



Cost-Benefit Analysis of Medication Assisted Treatment (MAT)

Background

Medication-assisted treatment (MAT) programs aim to treat substance use disorder, prevent drug relapse and overdose, and ultimately promote long-term recovery for individuals with opioid use disorder. MAT may also help reduce recidivism by supporting rehabilitation efforts. The Pennsylvania Department of Corrections' (DOC) MAT program launched in 2014 at SCI Muncy, then expanded statewide.

The DOC's MAT program administers four primary medications: Suboxone, Sublocade, Revia, and Vivitrol. These medications fall into two classes: 1) antagonists and 2) partial agonists. Suboxone and Sublocade are partial-agonists, while Revia and Vivitrol are antagonists. Both types stop opioids from taking effect, but pharmacologically accomplish this in different ways. While antagonists block opioid receptors, partial agonists activate them—but not as strongly as full opioids like heroin or fentanyl. MAT medications are also available in multiple forms: Revia and Suboxone are pills (administered daily), while Sublocade and Vivitrol are shots (administered monthly).

The MAT program cost the DOC approximately \$27 million to administer in 2023. Policymakers therefore wish to examine the costs and benefits of DOC's MAT program and determine if effectiveness and return on investment differ by MAT medication type. This brief reports on results of a cost-benefit analysis of DOC's MAT program.

Study Design

Multiple data sources and analytical approaches were used for this evaluation. The analysis weighs three types of costs against two types of benefits associated with each medication administered by the DOC's MAT Program:

- Costs: 1) Medication Diversions, 2) Medication Purchasing Costs, and 3) Program Administrative and Staffing Costs.
- Benefits: 1) Reduced Participant Mortality, and 2) Reduced Participant Recidivism

Cost Analyses

DOC's Bureau of Administration provided the purchasing, administration, and staffing costs for each MAT medication, shown in the table of results. Costs related to MAT drug diversions were estimated using a contingent valuation approach, based on a willingness-to-pay survey conducted among DOC staff and inmates from six SCIs offering MAT services, as well as MAT program specialists, counselors, and hearing

examiners. MAT diversion refers to the unauthorized use of prescribed MAT medications (e.g., drug sales, recreational use, etc.). This analysis only estimates the diversion cost for Suboxone, since the other MAT types are either much more difficult to divert or have no diversion value. On average, survey respondents were willing to pay \$4,184 to prevent a single incident of an MAT diversion. To estimate the total diversion cost, this amount was multiplied by the total number of confirmed diversion incidents in 2023. Searches of DOC data identified 45 confirmed diversion incidents involving Suboxone in 2023. Therefore, the total cost associated with Suboxone diversions was estimated at \$188,280.

Benefit Analyses

Recidivism and mortality benefits were calculated using a sample of DOC reentrants screened for opioid use disorder according to the Texas Christian University Drug Screen 2 (TCU II). Each medication's effect was analyzed by an external evaluator (Dr. Giovanni Righi, UCLA), using an instrumental variable approach. Individuals who received multiple MAT medications were classified by the last medication they received before release, and those imprisoned at SCIs with fewer than 30 MAT administrations were excluded from the sample. Linear probability modeling (LPM), logistic regression, and marginal effects post-estimation were combined with the instrumental variable structure to estimate the effect of each medication on mortality and recidivism. This analytic approach provides strong estimates of the causal effects of each MAT medication in the absence of a randomized control trial. Results for Vivitrol were also independently confirmed from an earlier randomized controlled trial conducted by another external evaluator (Dr. Jordan Hyatt, Drexel University).

Results indicated that Suboxone significantly reduced the probability of recidivism by about 35% at 6 months and 1 year after release, but by 3 years post-release this effect disappeared. The results table displays the total estimated amount of incarceration costs saved due to reduced recidivism at a fractional cost per day per person of \$46.58. The total annual benefit from reduced recidivism for Suboxone was estimated at nearly \$4.6 million. No other MAT showed a significant effect on recidivism; thus the benefits for Revia, Vivitrol, and Sublocade were estimated at \$0. Additionally, none of the medications examined were found to significantly affect mortality. Benefits for all MAT medications in terms of reduced mortality were therefore estimated at \$0.

Key Findings & Recommendations

The final results of the cost-benefit analysis were derived by calculating the ratio of each MAT medication's total benefits to its total costs. **Of the four MAT medications analyzed, only Suboxone provided a positive annual return on investment—\$6 gained for every \$1 spent. In contrast, the other three MAT medications examined— Sublocade, Revia, and Vivitrol—resulted in a net cost for the DOC.** Ultimately, the results suggest that expanding the use of Suboxone throughout the DOC's MAT program may result in significant cost savings and increased benefits.

Comparing the costs of shot versus pill medications also provides useful insights. Shot forms of MAT medications are significantly more expensive than pill forms. However, this evaluation found no evidence that MAT shot medications reduce mortality or recidivism or perform better than MAT pills. Suboxone, a pill, was the only medication shown to have a meaningful impact. The DOC may therefore wish to consider limiting the administration of MAT shot medications when possible and medically appropriate to maximize cost savings and increase benefits such as reduced recidivism and drug-related mortality.

Finally, Suboxone's higher potential for diversion compared to other MAT medications has led some to question if antagonist medications provided greater benefits than partial agonists. This evaluation found the cost of diversion to be relatively low, and found no evidence that antagonists are more effective than partial agonists. Suboxone—a partial agonist—was the only medication to provide a net benefit.

MAT Cost-Benefit Analysis Summary				
	Pills		Shots	
	Revia (Antagonist)	Suboxone (Partial-Agonist)	Vivitrol (Antagonist)	Sublocade (Partial-Agonist)
Benefits: Savings Due to Reductions in...				
1-Year Mortality	\$0	\$0	\$0	\$0
1-Year Recidivism	\$0	\$4,581,958	\$0	\$0
Costs: Expenses Associated with Medication...				
Diversion	\$0	\$188,280	\$0	\$0
Purchase	\$35,217	\$383,296	\$6,556,544	\$11,756,760
Admin & Staff	\$15,661	\$170,454	\$2,915,723	\$5,228,281
Benefit/Cost Ratio	\$0/\$0	\$4,581,958/\$188,280	\$0/\$0	\$0/\$0
	\$50,878	\$742,030	\$9,472,267	\$16,985,041
Result	Net Cost	Net Benefit (+\$6.17)	Net Cost	Net Cost



MAT Cost-Benefit Analysis: Supplemental Analyses

Overview

The following supplemental analyses consider how several scenarios could impact this study's findings. The study's main results demonstrate the relative superiority of Suboxone over other MAT medications in terms of a benefit-to-cost-ratio. Ultimately, these analyses show the findings are robust and persist across various scenarios.

Diversion

What if the number of Suboxone diversions, or the cost of each diversion, changed?

- This report's analyses estimated approximately 45 incidents of Suboxone diversion occurred per year. The annual number of Suboxone diversion incidents within the DOC would have to be twenty-one times higher than estimated for the benefits of Suboxone to no longer outweigh the cost.
- The estimated cost to DOC of one diversion incident of Suboxone (\$4184) would have to be twenty-one times higher than estimated in this report for the benefits of Suboxone to no longer outweigh the cost.
- Both the number of diversion incidents, and the cost per each diversion incident, would each need to be five times higher than estimated in this report for the benefits of Suboxone to no longer outweigh the cost.

Recidivism

This study estimated that Suboxone reduces recidivism odds by 35%, which is a rather large effect size. **What if Suboxone's effect on recidivism changed?**

- If Suboxone only reduced recidivism by 10%, the benefits of Suboxone would still outweigh the cost, resulting in \$1.76 in benefits gained for every \$1 spent.
- If the diversion costs for Suboxone were underestimated, and instead turned out to be two times higher, and Suboxone turned out to only reduce recidivism odds by 10%, the benefits of Suboxone would still outweigh the cost, generating \$1.41 in benefits for every \$1 spent.

Analyses for this study found that Vivitrol reduced the odds of recidivism by 6%, and that Sublocade reduced recidivism odds by 9.5%, but neither estimate was statistically significant. In the absence of statistical significance, it must be assumed that Vivitrol and Sublocade have no effect on recidivism.

But, what if Sublocade and Vivitrol *did* affect recidivism?

- If the recidivism estimates for Vivitrol and Sublocade had reached statistical significance, a 6% reduction in the odds of recidivism due to Vivitrol would result in \$.13 in benefits for every \$1 spent, and a 9.5% reduction in recidivism odds due to Sublocade would result in \$.12 in benefits for every \$1 spent. In neither case do the benefits of Vivitrol and Sublocade come close to outweighing their cost, nor do they come close to the net benefits estimated for Suboxone.

Overdose Deaths

Research estimating the monetary Value of a Statistical Life (VSL) among criminal justice populations indicates that the value of a single human life is between \$250,000 and \$5 million. Analyses for this study found a 2% reduction in the odds of overdose deaths for both Vivitrol and Sublocade, but neither estimate was statistically significant. Therefore, it was assumed that Vivitrol and Sublocade had *no* effect on overdose deaths. But **what if Sublocade and Vivitrol *did* affect overdose deaths?**

- If estimates for Vivitrol and Sublocade reached statistical significance, and in fact it turned out both reduced overdose deaths by 2%, each medication would produce between \$6 million and \$120 million in benefits.
- For Vivitrol, this would result in a benefit-to-cost ratio of between \$.63 per \$1 spent and \$12.67 per \$1 spent. Under the low estimate the cost for Vivitrol would still outweigh the benefits. Under the high estimate the benefit-to-cost ratio for Vivitrol would be twice the benefit-to-cost ratio for Suboxone.
- For Sublocade, a 2% reduction in overdose deaths would result in a benefit-to-cost ratio of between \$.35 per \$1 spent and \$7.06 per \$1 spent. Under the low estimate the cost of Sublocade would still outweigh the benefits. Under the high estimate the benefit-to-cost ratio for Sublocade would slightly outperform the benefit-to-cost ratio for Suboxone.

However, the above scenarios for Vivitrol and Sublocade assume there is no benefit from Suboxone in reducing overdose deaths. If Suboxone ended up demonstrating any benefit at all in terms of reducing overdose deaths, this would only further bolster its superiority to other MAT types such as Vivitrol and Sublocade in terms of its return on investment.

Cost to Society

This study focused primarily on the costs and benefits of MAT to the PA DOC. For example, the estimated financial benefits of recidivism reduction only account for cost savings resulting from a smaller DOC population due to reduced recidivism. However, reducing recidivism for new crimes brings broader benefits to society: fewer victims, reduced law enforcement and court costs, less property loss/damage, and lower fear of crime. A comprehensive study of the costs of crime by the RAND Corporation shows that a single crime avoided (among the most serious crime types) produces a benefit to society of approximately \$198,396. Based on this statistic, **how does Suboxone's estimated effect on recidivism translate into societal cost savings?**

- Suboxone was estimated to reduce the odds of recidivism by 35%. This translates into an estimated benefit to society of up to \$53.5 million. This means Suboxone could produce a benefit-to-cost ratio of up to \$78 in benefits for every \$1 spent (after factoring in Suboxone's associated costs), if societal benefits due to crime/recidivism reduction are included in the analyses.

Shifting to Suboxone

Both the main study's results and supplemental analyses demonstrate that Suboxone consistently outperforms other MAT medication types in both cost-effectiveness and recidivism reduction. A key policy recommendation from this study is therefore to expand Suboxone's use where medically appropriate while reducing reliance on other MAT medication types. For example, even a modest 10% shift in medication administrations from Vivitrol and Sublocade to Suboxone instead would yield significant savings: \$1.79 million in purchasing costs alone. If considering associated staffing efficiencies—as Vivitrol and Sublocade administration consume the majority of MAT-related staff time—this same 10% shift could also reduce personnel expenses, resulting in a total savings of \$2.66 million. Furthermore, the total projected annual savings for a 10% shift incorporating Suboxone's demonstrated recidivism reduction benefits increases to approximately \$3.23 million. More substantial shifts from Vivitrol and Sublocade to Suboxone would generate even larger cost savings.