

# Improving racial/ethnic health equity and naloxone access among people at risk for opioid overdose: A simulation modeling analysis of community-based naloxone distribution strategies in Massachusetts, USA

Xiao Zang<sup>1</sup>, Alexandra Skinner<sup>2</sup>, Zongbo Li<sup>1</sup>, Leah C Shaw<sup>2</sup>, Czarina N Behrends<sup>3</sup>, Avik Chatterjee<sup>4</sup>, Ali Jalali<sup>3</sup>, Ashly E Jordan<sup>5</sup>, Jake R Morgan<sup>6</sup>, Shayla Nolen<sup>2</sup>, Bruce R Schackman<sup>3</sup>, Brandon DL Marshall<sup>2</sup>, Alexander Y Walley<sup>7</sup>

1. Division of Health Policy and Management, School of Public Health, University of Minnesota; 2. Department of Epidemiology, School of Public Health, Brown University; 3. Department of Population Health Sciences, Weill Cornell Medical College; 4. Department of Medicine, Section of General Internal Medicine, Boston Medical Center and Boston University School of Medicine; 5. Center for Drug Use and HIV/HCV Research; 6. Department of Health Law, Policy and Management, Boston University School of Public Health; 7. Massachusetts Department of Public Health, Bureau of Substance Addiction Services and Grayken Center for Addiction, Section of General Internal Medicine, Boston Medical Center and Boston University School of Medicine

## Background

- In 2022, nearly 83,000 people in the US died due to drug overdose involving an opioid.
- In Massachusetts, the opioid overdose death (OOD) rate consistently exceeds the national average (32.5 per 100,000 in 2021, compared to 24.7 nationally).
- Timely administration of naloxone can prevent opioid overdoses from becoming fatal, with naloxone distribution representing pivotal components of the US DHHS Overdose Prevention Strategy.
- During the COVID-19 pandemic, there was a surge in OODs in Massachusetts, particularly among Black and Hispanic/Latinx populations.
- Despite the increasing racial and ethnic disparities in OODs, there was no compensatory increase in naloxone distributed to these groups.

## Objective

- This study aims to adapt a previously developed simulation model to evaluate alternative naloxone expansion strategies in Massachusetts, with the objective of identifying approaches that can lessen opioid overdose mortality and simultaneously reduce racial and ethnic disparities in OODs.

## Acknowledgement

- This work was primarily supported by the National Institutes on Drug Abuse (grant number: U01DA047408, P30DA040500).
- Data for this study were obtained through approved requests to the Massachusetts Department of Public Health (MDPH).

## Methods

- We adapted a calibrated, individual-based model that is composed of a microsimulation and an integrated decision tree model, **PROFOUND**, to assess the potential outcomes of naloxone distribution expansion strategies across racial and ethnic populations in Massachusetts.
- We measured naloxone availability using naloxone kits per OOD and evaluated scenarios of achieving higher benchmarks for naloxone availability (40, 60 and 80 kits per OOD) from 2022 levels. We compared the annual numbers and rates of OODs, and total healthcare costs between two naloxone distribution strategies (**Table**):
  - Proportional distribution** - achieving the benchmark ratio at the overall population level while distributing additional kits proportional to the 2022 level for each racial and ethnic group.
  - Equity-focused distribution** - achieving the benchmark ratio among each racial/ethnic group.

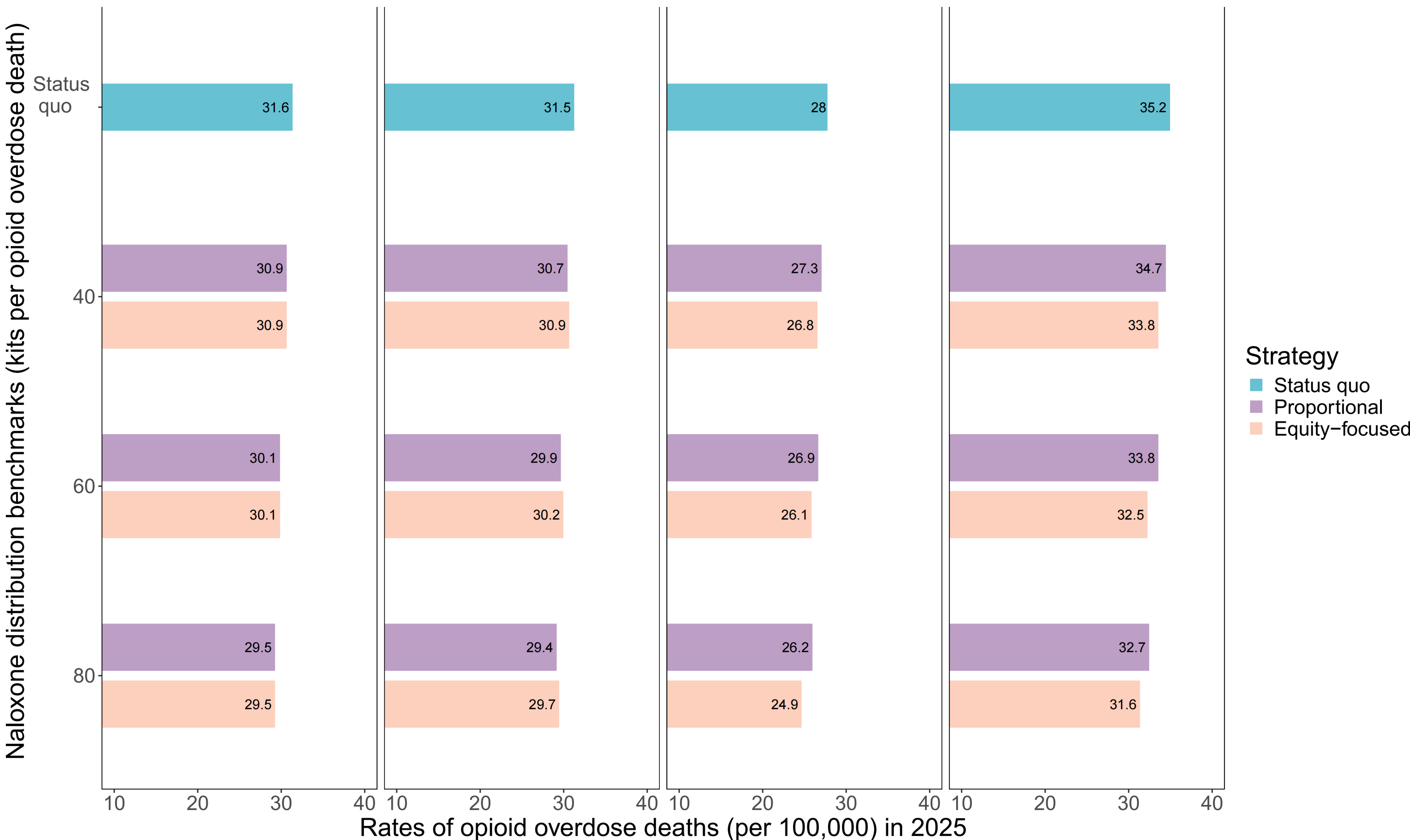
Table. Ratio of naloxone kits per OOD for each racial and ethnic population under different naloxone distribution scenarios

	Overall	White	Black	Hispanic/Latinx
Status quo (2022 level)	26.0	28.8	17.3	18.9
Proportional distribution				
40 kits per OOD ratio	40	44.3	26.6	29.1
60 kits per OOD ratio	60	66.5	39.9	43.6
80 kits per OOD ratio	80	88.6	53.2	58.2
Equity-focused distribution				
40 kits per OOD ratio	40	40	40	40
60 kits per OOD ratio	60	60	60	60
80 kits per OOD ratio	80	80	80	80

## Results

- Both naloxone distribution strategies yielded comparable predicted reductions in total OODs in 2025 and incurred similar incremental costs.
- However, the two naloxone distribution strategies led to different reductions in the annual rate of OODs in 2025 across racial and ethnic groups (**Figure**).
- For achieving an 80 kits per OOD benchmark, proportional distribution resulted in 6.7%, 6.5%, and 7.1% reduction in annual OODs in 2025 among White, Black, and Hispanic/Latinx populations, respectively. In contrast, equity-focused distribution achieved a reduction of 5.7%, 11.3%, and 10.2% in the respective groups.

Figure. Projected rate of OODs per 100,000 people in 2025 in different naloxone distribution scenarios



- In all scenarios, the cost per OOD averted was lower than the generally accepted thresholds for cost per life saved.
- To facilitate the use of the model in resource allocation decisions for naloxone distribution, we also developed a webtool to help disseminate the model, visualize model outcomes, and allow users to explore model results at substate levels: <https://profoundmodel.org/>

## Conclusion

- An equity-focused naloxone distribution strategy designed to reduce racial and ethnic disparities in naloxone availability could substantially improve health equity while potentially improving overall population health at lower healthcare costs per OOD averted than a proportional distribution strategy.
- Achieving this goal necessitates a combination of policy changes, equity-focused programmatic interventions, and robust data collection efforts.