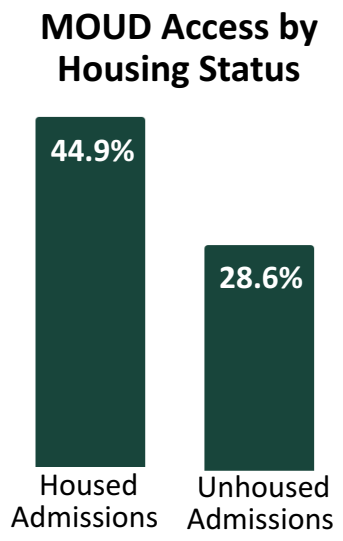# Factors Predicting MOUD Access for (Un)housed Patients: A Machine Learning Approach

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INTRODUCTION

MOUD Access by Housing Status

- 44.9% Housed Admissions
- 28.6% Unhoused Admissions

- 42,065 people died in the US from opioid overdose in 2022 alone.[1]
- Medications for opioid use disorder (MOUD) are effective treatments but accessible by only a minority of patients[2] (left figure).
- Our research seeks to: (1) identify and rank which factors are most important in predicting if a patient will receive MOUD; and (2) explain why unhoused patients have lower MOUD access rates.

METHODS

- MOUD access is a multifactorial issue which can be explored with machine learning and a large dataset.
- We utilize a gradient boosted decision tree algorithm (XGBoost) to train our model on SAMHSA's Treatment Episode Data Set[3] of opioid admissions (n=524,134; features=57).
- We use Shapley values to quantify and interpret the predictive power and influencing direction of individual features (variables).

REFERENCES

1. SUDORS Dashboard: Fatal Overdose Data | Drug Overdose | CDC Injury Center. (2023, August 25). https://www.cdc.gov/drugoverdose/fatal/dashboard/index.html
2. Hsu, M., Jung, O. S., Kwan, L. T., Jegede, O., Martin, B., Malhotra, A., & Suzuki, J. (2024). Access challenges to opioid use disorder treatment among individuals experiencing homelessness: Voices from the streets. *Journal of Substance Use and Addiction Treatment*, 157, 209216. https://doi.org/10.1016/j.josat.2023.209216
3. Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. (2019). Treatment Episode Data Set | CBHSQ Data. https://www.samhsa.gov/data/data-we-collect/teds-treatment-episode-data-set
4. United States Department of Housing and Urban Development. (2023). The 2022 Annual Homeless Assessment Report (AHAR) to Congress Part 1: Point-in-time Estimates of Homelessness.

RESULTS

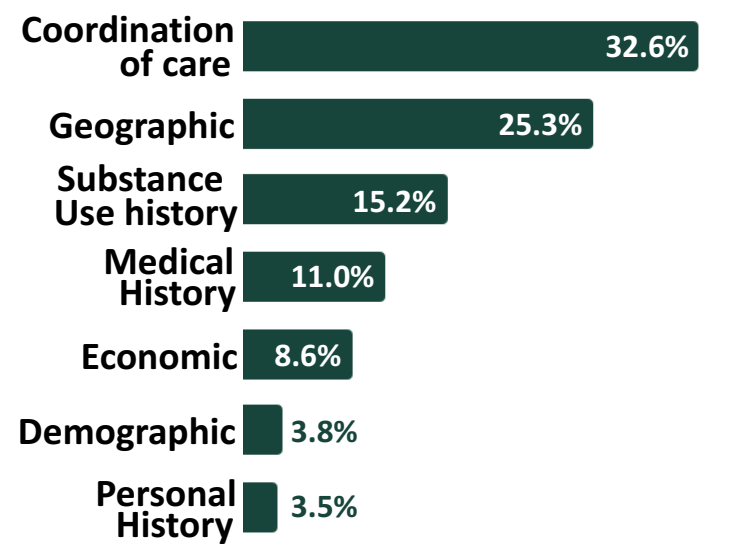**Service Setting (left) and Treatment (right) for Housed Admissions**
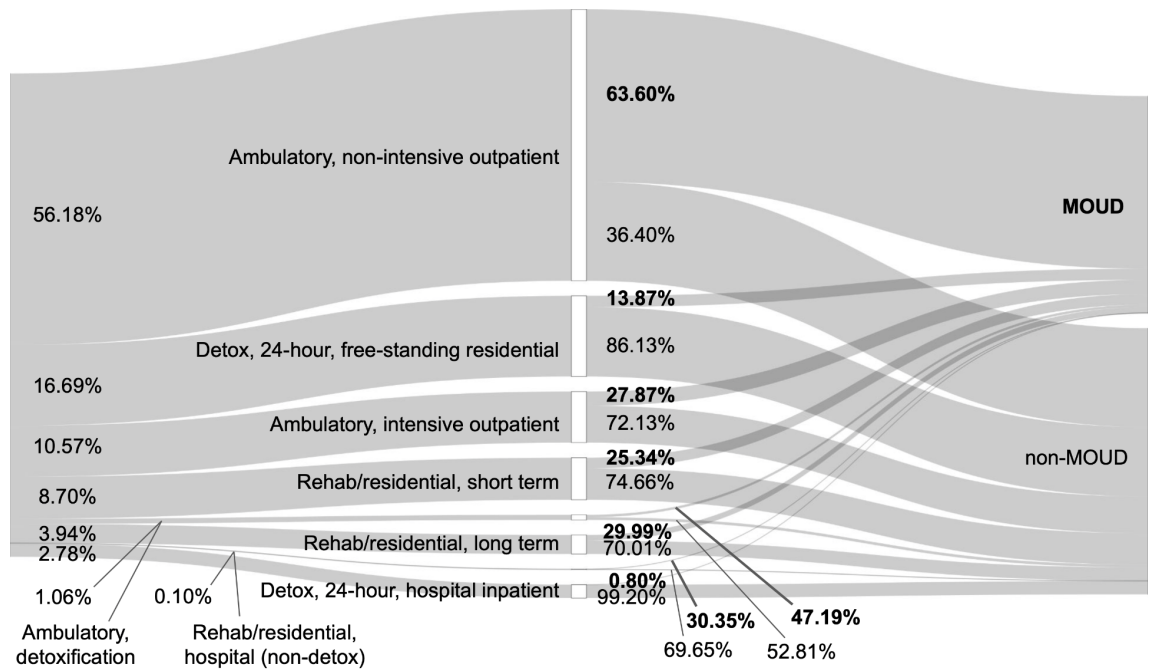
Service Setting (left) and Treatment (right) for Unhoused Admissions
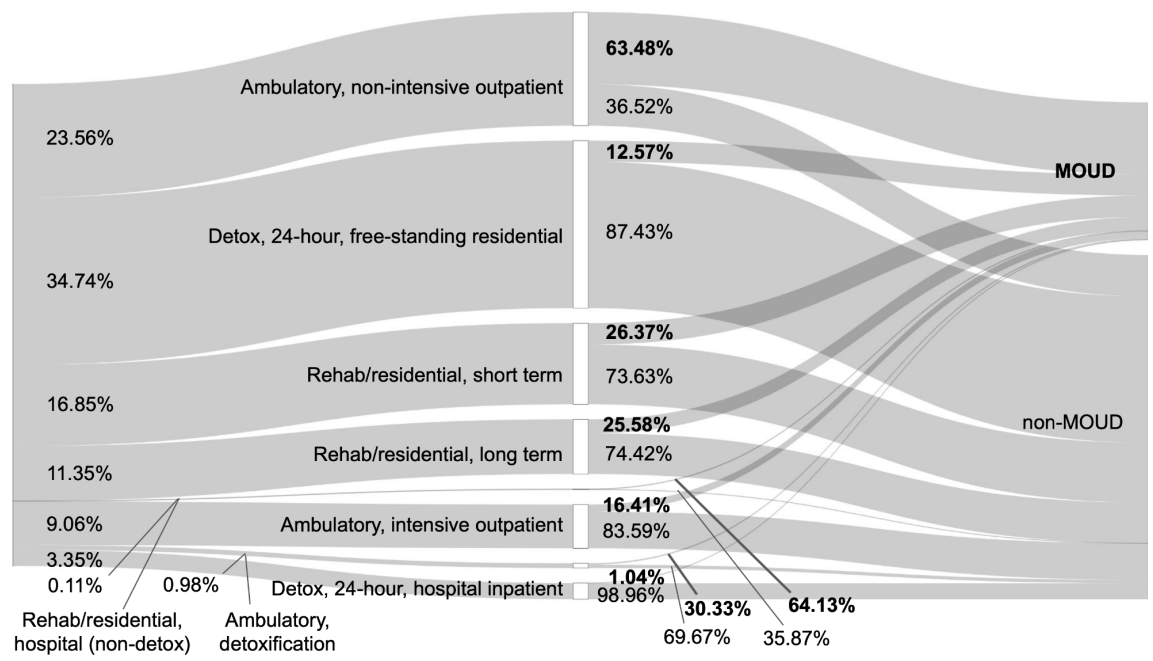
- Our model is effective in predicting access to MOUD with an accuracy of 85.6% and AUC of 0.94.
- Roughly half of the model's predictive power emerges from geographic location (25.3%) and facility type (24.0%) alone. The 57 features can be grouped into 7 categories (right figure).
- We find that unhoused patients more often go to facilities with lower MOUD treatment rates, and once there, are less likely to receive MOUD than housed patients. This is visualized in the left figures that show housed (upper middle figure) and unhoused (bottom middle figure) admission and treatment rates.
- However, if unhoused patients instead went to the facilities that housed patients enter at an equal percent (but still received MOUD at the lower, unhoused rates), 89.50% of the disparity in MOUD access would be eliminated.

Relative Feature Importance (out of 100%) Shows Predictiveness of Each Feature Group

- Coordination of care — 32.6%
- Geographic — 25.3%
- Substance Use history — 15.2%
- Medical History — 11.0%
- Economic — 8.6%
- Demographic — 3.8%
- Personal History — 3.5%

CONCLUSION

- The rise of opioid use disorder[1] with homelessness[2,4] poses a public health crisis; this can be attenuated with increased MOUD access.
- Achieving parity in MOUD access between housed and unhoused patients should involve improving access to service settings that have high rates of MOUD treatment.