Allocative Efficiency Analysis of Harm Reduction Strategies to Reduce Overdose Mortality in Connecticut

Jillian Frechette, MPH[1]; Qinlian Zhao, PhD[1]; Ramon Rodriguez Santana, MPH, MBA[2]; Mark Jenkins[3]; Marianne Buchelli. MPH, MBA[2]; Dyanna Charles, MPH[1] Scott Braithwaite, MD[1] for Population Health
[1]New York University Grossman School of Medicine, New York City, NY, USA; [2] Connecticut Department of Public Health, Hartford, CT, USA; [3]Connecticut Harm Reduction Alliance, Hartford, CT

Scaling up **naloxone distribution**, **community-based MOUD, and harm reduction centers** can cost-efficiently **avert over 17% of opioid overdose deaths** in Connecticut over the next 5 years – **saving $1.67 billion** in societal costs.

Background

- The unintentional **opioid overdose mortality rate in Connecticut (CT)** is higher than the United States national average, at **33.6 per 100,000** in 2023
- **Harm reduction interventions** have made progress, but **budget constrains scale up** of all interventions

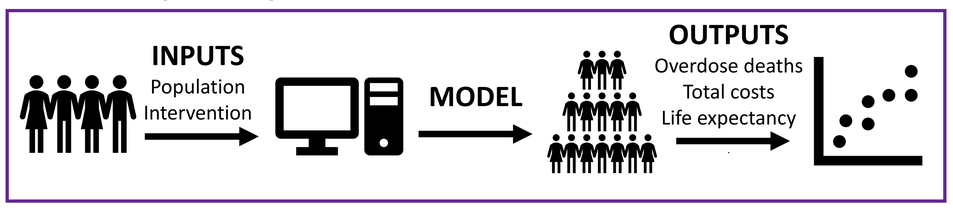
<u>Aim</u>: Determine the most efficient (i.e., greatest benefit per cost) resource allocation to reduce overdose deaths and improve life expectancy among people with opioid use disorder (OUD) in Connecticut

Methods

In collaboration with the CT Department of Public Health, we created, calibrated, and validated a simulation model of people with OUD in Connecticut

Modeling approach:

- Probabilistic state-transition simulation model
- Interventions impact overdose mortality risk
- **Comparison of *current* v. *scaled up* combinations of interventions**
  - Scaled to estimated "saturation"
- Varied ratios of MOUD
  - Current, choice-based, or all of either: methadone, oral buprenorphine, injectable buprenorphine, naltrexone



- Community-based MOUD
- Incarceration-based MOUD
- Harm reduction vending machines (HRVM)
- Naloxone distributed through syringe service programs (SSPs)
- Other community distribution of naloxone
- Harm reduction centers

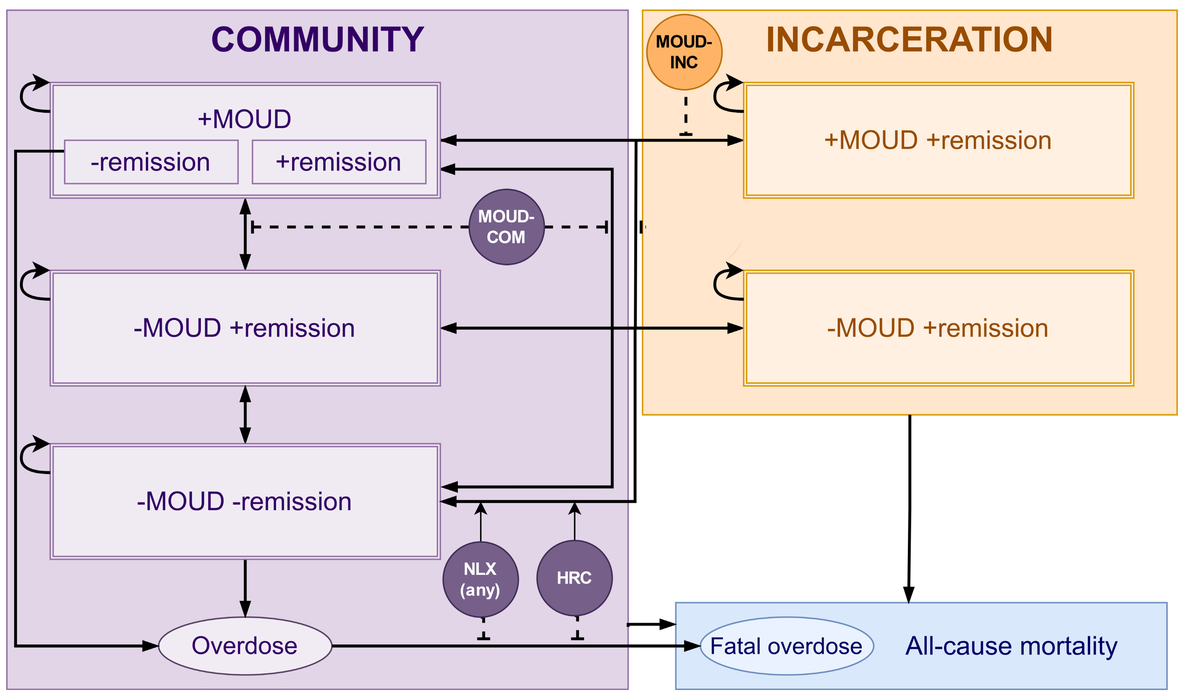
Model Population:

- ~ 90,895 people with OUD in CT
  - Higher risk:
    - People with history of incarceration
    - People who use injection drugs

Outcomes Measured:

- Deaths averted over 5 years
- Quality-adjusted-life-years (QALYs) gained
- Cost per death averted
- Cost per QALY gained

Model



MOUD: medications for opioid use disorder; MOUD-COM: MOUD offered in the community; MOUD-INC: MOUD offered in incarceration; HRC: harm reduction centers

- Simulated individuals with OUD live a virtual life in the model
- Individuals transition between:
  - Settings
    - **Community** or **incarceration**
  - Opioid use states
    - **Remission** or **actively using**
  - Treatment states
    - **Receiving MOUD** or **not**
- Probabilities and rates of transition based on literature
  - Transitions may occur in each single-day cycle
- If not in remission and in the community, **individuals may experience an overdose**
  - Overdose **may or may not be fatal**
  - May die of other causes in accordance with age-adjusted mortality rates
- **Intervention effects change the probabilities and rates**
  - e.g., individuals receiving MOUD are less likely to experience an overdose; an overdose that is witnessed and responded to with naloxone is less likely to be fatal

Results

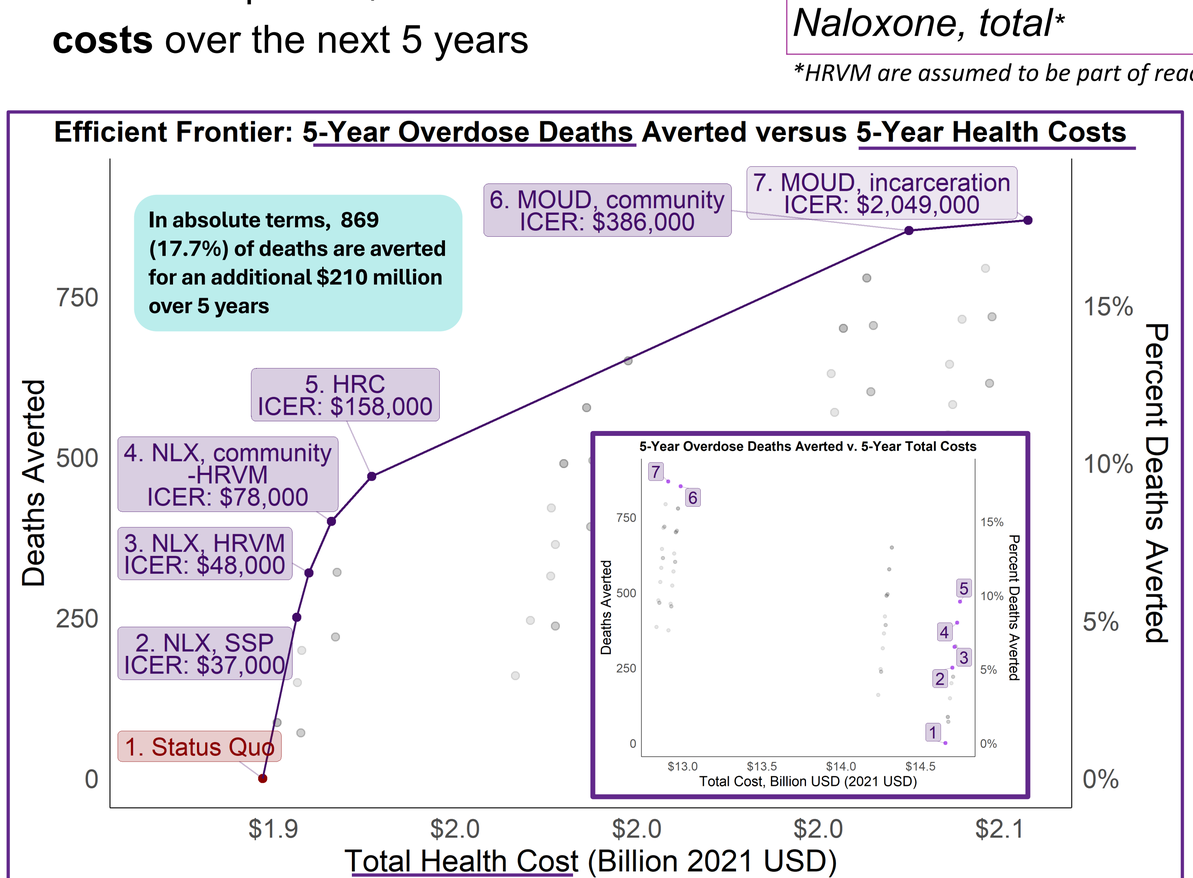
At **current coverage** levels, we estimate:

- **4,907 overdose deaths** will occur over the next 5 years (5.40% of the cohort)
- Each person with OUD lives **14.86 QALYs** beyond their current age
- The state spends **$1.90 billion in health costs** over the next 5 years

Impact of Individual Interventions on Overdose Deaths

Intervention	Deaths Averted	Intervention	Deaths Averted
Naloxone, HRVM	87 (1.77% ↓)	Harm reduction centers	71 (1.45% ↓)
Naloxone, SSP	251 (5.11% ↓)	MOUD, community	375 (7.64% ↓)
Naloxone, other	149 (3.03% ↓)	MOUD, incarceration	160 (3.26% ↓)
*Naloxone, total**	400 (8.15% ↓)	**All**	**858 (17.38% ↓)**

**HRVM are assumed to be part of reaching NLX saturation, and thus are included as part of "naloxone, other" when jointly maximizing*



Cost-efficiently scaling up naloxone, HRCs, and community-based MOUD, the maximally effective cost-efficient option:

- **Averts 853 (17.38%) opioid overdose deaths** over five years for **additional 5-year health cost of $178 million**
- Adds **0.36 QALYs** for additional per-person lifetime health cost of $12,000
- **Saves $1.67 billion over 5 years** considering societal costs
- *Scaling MOUD during incarceration averts **16 additional deaths,** but is not cost-efficient*

The same strategy but with **only buprenorphine** offered, yields less benefit but is cost-saving:

- **Averts 810 (16.51%) deaths** over five years, **saving $319 million in 5-year health costs**
- Adds **0.25 QALYs**
- **Saves $1.49 billion** over 5 years considering societal costs
- *Scaling MOUD during incarceration averts 22 additional deaths while saving health and societal costs, but is not cost-efficient*
- *Choice-based MOUD cost-efficiently yields an additional 0.31 QALYs*

Conclusion

- Connecticut can cost-efficiently avert approximately 17% of opioid overdose deaths in the next five years by scaling up naloxone, community-based MOUD, and harm reduction centers
  - From the societal perspective, this would save $1.67 billion
- Switching everyone to buprenorphine would be more efficient, but marginally less effective

Additional Key Information

Funding:
This work is supported by NIDA grant 5R01DA043815-05

Author contact:
Jillian.Frechette@nyulangone.org

NYU Langone Health

499