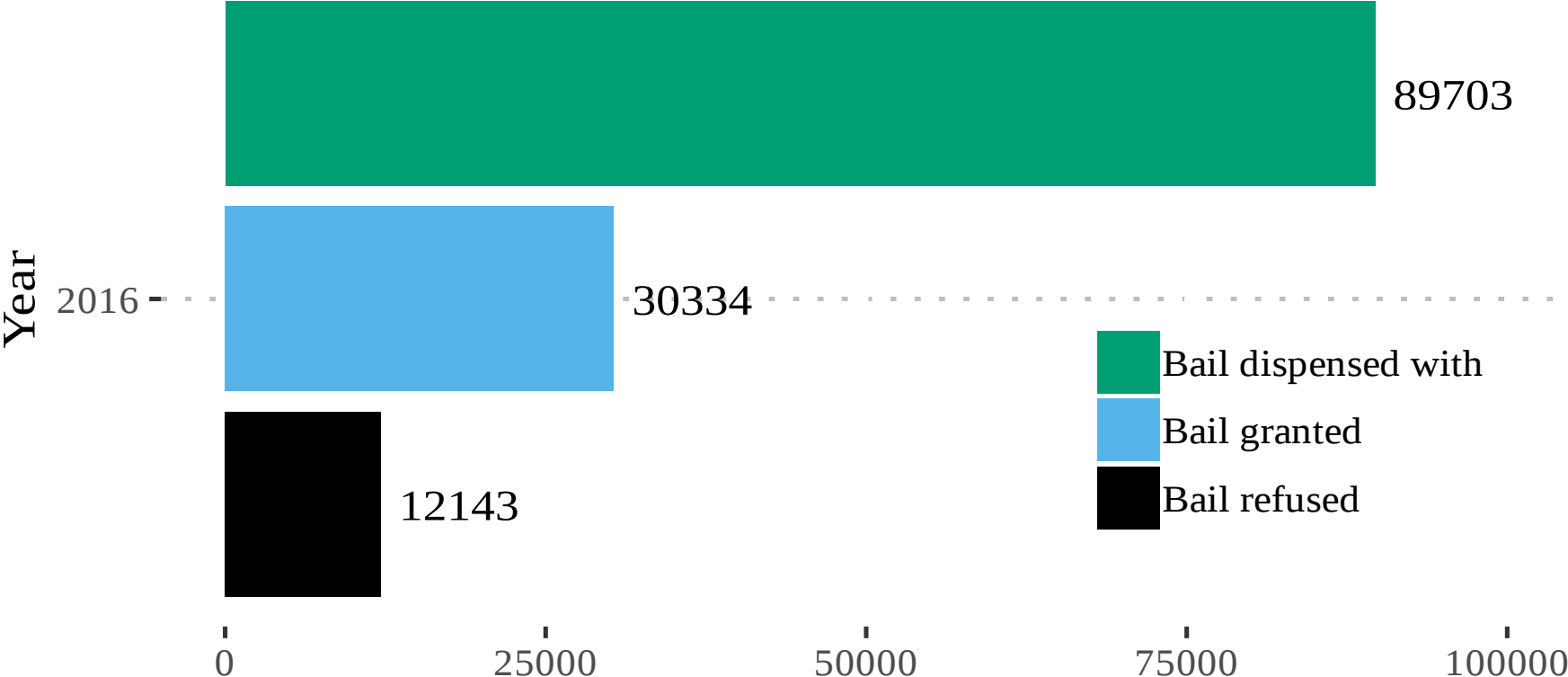
2. Bail granted



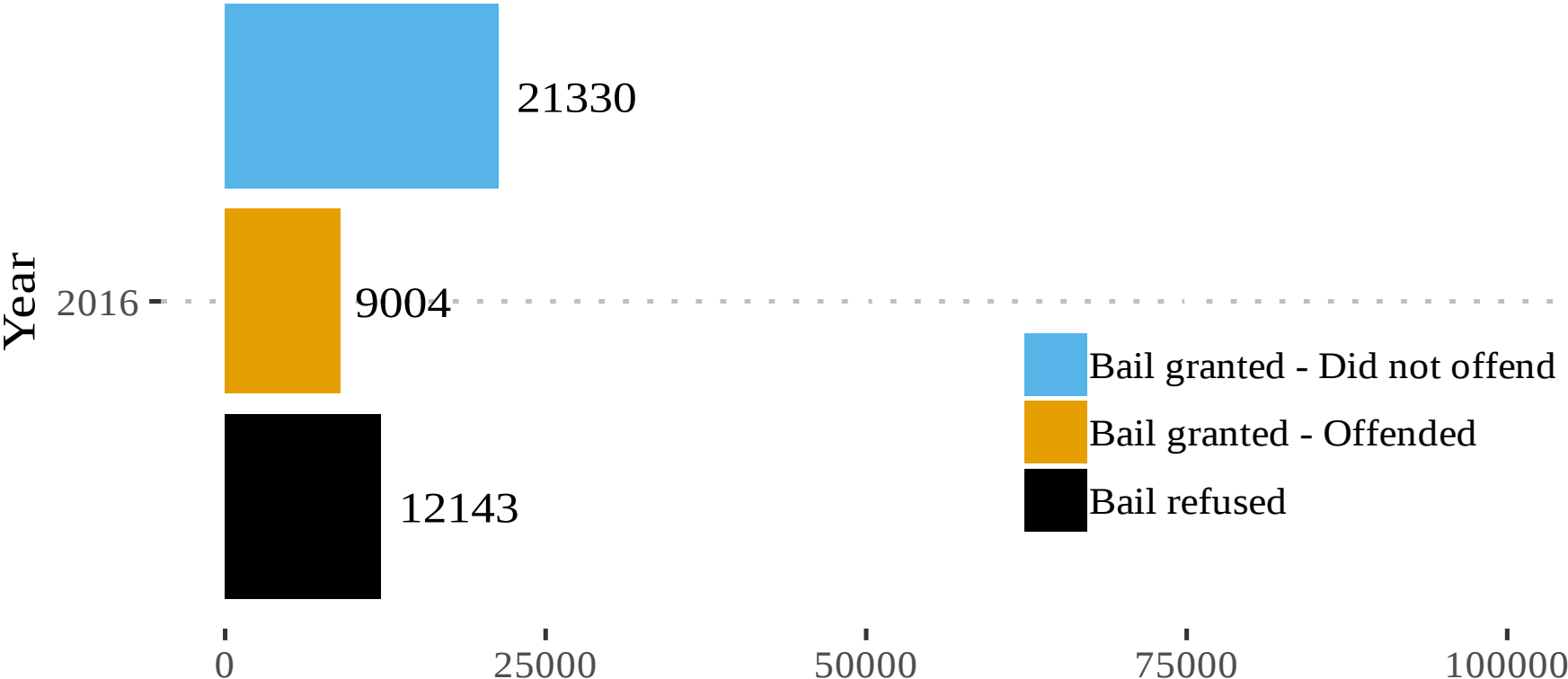
3. Bail refused



# Bail outcomes in 2016



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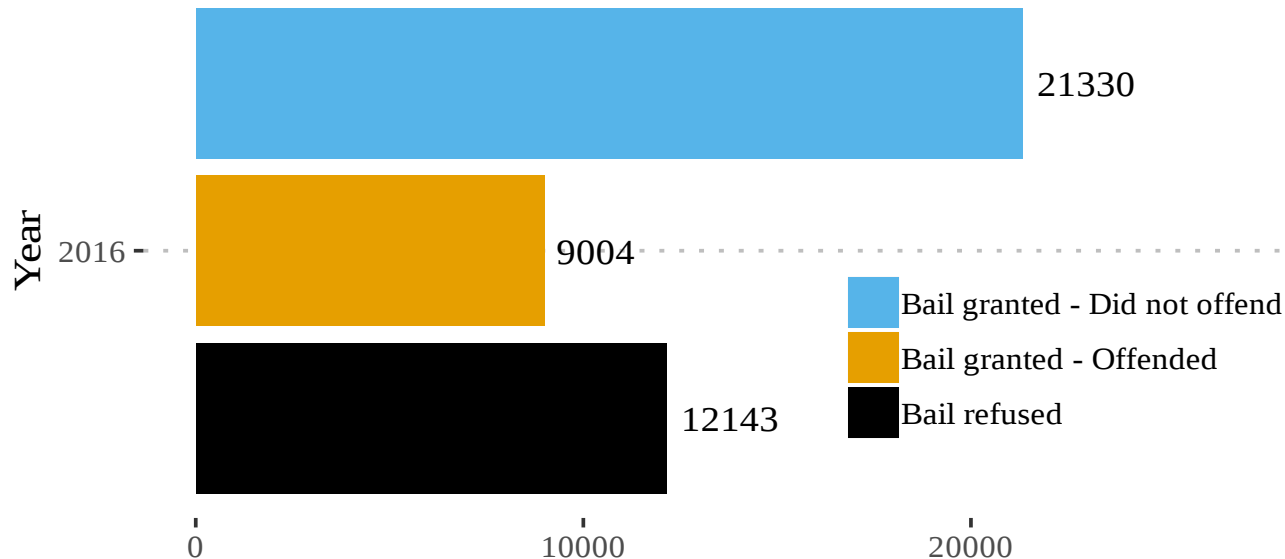
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2. Reduce **bail refusals** (without increasing **offending on bail**)?



## 2. Predictive modelling

# Data

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  - Defendants charged between 2011 and 2016

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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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# Predictors

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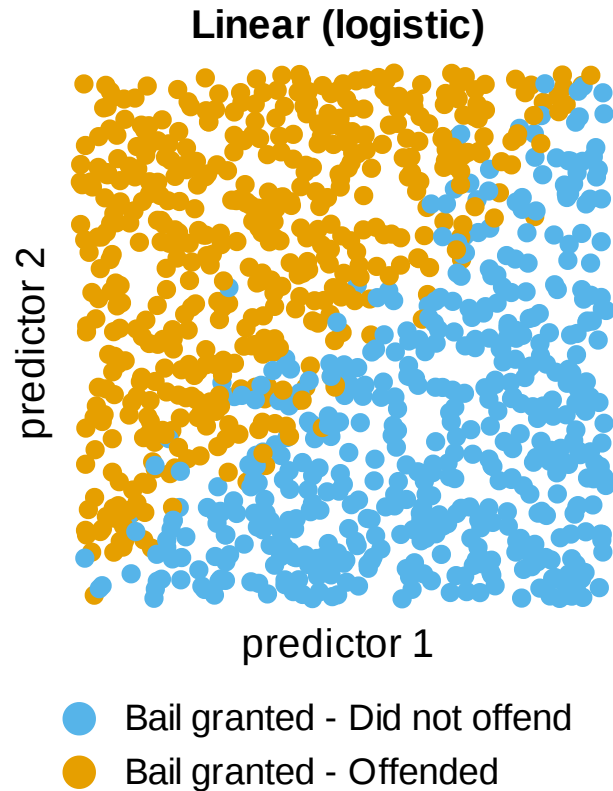
## 3. Criminal history:

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

# 3 Models compared

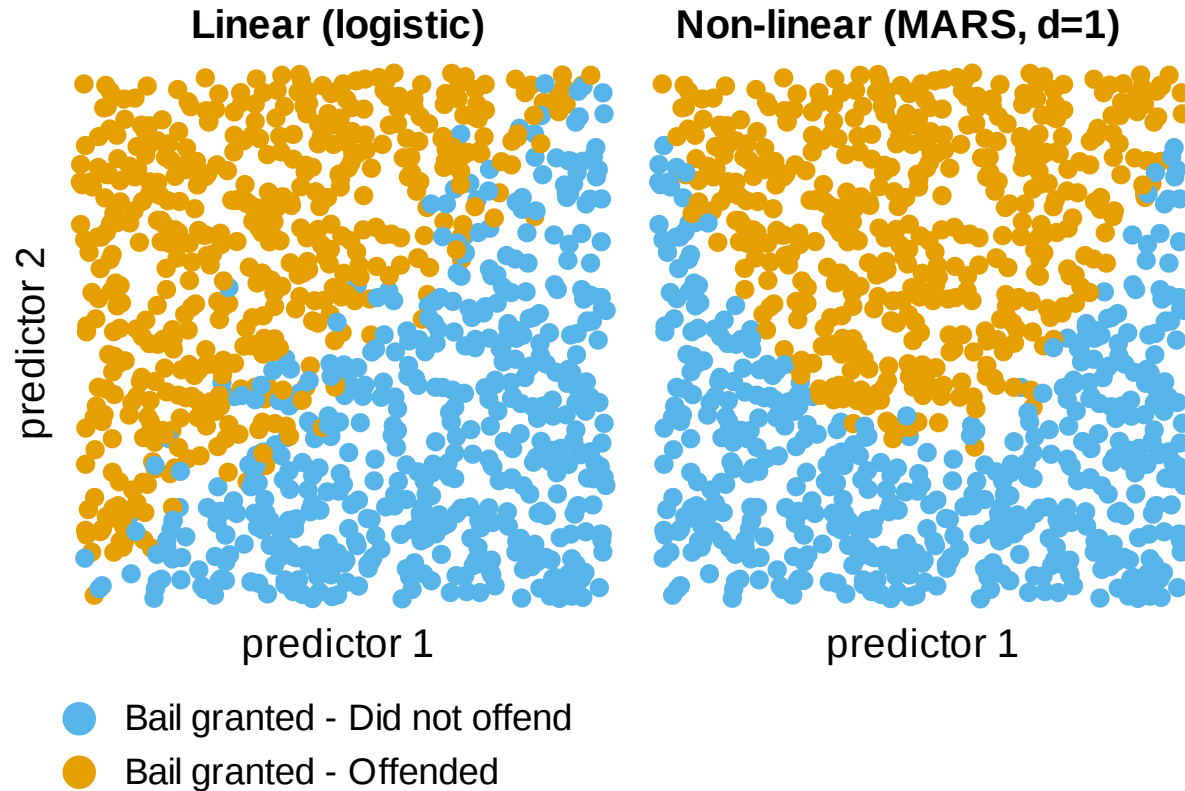


# 3 Models compared



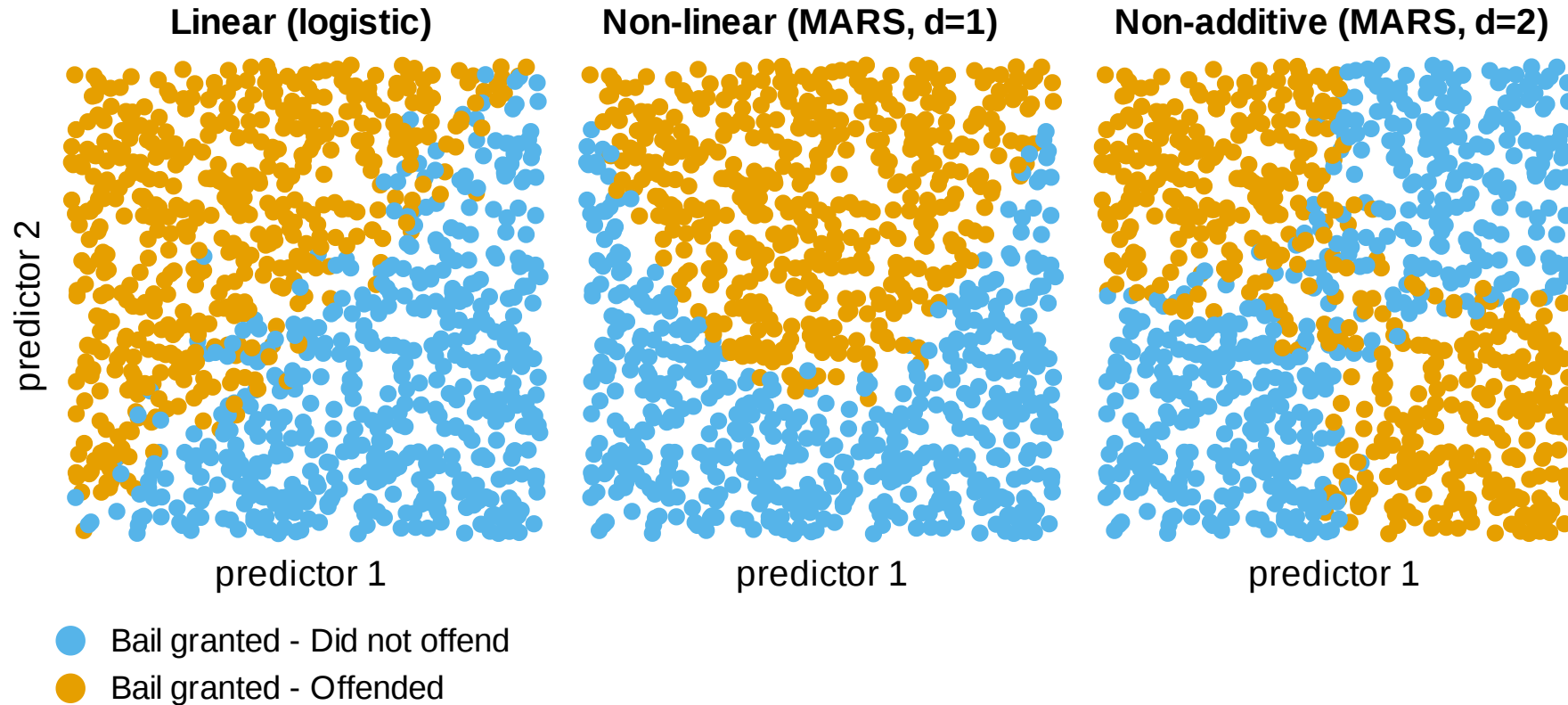
(MARS: multivariate adaptive regression splines (Friedman, 1991))

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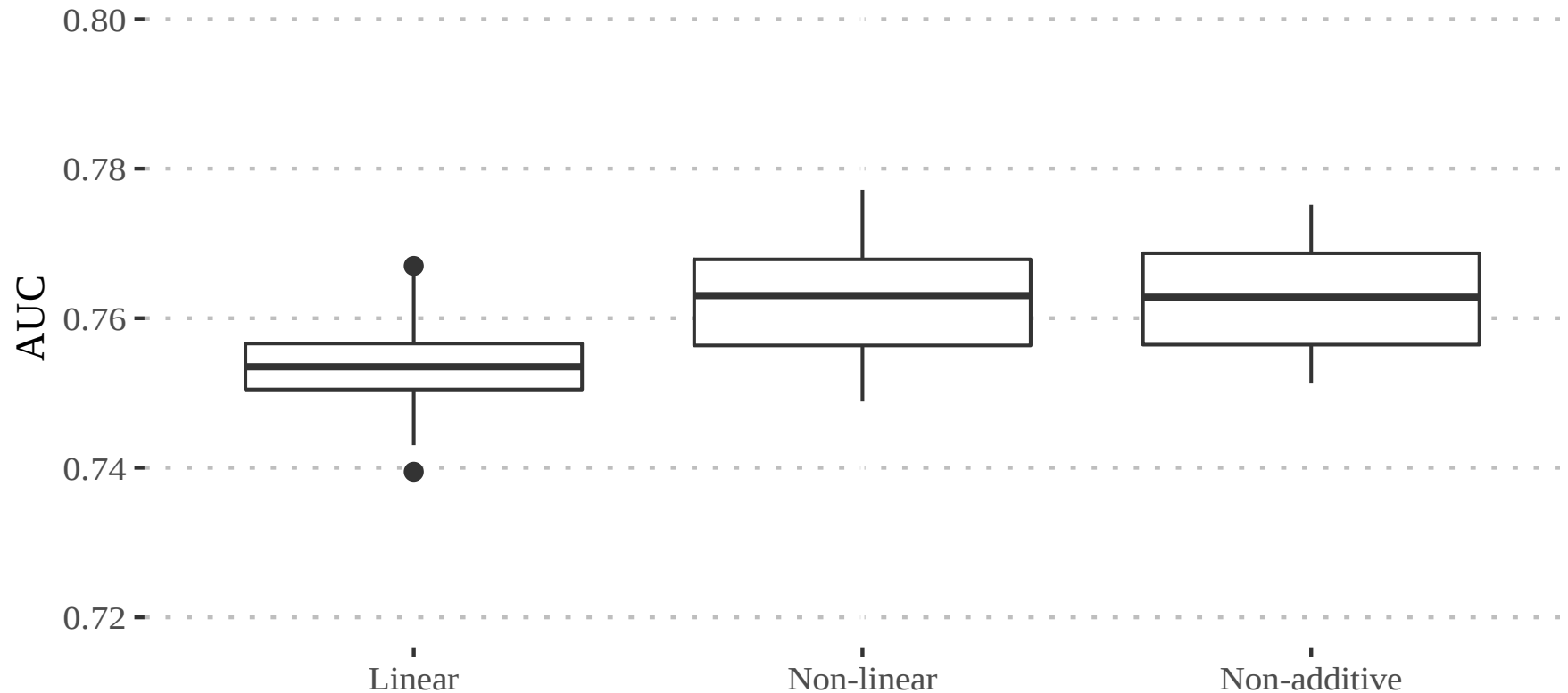
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# Model selection

based on AUC (area under curve)

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



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- Most serious offence in ANZSOC 03 (Sexual assault)
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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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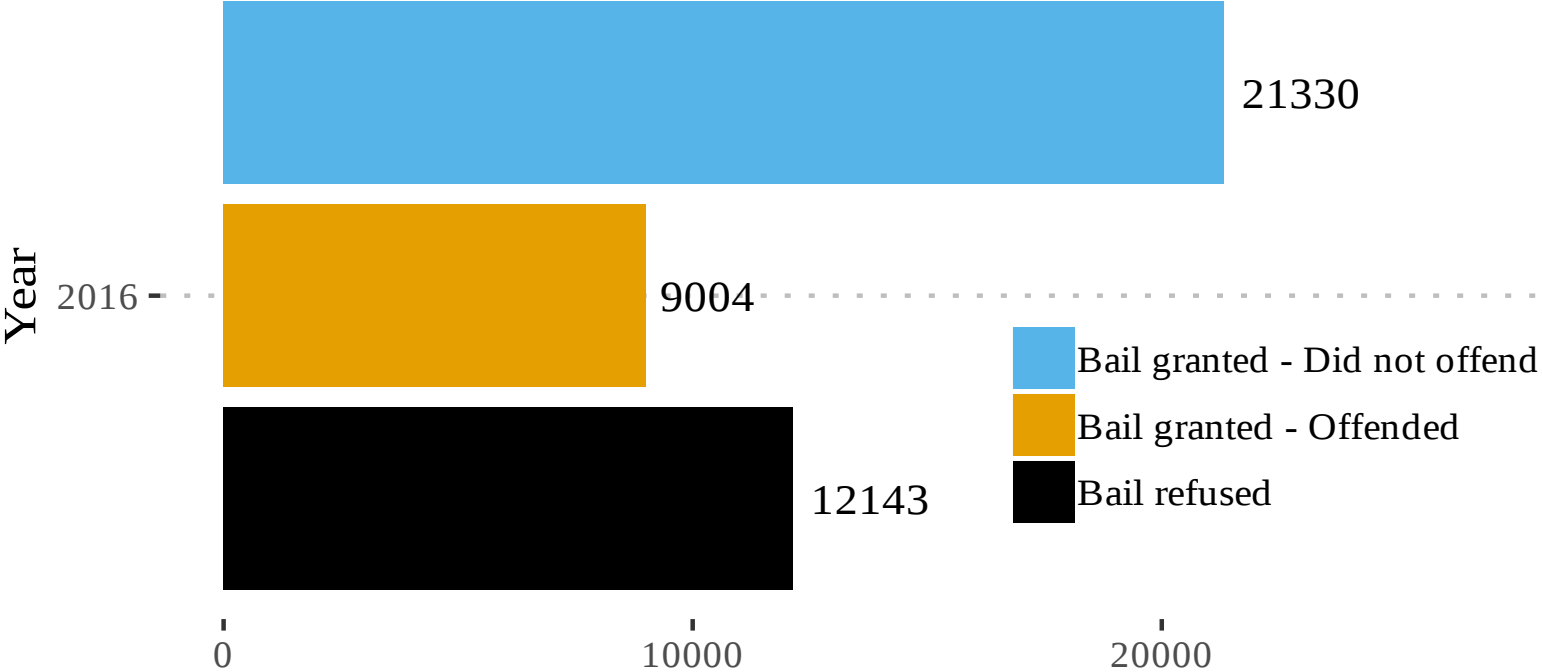
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3. Here we assume *hypothetically*:
  - individual **above** the threshold would be refused bail
  - individual **below** the threshold would be granted bail

# Some remarks

1. The model predictions are in terms of probabilities, i.e. likelihood of offending
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**

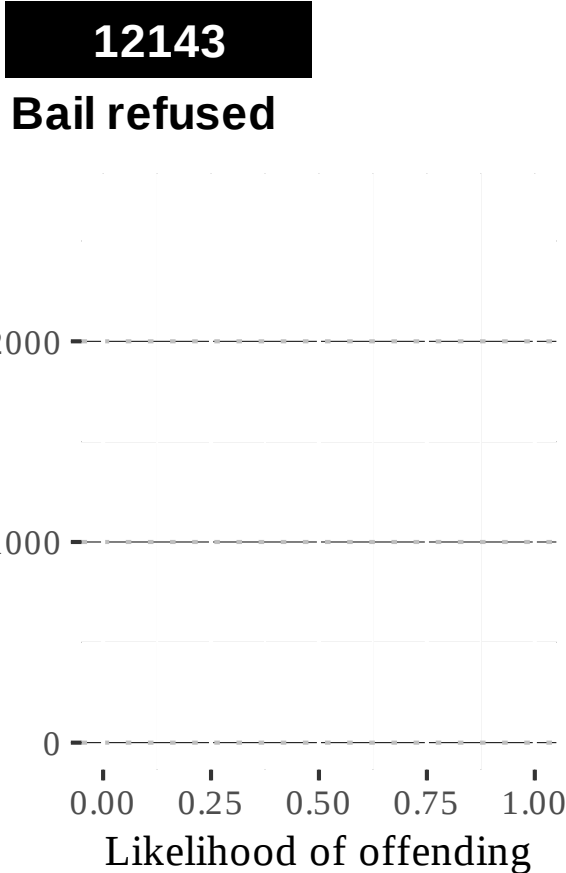
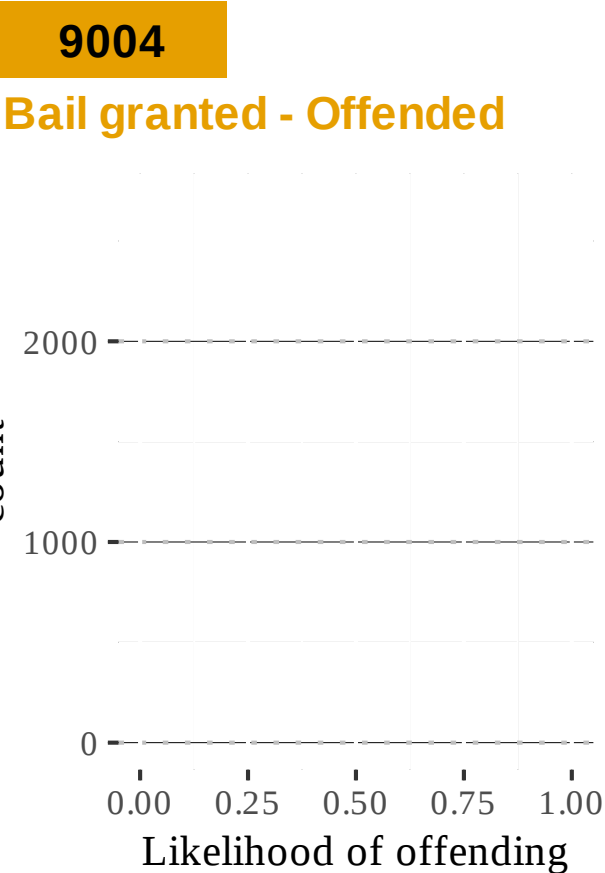
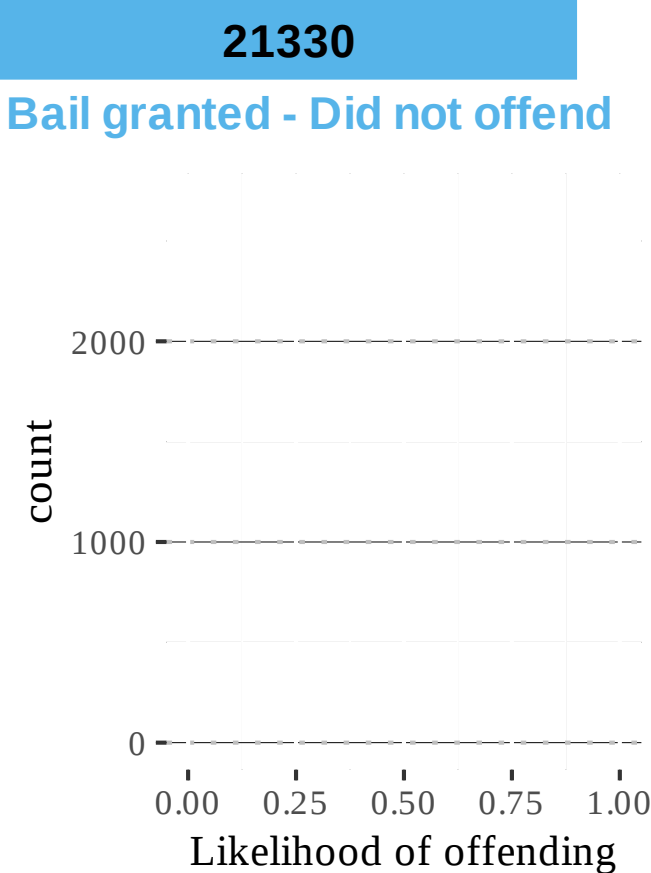
**9004**

**Bail granted - Offended**

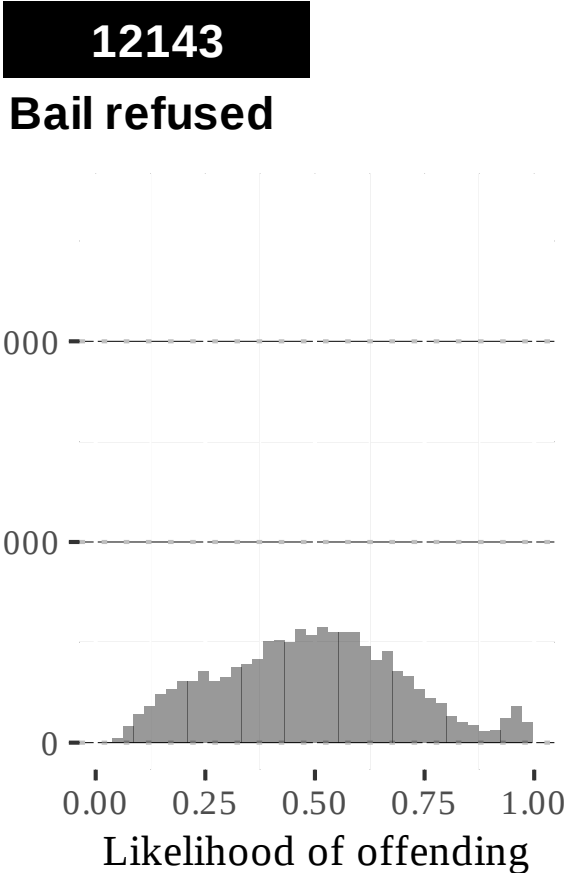
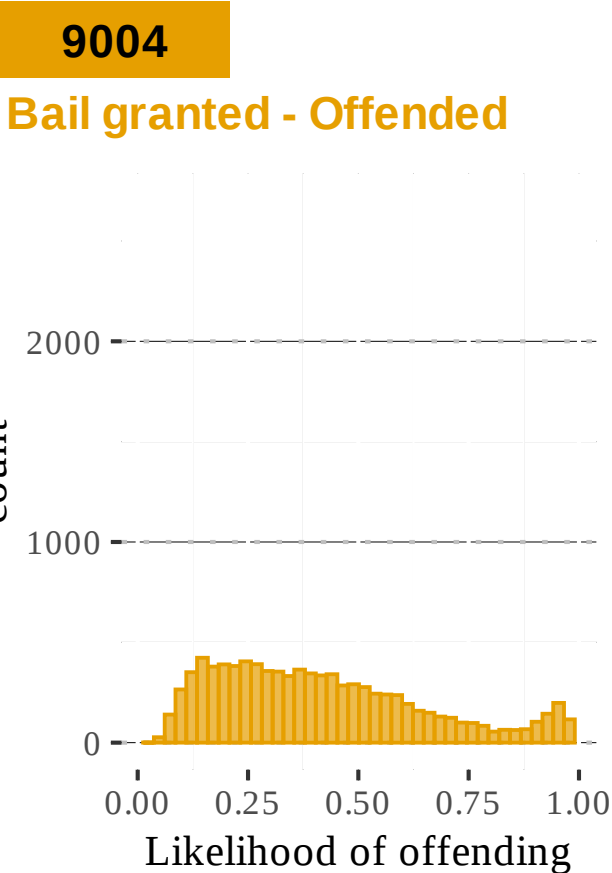
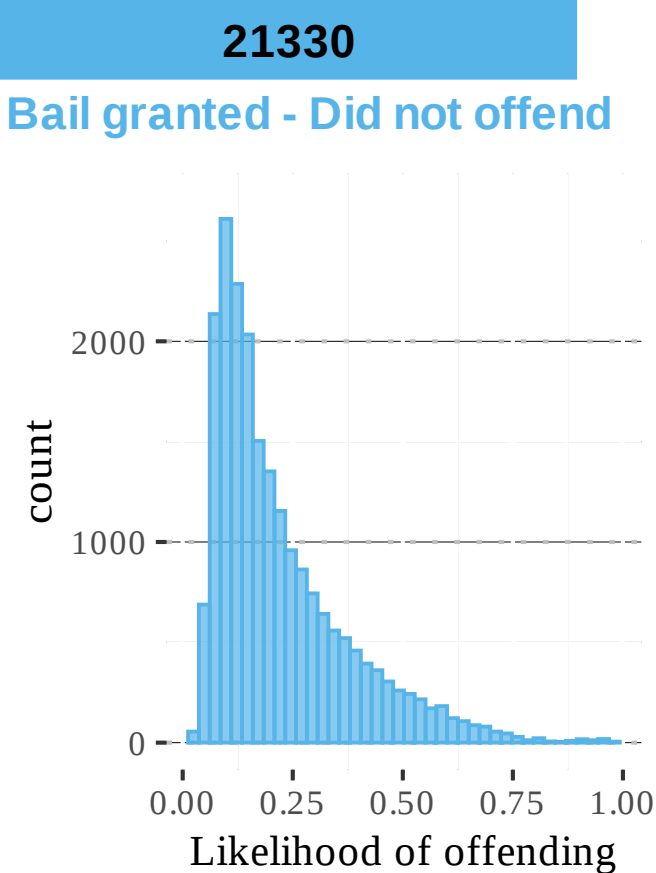
**12143**

**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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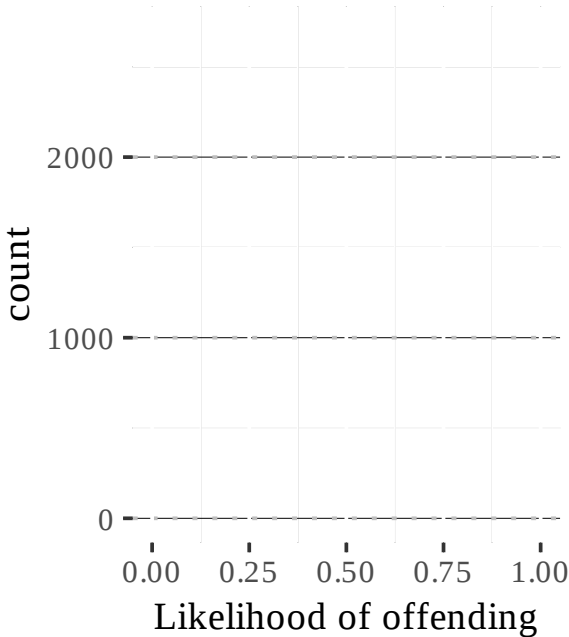
Bail granted - Offended

**12143**

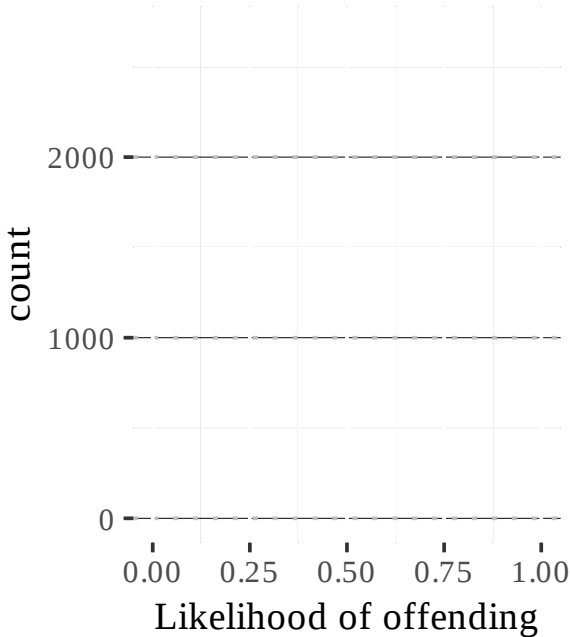
Bail refused

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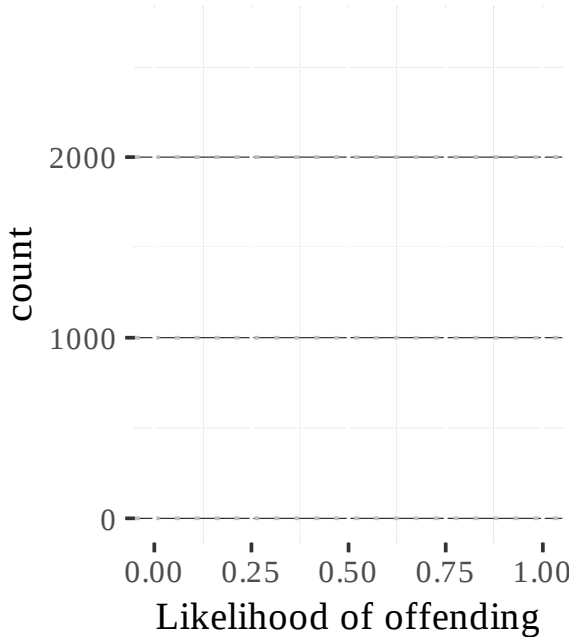
**21330**  
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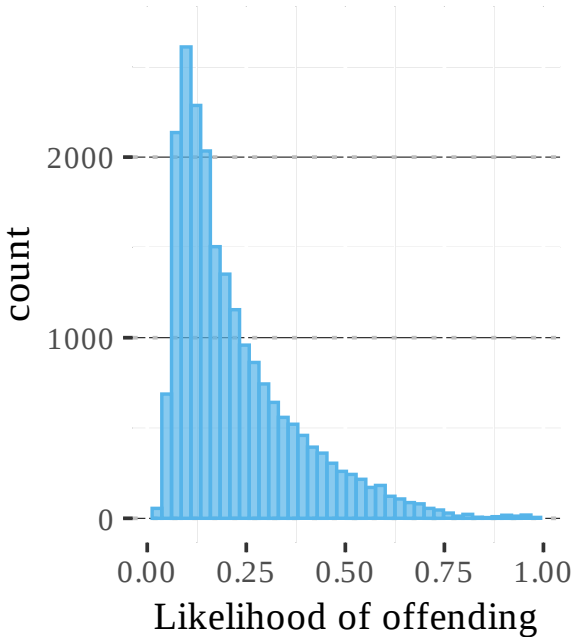


**12143**  
Bail refused

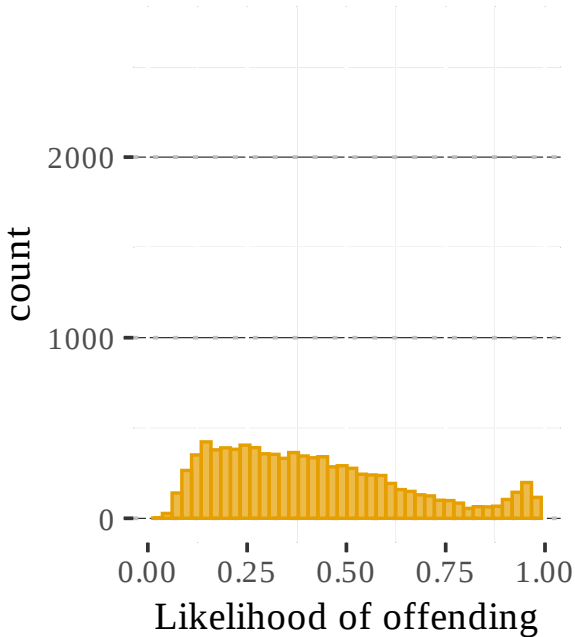


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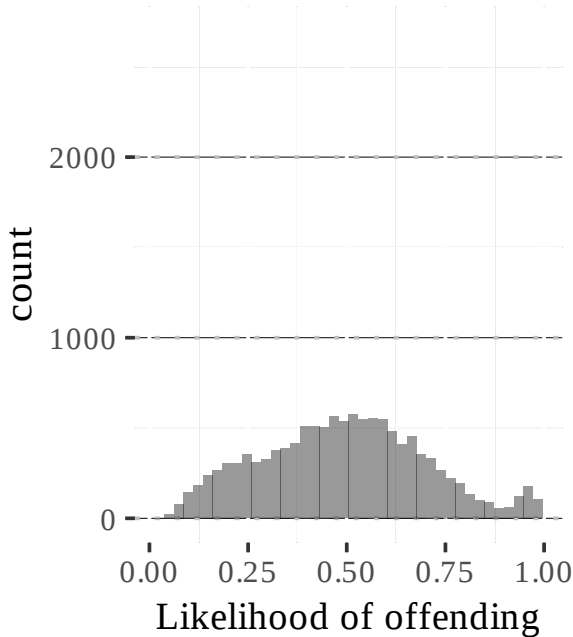
**21330**  
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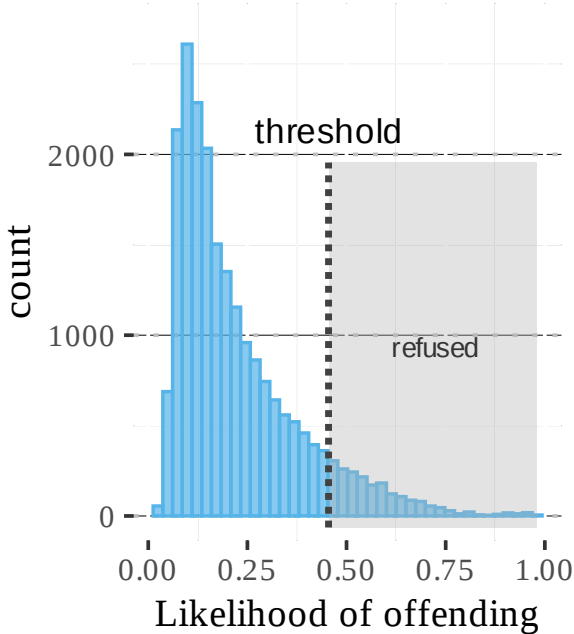


**12143**  
Bail refused

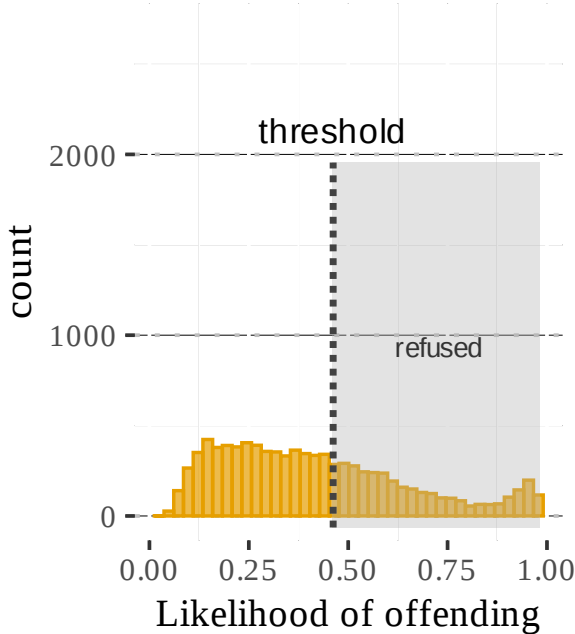


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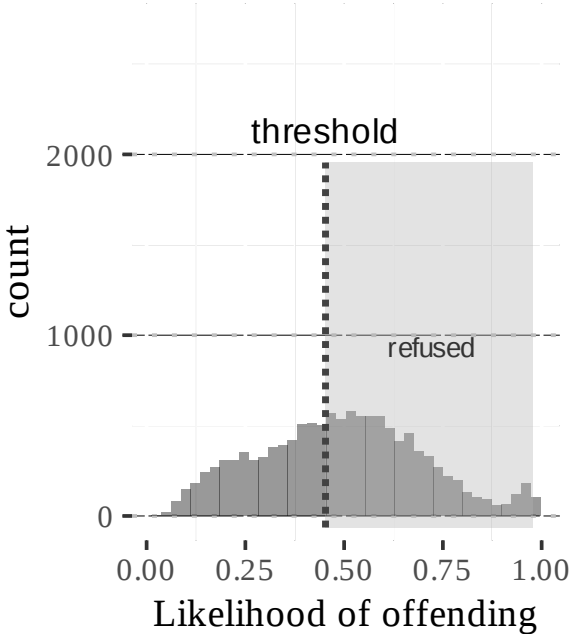
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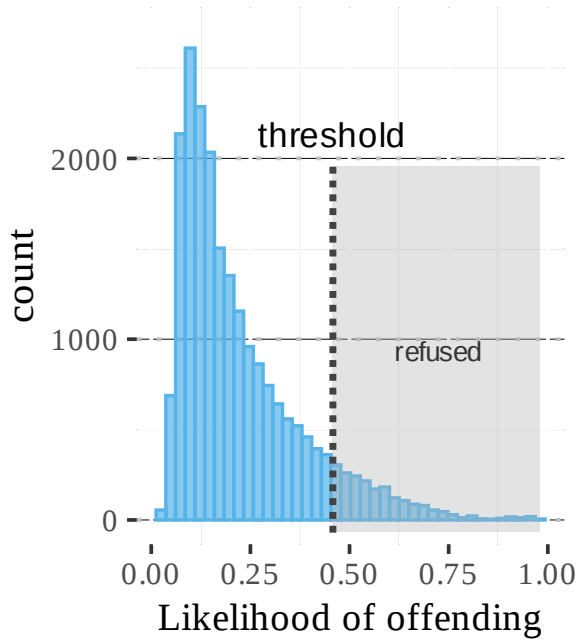
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Bail refused



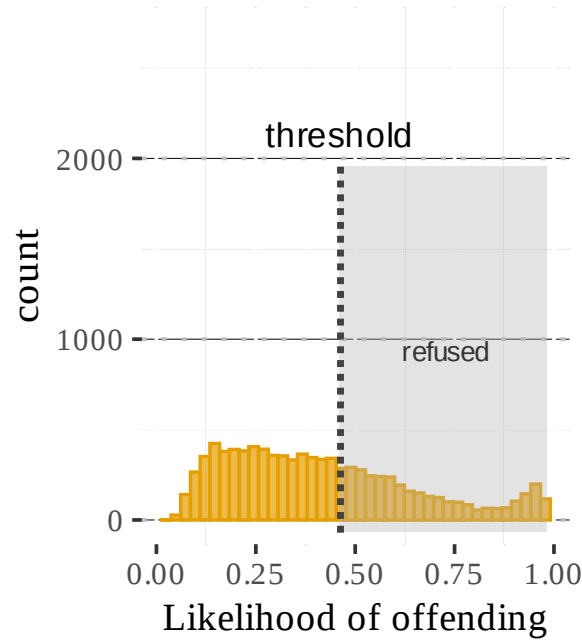


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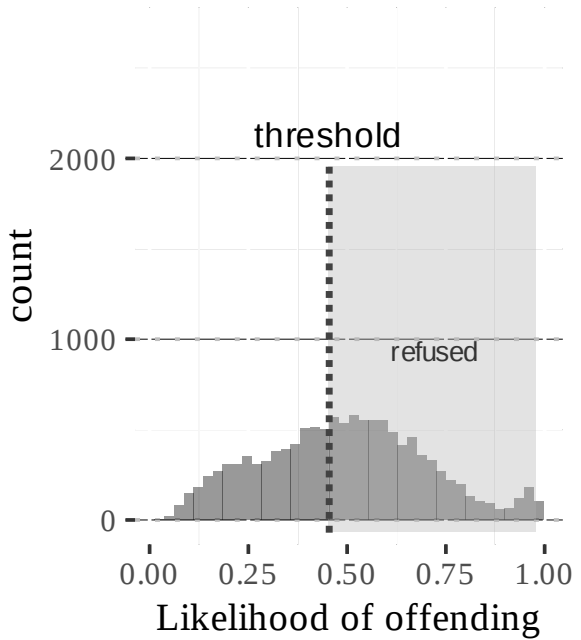
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**12143**  
Bail refused

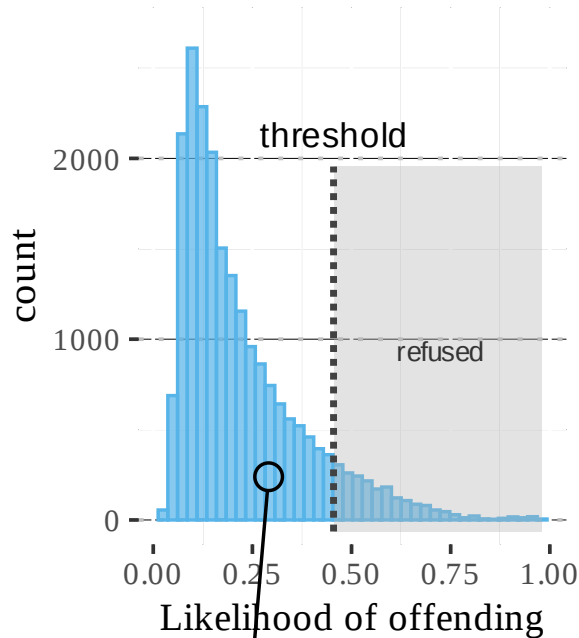


**Hypothetically bail refused: 12140**

# 1. Reduce offending on bail

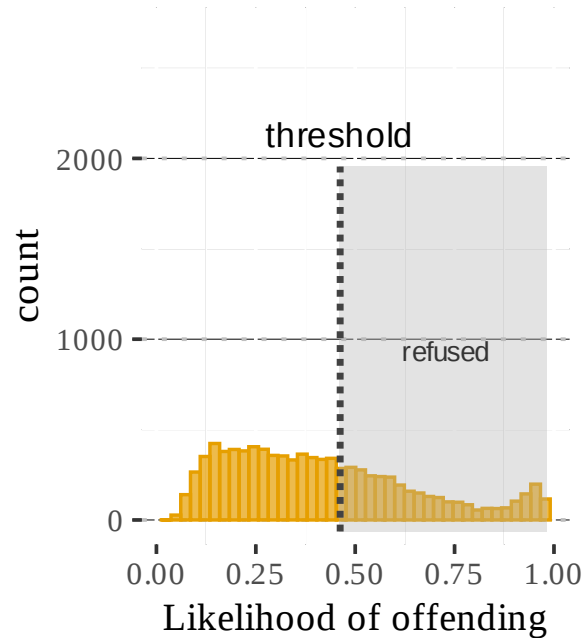
21330

Bail granted - Did not offend



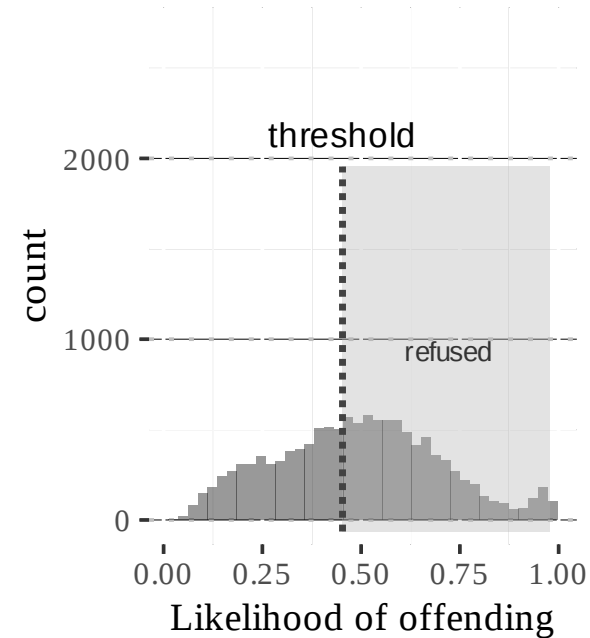
9004

Bail granted - Offended



12143

Bail refused



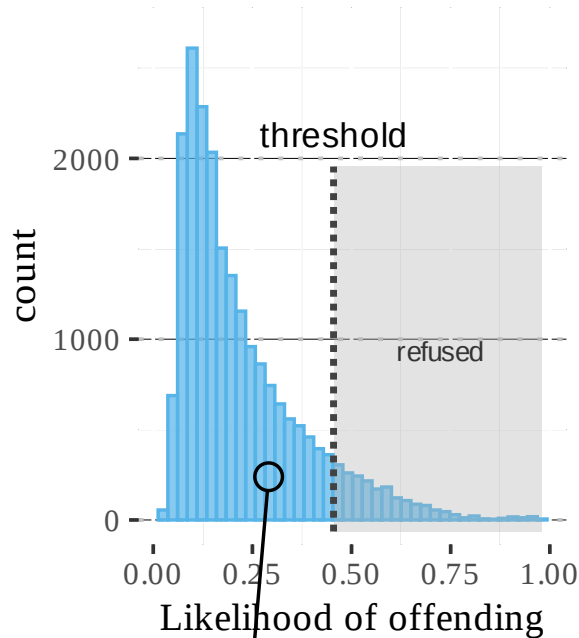
Hypothetically bail refused: 12140

Below: 19377  
Offended: 0

# 1. Reduce offending on bail

21330

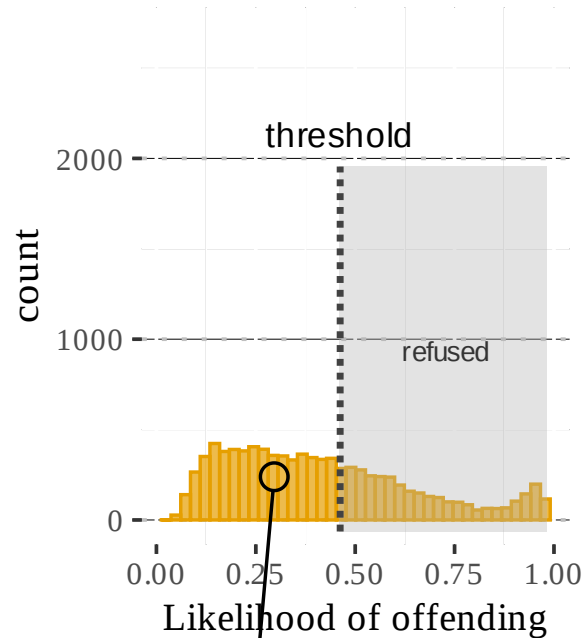
Bail granted - Did not offend



Below: 19377  
Offended: 0

9004

Bail granted - Offended

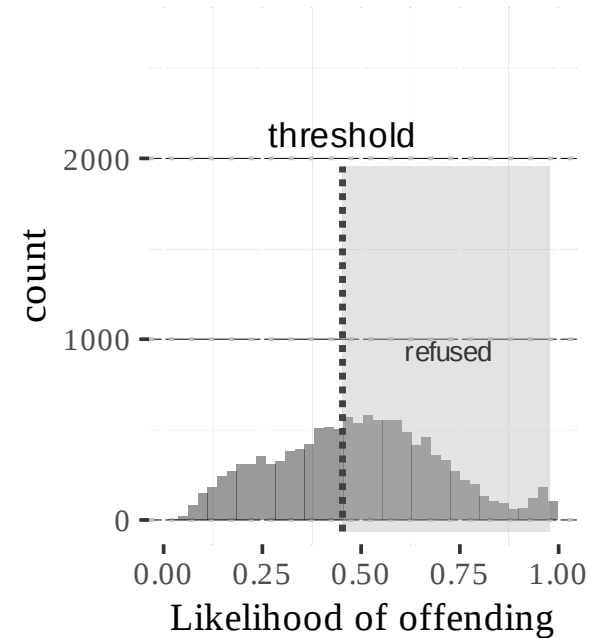


Below: 5648  
Offended: 5648

Hypothetically bail refused: 12140

12143

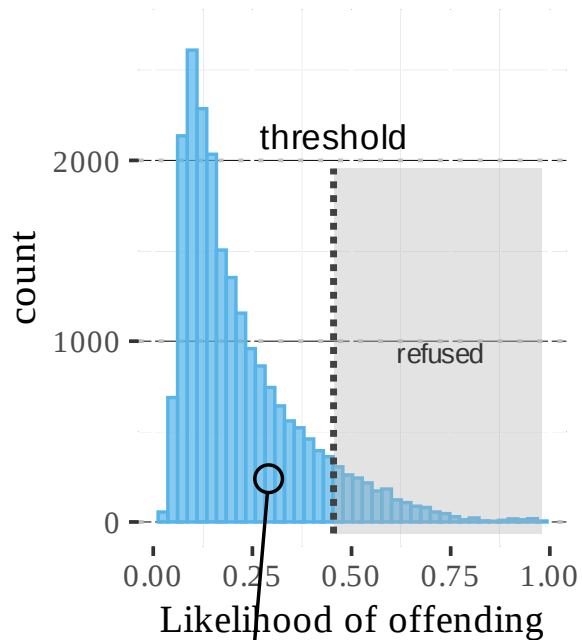
Bail refused



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21330

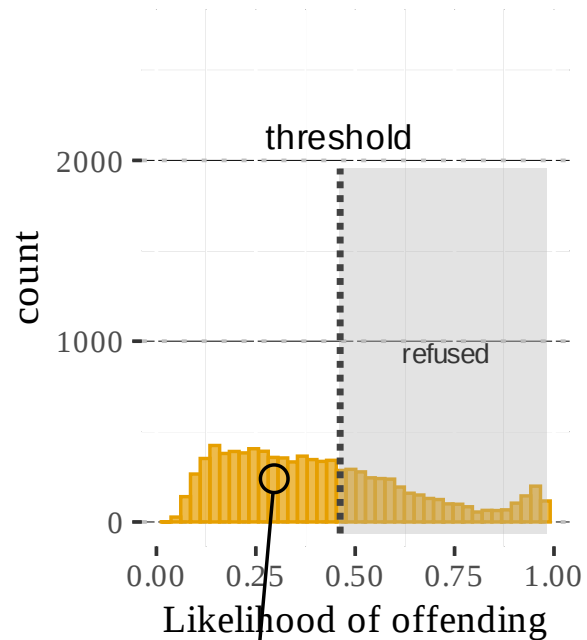
Bail granted - Did not offend



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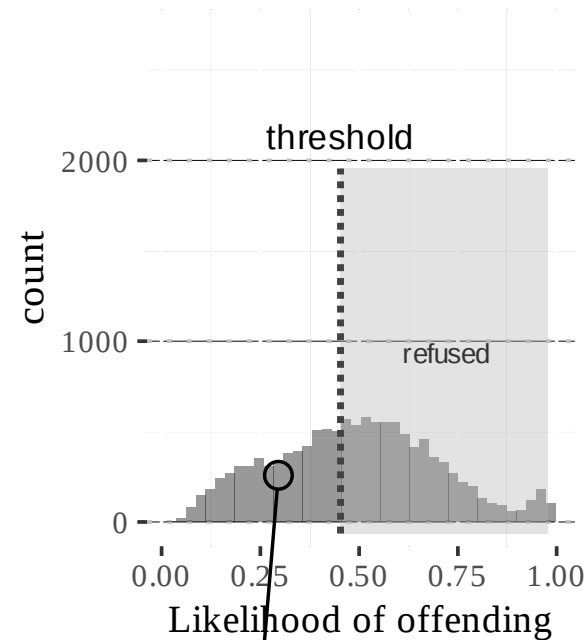


Hypothetically bail refused: 12140

Below: 5648  
Offended: 5648

12143

Bail refused

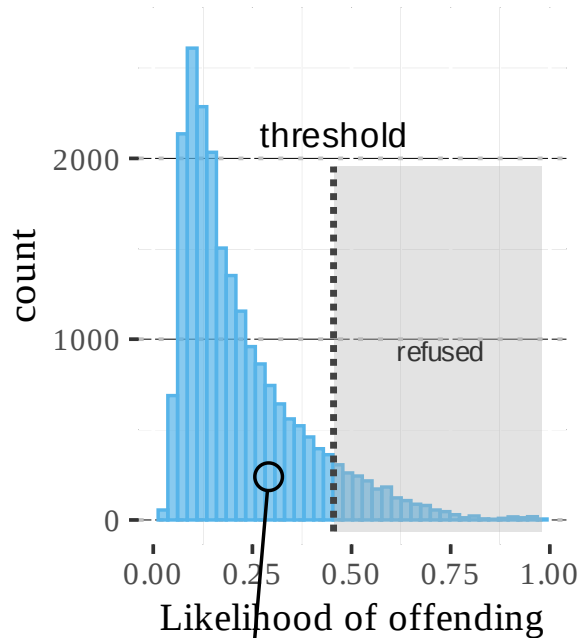


Below: 5312  
Offended: ?

# 1. Reduce offending on bail

21330

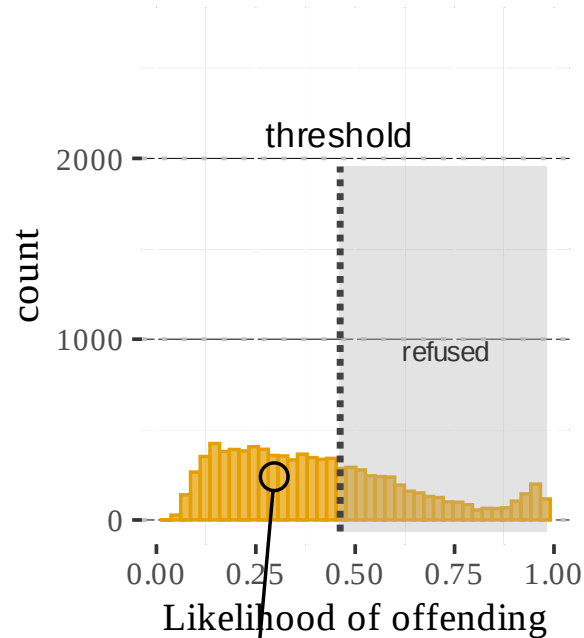
Bail granted - Did not offend



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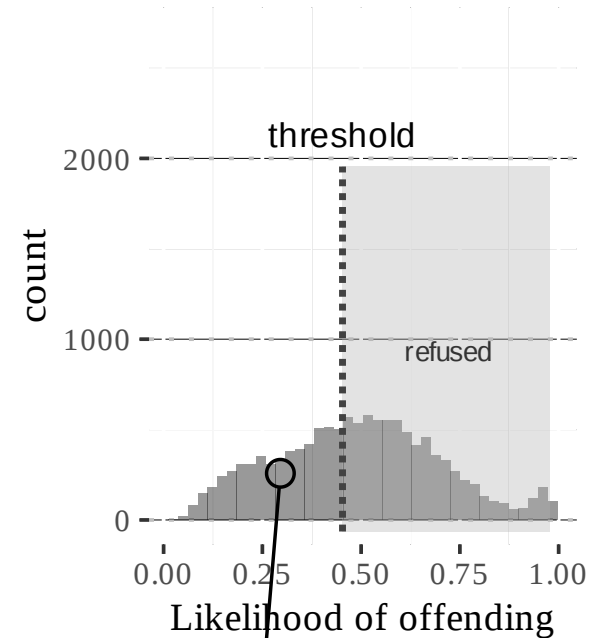


Hypothetically bail refused: 12140

Below: 5648  
Offended: 5648

12143

Bail refused



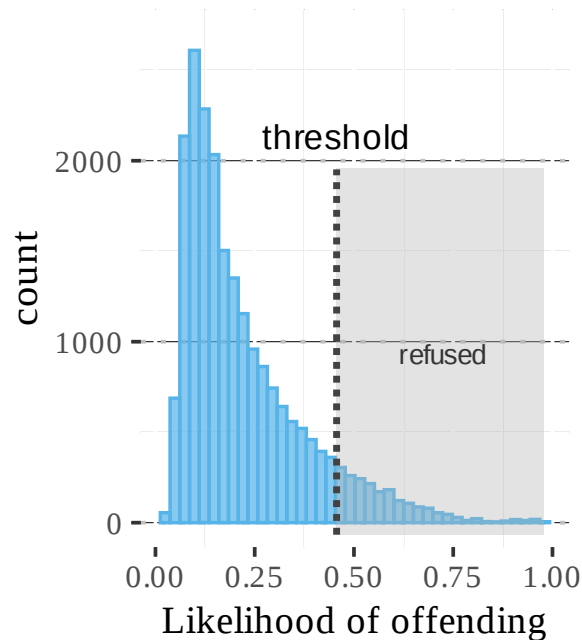
(assumed 50% would have)

Below: 5312  
Offended: 2656

# 1. Reduce offending on bail

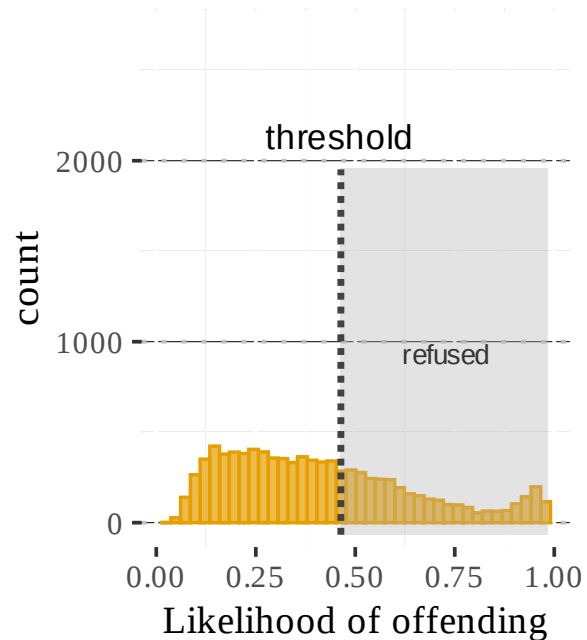
21330

Bail granted - Did not offend



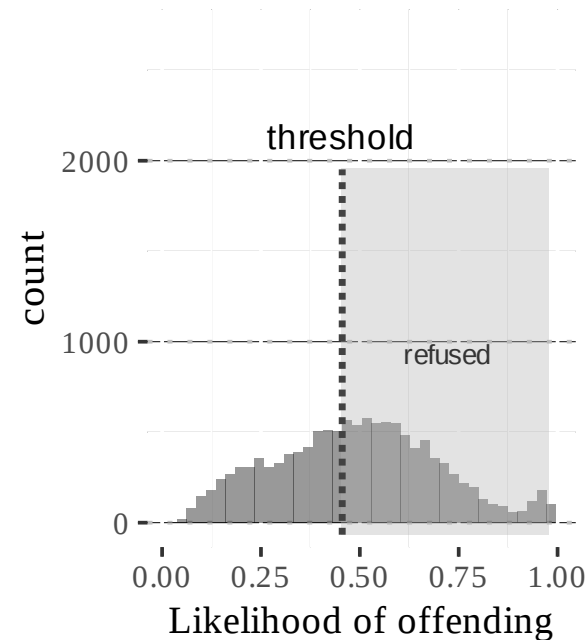
9004

Bail granted - Offended



12143

Bail refused



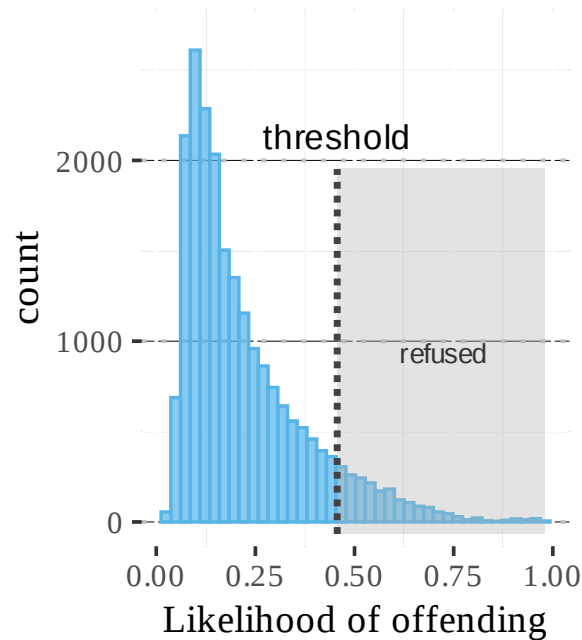
Hypothetically bail refused: 12140

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

# 1. Reduce offending on bail

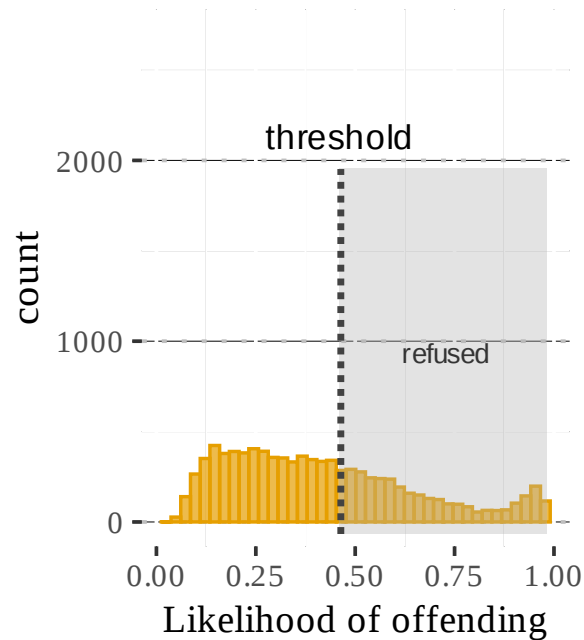
21330

Bail granted - Did not offend



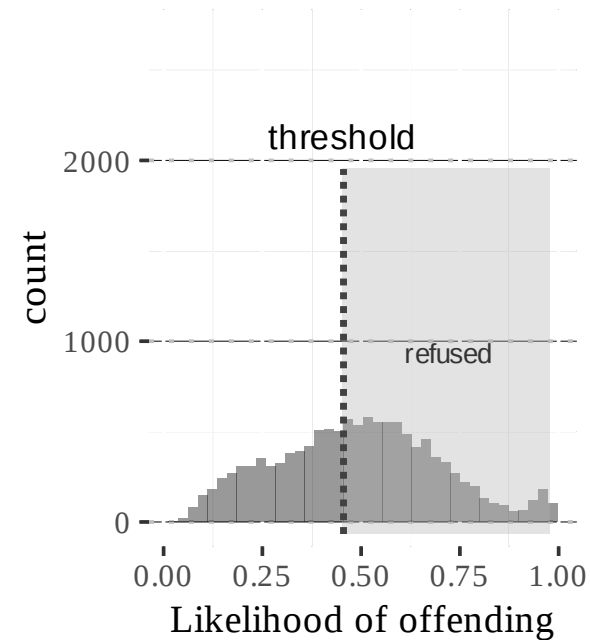
9004

Bail granted - Offended



12143

Bail refused



Hypothetically bail refused: 12140

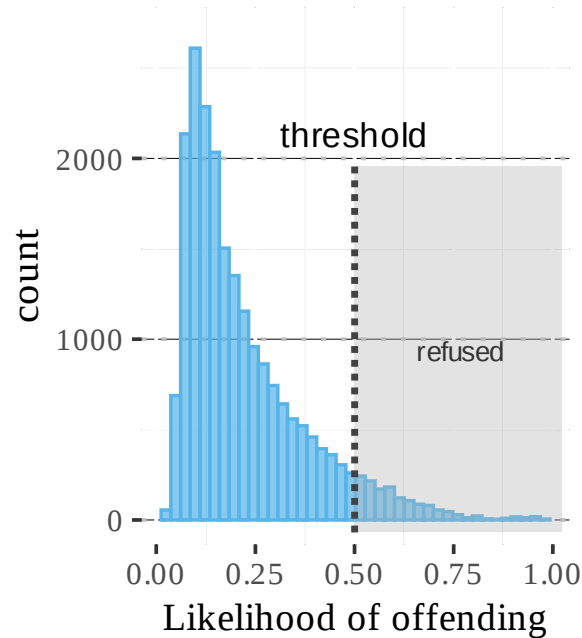
Hypothetically bail granted - offended:  $5648 + 2656 = 8304$

(a reduction of 700 or 7.8%)

# 2. Reduce bail refusals

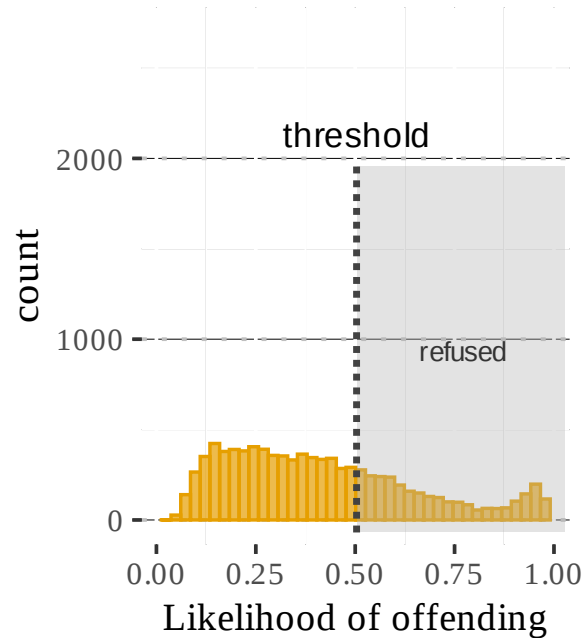
21330

Bail granted - Did not offend



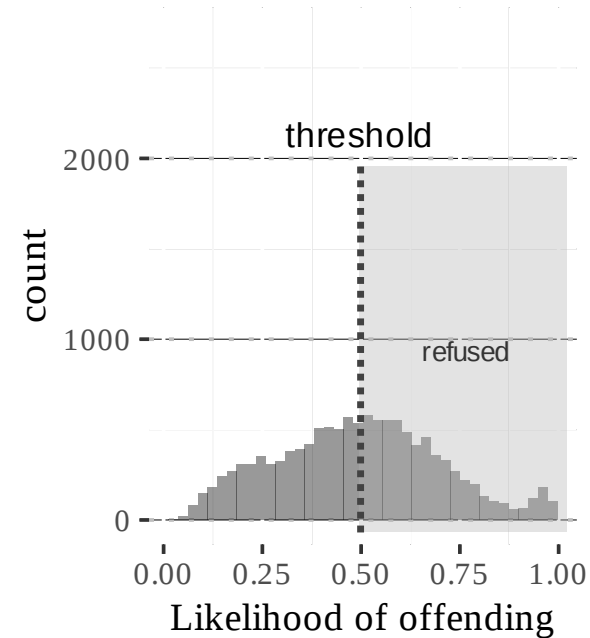
9004

Bail granted - Offended



12143

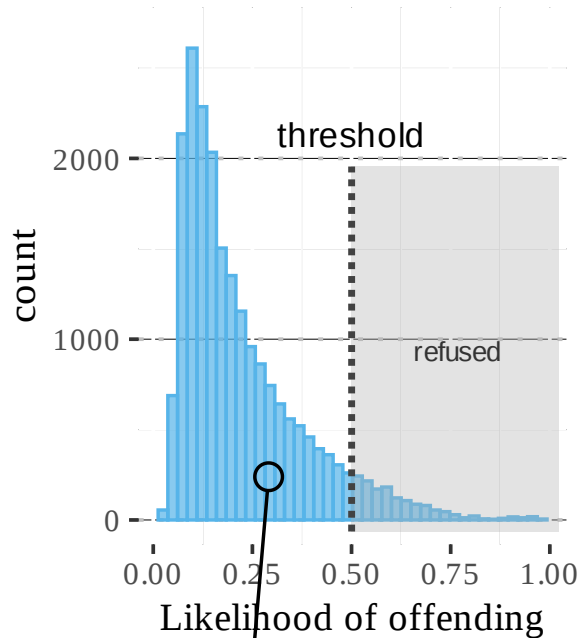
Bail refused





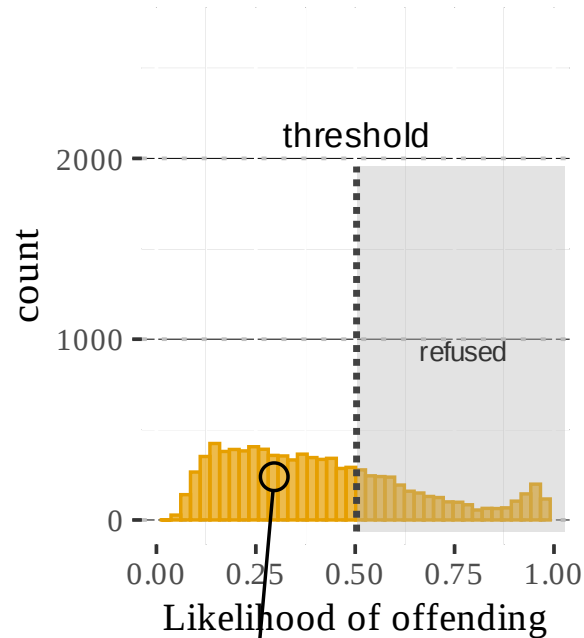
# 2. Reduce bail refusals

**21330**  
Bail granted - Did not offend



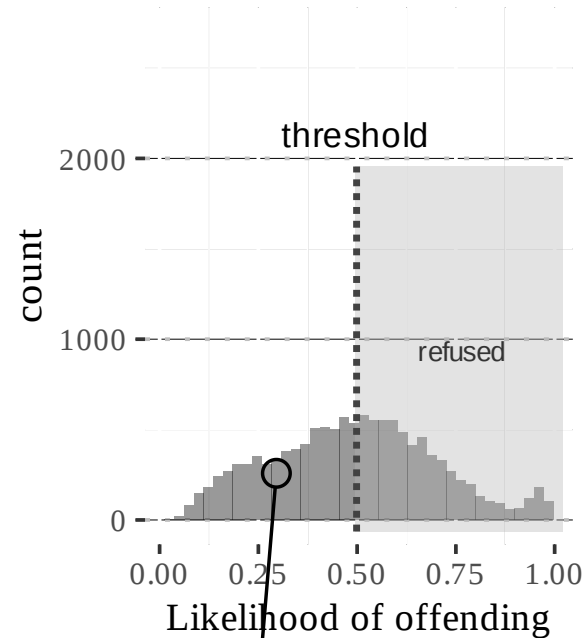
Below: 19377  
Offended: 0

**9004**  
Bail granted - Offended



Below: 6010  
Offended: 6010

**12143**  
Bail refused



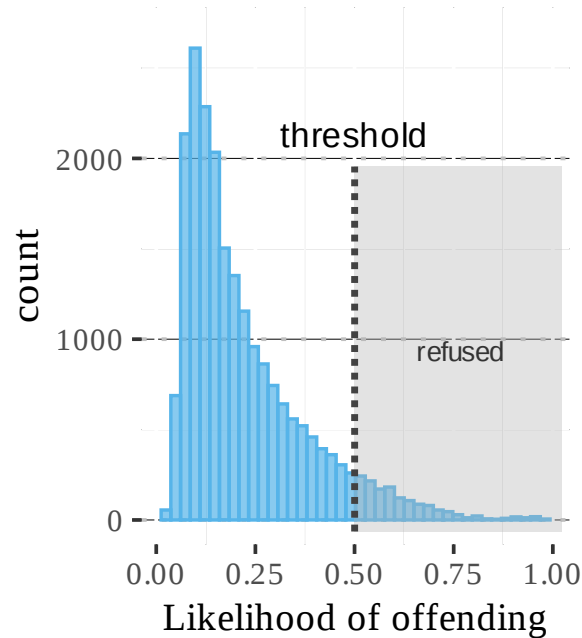
(assumed 50% would have)

Below: 5988  
Offended: 2994

# 2. Reduce bail refusals

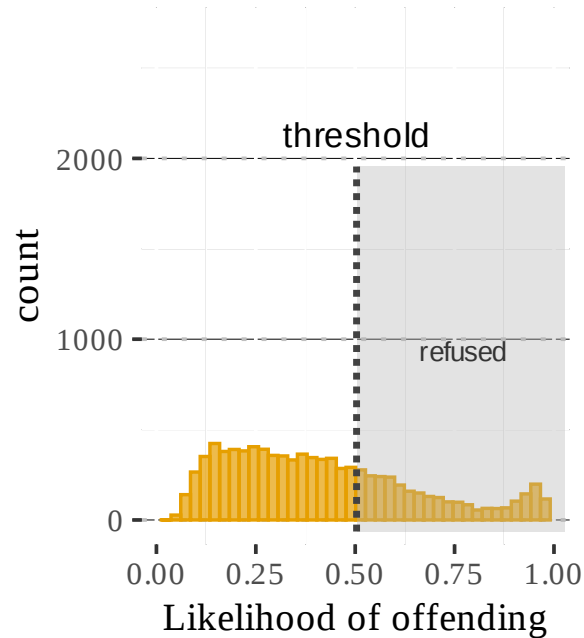
21330

Bail granted - Did not offend



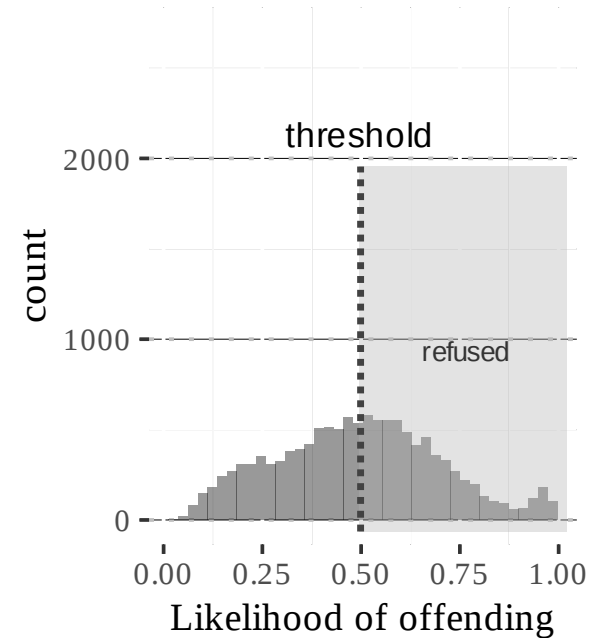
9004

Bail granted - Offended



12143

Bail refused

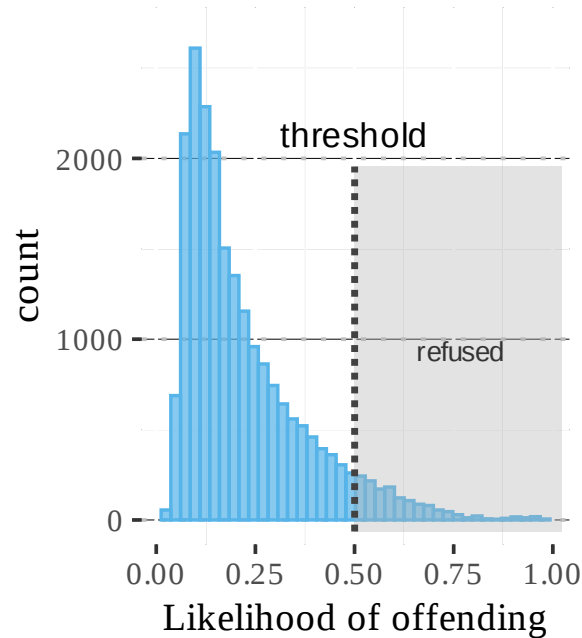


Hypothetically bail granted - offended:  $6010 + 2994 = 9004$

# 2. Reduce bail refusals

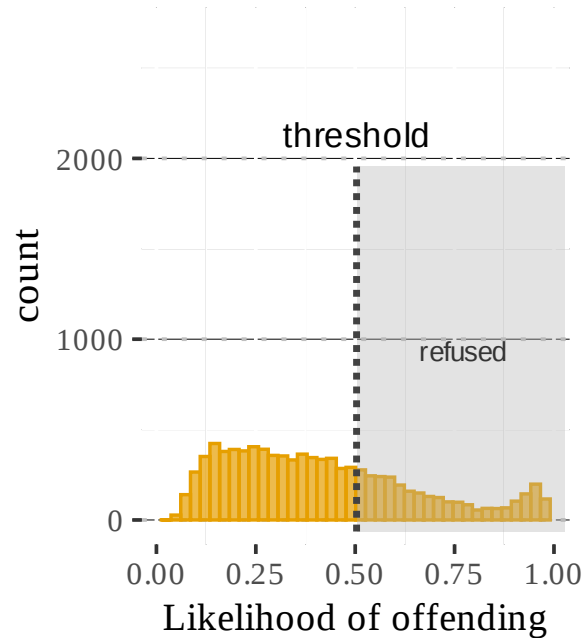
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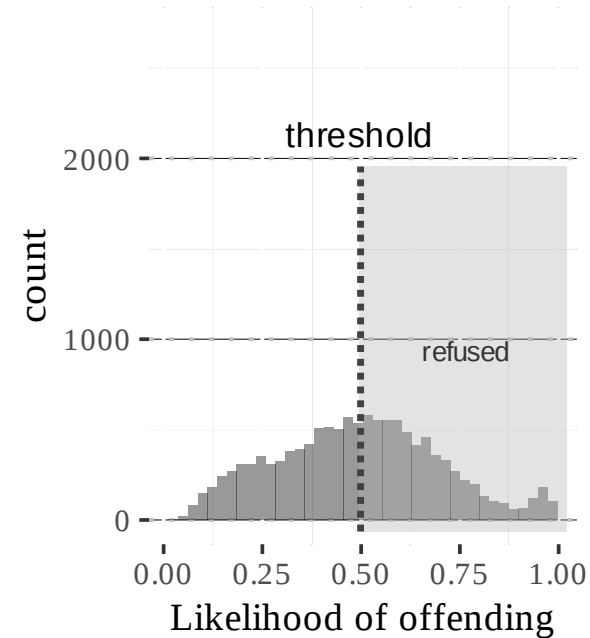
9004

Bail granted - Offended



12143

Bail refused



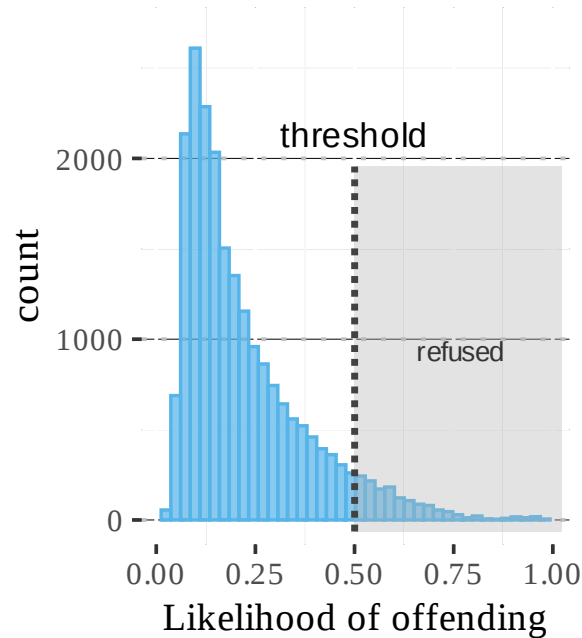
Hypothetically bail refused: 10750

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

# 2. Reduce bail refusals

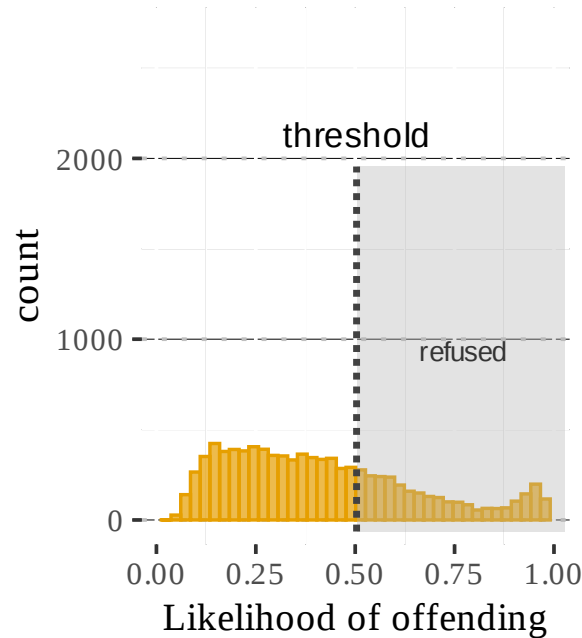
21330

Bail granted - Did not offend



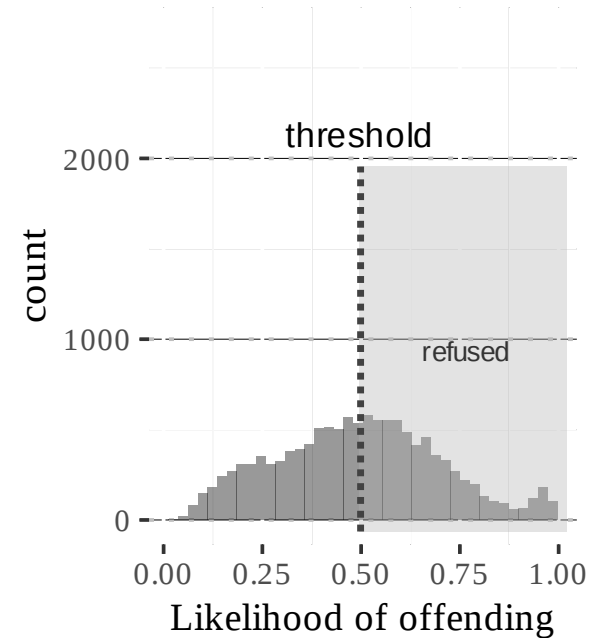
9004

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.