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ORIGINAL RESEARCH

Costs of opioid overdose education and naloxone distribution in New York City

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ABSTRACT

Background: Naloxone is an opioid antagonist medication that can be administered by lay people or medical professionals to reverse opioid overdoses and reduce overdose mortality. Cost was identified as a potential barrier to providing expanded overdose education and naloxone distribution (OEND) in New York City (NYC) in 2017. We estimated the cost of delivering OEND for different types of opioid overdose prevention programs (OOPPs) in NYC. *Methods*: We interviewed naloxone coordinators at 11 syringe service programs (SSPs) and 10 purposively sampled non-SSPs in NYC from December 2017 to September 2019. The samples included diverse non-SSP program types, program sizes, and OEND funding sources. We calculated one-time start up costs and ongoing operating costs using micro-costing methods to estimate the cost of personnel time and materials for OEND activities from the program perspective, but excluding naloxone kit costs. *Results*: Implementing an OEND program required a one-time median startup cost of $874 for SSPs and $2,548 for other programs excluding overhead, with 80% of those costs attributed to time and travel for training staff. SSPs spent a median of $90 per staff member trained and non-SSPs spent $150 per staff member. The median monthly cost of OEND program activities excluding overhead was $1,579 for SSPs and $2,529 for non-SSPs. The costs for non-SSPs varied by size, with larger, multi-site programs having higher median costs compared to single-site programs. The estimated median cost per kit dispensed excluding and including overhead was $19 versus $25 per kit for SSPs, and $36 versus $43 per kit for non-SSPs, respectively. *Conclusions*: OEND operating costs vary by program type and number of sites. Funders should consider that providing free naloxone to OEND programs does not cover full operating costs. Further exploration of cost-effectiveness and program efficiency should be considered across different types of OEND settings.

KEYWORDS
Cost; naloxone; overdose education

Introduction

Distributing naloxone, an opioid antagonist medication for reversing opioid overdoses, is one of the US Department of Health and Human Services' Opioid Initiative's three priority strategies for curtailing the opioid crisis.[1] Naloxone may be administered by lay people or medical professionals to reverse overdoses,[2] and can effectively reduce overdose mortality.[3,4] Naloxone administration by lay people, especially people who currently or formerly use drugs, may play a key role in overdose reversal. Particularly when immediate access to emergency medical services is limited, such as in rural or underserved locations and in fentanyl-driven overdoses, it may require quicker response times and additional naloxone doses to avoid fatality.[5] The receipt of naloxone is frequently paired with harm reduction education on overdose prevention and risk reduction.

In New York City (NYC), opioid overdose deaths reached a record high number in 2017 after seven consecutive years of overdose increases.[6] While NYC has seen a modest decrease of 3% in overdose rates from 2017 to 2018, opioid overdose fatality rates still remain high due to fentanyl.[6] In 2017, the NYC Mayor's office released a strategy to address the opioid crisis called HealingNYC, with one of its goals to quadruple naloxone distribution to 100,000 naloxone kits.[7] Over 100 registered opioid overdose prevention programs (OOPPs) provide overdose education and naloxone distribution (OEND) at no cost to participants in NYC. These programs are located in a variety of governmental agencies and non-governmental organizations including syringe service programs (SSPs), substance use disorder treatment programs, community health centers, hospital systems, programs for the unhoused, programs for justice impacted populations, and other types of community-based organizations. The HealingNYC initiative ultimately resulted in an

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Supplemental data for this article can be accessed here.

increased number and diversity of registered OOPPs for the distribution of naloxone, which required the expansion of training to accommodate new programs less familiar with engaging people who use drugs.

Recent studies have found that OEND is cost-effective, except in secondary school settings with low overdose rates.[8–15] Most of these studies estimate the cost of delivering OEND by type of person trained (i.e., lay persons, law enforcement, emergency services), but not type of program delivering the training to lay persons. Costs have been identified as a barrier to providing effective OEND due to naloxone costs and staff time.[16–19] For example, previous work has indicated that salary support for staff time, limited time availability of staff to provide OEND, and poor staff buy-in are barriers to OEND implementation.[19] While programs may receive their naloxone kit supply at no cost from government agencies, as they do in NYC, other service delivery costs may still remain a barrier to providing OEND. To assess the resources needed by various types of OOPPs to provide OEND, we estimate start-up and program operational costs for different types of OOPPs in NYC.

Methods

Data collection

At the end of 2017, approximately 176 OOPPs in NYC had registered with the New York State Department of Health to receive and subsequently dispense intranasal or intramuscular naloxone under a standing order.[20] The vast majority of naloxone kits provided by DOHMH to OOPPs were the Narcan® nasal spray formulation, but intramuscular injection naloxone formulations were also available predominantly through SSPs as an option for people who preferred that to the nasal spray. In NYC, OEND is overseen by the NYC Department of Health and Mental Hygiene (DOHMH). OOPPs included all SSPs in NYC and several large hospital/health systems, substance use disorder treatment programs, government agencies, and community-based organizations. We interviewed 13 naloxone coordinators whom each represent an SSP with the exception of one coordinator who supports two programs, resulting in full representation of all 14 SSPs in NYC. We purposively sampled 16 non-SSPs to achieve a diversity of program types (i.e., programs for unhoused people, programs for justice impacted populations, large hospital/health systems, substance use disorder treatment programs, and other community-based organizations), program sizes (single site vs. multi-site), and funding sources (received funding from DOHMH to support OEND program costs vs. no funding from DOHMH to support program costs). We successfully recruited 10 of 16 non-SSP OOPPs (71% participation) that served individuals in the Bronx, Brooklyn, Manhattan, and Staten Island. This sample has at least one program from each of the major non-SSP program types that distributed the majority of naloxone kits among non-SSP OOPPs and includes an even number of single-site and multi-site organizations. Three SSPs were not included in the analysis due to insufficient data, resulting in 11 SSPs and 10 non-SSPs included in the final analysis.

We interviewed OOPP naloxone dispensing program leaders and staff between December 2017 and September 2019 to estimate the cost of OEND at each organization excluding the cost of the naloxone kits supplied by DOHMH. We conducted semi-structured interviews in person if possible (16 of 23) or by phone for approximately 1–2 h on average. Oral consent was obtained prior to each interview. Interviews covered topics regarding OOPP staffing and staff titles of individuals providing OEND, and the time for staff to conduct typical OEND activities described in Figure 1 (see Supplementary Appendix Table 1 for definitions). The cost of personnel time for staff providing OEND was estimated using NYC wage rates for similar positions from the US Bureau of Labor Statistics (Supplementary Appendix Table 2).[21] Fringe benefits for SSPs were derived from annual SSP budgets. We used the median fringe benefit rate for full-time and part-time employees. Fringe benefits for non-SSPs were estimated using the average national fringe rate across all industries from the US Bureau of Labor Statistics.[21] Because costs were calculated from the program perspective, volunteer time was not included in the labor costs.

At the time of the study, DOHMH required OOPPs to submit naloxone recipient forms on a monthly basis to document each naloxone kit dispensed. These forms included information regarding OEND location and characteristics of the naloxone recipient.[22,23] Aggregated results allowed investigators to estimate the average number of naloxone kits dispensed per program per month. This study was approved by the Institutional Review Board of Weill Cornell Medical College.

Analysis

We calculated program costs using micro-costing methods to estimate the cost of personnel time and materials involved in OEND (Supplementary Appendix Table 2). Startup costs were collected from each program and included costs of conducting startup OEND training sessions for staff members, developing training materials, and developing an inventory database. Staff members were initially trained either off-site at one of two training sites or on-site by other trained staff. If staff attended the training offsite, we included an estimated travel time to attend the training. Ongoing OEND costs include variable costs, which are costs that are associated with each person receiving OEND and are calculated per OEND event, and time-dependent costs, which are costs that occur on a regular weekly, monthly, or quarterly basis.

Variable costs include costs of delivering one-on-one OEND onsite or on a mobile unit, group OEND training delivered at specific organizations, and group OEND training delivered at community events. Programs received group training requests from organizations across all boroughs, which were usually requested to train the staff at those organizations to respond to on-site overdoses. Occasionally,

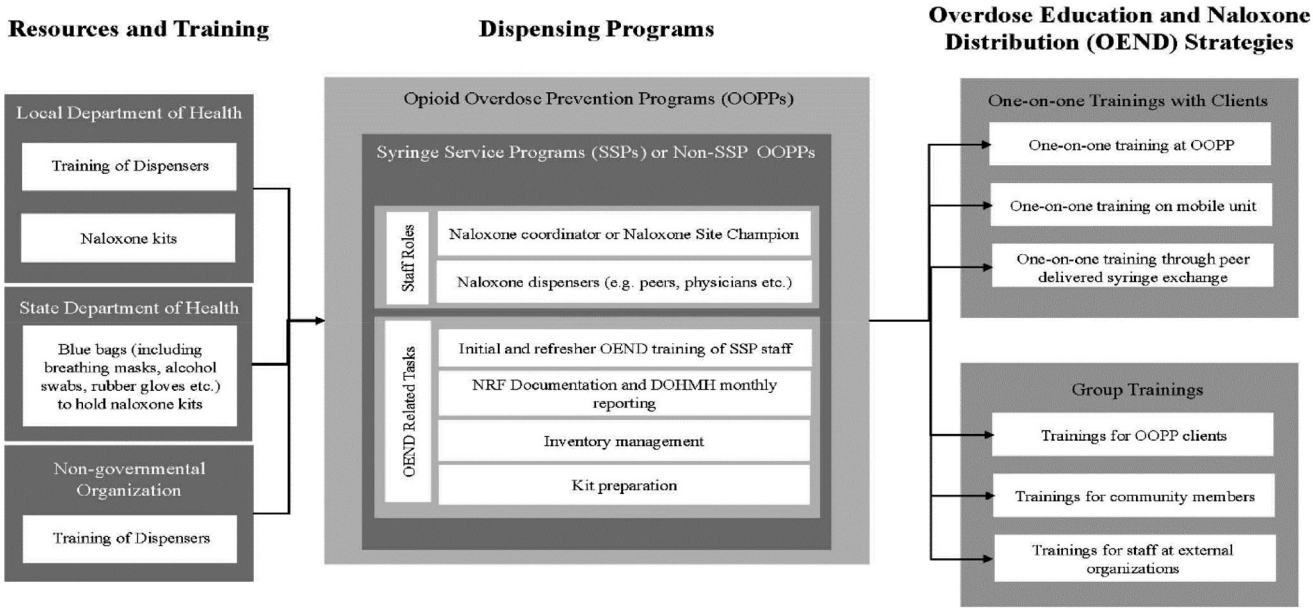

Figure 1. Overdose education and naloxone distribution resources and activities. *Note*: Costs did not include: (1) the trainer time for delivering the training of dispensers by DOHMH or another external program, (2) naloxone kits, and (3) blue bags. Staff time spent preparing kits, delivering training of dispensers, preparing blue bag OEND kits, managing inventory, providing trainings in one-on-one setting or in group settings and the subsequent documentation and reporting were included in the cost from the program perspective. OOPP: Opioid Overdose Prevention Program; SSP: Syringe Service Program; NRF: Naloxone Recipient form; OEND: Overdose Education and Naloxone Distribution; DOHMH: Department of Health and Mental Hygiene.

Table 1. Description of Opioid Overdose Prevention Programs (OOPPs).

	Program type		
	SSPs ($n = 11$)	Single site non-SSPs ($n = 5$)*	Multi-site non-SSPs ($n = 5$)
Number of fixed sites (range)	1–6	1–2	7–52
Number of OOPPs that dispense through peer outreach	11	2	0
Number of OOPPs that dispense through mobile units	7	1	1
Median number of kits per month (range)**	80 (27–187)	52 (13–58)	89 (37–196)
Primary dispensing route			
One-on-one OEND	7	4	4
Community OEND	2	1	0
Organizational OEND	2	0	1
Median number of trainings per month (Range)**			
One-on-one OEND	31 (9–90)	46 (0–107)	39 (8–68)
On-site group client OEND	1 (0–6)	0 (0–8)	3 (0–9)
Group community OEND	0 (0–12)	1 (0–1)	0 (0–2)
Group organizational OEND	4 (0–16)	0 (0–2)	1 (0–6)

*Single-site non-SSPs is defined as having no more than two fixed sites.
**Rounded to nearest whole number.

organizational training also included training for the organization's clients. Community training was often held in high-need neighborhoods with the highest rates of overdoses and was open to the public. We included the costs of OOPP staff travel time to and from the organizational or community training held off-site in the variable costs for these group training.

Time-dependent costs include tracking and managing naloxone inventory, blue bag assembly (i.e., inserting naloxone kits, educational materials, breathing mask, alcohol swab, etc into a blue bag for distribution), regularly scheduled overdose education client group training, naloxone recipient form database management, documentation and reporting to agencies that supply naloxone kits, and refresher OEND staff training. We used the monthly average number of kits distributed in the first half of 2018 for programs interviewed between December 2017–2018, and we used the monthly average for the first half of 2019 for programs interviewed in 2019 to estimate the annual cost per naloxone kit dispensed at each program.

We estimated overhead costs and applied site-specific overhead rates for SSPs and non-SSPs. Overhead costs for SSPs and non-SSPs were calculated using the ratio of costs for equipment, supplies, consultants, and program administration to costs of personnel, fringe benefits, and travel as reported in 2017 IRS 990 Forms for each nonprofit organization, except for the large hospital systems for which overhead was calculated based on previously published analyses.[24]

Results

Characteristics of OEND programs

Table 1 describes program characteristics of SSPs and non-SSPs, including OEND dispensing strategies. The 11 SSPs

Table 2. New York City OEND Startup Costs (2017 US Dollars).

	SSPs			Single site non-SSPs			Multi-site non-SSPs		
	$n = 11$			$n = 5$			$n = 5$		
	Average ($)	Median ($)	Range ($)	Average ($)	Median ($)	Range ($)	Average ($)	Median ($)	Range ($)
Startup costs									
Staff training	1,156	789	448–2,811	1,492	1,600	723–2,168	11,760	1,311	522–51,286
Training material development	196	29	0–1,182	327	0	0–1,330	524	300	92–1,093
Naloxone tracking database development	5	0	0–57	59	0	0–296	2,024	219	0–7,769
Other start-up costs	104	0	0–1,145	0	0	0–0	185	0	0–923
Total startup cost (without overhead)	1,461	874	448–4,504	1,878	2,039	723–2,930	14,493	6,842	2,285–51,446
Total startup with overhead*	1,745	1,024	522–5,481	2,330	2,403	821–3,800	20,823	7,635	2,600–76,858

*Overhead for SSPs were calculated using actual budget contracts. Overhead for non-SSPs was calculated using 2017 IRS 990 Forms.
SSP: Syringe Service Program.

varied from one to six fixed sites with an average of two fixed sites per SSP. The five single-site non-SSPs were community-based organizations that served high-need populations at risk for witnessing or experiencing an overdose. Two of the multi-site non-SSPs were part of larger hospital systems that had 7–30 sites and three were large multi-site community-based organizations that had 15–52 sites.

Seven SSPs had one or two mobile units to dispense syringes and naloxone kits, making an average of four stops per week and all eleven sites also dispensed naloxone through peers who deliver kits to other people who use drugs. Only one non-SSP delivered OEND on a mobile unit and no non-SSPs did peer delivery. All SSPs receive DOHMH funding to support a naloxone coordinator, peers, and/or other staff involved with naloxone dispensing. Among non-SSPs, six out of ten received DOHMH funding to support OEND activities.

Seven of the eleven SSPs and seven of the 10 non-SSPs distributed kits primarily through one-on-one training. The naloxone coordinator at SSPs led a median of eight external group training per month. For non-SSPs, single-site programs led a median of two external group training per month and multi-site programs led a median of three per month. Non-SSPs distribute more kits per month compared to SSPs with a median of 89 (range: 37–196) for multi-site non-SSPs, 52 (range:13–58) for single-site SSPs, and 80 (range: 27–187) for SSPs.

Startup costs

Median startup costs (excluding overhead) were highest for multi-site non-SSPs ($6,842, range: $2,285 to $51,446), followed by single-site non-SSPs ($2,039, range: $723 to $2,930) and then SSPs ($874, range: $448 to $4,504) (Table 2). Median incremental overhead costs were highest for multi-site non-SSPs ($793, range: $314 to $25,412), followed by single-site non-SSPs ($363, range: $98 to $870), and then SSPs ($168, range: $74 to $977). Approximately 70% of startup costs at non-SSPs were for initial staff training with 20% of these training costs from travel time to training sites. Approximately 90% of startup costs at SSPs were for initial staff training, and approximately 30% of these training costs were for travel to training sites. The median cost to train staff at multi-site non-SSPs was $174 per person trained (range: $73 to $212), $145 per person trained (range: $99 to $155) for single-site non-SSPs, and $90 per person trained (range: $49 to $132) for SSPs. The cost per person trained at non-SSPs was higher because the staff at non-SSPs were more likely to be medical professionals who had higher salaries and because non-SSPs have more additional startup costs than SSPs. It was also more costly for program staff to attend offsite training rather than onsite training due to additional costs of travel time. Seven out of 10 non-SSPs developed their own training materials for OEND training and three of the five multi-site non-SSPs developed inventory tracking databases to manage inventory over multiple sites, whereas SSPs generally used existing training materials and tracking databases.

Ongoing program costs

The median monthly cost (excluding overhead) was highest for multi-site non-SSPs ($2,737, range: $924 to $5,017), followed by single-site non-SSPs ($1,959, range $820 to $31,502) and then SSPs ($1,579, range: $509 TO $2,788) (Table 3). Overhead added an additional median monthly cost of $628 for multi-site non-SSPs, $421 for single-site non-SSPs, and $334 for SSPs. Four out of eleven SSPs and three out of ten non-SSPs had a higher proportion of their total costs for time-dependent activities (i.e., kit preparation, documentation, inventory management, and reporting) than for variable costs directly related to OEND service delivery. An additional SSP and two non-SSPs spent between 40–50% of their total costs on time-dependent activities.

The highest individual cost categories for both SSPs and non-SSPs were group OEND, one-on-one OEND, and documentation and reporting. SSPs had higher costs for delivering organizational or community group training because they often responded to training requests outside of their service area, resulting in higher travel costs. One-on-one training was more costly for non-SSPs because they were often delivered by higher salaried staff, such as a physician or nurse. Driven by a higher number of kits dispensed per month, SSPs reported spending considerable time (median 5 h per month, range: 0–29 h) on preparing the naloxone kits for distribution compared to non-SSPs (median 2 h per month, range: 0–6 h). This resulted in a median cost of $106 per month for SSPs (range: $0 to $615) and a median cost

Table 3. New York City OEND Ongoing Program Costs (2017 US Dollars).

	SSPs			Single site non-SSPs			Multi-site non-SSPs		
		$n = 11$			$n = 5$			$n = 5$	
	Average ($)	Median ($)	Range ($)	Average ($)	Median ($)	Range ($)	Average ($)	Median ($)	Range ($)
Variable costs									
One-on-one training	185	97	64–537	763	327	0–1,840	456	277	101–868
Client group trainings	28	14	0–113	93	23	0–374	486	240	0–1,906
Organizational trainings	527	324	0–1,486	388	56	0–1,550	188	0	0–863
Community trainings	207	41	0–973	5,256	30	0–25,972	99	83	0–320
Monthly variable cost	950	866	83–2,083	6,500	1,434	393–27,527	1,229	654	101–2,775
Time dependent costs									
Refresher staff trainings	73	56	12–280	89	14	0–393	597	533	15–1,440
Tracking and inventory	58	30	3–217	153	131	19–277	144	92	63–364
Documentation and reporting	453	401	10–1,189	201	190	53–337	808	646	311–1,894
Kit preparation	156	106	0–615	79	67	27–184	84	82	0–140
Other*	3	0	0–38	813	255	0–3,192	0	0	0–0
Monthly time dependent cost	744	718	209–1,752	1,336	931	343–3,976	1,632	1,925	823–2,243
Total (without overhead)	1,694	1,579	509–2,788	7,836	1,959	820–31,502	2,861	2,737	924–5,017
Total cost with overhead**	2,001	1,927	597–3,393	8,433	2,465	1,006–33,059	3,643	3,524	1,051–5,645
Cost per kit (without overhead)	21	19	10–59	165	62	36–543	27	27	17–35
Cost per kit with overhead**	29	25	14–79	181	76	45–570	34	34	25–41

*Other costs included yearly promotional video production, ongoing database management and recurring additional materials such as fentanyl testing strips.
**Overhead for SSPs were calculated using actual budget contracts. We used the median overhead rate across all SSPs. Overhead for non-SSPs was calculated using 2017 IRS 990 Forms.
SSP: Syringe Service Program.

of $70 per month for non-SSPs (range: $0 to $184). Multi-site non-SSPs had substantially higher refresher training costs (median $533) compared to SSPs and single-site non-SSPs ($56 and $14, respectively) due to larger staff and more medical staff with higher wage rates.

The median ongoing program cost per kit distributed was lowest for SSPs ($19) and was almost double for single-site non-SSPs compared with multi-site non-SSPs ($62 vs. $27), consistent with the lower number of kits distributed monthly by single-site versus multi-site non-SSPs. Overhead added an additional median cost of $6 per kit for SSPs, $14 per kit for single-site non-SSPs, and $4 per kit for multi-site non-SSPs.

Discussion

We estimated that starting an OEND program in NYC requires a one-time median start-up cost of approximately $870 for SSPs and $2,500 for other programs, with 80% of those costs attributed to training staff to provide OEND. SSPs incur a median of $90 per staff member trained and non-SSPs incur a median of $150 per staff member. Training costs were higher for multi-site, large organizations with a larger staff to train. One strategy for reducing these costs for programs is to provide on-site staff training or virtual training rather than send staff to offsite training. Training is also more costly for organizations staffed primarily with medical professionals for OEND due to higher wage rates, although these professionals may obtain additional benefits from attending OEND training given the lack of other harm reduction training in medical education.[25] Shifting these pieces of training to be required in medical school training or offered through continuing medical education in person or virtually may more effectively expand medical professional exposure and shift the cost burden to better-resourced organizations. Several large health systems in the US have implemented comprehensive OEND programs that include encouraging medical professionals to provide naloxone prescriptions that can be filled at a pharmacy, implementing electronic health record alerts for OEND, and instituting in-house OEND training as part of medical education.[26,27] Funders and health departments may improve overdose prevention efforts within large medical system settings by supporting these activities.

Monthly median costs before overhead for sustaining ongoing OEND activities were approximately $1,600 for SSPs and $2,500 for non-SSPs. The monthly costs for non-SSPs were also driven by the number of sites, with multi-site programs incurring higher costs ($2,700) compared to single-site programs ($2,000). In addition to having a larger staff to train and re-train, OEND programs that have multiple sites spend more time in managing inventory, documentation, and reporting across sites that increase the cost. For single-site non-SSPs, inventory management can also be costly because they often do not have the existing inventory management tools and experience that SSPs have. Providing technical assistance to these programs, such as an inventory tracking sheet or guidance in incorporating tracking into electronic health record systems, could help lower their costs. Technical assistance may also improve efficiencies for all OOPPs, given that most programs incurred at least 50% of their total costs for activities other than those directly related to OEND service delivery. Since data collection for this study began, NYC DOHMH expanded their technical assistance and support for programs significantly, such as by prepackaging blue bags that kits are distributed in, encouraging programs to refer requests for training from far away programs to DOHMH, and providing more support for documentation and reporting.

Our estimated ongoing program cost per kit dispensed, excluding naloxone kit costs, (median $19 per kit for SSPs and $27 to $62 per kit for non-SSPs) is higher than other estimates used in the US cost-related studies of $10 or $13 per kit dispensed.[10,13,15] Our cost estimates exceed previous

estimates because it includes administrative and training costs beyond the cost of the time spent providing OEND. Costs previously cited in the literature were estimated based on the type of person who is dispensing naloxone (i.e., lay person, emergency medical services, law enforcement), but only one study focused on the setting (secondary schools) for estimating costs.[9] Our setting-specific estimates may help inform future studies that examine the efficiency of distributing naloxone through different organizations and inform funders of the resources required to support various types of OEND programs. Future studies should not only take into account differences in costs among programs, however, but also differences in program effectiveness of reaching individuals who are most likely to observe an overdose.

While our cost estimates include a diversity of community-based OEND program types, this study was limited to one urban setting. These results may not be generalizable to all OOPPs in NYC due to the wide variety of programs, capacity, and experience across programs. Our study was also focused on community-based providers and excluded first responders. Data were collected when new, individual-level reporting requirements had just been initiated for OOPPs receiving free naloxone kits from NYC DOHMH, and therefore the levels of time-dependent costs for administrative activities may represent some inefficiencies associated with the launch of this initiative. The naloxone program in NYC expanded substantially during this time with the number of kits distributed to programs nearly tripling from 2017 to 2019, resulting in more kits dispensed by OOPPs, and coincided with DOHMH scaling up technical assistance to programs in staffing and resources; therefore, the cost per kit estimate range may be biased upward.

Previous studies have demonstrated that OEND is a cost-effective strategy for preventing overdose fatalities,[8,10–15] unless provided in settings where opioid overdoses are very rare.[9] In this study, we found that OEND operating costs vary by program type and number of sites. Funders should consider that providing free naloxone to OEND programs without additional funding support does not cover the full cost of operating OEND programs. Given the robust literature on the performance of different types of community-based organizations providing OEND[28–31] and the evidence of varying costs by program type in this study, further exploration of cost-effectiveness and program efficiency should be considered across different community-based settings.

Authors' contributions

CNB and BRS conceived and planned the study design. EW and MW facilitated data collection and sampling. CNB and SG collected data, analyzed the data, and led the writing of the manuscript. CNB, BRS, AW, DP, and HVK provided oversight of the study. All authors contributed to the interpretation of data throughout the study and provided critical revision to the manuscript.

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Disclosure statement

The contents of this publication are solely the responsibility of the authors and do not necessarily represent the views of the funding agencies or the US government. The authors have no conflicts of interest to disclose. The funding organization had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

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