Predicting fentanyl use for patients in treatment for opioid use disorder
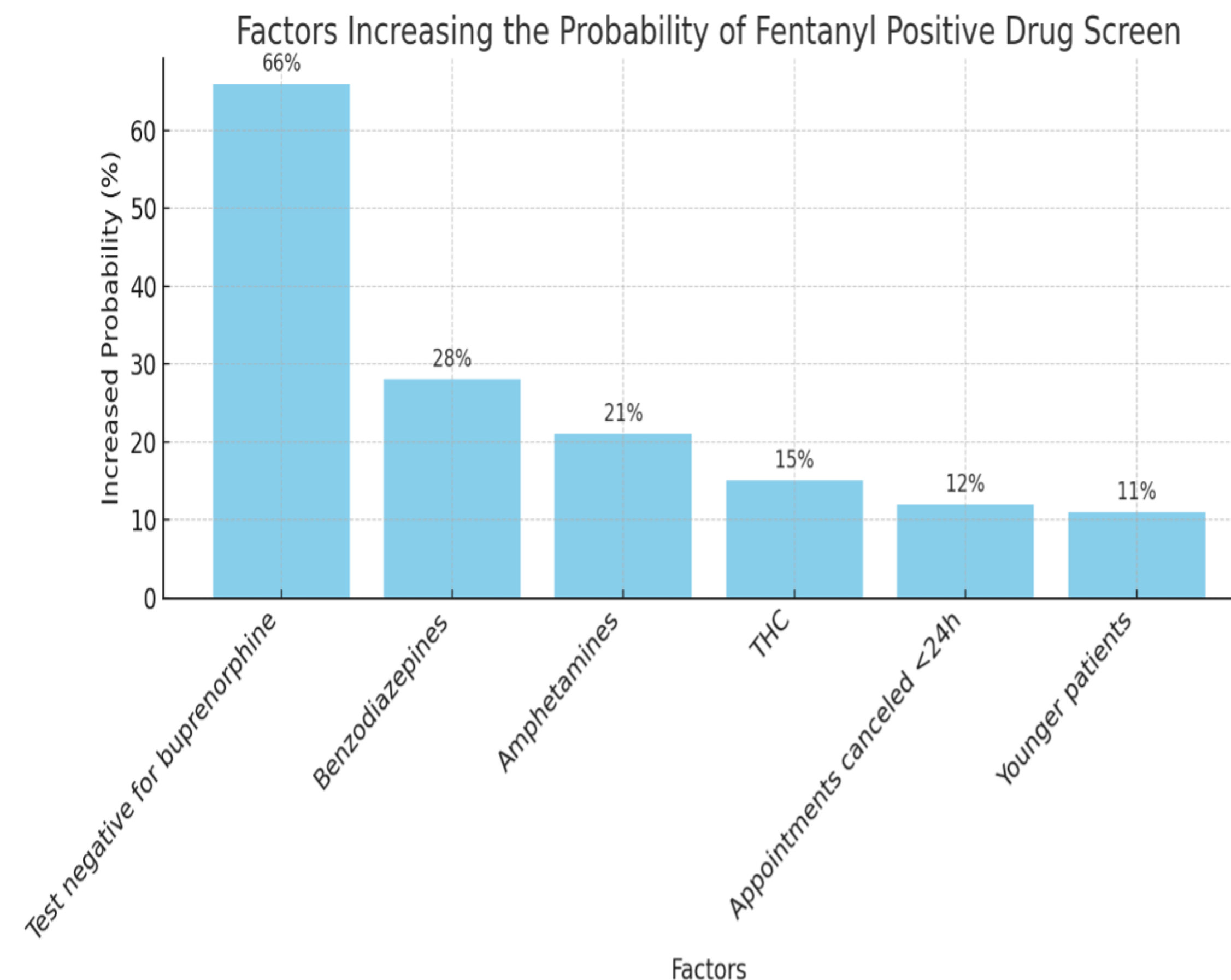
INTRODUCTION

- Fentanyl and fentanyl analogs are ubiquitous in all regions of the US and led to a 282% increase in overdose deaths from 2016 to 2021 (Jeffery, 2023)
- It is vital to employ predictive tools to identify patients at higher risk for relapse to fentanyl to facilitate timely intervention
- This study utilizes machine learning and AI with 30+ predictors on 10,000 patients to better identify which patients in MOUD treatment at risk of fentanyl relapse.

METHODS

- Design: A cohort study including all patients initiating treatment for OUD at one of 72 CleanSlate clinics between 6/30/2022 and 6/30/2023
- Outcome: One or more urine drug screen (UDS), performed subsequent to initial visit., positive for fentanyl
- Advanced XGBoost logistic model with Bayesian optimization was used to find the best predictors from over 30 features using Python.
- Shapley values were computed to assess each feature's impact on the likelihood of a positive fentanyl test, highlighting the most influential factors.

RESULTS

- 10,610 patients began MOUD treatment between 6/30/2022- 6/30/2023
- Average age 39 (SD 10 yrs.), 40% female, 5% Hispanic, and 70% are insured through Medicaid.
- 24% (2541) patients had a positive UDS for fentanyl at least once during the study period
- Shapley values identified failed bup tests, amphetamines, and THC, as well as with younger age and last-minute appointment cancellations, each increasing patients' risk of relapse

Factors Increasing the Probability of Fentanyl Positive Drug Screen

CONCLUSION

- Younger individuals and those using multiple substances are more likely to relapse to fentanyl, aligning with prior research (Goldman-Hasbun, 2019; Nguyen & Dinh, 2023)
- Programmatic and treatment related factors, non-adherence to treatment (UDS negative for buprenorphine) and late visit cancellations (<24 hours) should directly inform clinic policy to prevent relapse.
  - For example, staff should be instructed to inform clinicians of all late cancellations, enabling expedited check-ins with these patients and timely rescheduling
- It is crucial to identify patients at highest relapse risk in order to provide timely targeted support to these patients

AUTHORS & DISCLOSURES

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