



Budget impact tool for the incorporation of medications for opioid use disorder into jail/prison facilities

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ABSTRACT

Background: Given the personal and public consequences of untreated/undertreated OUD among persons involved in the justice system, an increasing number of jails and prisons are incorporating medication for opioid use disorder (MOUD) into their system. Estimating the costs of implementing and sustaining a particular MOUD program is vital to detention facilities, which typically face modest, fixed health care budgets. We developed a customizable budget impact tool to estimate the implementation and sustainment costs of numerous MOUD delivery models for detention facilities.

Methods: The aim is to describe the tool and present an application of a hypothetical MOUD model. The tool is populated with resources required to implement and sustain various MOUD models in detention facilities. We identified resources via micro-costing techniques alongside randomized clinical trials. The resource-costing method is used to assign values to resources. Resources/costs are categorized as (a) fixed, (b) time-dependent, and (c) variable. Implementation costs include (a), (b), and (c) over a specified timeframe. Sustainment costs include (b) and (c). The MOUD model example entails offering all three FDA-approved medications, with methadone and buprenorphine provided by vendors, and naltrexone by the jail/prison facility.

Results: Fixed resources/costs are incurred only once, including accreditation fees and trainings. Time-dependent resources/costs are recurring, but fixed over a given time-period; e.g., medication delivery and staff meetings. Variable resources/costs are those that are a direct function of the number of persons treated, such as the medication provided to each patient. Using nationally representative prices, we estimated fixed/sustainment costs to be \$2919/patient, over 1 year. This article estimates annual sustainment costs to be \$2885/patient.

Conclusion: The tool will serve as a valuable asset to jail/prison leadership, policymakers, and other stakeholders interested in identifying/estimating the resources and costs associated with alternative MOUD delivery models, from the planning stages through sustainment.

1. Background

Opioid misuse has been associated with increased criminal-legal activity, (Birbaum et al., 2011; Catalano et al., 2011; Mark et al., 2001; Murphy et al., 2014; Murphy & Polsky, 2016), which coincides with a high prevalence of opioid use disorder (OUD) among persons with criminal-legal involvement in the United States (National Academies of Sciences, E., and Medicine, 2019); the rate of OUD among individuals who are incarcerated is estimated to be around 15 % (Baillargeon et al.,

2009; Bronson et al., 2017; James & Glaze, 2006; Peters et al., 1998) versus ~1 % among the general US population, ages 12 and older (Substance Abuse and Mental Health Services Administration, 2022).

Pharmacotherapy is the recommended first-line treatment for OUD. The US Food and Drug Administration (FDA)-approved medications for OUD (MOUD) are methadone, buprenorphine, and naltrexone. Despite ample evidence that treating OUD at the point of incarceration is beneficial to both personal and public health, more than 80 % of incarcerated individuals with a history of OUD do not receive MOUD

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during their stay (Krawczyk et al., 2017). Benefits associated with MOUD provision during or immediately following incarceration include improved linkage to community-based treatment (Gordon et al., 2014; Kinlock et al., 2007; Magura et al., 2009), increased treatment retention (Carroll et al., 2008; Gordon et al., 2015; Kinlock et al., 2009), and reduced criminal behavior overdose risk and risk behaviors associated with HIV infection (Degenhardt et al., 2011; Kerr et al., 2007; Kinlock et al., 2009; MacArthur et al., 2012). Rhode Island was the first state to begin offering both induction and maintenance of all three FDA-approved medications; they found that after 1 year of implementation, the postincarceration deaths had decreased by 61 % (Substance Abuse and Mental Health Services Administration, 2019a; The Pew Charitable Trusts, 2020). In fiscal year 2017, Kentucky estimated that for every dollar spent on substance use treatment in correctional facilities there was a return of more than \$4 in cost offsets (Deck et al., 2009; Green et al., 2018; Mattick et al., 2003; Staton et al., 2018).

In the late 1980s and mid 1990s, several correctional facilities offered at least one form of MOUD (National Governors Association, A. C. A., 2021a); by 2018, only 14 states in the United States (27 % of jurisdictions) offered methadone or buprenorphine maintenance in any jail or prison facility, while 39 (76 %) offered injectable extended-release naltrexone just prior to release (Substance Abuse and Mental Health Services Administration, 2019b). Since 2018, an increasing number of jails and prisons have begun to offer all three MOUD, either on their own, or in response to a legislative mandate, including at least 15 bills across 12 states, resulting in 62 % of states with at least one facility offering some form of MOUD (National Academy for State Health Policy, 2020; National Governors Association, A. C. A., 2021b; The Pew Charitable Trusts, 2017). However, the resources required to implement MOUD programs in jails and prisons vary widely due to the myriad possible combinations of a) existing services and b) potential delivery models. For example, with regard to (a), a facility may not currently offer any MOUD, but decide to offer extended-release naltrexone or buprenorphine upon release from incarceration, or they may already provide the latter service, and decide to offer MOUD to incarcerated people throughout their stay. Jails/prisons may decide to offer MOUD only to persons who enter the facility with an existing, verifiable prescription (i.e., maintenance), while other facilities may choose to offer both MOUD initiation and maintenance. With regard to (b), observed MOUD delivery models in jails/prisons include the medication being provided by the facility's health care team, a vendor, or a combination of the two. In addition to treatment administration, vendors can provide licenses, staff supervision, training, and intake assessments. Examples of direct delivery by the facility include: on-site jail/prison health care providers administering naltrexone, which can be prescribed by any provider with a Drug Enforcement Agency license to prescribe medications; on-site providers obtaining Drug Addiction Treatment Act (DATA) waivers to prescribe buprenorphine; and the facility becoming a licensed opioid treatment provider (OTP), thereby allowing jail/prison health care providers to store and dispense methadone onsite. Conversely, a facility may hire a vendor with an OTP license to provide all MOUD onsite. A combined model may entail the facility's providers delivering a relatively-low-barrier treatment (i.e., naltrexone), while a vendor with the necessary licensure delivers methadone and buprenorphine. Still, other facilities have chosen to transport patients to an off-site treatment provider (National Commission on Correctional Health Care, 2021; National Council for Behavioral Health, V. S., 2020).

Jail/prison health care, unlike civilian health care, is constrained by fixed budgets, typically financed by state and federal funds, because providers cannot bill insurance (public or private) while a person is incarcerated. Moreover, jail/prison health care budgets can vary drastically between states; for example, in fiscal year 2015, the per-inmate cost for observed expenditures in Louisiana was \$2173 vs. \$13,747 in Vermont (The Pew Charitable Trusts, 2017). Such financial constraints add even more weight to the identification of planning and start-up (i.e. implementation) costs, in addition to the day-to-day operation costs,

when deciding on a particular delivery model (Saldana et al., 2022).

As a direct result of our work alongside clinical trials evaluating the comparative-effectiveness of various MOUD models for jails/prisons, including the National Institute on Drug Abuse (NIDA)-funded, Justice Community Opioid Innovation Network (JCOIN) (Murphy et al., 2021) and Health and economic outcomes of treatment with extended release naltrexone among pre-release prisoners with opioid use disorder (HOPPER): protocol for an evaluation of two randomized effectiveness trials (Murphy et al., 2020), we developed a budget impact tool to assist jail/prison stakeholders, and criminal-legal researchers in estimating the costs associated with implementing and sustaining the aforementioned multitude of MOUD program options for jails and prisons. In this article, we discuss the context of MOUD provision within jails/prisons, and how the components of the tool can be used to estimate the implementation and sustainment costs of a given MOUD delivery model in either setting; we finish with an applied example of the tool to a hypothetical MOUD program.

2. Methods

2.1. Overview

The study team identified the resources required to implement and sustain each MOUD program in US jails and prisons; and estimated the associated costs, via micro-costing analysis, which entails systematically capturing, cataloging, and valuing changes in resources resulting from the use of an intervention to treat patients (Neumann et al., 2017). Resource identification was guided by a tailored version of the Drug Abuse Treatment Cost Analysis Program (DATCAP) instrument (French, 2003), and we determined and categorized necessary resources utilizing a combination of administrative data and data collected using semi-structured interviews of relevant study staff. We identified 12 jails in Massachusetts and Maryland and 2 prisons in Maryland and Pennsylvania. The number of individuals interviewed varied among sites but averaged between 6 and 8 individuals. The semistructured interviews included personnel who typically handle, and are therefore most familiar with, the day-to-day operations of the MOUD program. "Relevant personnel" varied across sites, but could include clinicians (doctors, nurses, physician assistants, nurse practitioners), social workers, managers/directors, information technology staff, health service administrators, counselors, superintendents, deputies, and sheriffs. We have included a template of potential interview questions in the appendix. The resources were grouped within the budget impact tool according to type (fixed, time-dependent, variable; defined below) and phase (implementation, sustainment). The tool utilizes the resource-costing method to value resources, which entails weighting the number of resource units utilized by a relevant unit cost. The end-user then customizes the tool by selecting the resources they would require for a desired MOUD delivery model, inputs the estimated demand for MOUD, and, if desired, replaces the existing nationally representative unit costs, with values that more closely reflect their environment. Additionally, we will make this tool publicly available on the "Resources" page of the website for the Center for Health Economics of Treatment Interventions for Substance Use Disorder, HCV, and HIV (CHERISH; www.cherishresearch.org). CHERISH is a NIDA-funded multi-institutional center of excellence whose mission is to develop and disseminate health economic research on health care utilization, health outcomes, and health-related behaviors that informs substance use disorder treatment policy, and HCV and HIV care of people who use substances. We can arrange guidance to those who are interested in a more in-depth application via the free economic consultation service offered by CHERISH, requests for which can also be submitted via the "Resources" page of the website (Murphy et al., 2018).

2.2. Measures

We categorized resources/costs as either “fixed”, “time-dependent”, or “variable”. Fixed resources/costs are those that are incurred only once and are not directly related to the number of persons treated. Examples of fixed costs could include construction or renovation of a space for dispensing medications, trainings, and one-time licensing fees. Time-dependent resources/costs are those that are recurring but fixed over a given time-period. Common examples of time-dependent resources/costs include rent/lease fees and annual licensing fees. Variable resources/costs are those that are a direct function of the number of persons treated, such as staff time and medications. The budget impact tool organizes the aforementioned resource categories into two phases: “implementation” and “sustainment”. The implementation phase is the period from inception, including all planning activities, until steady-state, and includes all fixed, time-dependent, and variable costs that would be incurred over that time-period. The sustainment phase is the period following steady-state and includes the time-dependent and variable costs that would be incurred on an annual basis, following the implementation phase. Fixed costs are not included in the sustainment phase, given that they are primarily required for purposes of implementation, and do not recur over time. The expected time until steady state is a modifiable feature in the tool, given that it will vary across facilities.

The tool contains nationally representative unit costs for valuing each resource; however, as mentioned above, the user can modify these. The hourly wages and fringe benefits for employers were derived from the Bureau of Labor Statistics (Bureau of Labor Statistics, 2021). The team derived other supply costs from the Federal Supply Schedule, including those associated with medications and drug-screening tests (U.S. Department of Veterans Affairs, 2021). We used federal reimbursement rates to estimate travel costs, including food and lodging (U.S. General Services Administration, 2021). Contracted vendor fees were estimated by calculating the average costs from multiple Department of Correction facilities (Horn et al., 2018; National Council for Behavioral Health, V. S., 2020; The Pew Charitable Trusts, 2017, 2020; Vermont Agency of Human Services, 2016). We adjusted all monetary values to 2020 USD using the Consumer Price Index (Bureau of Labor Statistics, 2021). The data source links to each of the nationally representative value will be included in the last tab of the tool (Fig. 7).

3. Results

3.1. The tool

The budget impact tool includes 5 Microsoft Excel worksheets, with drop-down menus incorporated throughout to increase ease of use, and limit data-entry errors. The first worksheet is a dashboard that is automated by linking data from the other worksheets and displays the total costs of each resource category, by phase (see Fig. 1. ‘Dashboard’). The remaining worksheets include the various resources that could be associated with different MOUD delivery models, and their associated unit costs. Thus, users will select the quantity of each relevant resource, adjust the unit cost if desired, and be able to view detailed cost estimates for each resource category.

The second worksheet contains the fixed and time-dependent resources/costs (see Fig. 2. ‘Start-Up Costs’ & Fig. 3/3a ‘Time- Dependent Costs’). The fixed resource options include accreditation and licensing fees (e.g. those associated with one-time start up fees via vendor contract), dispensary design and construction, set-up of information technology services, supplies, meetings to implement the program, training, and interim medication delivery. The dispensary category pertains to those who plan to build a dispensary within the facility, typically with the intent of becoming an OTP. The interim medication delivery category captures the resources associated with a temporary medication delivery system for facilities planning to build a dispensary, but who are

Resource Category	Annual Totals
Fixed Start Up Costs	\$49,887
Vendor Accreditation and Licensing Fee	\$ -
Dispensary	\$ -
Information Technology Services	\$ 10,000
Supplies	\$ 5,050
Meetings	\$ 32,549
Training	\$ 2,289
Interim Medication Delivery	
Time Dependent Costs (Annual)	\$313,734
Annual Vendor Fee	74,060
Software System	13,440
Trainings	36,867
Meetings	64,452
Medication Delivery	104,611
Dosing	20,304
Variable Costs	\$3,944,108
Labor Costs	3,109,221
Vendor Employees	822,104
In-House Jail Employees	2,287,116
Vendor OUD Treatment Costs	752,749
OUD Treatment	542,808
MOUD Assessment	127,084
Program Counseling Sessions	82,857
Testing Supplies	82,138
Oral	42,420
Urine	37,562
Additional Supplies	2,156
Year 1 Costs	\$4,307,729
Subsequent annual Costs	\$4,257,842

Fig. 1. Dashboard.

interested in offering medications right away.

The time-dependent resource options include accreditation fees (e.g., those associated with on-going fees based on the vendor monthly/annual rate per facility), annual software system fees, annual orientation/trainings, weekly and monthly meetings, and medication delivery. The meeting components consist of the occupations and number of employees that would attend, and their time commitment during the year, all of which can be easily adjusted via drop down menus.

The next three worksheets include the variable resources that the team identified (therapy, labor, testing), and their associated unit costs. The labor tab consists of the various employee occupations involved in the MOUD Program, as well as their salary, fringe benefit rate, and the proportion of their full time equivalent (FTE) dedicated to the program (see Fig. 4. ‘Labor’). An FTE = 1.0 implies 40 h per week, or the equivalent of 1 full-time person. The therapy tab includes all currently approved/available MOUD types; the average daily medication cost, per-patient; the average number of patients treated per month for both

Fixed Start-Up Costs				\$49,887	
	Unit Cost	Unit	Duration of Time (months)	Total	
Accreditation and Licensing Fee					
Dispensary					
	Design	0	0	\$0	
	Furniture/Supplies for Dispensary	0	0	\$0	
	Construction Costs	0	0	\$0	
Information Technology System					
	Software System	\$10,000.00	1	na	\$10,000
Storage Supplies					
	Lock Boxes	\$10	5	\$5,050	
	Construction Totes	\$50	100	\$5,000	
Meetings to Implement Program					
		\$/hr	hrs per month	# of months	
	Special Sheriff	\$78	4	8	\$2,495
	Superintendent	\$75	4	8	\$2,391
	Assistant Superintendent of Programs	\$61	4	8	\$1,956
	MAT Director	\$54	4	8	\$1,729
	Director of Fiscal Operations	\$47	4	8	\$1,512
	CFO	\$67	4	8	\$2,152
	Health Services Administrator	\$59	4	8	\$1,889
	Regional Director	\$87	4	8	\$2,789
	Regional Vice President	\$87	4	8	\$2,789
	Project Manager	\$53	4	8	\$1,697
	Clinic Director	\$67	4	8	\$2,152
	VP Operations and Program Development	\$75	4	8	\$2,391
	Medication Compliance Specialist	\$30	4	8	\$972
	Clinical Supervisor	\$56	4	8	\$1,797
	Clinician	\$33	4	8	\$1,049
	Regional Director of Operations	\$87	4	8	\$2,789
Training					
		\$/hr	hrs	# of employees	
	Registered Nurse Manager	\$50	8	1	\$403
	Licensed Practical Nurse	\$32	8	2	\$504
	Registered Nurse-intake	\$50	8	2	\$805
OBAT Training					
		\$/hr	hrs	# of employees	
	Registered Nurse Manager	\$50	2	1	\$101
	Licensed Practical Nurse	\$32	2	1	\$63
	Registered Nurse-intake	\$50	2	1	\$101
	Clinical Supervisor	\$56	2	1	\$112
	Clinician	\$33	2	1	\$66
	Clinic Director	\$67	2	1	\$134
Interim Medication Delivery					
		\$/mile	miles/mo	amount of months	
	Mileage				
		\$/hr	hrs/month		

Fig. 2. Fixed start-up costs.

induction and maintenance; group and individual counseling sessions; and the estimated number of treatment days per year (see Fig. 5. ‘Therapy’). The average medication cost, per-patient, will be calculated according to delivery model; for example, facilities that contract with a vendor may pay a flat fee per-medication, per-patient, or they may pay according to dose. Depending on the facility’s MOUD program, patient requirements may also include weekly or monthly group and/or individual therapy sessions for the patients. The testing tab (see Fig. 6. ‘Testing’) includes multiple types of oral and urine screens that a facility might use during the MOUD assessment.

3.2. Applied example

The scenario modeled here is one in which a correctional facility (jail or prison) chooses to offer all 3 MOUD using a combination of vendors and their own health care staff. The hired vendor would provide the buprenorphine and methadone, while naltrexone would be offered by the facility’s medical staff. The facility’s medical staff would administer all 3 medications. This type of agreement would be based on the vendor and jail/prison preference. We assumed the average number of MOUD patients per month would be 123 (86 on buprenorphine; 28 on methadone; and 9 on extended-release naltrexone). The number of patients seen, and the medication distribution were assumed according to our

real-world observation including several recent and ongoing criminal legal-based trials targeting OUD.

The fixed resources for this example include meetings, trainings, software installation, and license/accreditation fees (see Fig. 2). Based on our “real-world” observations, we assume that facility and vendor employees met weekly for an hour, for 8 months prior to the launch of the MOUD program, to discuss program logistics, policies, and procedures. Facility employees included a special sheriff, superintendent, assistant superintendent of programs, director of fiscal operations, chief financial officer, MOUD director, and health services administrator, while vendor employees consisted of a regional director, regional vice president, project manager, clinic director, vice president of operations and program development, medication compliance specialist, clinician, and clinician supervisor. As Fig. 2 shows, the cost of these meetings totaled \$32,549. An 8-h start-up training was done for the facility’s health care staff (registered nurse [RN] manager, licensed practical nurse, RN) as well as a 2-h office-based addiction treatment (OBAT) training for both nurses (facility and vendor) and supervisors to attend. The cost of training sessions came to \$2289. We further assumed that the facility required the installation of new software by information technology services to input confidential data regarding dosing and assessments for a fee of \$10,000. Storage supplies were purchased for when the medication is retrieved from the OTP, to safely deliver methadone

Time Dependent Costs					\$313,734
Vendor Fee					\$74,060
	Medical Vendor Licensing Fee	\$2,060		1	\$2,060
	Monthly Administrative Fee	\$6,000		12	\$72,000
Annual Software System					\$13,440
	Per-User		Users	Months	
	\$112		10	12	\$13,440
Annual Training					\$36,867
	\$/hr	hrs/yr	# of employees		
	Registered Nurse Manager	\$50	40	1	\$2,013
	Licensed Practical Nurse	\$32	40	2	\$2,520
	Registered Nurse Intake	\$50	40	1	\$2,013
	Physician	\$138	40	1	\$5,506
	Clinicians	\$33	40	2	\$2,623
	Clinical Supervisors	\$56	40	2	\$4,493
	Security Personnel	\$43	40	3	\$5,102
	Recovery Support Navigators	\$34	40	2	\$2,695
	MAT Director	\$57	40	1	\$2,268
	Naltrexone Coordinator	\$36	40	1	\$1,456
	Naltrexone Case Manager	\$42	40	1	\$1,697
	Health Service Administrator	\$59	40	1	\$2,361
	Project Manager	\$53	40	1	\$2,121
Meetings					\$64,452
	\$/hr	hrs/mo	# of employees	Months	
MultiDisciplinary Team:					\$29,251
	Naltrexone Director	\$57	8	1	\$5,443
	Naltrexone Coordinator	\$36	8	1	\$3,494
	Nurse Manager	\$50	8	1	\$4,831
	Naltrexone Case Manager	\$38	8	1	\$3,651
	In-House MAT Clinician	\$34	8	1	\$3,293
	Vendor Clinical Supervisor	\$56	8	1	\$5,391
	Vendor Clinician	\$33	8	1	\$3,147
	Physician	\$138	8	1	\$13,214
	Peer Support Navigators	\$34	8	1	\$3,234
	Security Personnel	\$43	8	1	\$4,082
Meetings with Contracted Vendors					\$31,893
	\$/hr	hrs per month	# of employees	Months	
	Physician- Addiction Specialist	\$138	4	1	\$6,607
	Clinical Supervisor	\$56	4	1	\$2,696
	Clinician	\$33	4	1	\$1,574
	Project Manager	\$53	4	1	\$2,545
	Clinic Director	\$67	4	1	\$3,228
	Registered Nurse Manager	\$50	4	1	\$2,416
	Naltrexone Director	\$57	4	1	\$2,722
	Naltrexone Program Coordinator	\$36	4	1	\$1,747
	Assistant Superintendent of Programs	\$61	4	1	\$2,934
	MAT Director	\$54	4	1	\$2,593
	Health Services Administrator	\$59	4	1	\$2,833
Nurse Meetings					\$3,308
	\$/hr	hrs per month	# of employees	Months	
	Registered Nurse Manager	\$50	1	1	\$604
	Licensed Practical Nurse	\$32	1	1	\$378
	Registered Nurse-intake	\$50	1	1	\$604
	LADC Clinician	\$34	1	1	\$412
	Clinical Supervisor	\$56	1	1	\$674
	Program Manager	\$53	1	1	\$636
Medication Delivery					\$104,611
	\$/mile	miles/mo		Months	
	Mileage*	\$0.20	800	12	\$1,920
	\$/hr	hrs/month		Months	
	Security Personnel Time	\$43	75	12	\$38,266
	Security Personnel Time	\$43	37.5	12	\$19,133
	Registered Nurse Time	\$50	75	12	\$45,291
Dosing					\$20,304
	\$/hr	hrs/month	# of groups		
	Nurse	\$50	15	10	\$7,549
	Security Officers	\$43	15	10	\$6,378
	Security Officers	\$43	15	10	\$6,378

Fig. 3. Time-dependent costs.

and buprenorphine to the jail/prison. The storage supplies consisted of lock boxes and construction totes, for a total of \$5050. The fixed start-up costs for this model totaled \$49,887.

Fig. 3 portrays the time dependent costs that occur on a weekly/monthly/yearly basis. The vendor charges the facility an annual fee to cover licensing and other requirements necessary to provide OTP services, and a monthly administrative fee to oversee the program, totaling \$74,060 per year. The software system has a per-user cost of \$112, and we assume 10 users for an annual cost of \$13,440. We further assume that facility and vendor employees are required to attend an annual 40-h

training that provides an overview of employee responsibilities in the context of the MOUD program, and MOUD education. The training attendees include the vendor physician, 2 vendor clinical supervisors, 2 vendor clinicians, and 5 facility RNs, and a facility RN Manager. Additionally, a multi-disciplinary team meeting is held weekly to review patients' treatment strategies; attendees include the physician, RN manager, clinic supervisor, clinician, and peer support navigators. Weekly meetings also occur between the vendor's managers and facility staff, to discuss day-to-day operational issues, and review any program concerns. These meetings could include the physician, clinical

Labor Inputs						\$3,109,221
	Annual Salary	Rate	Adjusted Annual Salary	FTE	Annual Cost	
Vendor Employees						
					\$822,104	
Physician- Addiction Specialist/ Addictionologist						
MAT	\$218,850	31%	\$287,131	0.20	\$57,426	
Clinical Supervisor	\$89,290	31%	\$117,148	1.00	\$117,148	
Clinician	\$52,120	31%	\$68,381	1.00	\$68,381	
VP Operations and Program Development	\$118,800	31%	\$155,866	1.00	\$155,866	
Regional Director of Operations	\$138,590	31%	\$181,830	0.20	\$36,366	
Regional Director	\$138,590	31%	\$181,830	0.20	\$36,366	
Regional Vice President	\$138,590	31%	\$181,830	0.20	\$36,366	
Project Manager	\$84,290	31%	\$110,588	1.00	\$110,588	
Clinic Director	\$106,910	31%	\$140,266	1.00	\$140,266	
Medication Compliance Specialist	\$48,270	31%	\$63,330	1.00	\$63,330	
Jail Facility Employees						
					\$2,287,116	
Registered Nurse Manager	\$80,010	31%	\$104,973	1.00	\$104,973	
Licensed Practical Nurse	\$50,090	31%	\$65,718	4.20	\$276,016	
Registered Nurse-intake	\$80,010	31%	\$104,973	2.10	\$220,444	
LADC Clinician	\$54,540	31%	\$71,556	2.10	\$150,269	
Security Personnel	\$67,600	31%	\$88,691	5.50	\$487,802	
Recovery Support Navigators	\$53,560	31%	\$70,271	3.00	\$210,812	
Naltrexone Director	\$90,150	31%	\$118,277	1.00	\$118,277	
Naltrexone Program Coordinator	\$57,870	31%	\$75,925	1.00	\$75,925	
Naltrexone Program Navigator	\$67,440	31%	\$88,481	1.00	\$88,481	
Naltrexone Case Manager	\$60,470	31%	\$79,337	1.00	\$79,337	
Special Sheriff	\$123,980	31%	\$162,662	0.20	\$32,532	
Superintendent	\$118,800	31%	\$155,866	0.20	\$31,173	
Assistant Superintendent of Programs	\$97,180	31%	\$127,500	1.00	\$127,500	
MAT Director	\$85,900	31%	\$112,701	1.00	\$112,701	
Director of Fiscal Operations	\$75,140	31%	\$98,584	0.20	\$19,717	
CFO	\$106,910	31%	\$140,266	0.20	\$28,053	
Health Services Administrator	\$93,830	31%	\$123,105	1.00	\$123,105	

Fig. 4. Labor costs.

OUO Treatment Costs					\$752,749
OUO Treatment					\$542,808
	Daily Cost Per Patient	Patients Per Month	Days/Month	Months	
Methadone	\$10.00	28	30	12	\$100,800
Suboxone	\$10.00	68	30	12	\$244,800
Subutex	\$10.00	18	30	12	\$64,800
Extended Release Naltrexone	\$1,226	9	1	12	\$132,408
Extended Release Buprenorphine	\$1,169				
Naltrexone Tablet	\$96				
MOUD Assessment					\$127,084
	\$/Hr	Hours	Patients/Month	Months	
Induction					\$103,186
MOUD Behavioral Clinician	\$34	1	42	12	\$17,289
Clinician	\$33	1	42	12	\$16,522
Physician	\$138	1	42	12	\$69,375
Maintenance					
Clinician	\$33	0.75	81	12	\$23,898
Program Counseling Requirements					\$82,857
Group Treatment Counseling Sessions					\$17,077
	\$/Hr	Hours/Month	# of Groups/Month	Months	
Vendor Clinician Supervisor	\$56	16	1	12	\$10,783
Vendor Clinician	\$33	16	1	12	\$6,294
Individual Counseling Sessions					\$65,780
	\$/Hr	Hours	# of Patients/Month	Months	
Vendor Clinician Supervisor	\$56	1	62	12	\$41,783
Vendor Clinician	\$33	1	61	12	\$23,996

Fig. 5. Therapy costs.

Testing				\$82,138
	Unit Cost	Unit	Duration in Months	Annual Cost
Oral Fluid Drug Screen				\$42,420
Oral Fluid Drug Screen Collection Device (shipment included must be >6 samples)	\$3	500	12	\$15,000
THC/COC/AMP/OPI300/mAMP/PCP/BAR/BZO/MTD/MDMA/OXY/K2	\$5	500	12	\$27,420
Additional Tests : Buprenorphine, Fentanyl, Methamphetamine	\$2	100	12	\$1,800
EMIT Urine Drug Screen w/ Creatinine				\$37,562
Amphetamines/Methamphetamine, Benzodiazepines, Cannabinoids, Cocaine, Methadone, Methadone Metabolite, Opitaes, Oxycodone	\$6	500	10	\$31,250
Additional Tests : Fentanyl	\$2	100	10	\$1,500
Additional Tests : Buprenorphine	\$1	100	10	\$500
Additional Supplies				\$2,156
Crackers	\$4	500		\$1,780
Cups	\$4	100		\$376

Fig. 6. Testing costs.

Data Sources	Data Links
Bureau Labor of Statistics	https://www.bls.gov/ooh/home.htm
Federal Supply Schedule	https://www.fss.va.gov/
General Services Administration	https://www.gsa.gov/

Fig. 7. Data sources.

supervisor, clinician, project manager, clinic director, RN manager, naltrexone director, naltrexone program coordinator, assistant superintendent of programs, MOUD director, and health services administrator. Monthly meetings also take place with the facility and vendor nursing staff to discuss any concerns of the MOUD program processes (e. g., avoiding diversion).

Methadone and buprenorphine are obtained daily by the jail/prison staff from a nearby OTP. We assume the OTP is approximately 10 miles from the jail facility. The staff inform the vendor of all relevant dose information for each medication, which are stored in the secure lock boxes and construction totes and picked up the next morning. Two correctional officers accompany the vendor nurse to retrieve the medication, which is then the facility's health care providers administer. Following the provision of medication, the empty methadone vials are returned to the OTP by 1 correctional officer and a vendor nurse. The total number of miles accrued within a month is 800 and the total annual medication delivery cost comes to be \$104,611 (see Fig. 3).

The average number of incarcerated people on buprenorphine in a given month is 86. The method of trying to ensure the buprenorphine tablet is fully digested to avoid diversion is a lengthier and more resource-intensive process compared to methadone and extended-release naltrexone. The medication dosing for buprenorphine consists of one nurse and 2 security officers. The nurse crushes the buprenorphine tablet and places it under the patient's tongue. The patient is required to sit and be observed by the security officers for about 15 min

while the tablet dissolves. Patients are then given a cup of water to swish in their mouth, followed by a cracker and an additional cup of water to ensure the tablet was fully ingested. Dosing takes place in groups of approximately 10 people, and averages about a half hour per group. In this scenario the total buprenorphine administration costs come to \$20,304. The total annual time-dependent cost for the MOUD delivery program would be \$313,734.

The variable costs for this model include those associated with the labor, medication, and other supplies required to treat a particular patient. Upon arrival to the jail, all criminal-legal are screened by a urinalysis for recent substance use as part of the initial medical intake. If an incarcerated person states that they are on an active MOUD prescription, they will be maintained on that medication and dose, following verification of their prescription by the vendor's staff and an additional, more comprehensive urinalysis. The process for those on maintenance takes an additional 30–45 min to speak with a clinician about the program requirements and what is expected of them to continue their medication during incarceration. Those who are interested in initiating an MOUD will send a request to be inducted and will speak to a facility behavioral health clinician who will complete three assessments (biopsychosocial, DAST-10, and DSM-5) to determine an OUD diagnosis. If the incarcerated person seems like an appropriate candidate for induction, a vendor clinician meets with the patient to discuss what is required of the program (urinalysis, group sessions, medical requirements) and documents it in the software system, which takes approximately an hour. Once all

the appropriate assessments are completed, the incarcerated person is seen by a physician, which may take up to an hour to speak about concerns and dosage. The MOUD program requirements by the vendor include a 1-h weekly group therapy session, as well as monthly individual behavioral health sessions held by the vendor clinicians.

The therapy tab (Fig. 5) includes all potential medication formulations; the mean, per patient cost for each medication; number of patient days; and the labor costs associated with different types of visits (e.g., induction vs. maintenance). We assume, based on our real-world observations, a vendor-initiated medication cost of \$10 per person, per day, for oral buprenorphine and methadone. The cost of extended-release naltrexone and buprenorphine, which are typically given just prior to release from incarceration, are estimated to be \$1226 and \$1169, respectively, according to the Federal Supply Schedule (U.S. Department of Veterans Affairs, 2021). The estimated cost for the MOUD maintenance assessment is \$25/patient, and the induction process cost is \$205/patient. Assuming an average of 123 patients per month, with 42 induction visits and 81 visits being maintenance, the total annual cost of induction and maintenance would be \$103,186 and \$23,898, respectively. The facility offered four 1-h group therapy sessions per week, resulting in 16 h per clinician, times 2 clinicians per month. The total cost of group therapy would be \$1423 per month (\$17,077 annually). The individual therapy sessions would amount to \$65,780 annually. The 'testing' tab contains different types of drug screening tests used for maintenance and induction referrals. We assume that random urine screens are done throughout each month to ensure compliance during treatment. We also included additional testing supplies, such as crackers and cups that are used for those on buprenorphine. The annual costs for the urine test, mouth swabs, crackers and cups were \$82,138.

Assuming the facility would reach steady state by year 2 of the program, that all implementation costs would be spread out over the first 12 months of the program, and an average of 123 patients/month, the total cost to the facility over that period would come to \$4,307,729 or \$2919/patient. Following the implementation period, and the payment of the fixed start-up costs, the annual estimated cost of sustainment would be \$4,257,842 or \$2885/patient.

4. Discussion

The care that jails and prisons provide is critical to fighting disease, and promoting physical and behavioral health, which, in the case of OUD specifically, has been shown to promote both public and economic health. The customizable budget impact tool described above is designed to provide practical information on the types of costs incurred by jails/prisons in the implementation and sustainment phases of an MOUD program. Correctional facilities need time to develop the necessary protocols and calculate the demands for services as well as possibly coordinating with other agencies (The Pew Charitable Trusts, 2020). This tool can help to adjust the needs of health care services for MOUD. The CHERISH website would provide a link to the tool and a request can be made via the "Resources" page of the website.

The example presented here does not reflect that of a specific facility's MOUD program, but rather one of many possible uses of the tool. Facilities will undoubtedly identify resources/costs associated with implementation or provision of MOUD at their site, that are not in the tool. Feasible MOUD delivery models will vary by site, according to their location (e.g., proximity to an OTP), capacity, availability of (grant) funding, existing personnel, etc. While a larger budget would likely be needed to implement an MOUD program, it will be important for state policymakers to evaluate not only the relative program costs of feasible models, but also their relative effectiveness, including the potential downstream cost offsets that would occur as a result of successful treatment (e.g., lower recidivism; less high-cost health care utilization following reentry to the community, such as ED visits; reduced utilization of state safety-net programs, etc.).

To the best of our knowledge, little-to-no evidence exists on the

relative effectiveness of various MOUD delivery models in jails or prisons; however, we plan to explore this question, while controlling for site characteristics, in future work, following the completion of the aforementioned clinical trials. Fortunately, the tool should be sufficiently flexible/customizable to accommodate any such occurrence. Moreover, the publicly available tool will be updated over time, as additional studies are completed and new resources are identified.

5. Conclusion

The comprehensive, customizable, and publicly available budget impact tool presented in this article is the first of its kind. The tool will serve as a valuable asset to jail/prison leadership, policymakers, and other stakeholders interested in identifying/estimating the resources and costs associated with alternative MOUD delivery models, from the planning stages through sustainment.

CRedit authorship contribution statement

Danielle Ryan, Sean M. Murphy: Conceptualization, Methodology, Formal Analysis, Resources, Writing-Original draft preparation, Writing - Review & Editing, Visualization. **Ivan Montoya, Peter Koutoujian, Kashif Siddiqi, Philip Jeng, Techna Cadet, and Edmond Hayes:** Formal Analysis, Writing - Review & Editing, and Validation.

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Declaration of competing interest

No competing interests to declare.

Appendix A. Supplementary data

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