



PREDICTING COSTA RICAN HOUSEHOLD POVERTY LEVEL

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Costa Rica



Capital city:

San José

Area:

51,100 km²
(19.700 sq mi)

Population:

4,857,274

Density:

220/sq mi

Income level:

Upper middle Income

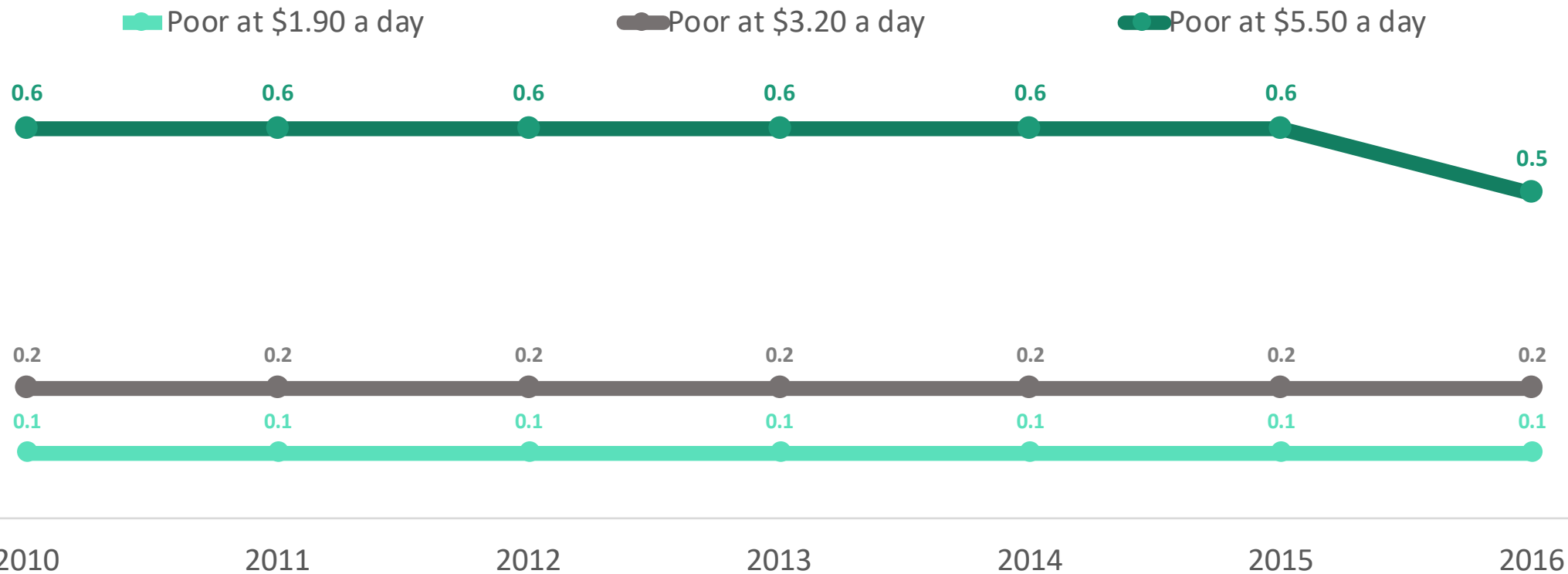
GDP per capita:

\$12,144

Source: Wikipedia, 2018

Poverty in Costa Rica

NUMBER OF POOR IN COSTA RICA (MILLIONS)



Source: The World Bank, World Development Indicators, 2018

2016 – Poverty reduction due transfers



POVERTY

10,400

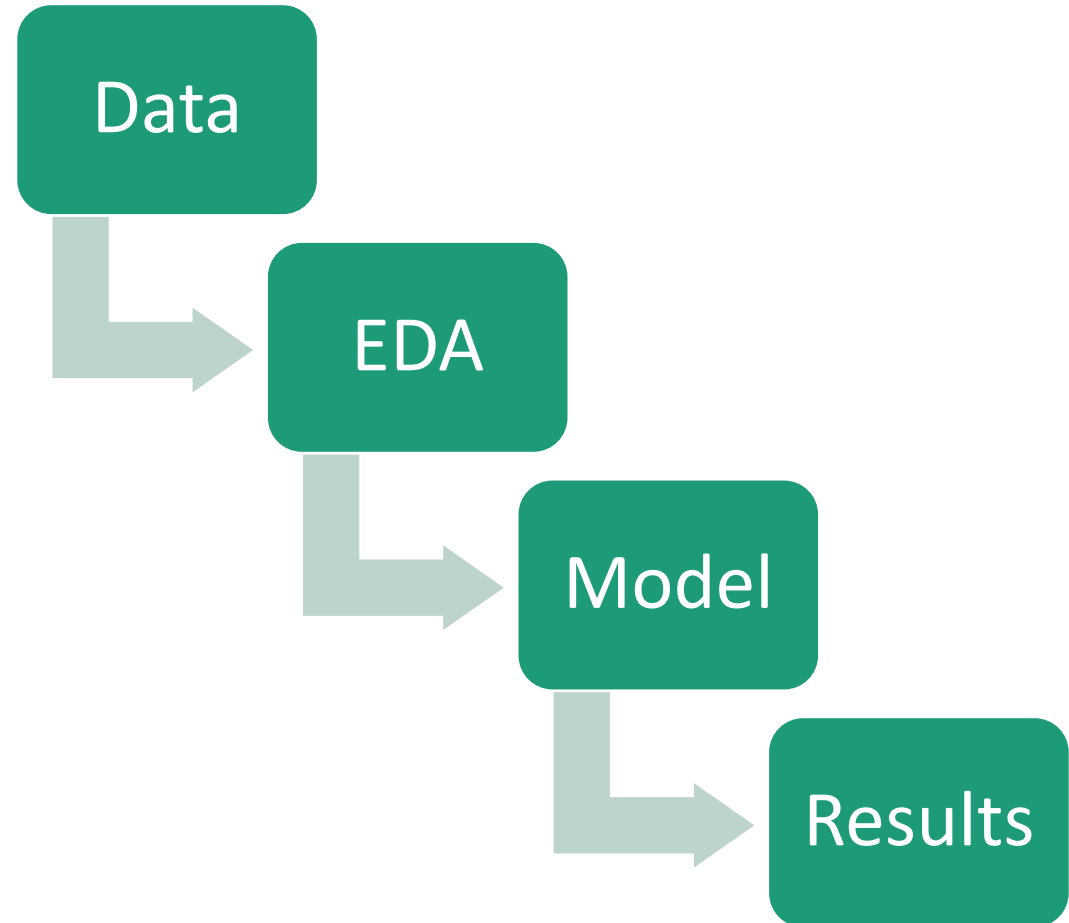


22,620

The project

Goal

To identify which households have the highest need for social welfare assistance in Costa Rica



1. Data

An aerial photograph of a construction or demolition site. A large, rectangular pile of debris, including wooden planks and metal structures, is situated in the center-left. To the right of the debris is a body of water, possibly a pond or a reservoir. The background is filled with dense green trees and vegetation. The overall scene suggests a natural area undergoing development or restoration.



Data sets

TRAIN

9,557 individual observations

2,973 households

143 features

TEST

23,856 individual observations

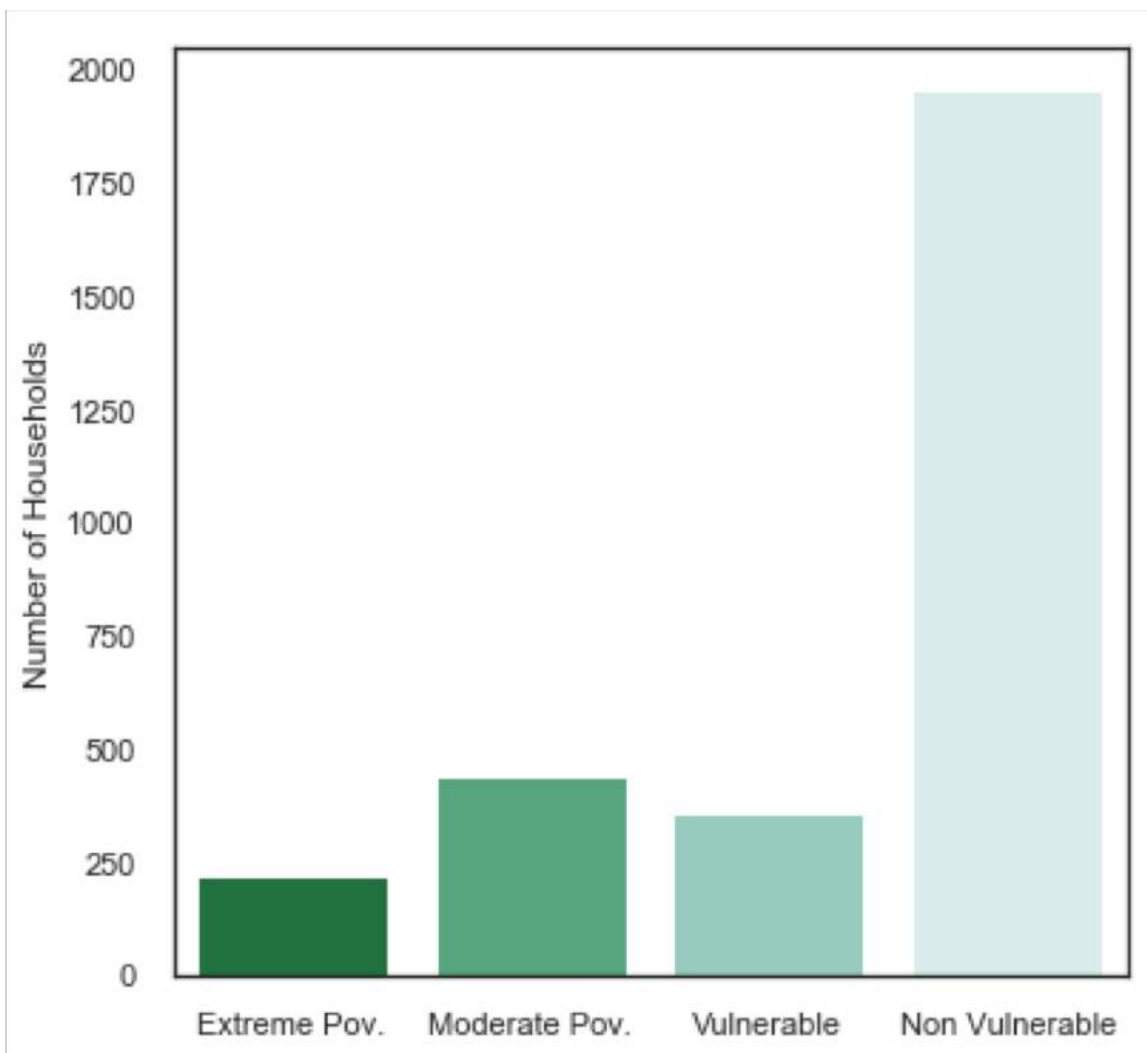
7,352 households

142 features

An aerial photograph of a dense green forest. A small, light-colored building with a dark roof is visible in the center-left. A narrow path or road winds through the trees, leading towards the building. The overall scene is lush and green.

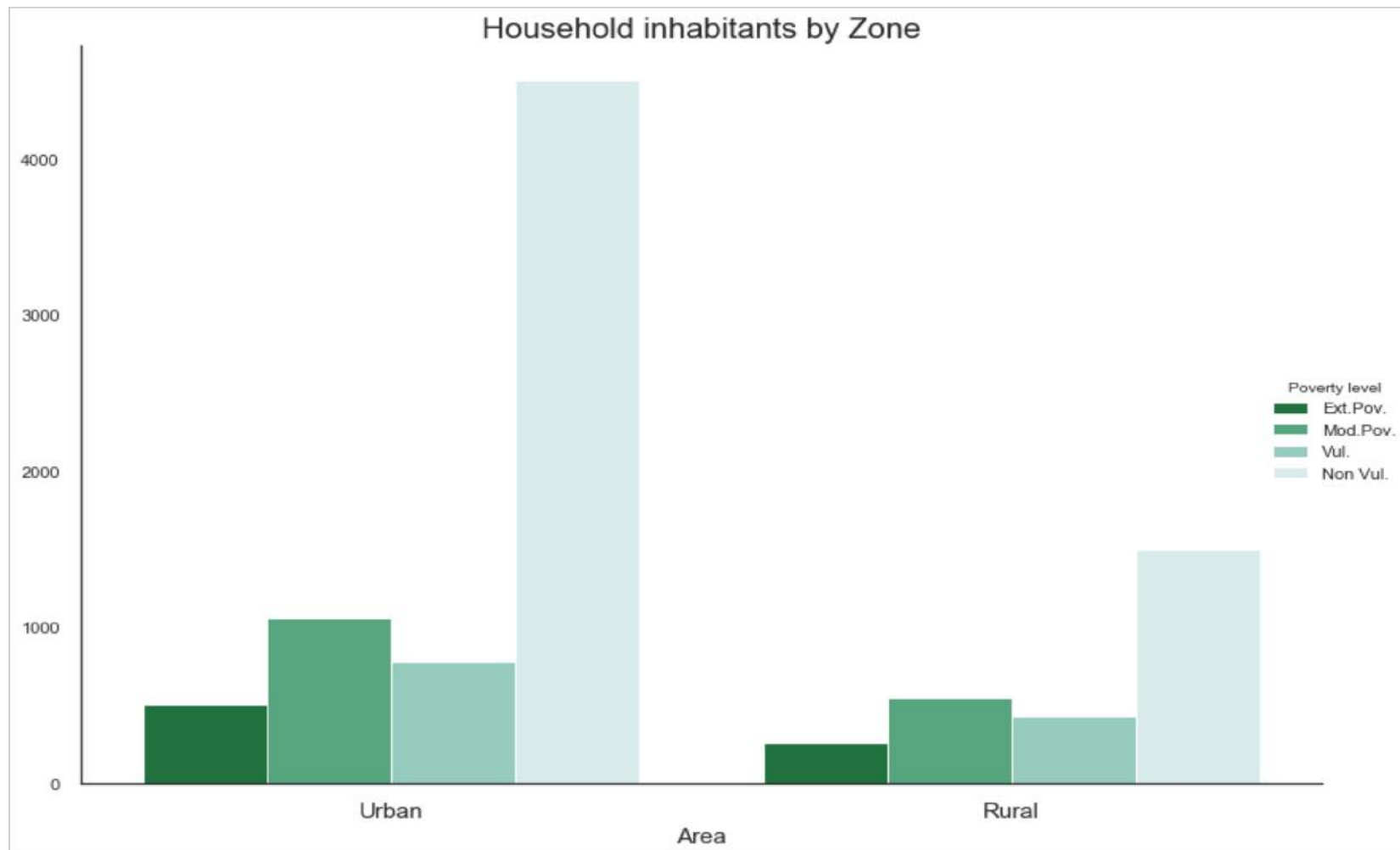
2. Exploratory data analysis

Poverty level of households

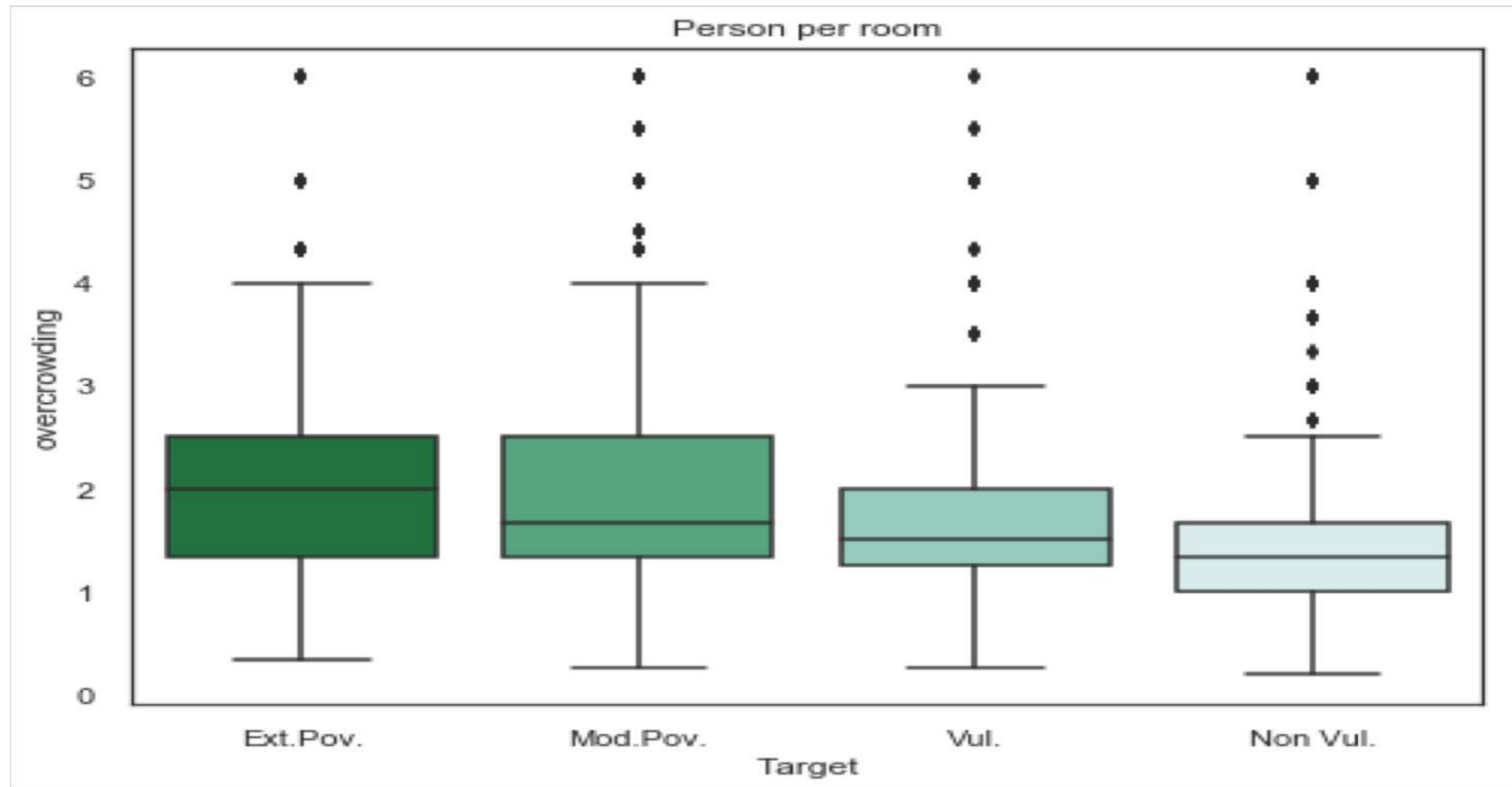


34% of households
between extreme
poverty and vulnerable.

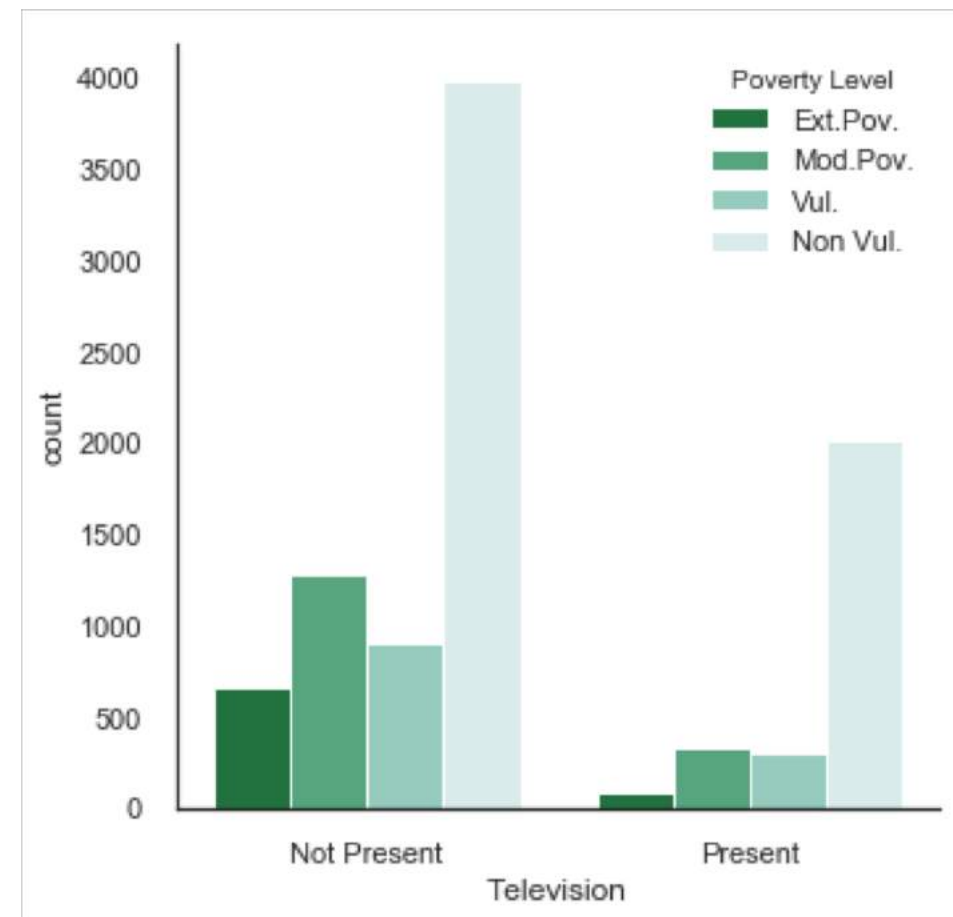
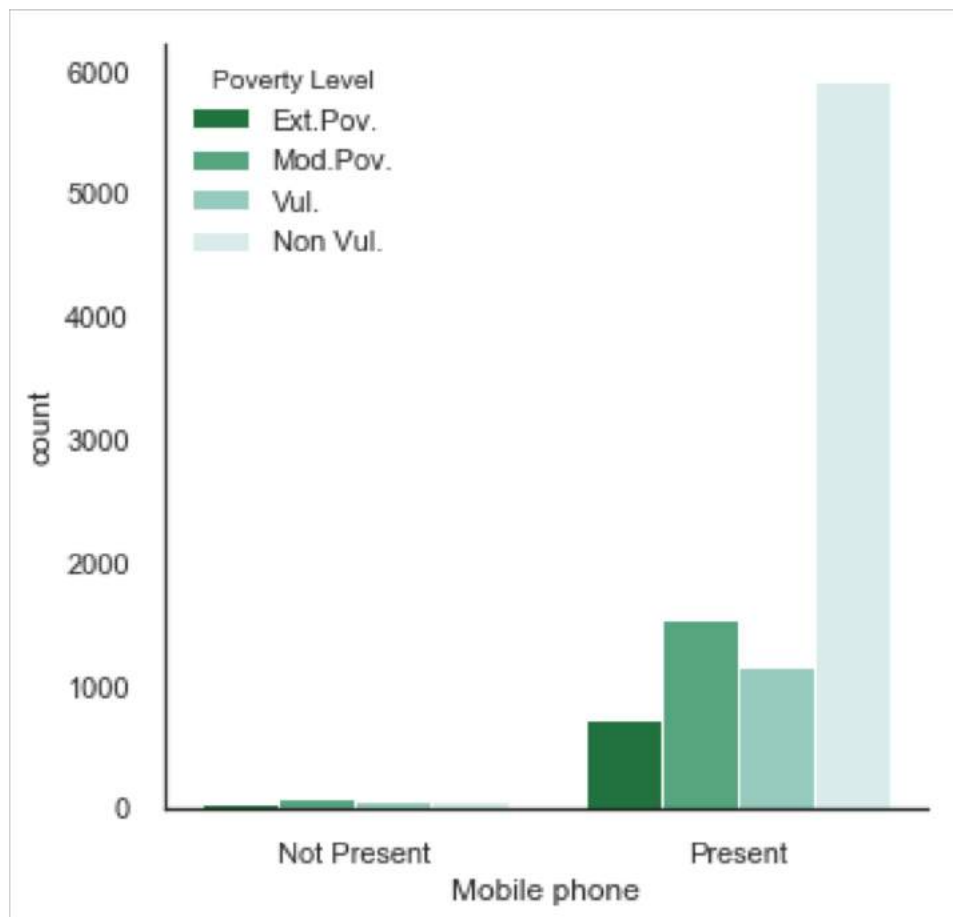
71% of households in urban areas



Overcrowding is higher in more vulnerable households.

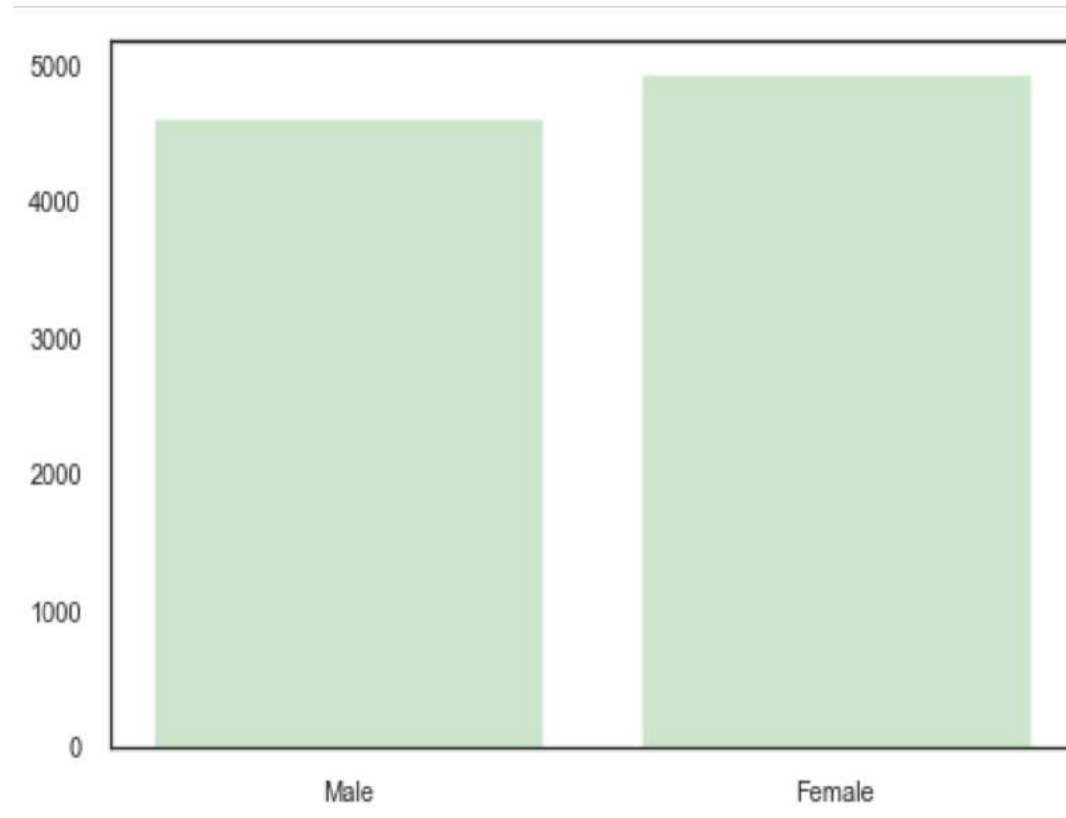


Assets

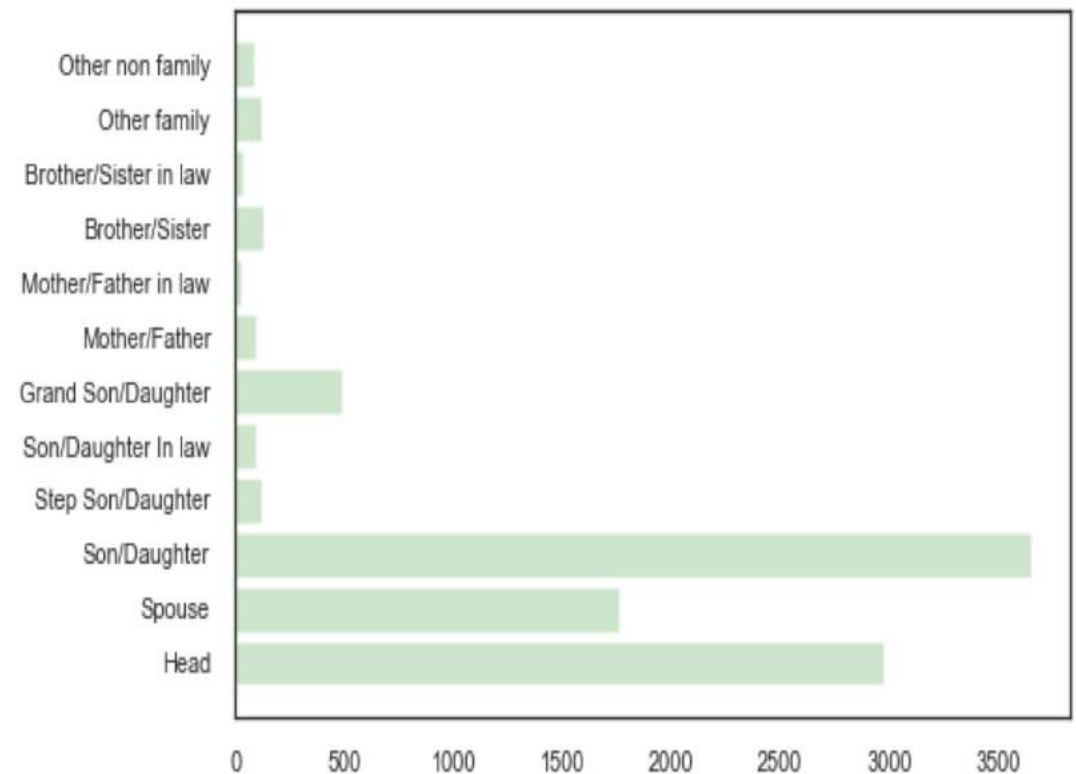


Individual characteristics

Gender distribution

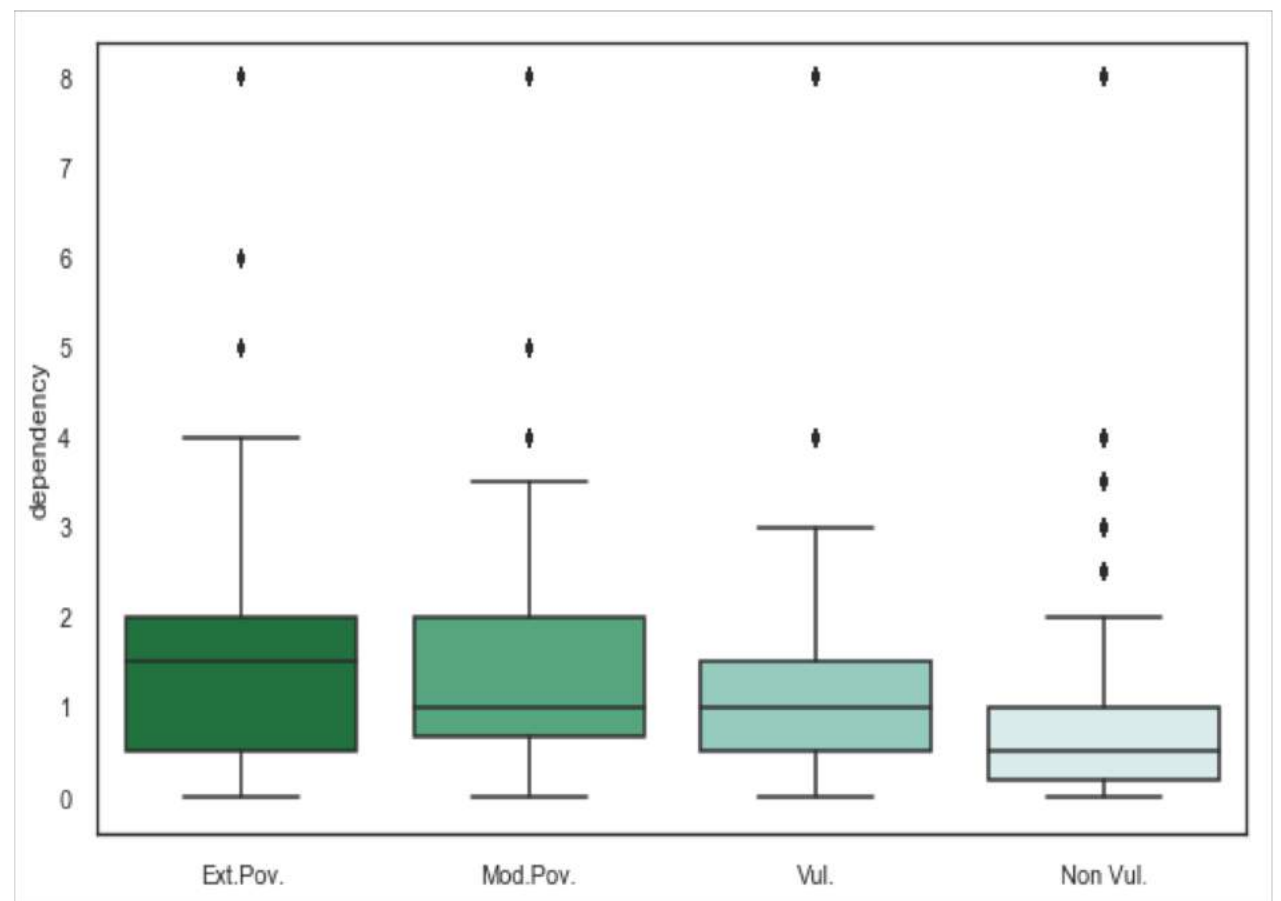
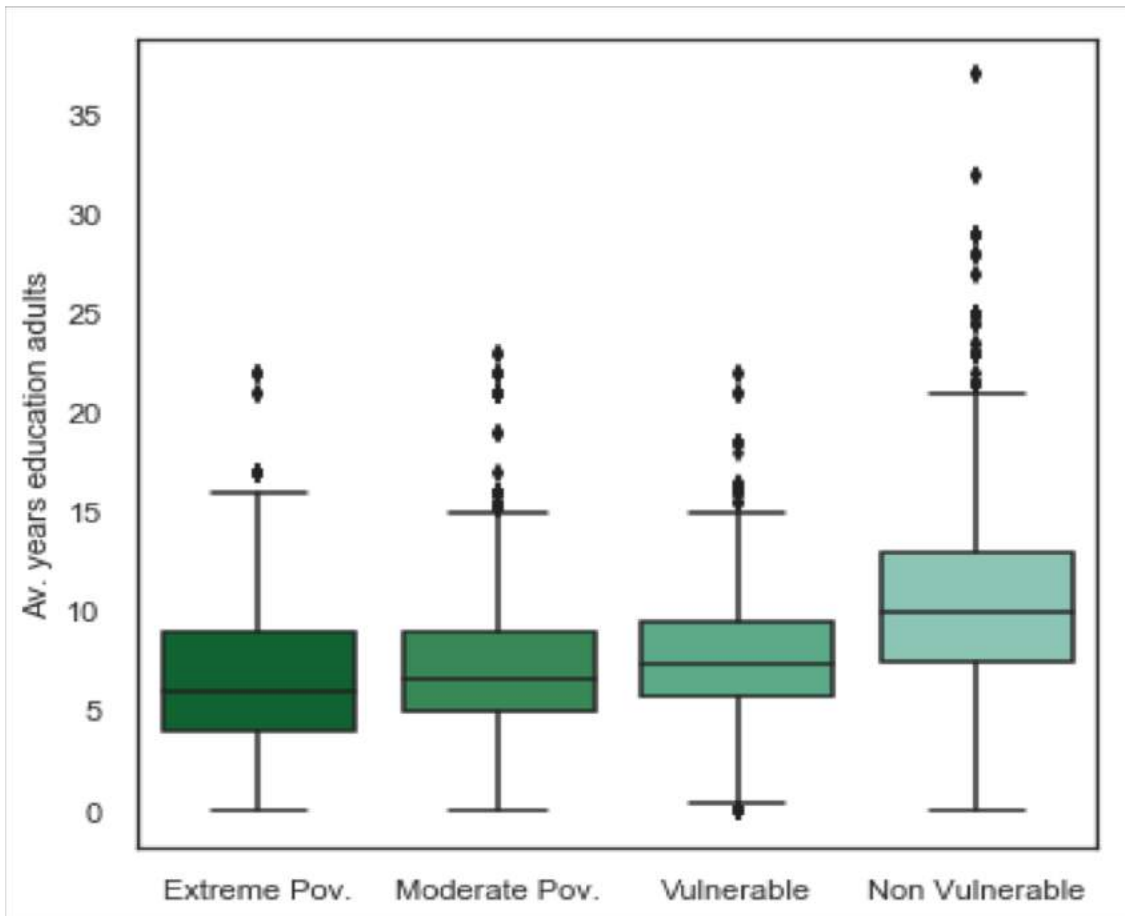


Family role



Education

Dependency





Feature engineering

✓ Rent per capita

✓ Male / female per household

✓ Children per household

✓ Youth per household

✓ Elderly per household

✓ Ratio children per adult

3. Modeling

An aerial photograph of a construction site. A large, light-colored pile of dirt or sand is the central focus. To the right, a dark, paved road or path runs diagonally. The surrounding area is covered in green vegetation. The image is slightly blurred and has a greenish tint.

Model Comparison

MODEL	ACCURACY SCORE TRAIN	ACCURACY SCORE TEST
Random forest	1.0	0.93682
Extra tree classifier	1.0	0.85062
Adaboost	0.70294	0.68786
Gradient booster	0.81247	0.78410
Random forest with PCA	0.99413	0.75146

Best Model

Features:

New features

Dropped features with correlation
> 0.90

Model:

Random Forest

Grid search:

- Max. depth: 50
- Min. samples split: 2
- N estimators: 60

4. Results

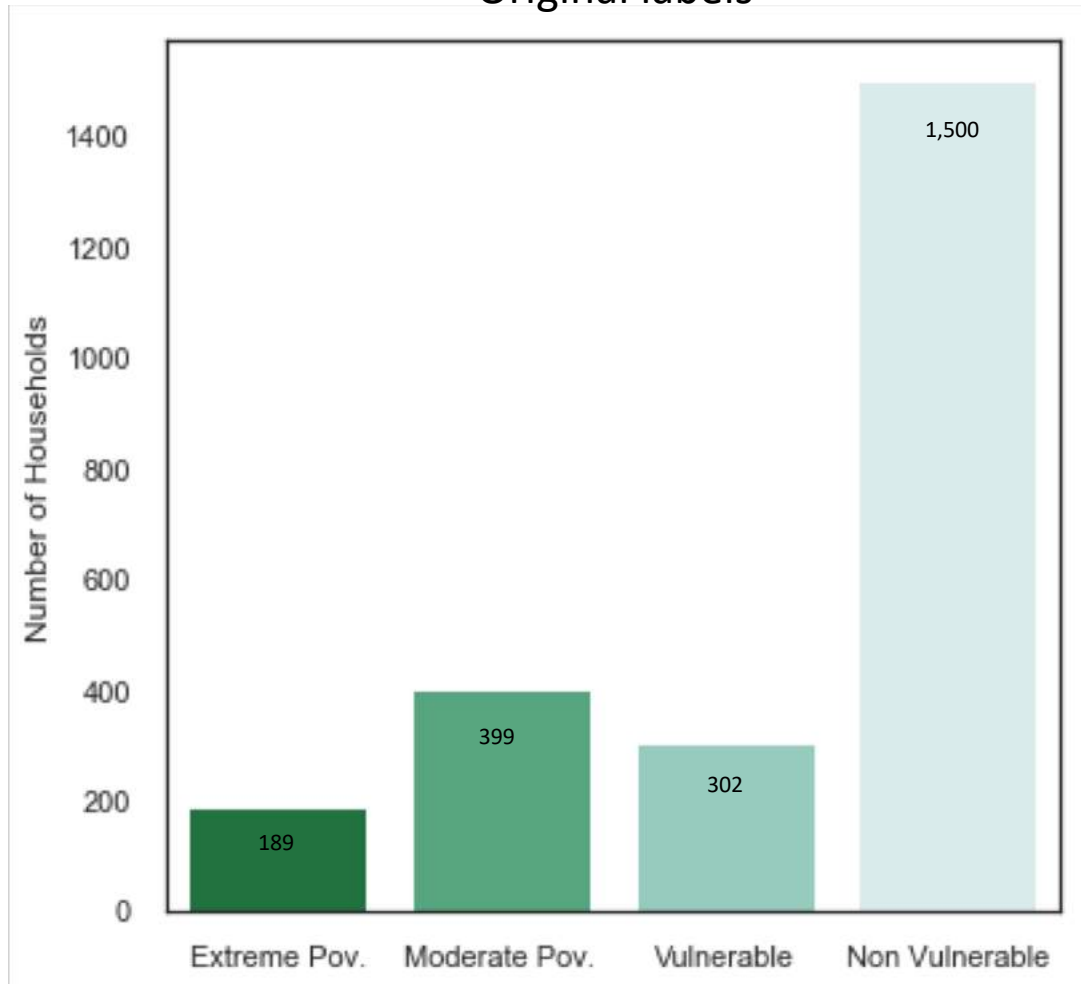
An aerial photograph of a construction or demolition site. In the center, there is a large, rectangular pile of debris, possibly a collapsed structure, surrounded by a muddy or sandy area. To the right, there is a body of water, and further right, a dense line of green trees. The overall scene is somewhat desolate and industrial.

Model scores

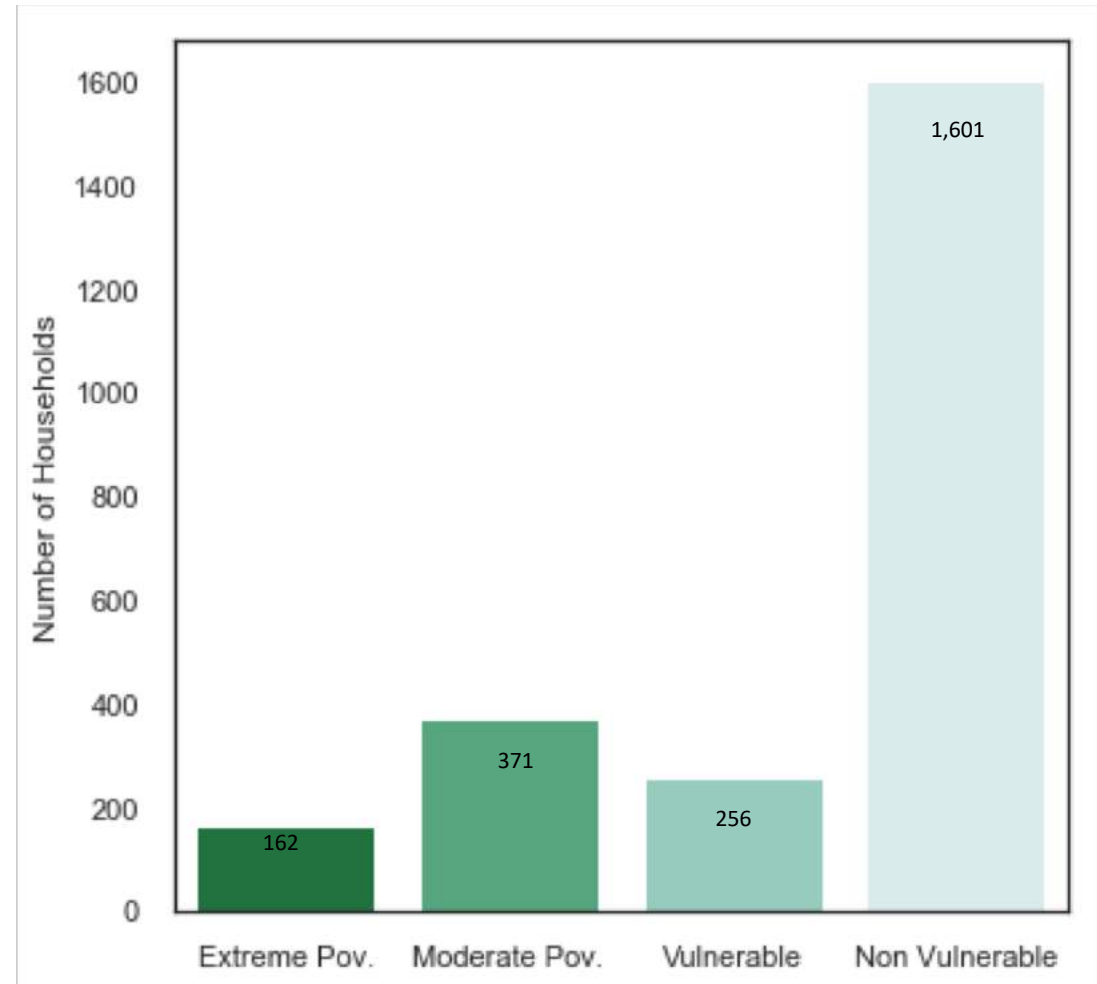
	PRECISION	RECALL	F1
Extreme poverty	0.96	0.82	0.88
Moderate poverty	0.93	0.86	0.89
Vulnerable	0.96	0.81	0.88
Non - vulnerable	0.93	1.00	0.96
Average	0.94	0.94	0.94

8% of values wrongly predicted

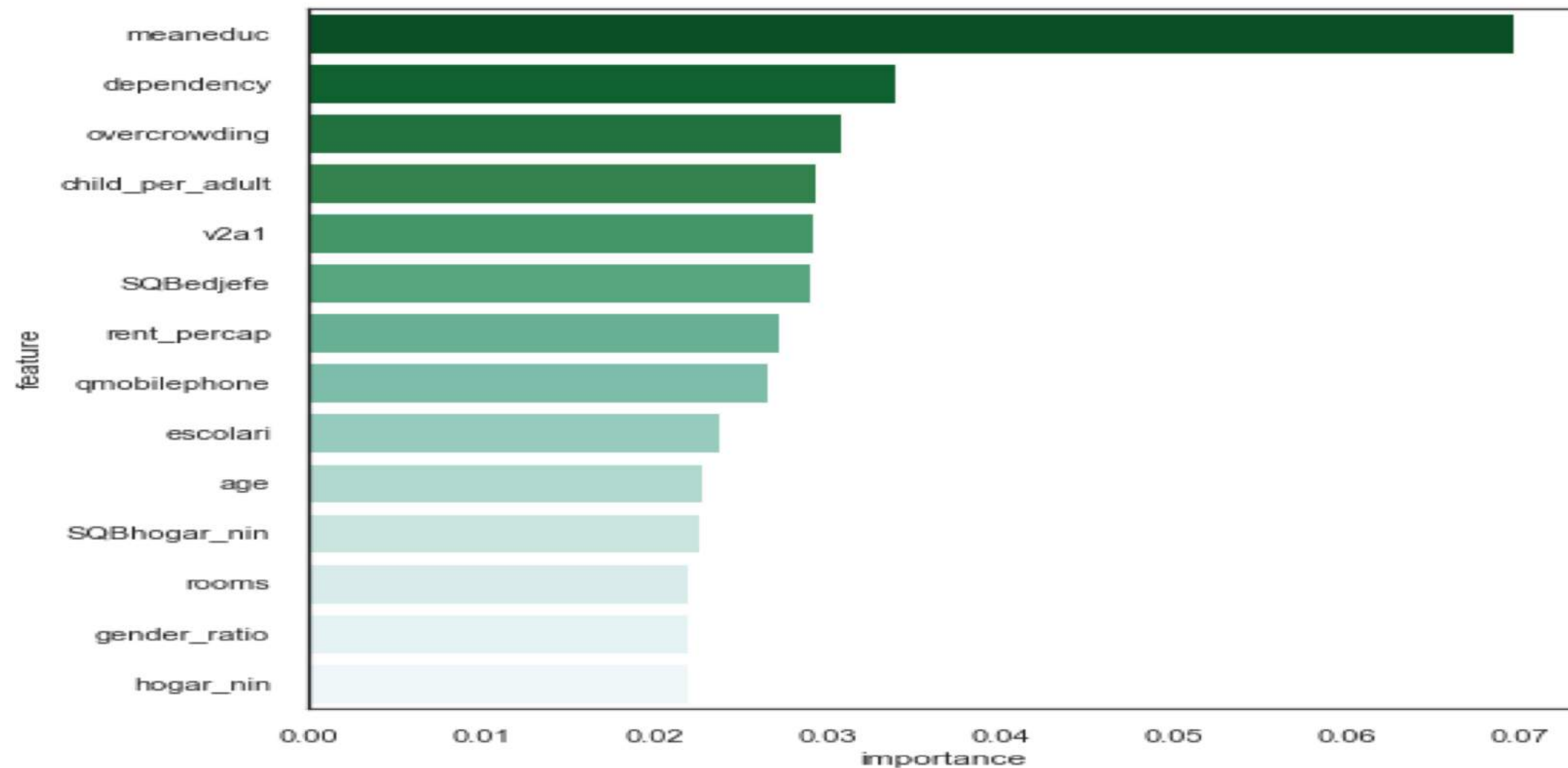
Original labels



Predicted labels



Feature Importance



An aerial photograph of a tropical island, likely Bora Bora, showing a winding wooden boardwalk through dense, lush green vegetation. The water is visible in the background, and the overall scene is vibrant and scenic.

5. Recommendations / Next Steps



Policy Recommendations

Focus support of monetary and non monetary welfare transfers with educational purposes.

Increase support to families with higher dependency levels.

Review housing policies and how are they addressing overcrowding problems.

An aerial photograph of a city, likely Rio de Janeiro, showing a river, buildings, and lush green hills. The image is used as a background for the title.

Next steps

Train the model with more observations.

Engineer new features.