Estimation of Opioid Use Disorder Prevalence Under Unique Data Scenarios: A Simulation Study

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Background

- This research aims to investigate multiple systems estimation - a method for estimating the number of people who use opioids living in a jurisdiction while addressing underreporting in surveillance, particularly in demographics where data may be increasingly sparse.

Methods

- A population was created with simulated capture histories of six data sources and demographic information.
- We examined different model selection procedures (MSP) between Poisson and Negative Binomial (NB) distributions with log-linear models.
- Model efficacy and accuracy was benchmarked by comparing model estimates against the simulated ground truth.
- We applied these models, stratified by race and sex separately, to Massachusetts Public Health Data with six data sources to estimate the total prevalence of opioid use disorder in the state.

Results

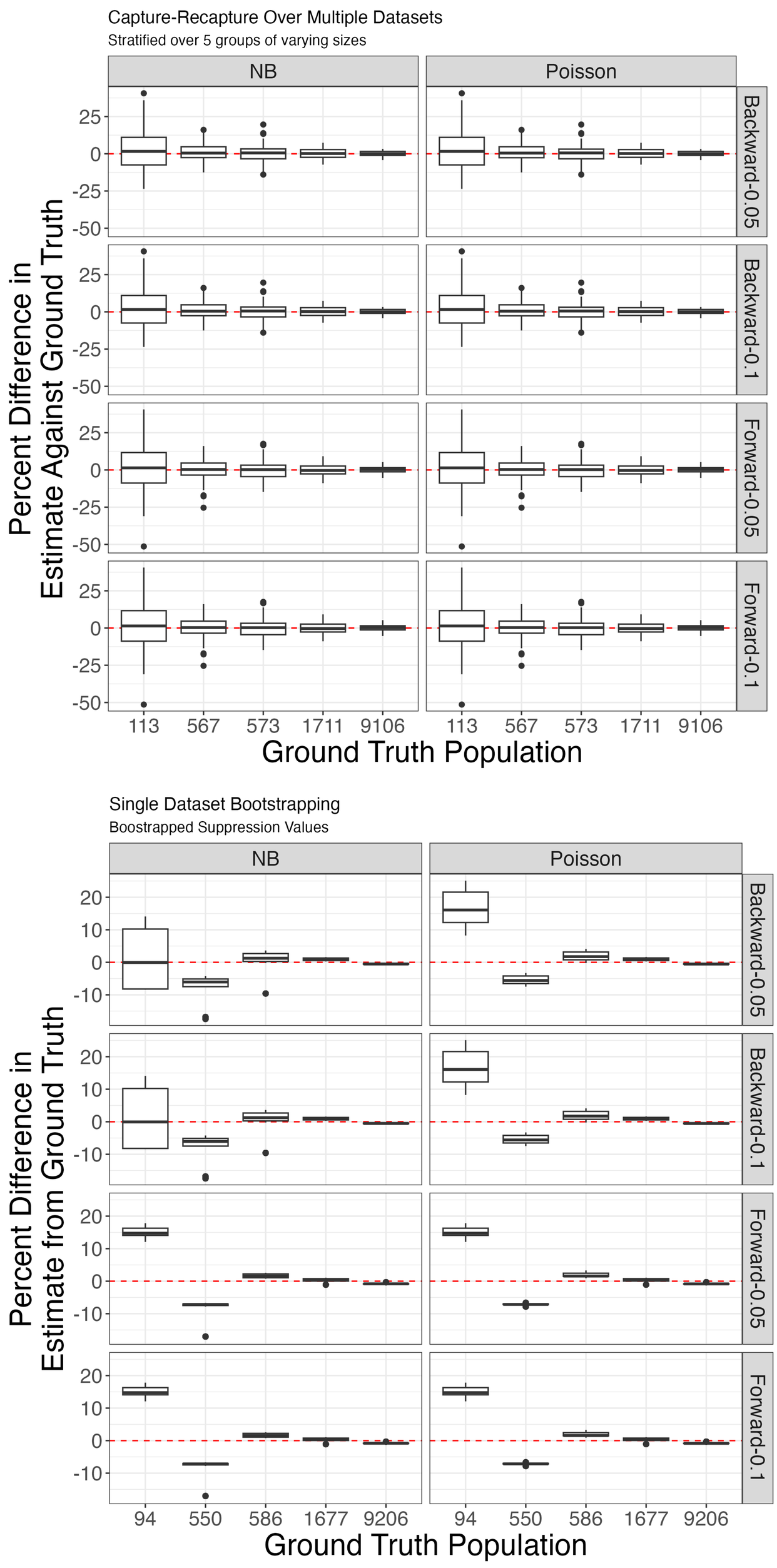
- (Top) Bootstrapping across multiple datasets demonstrates a convergence towards the ground truth, suggesting that in scenarios of single model failure, analogous models are likely sufficient to maintain accuracy and reliability.
- (Bottom) Bootstrapped backward-stepwise NB models can recover the empirical ground truth at the cost of wide bounds.
- When estimating MA prevalence for opioid use disorder, the 95% confidence intervals between the two overall estimates between the stratifications were overlapping.

Takeaway

- (Bottom) When emulating a dataset, and bootstrapping over small counts, Negative Binomial estimates using backward step-wise MSPs better estimated the true prevalence.

Prevalence Estimation on Massachusetts Data (2022)

Demographic	Known	Estimate (95% CI)	Total (95% CI)
Male	71,121	7,476 (7,306, 7,648)	78,597 (78,427, 78,769)
Female	46,429	3,767 (3,641, 3,898)	50,196 (50,070, 50,327)
White	92,723	8,951 (8,762, 9,143)	101,674 (101,485, 101,866)
Hispanic	14,829	1,287 (1,219, 1,357)	16,116 (16,048, 16,186)
Black	7,851	881 (823, 944)	8,732 (8,674, 8,795)
Asian/PI	495	124 (98, 155)	619 (593, 650)
Other	1,440	283 (245, 326)	1,723 (1,685, 1,766)



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