A FRAMEWORK TO DETERMINE NALOXONE SATURATION WITH SIMULATION MODELING AND COST-EFFECTIVENESS METHODS

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Background
Jurisdictions lack practical tools to determine data-informed naloxone saturation targets that account for local overdose dynamics and resource constraints. We introduce a generalizable framework integrating simulation modeling with cost-effectiveness principles to identify local naloxone saturation targets, using Rhode Island as a case study.

Methods
Analogous to cost-effectiveness analysis, we defined the "cost-effectiveness" of naloxone distribution as the number of additional kits required (analogous to "incremental cost") to avert one additional opioid overdose death (OOD) (analogous to "incremental effect"). This metric can be estimated using simulation model by projecting OODs under varying naloxone distribution levels，calculated as the ratio of difference in naloxone kits to difference in OODs between adjacent distribution levels. Decision-makers can compare this metric to a predefined kits-per-death-averted threshold (analogous to "willingness-to-pay"), representing the maximum kits they are willing to distribute to avert one death, with the corresponding distribution level defining the saturation target. Alternatively, a cost-per-life-saved threshold may be used, which can be converted to an equivalent kits-per-death-averted threshold by dividing the monetary threshold by unit cost per naloxone kit. Using Rhode Island as a case study, we applied a simulation model to project annual OODs in 2026 under a range of annual distribution scenarios, and calculated additional kits required to avert one OOD and compared against hypothetical thresholds.

Results
Kits-per-death-averted increased with distribution levels, from 761 kits per OOD averted at 60,000 kits distributed annually to 16,836 kits per OOD averted at 280,000 kits distributed annually. Hypothetical thresholds of 5,000 and 10,000 kits per OOD averted corresponded to saturation targets of approximately 194,000 and 243,000 kits distributed annually, respectively. A hypothetical cost-per-life-saved threshold of $1,500,000 per life saved corresponds to 238,800 kits distributed annually.

Conclusion
This framework provides an approach for states to set evidence-based naloxone saturation targets based on state-specific budgetary constraints and public health considerations.

Disclosure of Interest Statement
We declare no conflict of interest.

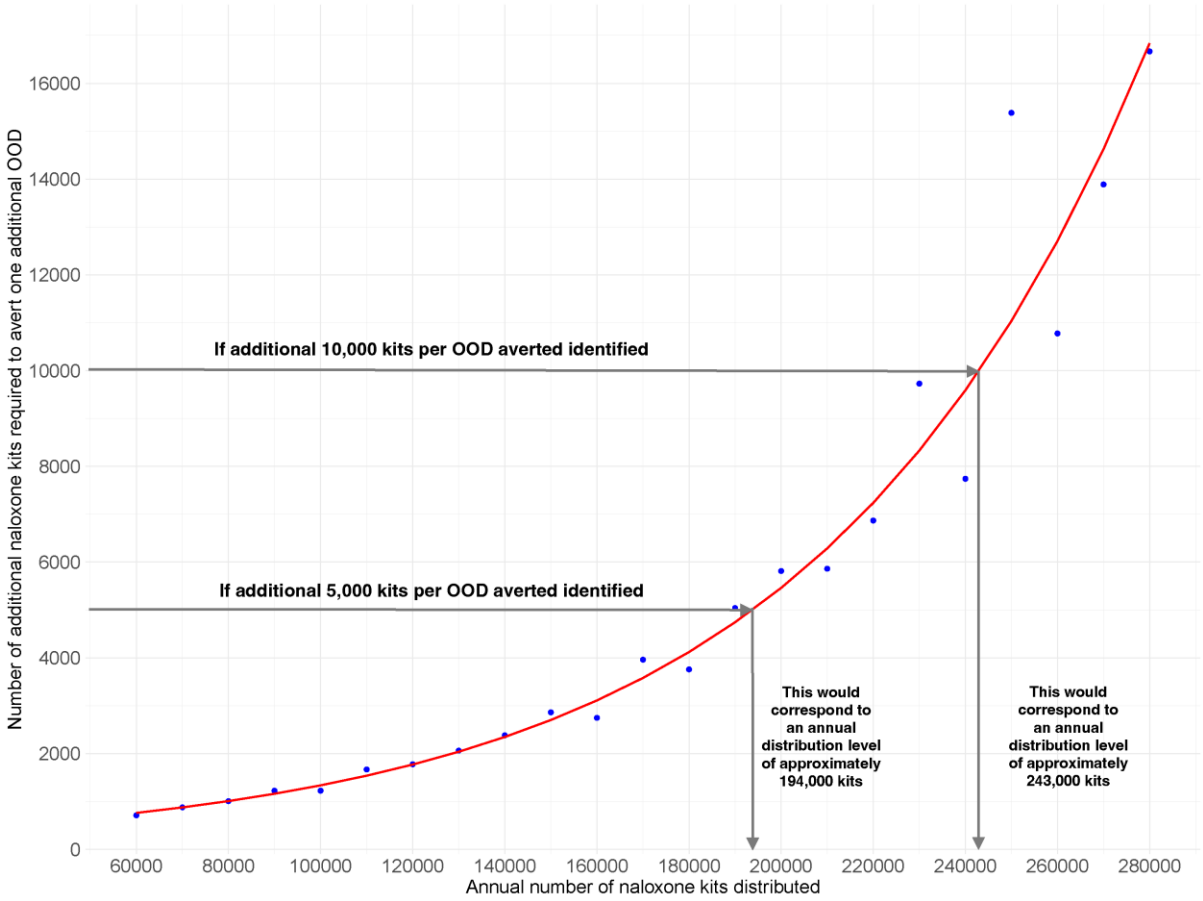

Figure. Number of additional naloxone kits required to avert one additional opioid overdose death (OOD) by the number of naloxone kits distributed in a year in Rhode Island.