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

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Background

- This research aims to improve multiple systems capture-recapture 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 and demographic information, then we examined the accuracy of estimates between Poisson and Negative Binomial (NB) distributions with log-linear models.
- Model efficacy was benchmarked by comparing model estimates against the simulated ground truth.

Results

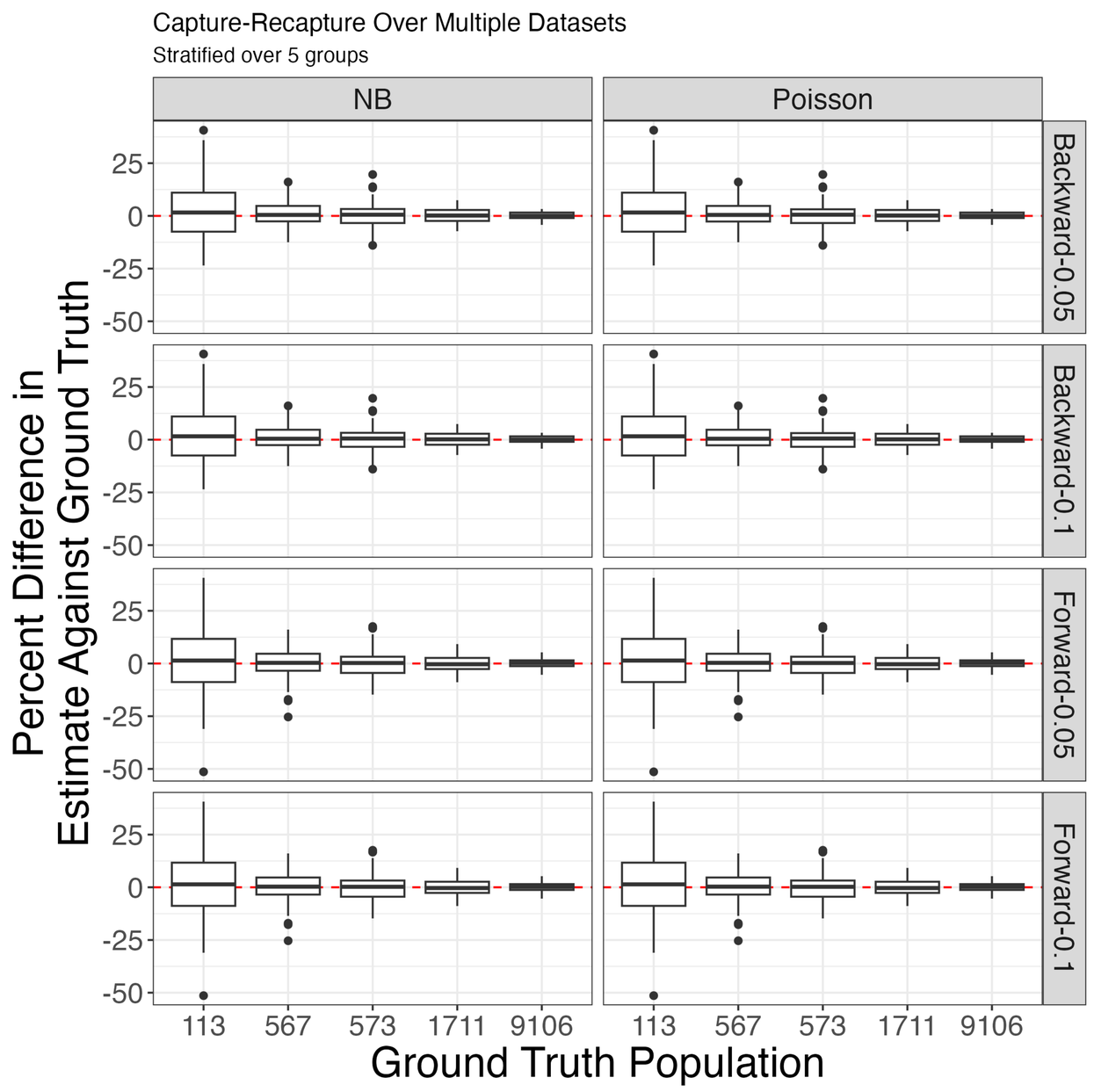
- As populations become small, single point estimation using capture recapture loses accuracy showing a potential lack of robustness with respect to capture histories and population size; however, this lack of robustness can be addressed through bootstrapping estimations
- This indicates that, with bootstrap methods, we can recover the true prevalence of opioid use disorder in situations where data on certain demographics is sparse.

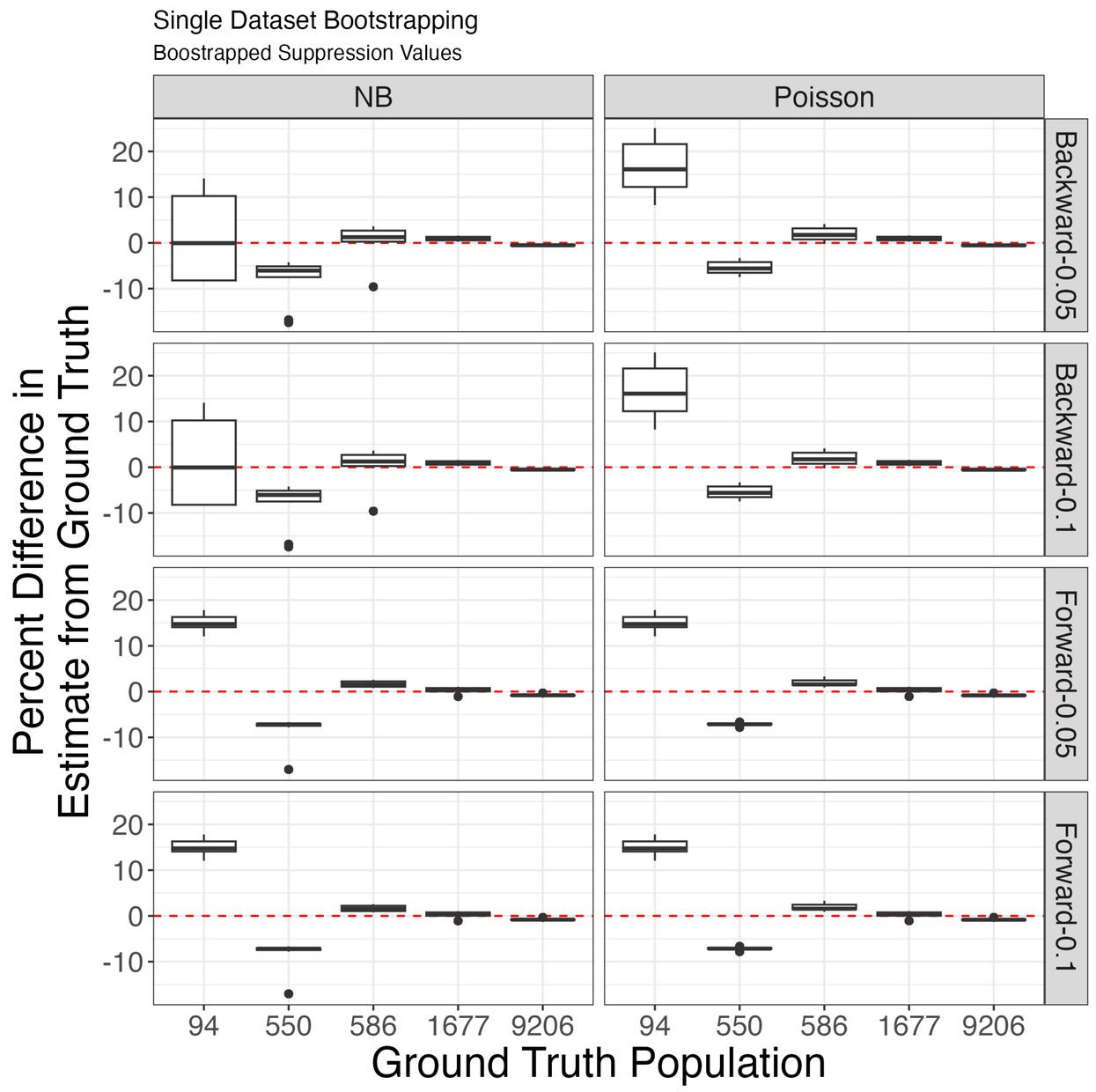
Takeaway

- (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) When emulating our dataset of interest – the Massachusetts Public Health Database, 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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