Optimizing the Effectiveness of Naloxone Distribution in the State of New Hampshire: A Program Evaluation

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Optimizing the Effectiveness of Naloxone Distribution in the State of New Hampshire:

A Program Evaluation

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Table of Contents

Problem Description............................................................................................................. 5
Available Knowledge........................................................................................................... 9
Rationale............................................................................................................................... 15
Specific Aim......................................................................................................................... 17
Methods ............................................................................................................................... 18
Context................................................................................................................................. 18
Interventions......................................................................................................................... 18
Data Analysis Plan............................................................................................................... 20
Advocacy............................................................................................................................... 22
Ethical Considerations......................................................................................................... 22
Results................................................................................................................................. 23
Discussion............................................................................................................................ 34
Summary............................................................................................................................... 34
Interpretation......................................................................................................................... 36
Limitations............................................................................................................................ 41
Conclusions.......................................................................................................................... 44
References............................................................................................................................. 47
Appendices............................................................................................................................ 54
Abstract

Introduction: At the peak of New Hampshire’s opioid crisis in 2016, lawmakers strategized on solutions. With the passage of State Bill 447, a naloxone study commission was formed to understand best practices around the distribution of the critical opioid reversal medication. The findings of the Commission became the only discussion concerning naloxone distribution despite the report’s call for a long-term distribution plan. Literature searches turned up no published reports or evaluations for the naloxone distribution program in New Hampshire. Therefore, it seems that state-sponsored community naloxone distribution continued through 2018 in New Hampshire with no formal evaluation of the program’s effectiveness.

Methods: In order to develop an understanding of the naloxone distribution program in New Hampshire, a program evaluation was conducted. Because the evaluation is concerned with determining whether the strategies and initiatives of the naloxone distribution program have been met, a performance monitoring evaluation design became the philosophical construct that guided this work. A logic model was used to choose goals of interest and the tests associated with favorable program outcomes. Significant events in New Hampshire surrounding the opioid crisis were explored. Data for overdose deaths and naloxone distribution were the focal point of this project. The project collected data on distributed naloxone and opioid overdose deaths between the years of 2014-2018. Only 2017 and 2018 data for opioid overdose deaths were compared to naloxone distribution because the 2014-2016 data was incomplete.

Results: There were 409 opioid deaths in 2017 and 399 opioid overdose deaths in 2018 in New Hampshire. Between 2017 and 2018, naloxone supply was increased by 38%-493%, varying widely across New Hampshire counties. Statistically significant increases in naloxone distributed to target users occurred only in Hillsborough and Strafford counties.
Discussion: Statistically significant changes in death rates between 2017 and 2018 did not occur for any comparison groups, state, or countywide. Conversely, targeted naloxone distribution rates differed by county. Stakeholders believe that increases in Strafford and Hillsborough Counties were partly attributed to the creation of SSPs in those areas occurring during the timeframe observed.

Conclusions: This program evaluation sheds light on the need for better data tracking and transparency between organizations. According to the evaluation, maximum benefits in reducing opioid deaths will be realized when naloxone distribution efforts are focused in Belknap, Hillsborough, Strafford, Cheshire, Rockingham, and to some extent Merrimack Counties at a rate that is significantly higher than the rate of opioid overdose deaths. Future studies are needed to understand how social determinates affect the rate of opioid overdose deaths and more effectively target naloxone distribution.

Keywords: naloxone, opioid overdose deaths, Narcan, opioid, harm reduction, evaluation, program
Optimizing the Effectiveness of Naloxone Distribution in the State of New Hampshire: A Program Evaluation

Problem Description

Between the years of 1999 and 2013, the rate of New Hampshire opioid overdose deaths gradually rose and then sharply increased from 2014-2017. Multiple factors contributed to this rapid increase, although synthetic opioid use was a primary factor according to the CDC (CDC Injury Center, 2019). Prescription misuse opioid overdose peaked in 2007 and has since remained stable (National Institute on Drug Abuse (NIDA), 2019). In stark contrast, as prescription overdose deaths began to level off, 2013-14 brought a spike in NH synthetic opioid-related deaths. This trend occurred nationwide, and in 2017, 47,600 of 70,237 (~68%) deaths were related to synthetic opioids (NIDA, 2019). Figure 1 shows the progression of the opioid crisis by examining types of opioid deaths between 1999 and 2019.

![Figure 1. New Hampshire drug overdose deaths by overdose category (NIDA, 2019)](image-url)
A critical intervention to reduce opioid-related overdoses is naloxone access (Penn Leonard Davis Institute of Health Economics, 2019). According to the United States Surgeon General, naloxone awareness and targeted education and distribution are integral to reducing opioid-related deaths (Office of the Surgeon General, 2018). On June 2, 2015, the State of New Hampshire approved House Bill 271, authorizing standing orders for opioid antagonists like naloxone (Narcan®). HB 271 also included a provision allowing organizations to possess, store, or distribute naloxone. The bill protects individuals that use the medication to aid persons who overdose on opioids (Gencourt State of NH, 2015). Months later, HB 270 went into effect granting immunity from arrest, prosecution, and conviction for those who witness and request medical assistance for persons who have sustained an opioid overdose. New Hampshire House Bills 270 and 271, in conjunction with the “Good Samaritan Law” RSA 508:12, protect those who witness an emergency or crime and may come to the aid of victims without fear of liability if the assistance results in an injury or death. Specifically, Section 318-B:28-b of the Controlled Drug Act protects individuals who request medical assistance for persons overdosing from being arrested and charged with possession of illicit substances. These changes marked New Hampshire’s legislative steps to addressing the state’s rising opioid death rates (Gencourt State of NH, 2015; Section 508:12 Aid at Scene of Emergency or to Victim of Crime, 1985).

At the peak of the state’s opioid crisis, lawmakers again strategized on solutions to the opioid epidemic. They passed Senate Bill 447, Establishing a Commission to Study Narcan® (An Act establishing a commission to study Narcan, 2016). The Commission’s Final Report cited six recommendations on naloxone and its distribution fulfilling the Commission’s role outlined in SB447:
1. Discouraged the creation of a Narcan Registry recording demographics of individuals who obtained Narcan

2. Did not endorse requirements for additional training on administration or dosing.

3. Rejected the implementation of mandatory reporting systems

4. Found that treating individuals who overdosed with Narcan should be supported in engaging with recovery services but not required to participate

5. Guided additional training material for inclusion in Narcan kits such as legal information surrounding overdoses and calling 911

6. Recommended improved access and responsive distribution of Narcan and training for both community and law enforcement to more effectively reach those at the highest risk for overdose (NH Commission to Study Narcan, 2017)

The commission report concluded by summarizing the naloxone distribution quantities from October 2015 through October 2017. The Commission found that the state distributed 12,136 units to community groups and health agencies. Furthermore, the report stated, “greater availability of Narcan has greater potential to prevent opiate overdose-related deaths,” and called for further investigation into whether supplies and distribution were meeting community needs (NH Commission to Study Narcan, 2017). The findings of the Commission’s Final Report were the only state discussion concerning the distribution of naloxone despite a call in the report for the committee to produce a long-term distribution plan (An Act establishing a commission to study Narcan, 2016). Legislative policy changes were compiled and organized into a timeline for reference in Figure 2.
Literature searches turned up no published reports or evaluations for the naloxone distribution program in New Hampshire. Therefore, it seems that state-sponsored, community naloxone distribution continued through 2018 in New Hampshire with no formal evaluation of the program’s effectiveness. Program evaluation is essential to ensure fiscal responsibility and the ability to meet goals and objectives by process and outcome examination (Milstead, 2016).

The absence of viable program metrics and outcome measures did not deter the state from changing its naloxone distribution model when it transferred responsibility for distribution to the newly adopted Doorway hub and spoke framework beginning in early 2019. Data regarding program efficacy should inform future decision making (Centers for Disease Control and Prevention, Program Performance and Evaluation Office, 2019).

The purpose of this project was to describe the structure, process, and outcomes of New Hampshire’s state-sponsored community naloxone distribution program, focusing on
associations between opioid overdose death rates and naloxone access and distribution. Analysis from this evaluation produced recommendations to optimize naloxone distribution. Findings were disseminated to stakeholders to highlight naloxone program successes and areas of opportunity to inform future quality improvement projects and the promotion of evidence-based practice.

Available Knowledge

Naloxone, an opioid reversal drug or opioid antagonist, was approved by the Food and Drug Administration (FDA) for intravenous and intramuscular pharmaceutical use in the United States in 1971 (American Chemical Society, 2016). The medication works by binding to the same receptors that opioids bind. Fortunately, mu receptors have a higher affinity for naloxone which make the drug so effective at reversing the dangerous respiratory and central nervous system depression that opioids produce, thus allowing a temporary 20-90-minute reprieve from the deadly effects of opioid overdose (Harm Reduction Coalition, n.d.; Jordan & Morrisonponce, 2019). Developed in 2012, intranasal naloxone was finally approved by the FDA in 2015. FDA approval coincided with New Hampshire’s Standing Order Bill allowing widespread naloxone distribution (American Chemical Society, 2016).

Widespread naloxone distribution is crucial. States with naloxone access and Good Samaritan Laws have been shown to exhibit statistically significant reductions in opioid-overdose mortality by 14% and 15%, respectively (McClellan et al., 2018). The McClellan et al. 2018 study compared states having Good Samaritan and favorable naloxone legislation to those who did not have Good Samaritan Laws between the years 2002 and 2014. Studies show that naloxone distribution by laypersons is cost-effective (Coffin & Sullivan, 2013; Langham et al., 2018; Open Society Foundations, 2013). Depending on the delivery method, naloxone can range
from between $40-$89 per dose with generic versions hovering around the $40 mark (LaVito, 2019). To lower costs even further, in April 2019, the FDA approved the first generic naloxone hydrochloride nasal spray (US Food and Drug Administration, 2019). A focus on cost reduction has been central to the philosophy of making naloxone available for everyone at risk for an opioid overdose. The U.S. Surgeon General, a strong advocate for the opioid reversal medication, states that naloxone should be carried by anyone who knows someone at risk for overdose (LaVito, 2019).

New Hampshire has received grant funding for naloxone from the Substance Abuse and Mental Health Services Administration through STR (State Targeted Response) and SABG (Substance Abuse and Treatment Block), SOR (State Opioid Response) grants with the majority of federal grant monies distributed through the New Hampshire Bureau of Drug and Alcohol Services (BDAS) (Bipartisan Policy Center, 2018). The New Hampshire Department of Safety also received an $800,000 grant to train first responders to administer naloxone and provided 10,000, two-dose Narcan kits to at-risk individuals accessible via several alternatives (Carbone, 2017; US Department of Health and Human Services, n.d.).

In 2017-18, New Hampshire used $12,000 of STR funds for naloxone distribution and $600,000 for the Department of Corrections naloxone distribution (Bipartisan Policy Center, 2018). New Hampshire Medicaid spending on naloxone increased from $2,572 in 2016 to a projected $15,000+ in 2018 (Bipartisan Policy Center, 2018). Despite the costs associated with naloxone training and distribution, cost-benefit analysis traditionally shows promise for decreasing overall health care expenditures for these prevention measures. One study states that layperson distribution of naloxone increases quality-adjusted life years (QALY) and costs far less than what is considered a traditional cost-effectiveness threshold for medical interventions.
Markov models that evaluate probabilities using modeling for randomly evolving systems have demonstrated cost-effectiveness in all conducted analyses (Open Society Foundations, 2013). According to the Institute for Clinical and Economic Review, the average value attributed to one QALY is between $50,000-$150,000, the cost attached to one year of perfect health (Institute for Clinical and Economic Review, 2019). Cost-effective treatment includes anything costing less than this threshold for each QALY gained. Although the use of QALY is controversial and, as some state, “built on value-judgments,” it has been useful for testing the quality and value-added benefits for health interventions (Institute for Clinical and Economic Review, 2019; Smith, 2019). Modeling shows that in the US, naloxone costs between $421 and $2429 per life-year gain in populations with opioid use disorder (Open Society Foundations, 2013). The higher-end dollar amounts include not only naloxone but also consider the price associated with expenditures for the criminal justice system and healthcare research (Open Society Foundations, 2013).

Community-based naloxone distribution is estimated to have averted over 10,000 opioid-overdoses in the past two decades in the US (Jordan & Morrisonpence, 2019). The World Health Organization states that people who use drugs (PWUD) have a lifetime prevalence of 70% for a witnessed drug overdose; the majority are attributable to opioids (World Health Organization, 2018). In New Hampshire, according to the Bipartisan Policy Center, Naloxone community training has been provided to 25,000 individuals (Bipartisan Policy Center, 2018). From 2012-2016, Narcan prescriptions in New Hampshire have increased from 877 to 2793 doses (Carbone, 2017). Increased naloxone distribution and education about its use tripled the life-saving opportunities and chances for recovery in New Hampshire (Carbone, 2017). Access to naloxone and training on its use is also critical for bystanders witnessing an opioid overdose. Non-
randomized studies show that these individuals can and do reverse overdoses in the community when provided with both naloxone kits and training (Clark et al., 2014).

In determining the most cost-effective means of naloxone distribution, it is vital to understand the target populations at risk for overdose and the barriers to dispersal. Lagisetty, Bohnert, & Fendrick (2018), stated that it is more important to strategically target those at-risk individuals who will receive the most benefit from naloxone distribution and training rather than broad population-based application. Reporting shows that although rural areas face similar problems related to opioid use and death, naloxone distribution programs in urban cities are more likely to connect with individuals most in need of the reversal drug (Doleac & Mukherjee, 2019). The logic that densely populated cities provide more opportunities for bystanders to administer naloxone and shorter emergency service response times provide support to bolster programs in urban areas. In 2017, Rockingham and Hillsborough Counties, the two largest by population in NH, experienced the highest number of drug deaths at rates of 31.66 and 47.59 per 100,000 people, respectively (Duval, 2017).

Targeted distribution of naloxone requires an understanding of the benefits of geographic distribution efficacy but also usage and target populations that are at the highest risk for overdose and how to connect them to naloxone. Evidence shows that there are two main categories of at-risk opioid users- those who misuse opioids prescribed by their health care provider and those who use illicit opioids (street derived heroin and fentanyl) for non-medically prescribed purposes (Lagisetty et al., 2018). The American Society of Addiction Medicine (ASAM) adds individuals with an opioid use disorder but who are currently in recovery, to the list of targeted recipients (ASAM, 2016). Targeting individuals and communities at high risk and providing opioid education and naloxone distribution (OEND) has been linked to death rates that are 26-46%
lower when compared with areas not implementing OEND practices (Walley et al., 2013).

Multiple sources report universal naloxone distribution targeting high-risk opioid users to be best practice (Lagisetty et al., 2018; World Health Organization, 2018). Availability through pharmacies in New York was described as “spotty” (Correal, 2018), and a formal exploration of availability in New Hampshire pharmacies has not been undertaken. Opioid consumers have reservations about accessing naloxone via pharmacies; feelings of stigmatization and pharmacies lack supplies, and knowledge regarding dispensing protocols makes this mode of distribution less than satisfactory (Lagisetty et al., 2018). The most successful and patient-centered distribution locations include “high-yield venues” like emergency rooms, syringe service programs (SSPs), and treatment facilities that engage opioid consumers at a higher frequency (Lagisetty et al., 2018). In 2019, New Hampshire opened The Doorway as part of the state’s new “hub and spoke” program to better meet the needs of patients with substance use disorders (Wickham, 2019). Utilizing funds from the SOR grant, the Doorway program provides treatment referrals, clinical evaluations, and naloxone at any of their 9 locations around the state. Another mode of naloxone delivery at the community level includes five SSPs operating in cities around NH. Figure 3 represents the various means of accessing naloxone in the state.

Typical Access Points for Naloxone in New Hampshire

![Figure 3: Accessing Naloxone in New Hampshire](image)
Despite the legislative strides improving accessibility of naloxone and increased funding for opioid treatment and recovery, the CDC reports that 467 people still died of drug overdoses in 2017, placing New Hampshire in the top five states for drug overdose mortality statistics nationwide (CDC Injury Center, 2019). Interesting to note, the New Hampshire Office of the Chief Medical Examiner’s Drug Death Data report issued on October 16, 2019, reveals incongruencies between the CDC data and the actual drug overdose-related death count in the state. Due to state upgrades to case management software, previously unrecorded data bumps overdose death totals to 490 people in 2017 (NH Office of the Chief Medical Examiner, 2019). Inconsistencies add confusion to already difficult to measure outcomes for opioid-related deaths. Also, the data related to the effectiveness of the state’s naloxone program has not been thoroughly evaluated. Neither the State Board of Pharmacy nor the NH Hospital Association monitors the use and distribution of Narcan (Carbone, 2017). The only publicly available data set has been EMS administration of naloxone, which does not include administration by community members necessitating examination of state-funded, community naloxone doses with objective outcome measures.

In June 2017, the BDAS provided a framework for Naloxone distribution circulating the “Naloxone Distribution Information for Regional Public Health Network Partners” information guide (BDAS, 2017). The guidelines included background information on state legislative changes and reviewed the supports for public health network partners in their efforts to provide a distribution and training program for naloxone. The report included recommendations for distribution, access to training for educators and end-users, and how to acquire naloxone, but intended outcomes to measure the success of the initiative were not discussed.
Historically, substantial evidence backs the efficacy and cost-effectiveness of naloxone distribution programs. In New Hampshire, utilization of program evaluation tools to understand and refine the structure, process, outcomes, and cost-effectiveness of naloxone distribution has not publicly been examined and looking at how community distribution affects opioid death is needed. The purpose of a naloxone program evaluation in New Hampshire would serve to describe the current state while focusing on the utility and effectiveness of the current distribution model for targeting at-risk populations to reduce opioid deaths and provide recommendations for improvement. The development of program goals and viable target outcomes would provide measures of program success and inform future health policy decisions.

**Rationale**

The Center for Disease Control and Prevention endorses program evaluation to promote continuous quality improvement and reduce the cost of health care by ensuring that data drives decisions when making financial investments in public policy and programing (Centers for Disease Control and Prevention, Program Performance and Evaluation Office, 2019). The CDC’s Framework for Program Evaluation guided a systematic evaluation of naloxone distribution to assess the impact and effectiveness related to costs and outcomes in the State of New Hampshire. Appendix A provides the CDC’s visual depiction of the stepwise evaluation process that includes describing the stakeholders, the program, the design and methodologies, development of program data concerning best practice evidence, and established policy to justify conclusions and recommendations.

This program evaluation looked at community naloxone distribution from a process and outcome standpoint. Because the evaluation is concerned with determining whether strategies and initiatives have been met, a performance monitoring evaluation design became the
philosophical construct which guided this work. According to the W.F. Kellogg Foundation, performance monitoring design ensures accountability, well-managed utilization of program resources, and promotes transparency in tracking progress toward pre-established goals while alerting stakeholders promptly of deficiencies (W.K. Kellogg Foundation, 2017). This design was appropriate because it has the flexibility to be conducted throughout a program’s lifespan and can answer whether program efforts have been conducted as planned and met original goals (W.K. Kellogg Foundation, 2017).

Due to the unpredictability and quickly changing environment around health promotion and policy for the opioid epidemic, this program evaluation design progressed from a developmental evaluation (DE) perspective. DE embraces the philosophy of supporting innovation and promoting continuous quality improvement in an environment that requires adaptivity (W.K. Kellogg Foundation, 2017). DE recognizes that engaging in frequent program evaluation provides benefits from enhanced creativity and responsiveness to environmental changes by a continuous refinement of processes (W.K. Kellogg Foundation, 2017). The utilization of formal program evaluation for New Hampshire’s community naloxone distribution program aligns with federal policy. In 2011, President Barack Obama signed the Government Performance and Results Modernization Act requiring federal agencies to perform program evaluations to effectively communicate achievement and improve program outcomes (SAMHSA, 2014). As a result, SAMHSA evaluations collect and report on findings promoting transparency related to the performance of federally funded programs. State programs receiving federal dollars through grants and funding matches also require evaluation (Milstead, 2016). The
absence of comprehensive program evaluation for naloxone distribution in New Hampshire, which is funded both by Medicaid and block grant dollars, represents a quality gap.

**Specific Aim**

The purpose of this program evaluation was to describe the current state of New Hampshire’s community naloxone distribution model using the CDC Program Evaluation Model. Associations between opioid overdose death rates and naloxone access and distribution were analyzed. The data analysis provided insight helping formulate recommendations to optimize naloxone distribution in the community. Findings were disseminated to stakeholders to highlight naloxone program successes and areas of opportunity to inform future quality improvement projects and the promotion of evidence-based program development. Figure 4 summarizes the project objectives in detail.

**Phase 1**

1. Describe naloxone distribution in the State of New Hampshire from 2014-2018,
2. Examine associations between overdose death rates and state distributed naloxone, and
3. Develop recommendations to optimize naloxone distribution.

**Phase 2**

1. Disseminate findings to stakeholders and advocate for optimization of naloxone distribution.
2. Conduct and evaluate stakeholder meetings to garner intention to change toward best practices.

*Figure 4. Detailed description of project objectives.*
Methods

Context

This project reviewed opioid overdose deaths in New Hampshire and the accessibility of community naloxone. In 2017, 2.3% or 3,000 individuals in New Hampshire aged 18-25 had an opioid use disorder (SAMHSA, 2019). For individuals over 25 years old, 1.4% or 16,000 had an opioid use disorder (Substance Abuse and Mental Health Services Administration, 2019). The State of New Hampshire has a population of 1.36 million dispersed throughout ten counties. It is the 42nd most populous state, 21st when compared by its size and population density. The largest city in New Hampshire is Manchester, with a 2010 census population of 109,565, followed by Nashua with a population of 87,970. The northern third of the state has high poverty rates and comprises only 5% of the total population (New Hampshire Population, 2019).

Interventions

The CDC program evaluation guide recommends the construction of a logic model to visualize the associations between program goals and resources, activities, outputs, and short and long-term outcome measures needed to meet those objectives (Centers for Disease Control and Prevention, Program Performance and Evaluation Office, 2019). Logic models engage the evaluators in the “Describing the Program” step of the CDC model. Available knowledge and guidance from stakeholders familiar with the New Hampshire naloxone distribution program allowed for the retrospective construction of goals and purposes that would be appropriate for this program evaluation. Program goals precipitated various realistic short and long-term objectives to guide the evaluation and create a post-factum logic model, see Appendix B.
**Data Collection Plan**

In order to guide this evaluation, the logic model was used to choose goals of interest and the tests associated with favorable program outcomes. Significant events in New Hampshire surrounding the opioid crisis were explored. Data for overdose deaths and naloxone distribution were the focal point of this project. The project collected data on distributed naloxone between the years of 2014-2018. There was a specific focus on state-funded community accessible naloxone, defined as kits provided directly to end-users, those at risk of an overdose, or persons potentially witnessing an overdose situation. Community naloxone distribution data was obtained from the New Hampshire Harm Reduction Coalition (NHHRC).

The NHHRC requested and received various data and statistics related to naloxone distribution from the New Hampshire Department of Health and Human Services Office of Legal and Regulatory Services under the Freedom of Information Act (FOIA). Data from the FOIA included naloxone distribution by provider type, town/county, and cost. The data also contained information related to training and program goals for advertising and marketing. Naloxone is also administered through emergency medical services, and this information was gathered using public data sets available from the Bureau of Drug and Alcohol Services (BDAS) and the New Hampshire Department of Health and Human Services (DHHS) Drug Monitoring Initiative. EMS and ED data shed light on the effectiveness of community naloxone distribution as hypothesized decreases in these usage categories are expected to be related to increasing naloxone access in the community. In order to understand the structure of the naloxone distribution program, a Google search was conducted using the question “Where can I get naloxone in New Hampshire?” The search served the purpose of assessing the various
distribution access points to end-users. The access points for community users will be contrasted with the access points discussed in Figure 3.

Opioid death data and legislative policy changes pertinent to naloxone distribution and its relationship with state law were gathered to provide context. State practices were compared to best practice evidence gathered using resources gathered from the literature search. Opioid-related death data was requested from the New Hampshire Office of the Medical Examiner (OCME) heretofore referred to as “OCME direct data.” The request looked specifically for data outlining the town where the opioid overdose occurred in addition to the place of death, which may be geographically unique and whether the overdose was intentional, as in the case of suicides. Evaluator used a Google Search to gather opioid death data from the CDC and to seek out any data and information related to opioid deaths not provided from the listed sources: including emergency medical services (EMS) data, emergency department (ED) utilization data, census data, and CDC handbooks and information on best practice. The New Hampshire Office of Strategic Initiatives’ webpage provided yearly population estimates (NH Office of Strategic Initiatives, 2019).

Qualitative and experiential data was collected from evaluator’s interactions with participants and volunteers at a Manchester, NH SSP. Interactions led to a more nuanced picture of how community naloxone distribution impacts target users. Informal communication relevant to the opioid epidemic was captured.

**Data Analysis Plan**

The evaluator examined data to understand the relationship between opioid overdose death (excluding suicides) and community naloxone distribution patterns. The information depicted in the New Hampshire opioid crisis timeline was utilized to search for potential
correlations between opioid overdose death and legislative initiatives that involve public
naloxone distribution programs. This evaluation used two data sets from the OCME, drug death
data from the Office of the Chief Medical Examiner from 2014 to 2019 available online, and the
direct data set that included all drug deaths by county from 2017-2018. OCME direct data was
organized by type of drug overdose and whether the death was accidental or suicide. Only New
Hampshire drug death data was used. Suicides and undetermined deaths were also excluded.
Opioid deaths were separated from non-opioid deaths because of the potential for overdose
reversal using naloxone for opioids.

Naloxone distribution data were categorized according to the type of distribution program.
The evaluation attempted to differentiate between doses intended for the target population of
opioid users by grouping the FOIA naloxone dataset into categories. For instance, each entry in
the “Agency Type” column was divided into one of 5 groupings, Community Event, Community
Health, SSP and Substance Use Treatment Programs (SUTP), and Agency Use. It was assumed
that state-funded community naloxone intended for SSP and SUTP would reach the target group
of opioid users, whereas the other categories were less likely to end up in the hands of people
with Opioid Use Disorder or those with a strong likelihood of witnessing an overdose. The
“Agency Use” category designates organizations that intended to use naloxone in their facility.
The “Agency Use” category included schools receiving minimal (1-2 doses) quantities of
naloxone for emergency administration. This categorization enabled analysis of the effect of
targeted distribution to people who use opioids and whether targeted distribution affects opioid
overdose mortality. State-funded kits sent to schools and police departments were typically
returned due to expiration, meaning that target users did not access agency use kits. Therefore,
agency use kits would not be useful in improving the target outcomes.
A quantitative evaluation of opioid-related death data was made using JMP statistical analysis software and Microsoft Excel. The software facilitated the exploration of correlations between opioid deaths and naloxone distribution per county using naloxone distribution datasets from the NHHRC FOIA request and the OCME drug death data. The methodology was iterative based on the quality and quantity of data obtained from state and national sources. Microsoft Excel Student’s T-test calculations ascertained statistical significance when a probability statistic was $p<0.05$.

Advocacy

The findings of this project were disseminated to stakeholders, including the NHHRC. The project is interested in disseminating findings and, by using gap analysis, intends to provide recommendations for optimization of naloxone distribution. Also, the project plan includes understanding the stakeholders’ intentions to utilize these findings to close distribution gaps and initiate the best practice.

Ethical Considerations

The data used in this project had no individual identifiers. The project evaluation makes limitations and conflicts of interest subject to full disclosure. The evaluator will respectfully engage with stakeholders from Queen City Exchange SSP, NHHRC and other community groups in a non-threatening manner that eliminates the potential for emotional harm or distress. The author has no conflicts of interest to declare.
Results

Collected drug death data from OCME was evaluated. Data from the years between 2014-2016 did not include cause of death (suicide vs. accidental), county, or detailed toxicology reports. More detailed information was included in the reports from the 2017 and 2018 datasets. Opioid Deaths were parsed out from total drug deaths from 2014-2019, and these were plotted in Figure 5. The 2019 data point in Figure 5 is incomplete due to 5 deaths pending toxicology.

Figure 5. State of New Hampshire opioid overdose death data (data source NH OCME Drug Death Data Sheets)

Figure 5 shows that total drug deaths, the sum of those with toxicology indicating overdose from substances other than opioids such as cocaine and methamphetamine and opioids follow a similar curve as opioid only overdose death. Between 2014 and 2019, opioid overdose drug deaths accounted for approximately 85 and 99 percent of the total number of drug deaths. The
graph in Figure 5 shows that all drug deaths and opioid drug deaths have decreased since the peak in 2017.

The 2017-18 drug death data directly from the OCME direct data contained specific content allowing for the extraction of valuable information and the exclusion of deaths that would not be affected by naloxone. These breakouts were not provided on the Drug Death Data Sheets available through the Department of Justice OCME website. Seven drug deaths in other states were excluded in the 2017-2018 dataset: one Maine, which was also a suicide, one Massachusetts, and five Vermont death, one of which was a vehicle accident. Two unknown counties were excluded as were two natural deaths, 13 undetermined causes, and 68 suicides. The unknown county exclusions canceled each other, one from 2017 and the other from 2018 data.

Figure 6. Sum totals of accidental opioid overdose deaths by county for 2017 and 2018
Overall, exclusions included 94 deaths from the medical examiner’s dataset as non-relevant to the state and not likely to be affected by naloxone for reversal.

After accounting for all exclusions and removing all non-opioid related deaths from the dataset, there were 409 opioid deaths in 2017 and 399 opioid overdose deaths in 2018 in New Hampshire. This data does not indicate a statistically significant reduction in deaths, \( p=0.92; \) 95\% CI [-4.98, 5.48]. Figure 6 shows the sum of 2017 and 2018 county deaths at a rate of death per 100,000 people. This Pareto illustrates that deaths in Belknap County are the most prevalent, followed by Hillsborough and Strafford counties. According to the graph, maximum benefits in reducing opioid deaths will be realized when naloxone distribution efforts are focused in Belknap, Hillsborough, Strafford, Cheshire, Rockingham, and to some extent Merrimack Counties.

**Figure 7.** Change in accidental opioid deaths per 100,000 people; T-test statistics * indicates \( p \) value <0.05
Figure 6 only includes accidental overdose deaths pulled from the OCME direct data set. Figure 7 further breaks out OCME opioid overdose deaths per 100,000 people for each county visualizing increases and decreases between 2017 and 2018. Figure 7 highlights increases in opioid deaths for Belknap (3% increase), Cheshire (21% increase), Merrimack (22% increase), and Sullivan (74% increase) Counties.

The second batch of data pertains to naloxone distribution. There were 776 naloxone shipments with a total of 28,453 kits distributed and remaining in circulation between September 16, 2015, and March 26, 2019. Kits that were removed from circulation were returned for being damaged or unused. The most common reason for return was expiration. Naloxone data from the FOIA request was sorted and categorized into usage groupings, Table 1. There were 432 naloxone kits shipped to five Doorways locations on December 31, 2018. These kits were excluded from the dataset due to the low chance of the facilities using the kits within the outlined evaluation period. The remaining naloxone distribution data were sorted into five groups based on Agency Type receiving the shipment, “Agency Use,” “Community Events,” “Substance Use Treatment (SUT),” “Syringe Service Programs (SSP),” and “Community Health.” Agency Use naloxone was delivered to different organizations with the intention that supplies would be utilized by staff. It is hypothesized that SSPs and SUT programs are the most likely to provide preventative naloxone to target users. This group would have the highest potential for opioid overdose reversal (Lagisetty et al., 2018). Table 1 shows a decrease in the Agency Use naloxone shipments between 2017 and 2018 from 59 to 39. Community Events and Community Health naloxone need also declined from 41 to 21 and 57 to 48 shipments, respectively, in the same period. Both SSP and SUT shipments increased from 2017-2018. SSP shipments climbed from 2 to 17 and SST from 56 to 92.
According to a BDAS stakeholder, community naloxone kits cost around $74 a box, which contains two 2 mg nasal intranasal inhalers. The combined sum of all use naloxone for 2017 and 2018 was 15,845 kits. The approximated cost for the kits at the stated price is $1,172,530. If we only account for targeted kits, those that will provide the highest likelihood of reducing overdose, the sum for 2017-18 is 1061 kits at the cost of $707,514.

The program evaluation analyzed community naloxone distribution, analyzing trends, and decreases in death based on naloxone access. Figure 8 shows the yearly amount of total naloxone distributed per 100,000 persons for each county in New Hampshire. T-tests show that the only statistically significant change in total naloxone distribution is for Strafford County, where p=0.046. In Strafford County, total naloxone distribution per 100,000 persons increased from 776 kits to 1,625. The evaluation also attempted to understand the changes in targeted access to naloxone across counties. Figure 9 explores the changes between 2017-18 of naloxone put into

<table>
<thead>
<tr>
<th>Agency Use</th>
<th>Community Event</th>
<th>Substance Use Treatment</th>
<th>Syringe Service Programs</th>
<th>Community Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Police</td>
<td>Church Programs</td>
<td>Drug Courts</td>
<td>Hand Up</td>
<td>Hospitals</td>
</tr>
<tr>
<td>Schools</td>
<td>Educational Programs</td>
<td>Recovery Centers</td>
<td>Project 439</td>
<td>Safe Stations</td>
</tr>
<tr>
<td>Office Use</td>
<td>Public Health Networks</td>
<td>Addiction Medicine</td>
<td>Southern NH AIDS/HIV Task Force</td>
<td>Shelters</td>
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<tr>
<td>Individuals</td>
<td></td>
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<td>Department of Corrections</td>
</tr>
</tbody>
</table>

Table 1. Community Naloxone Distribution Categories

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</thead>
<tbody>
<tr>
<td>Totals</td>
<td>59</td>
<td>39</td>
<td>41</td>
<td>21</td>
<td>56</td>
<td>92</td>
<td>2</td>
<td>17</td>
</tr>
</tbody>
</table>

Note. Total shipments are calculated by year for each category. Shipments could range from one kit to over 100 kits.
the hands of target users. The graph shows that there were across the board increases in targeted naloxone delivered by SUT and SSP in all counties except for Coos.

Figure 8. Naloxone Distribution by County per 100,000 people calculated by multiplying the total number of kits distributed in a county by 100,000 and dividing by the county’s population.

Naloxone supply was increased by 38%-493% across New Hampshire counties. The graph reports data in kits per 100,000 people and also relates the associated percent decrease in opioid overdose deaths between 2017-2018. The most substantial reductions were seen in Coos and Grafton with 51% and 22% decrease in opioid overdose deaths, respectively. The highest increases in opioid deaths were seen in Cheshire and Merrimack counties. It is of note that only Hillsborough and Strafford Counties had a statistically significant increase in targeted naloxone
with \( p=0.0487 \) and \( p=0.0182 \), respectively.

An essential aspect of this evaluation was to compare deaths to community naloxone distribution. Figure 10 shows opioid overdose deaths plotted against naloxone distribution types in a stacked bar graph. This graph utilizes OCME direct death data for opioid overdose, excluding suicides, undetermined, natural, and vehicle deaths as well as deaths from other states. Data from 2017-2018, seen here broken into quarters and bars and then subdivided into distribution modes, SUT, SSP, Community Event, or Community Health. Community Event and Community Health naloxone distribution decreased between 2017 and 2018, whereas SSP and SUT distribution increased over the same period. The death data shows a decreasing trend but no statistically significant decrease, \( p=0.63 \), for opioid deaths between 2017 and 2018. The median for each year was 2017, \( M=103 \), and 2018, \( M=99 \).
Figure 10. Death to Distribution. This figure shows data from OCME and the FOIA requests compiled to illustrate how community naloxone distribution and opioid overdose death data compared between 2017 and 2018.

Figures 11 and 12 depict bivariate models comparing opioid deaths to the total number of kits, all distribution methods, and opioid deaths to targeted naloxone distribution, respectively. Each data point within the figures depicts quarterly opioid deaths and kits distributed statewide. There is no correlation between the variables of naloxone distribution and death, either targeted naloxone or otherwise, between the years of 2017 and 2018. With respective p values of 0.32 and 0.20, indicates that the fitted line explains no variation, and there is not a relationship between x
and y, naloxone distribution, and opioid overdose death variables.

Figure 1. Scatterplot of naloxone kits to opioid overdose deaths by quarter for 2017-2018

Figure 12. Scatterplot of naloxone kits targeted to end users compared to opioid overdose deaths by quarter for 2017-2018
Looking at bivariate analysis is only one piece of the picture. A run chart provides a deeper dive into the OCME direct data for opioid overdose. Run charts are essential tools for DE and continuous improvement because they monitor trends and predict patterns. Figure 13 shows direct data plotted in a run chart. The points at which SSPs are implemented in various counties are added for reference. Of note are the drops in deaths occurring shortly after each SSP county began distributing naloxone. Although correlation does not equate to causation it is an interesting finding. Also, of note is an astronomical point with 54 deaths in July 2018. Whether this was an increase in drug potency or something else would need further evaluation. There is a total of 7 runs for this run chart which is indicative of a signal of change. Without OCME direct data for 2019 it is difficult to see if this becomes a shift in the dataset which would indicate the median may have changed and that the intervention of community naloxone distribution may be having a non-random effect on the process. Run charts were also used to evaluate EMS data.

*Figure 13. Run chart for NH accidental opioid overdose deaths by month for 2017-18*
Although EMS data is not considered part of the community naloxone distribution, understanding trends in EMS administration of naloxone is worthwhile as a marker of overdose incidence. The evaluation was interested in determining any potential relationships between EMS reversal data and naloxone and overdose in New Hampshire. EMS data measures emergency access to naloxone given to individuals for decreased alertness, meaning there may be administrations that are not tied to opioid overdose. Overall, EMS naloxone distribution has been decreasing since 2016, see Figure 14. All New Hampshire counties except for Cheshire had decreased EMS naloxone administration from 2017-2018, see Figure 15. There was a statistically significant decrease in EMS naloxone administration between 2017 and 2018 (p=0.011). According to the New Hampshire Bureau of Emergency Medical Services, heroin and non-heroin opioid EMS overdose responses decreased by 423 and 12, respectively, between 2017 and 2018, (Center for Excellence, 2019).

![EMS Cases Involving Naloxone Administration](image)

**Figure 14.** Yearly EMS cases involving naloxone administration (Data source NH Bureau of EMS)
Emergency room visits related to opioid use were investigated, but the opioid overdoses were not separated from other opioid-related visits in the data set (Center for Excellence, 2019). The Governor’s Commission Report on Alcohol and Other Drugs Mid-Year Report did state that there was a 17% decrease in ED visits related to opioid use, see Appendix C (Center for Excellence, 2019).

**Discussion**

**Summary**

The purpose of this program evaluation was to describe the current state of New Hampshire’s community naloxone distribution model. Associations between opioid overdose death rates and naloxone access and distribution were analyzed at both the state and county levels to gain insight into program gaps and to assess what effect targeted naloxone distribution
had on opioid overdose deaths. EMS data was also gathered. State legislative and policy changes were reviewed to understand further the implications for the naloxone distribution program in the state.

The program evaluation utilized the CDC framework, engaging stakeholders directly involved with the New Hampshire BDAS, New Hampshire Harm Reduction Coalition, and SSP volunteers and participants. Stakeholder engagement provided perspective allowing for the creation of a logic model to understand the relationships between the resources, activities, and outputs of short- and long-term outcomes and how best to test for successful implementation.

The evaluation focused on tests that were deemed useful in accomplishing goals of decreased morbidity and mortality for people who use opioids in the state of New Hampshire. Opioid overdose deaths, community naloxone distribution, and reduction in EMS naloxone administration, and to a smaller extent, ED visits between 2017 and 2018 were analyzed. Analysis of death data showed a decrease of only 10 opioid overdose deaths at the state level. Death rates between the counties varied widely. Statistically significant changes in death rates between 2017 and 2018 did not occur for any comparison groups, state, or countywide. Conversely, targeted naloxone distribution rates differed by county. Statistically significant increases were only seen in Hillsborough and Strafford Counties. Stakeholders believe that this was partly attributed to the creation of SSPs in those areas occurring during the timeframe observed. During the evaluation’s timeframe, SSP and SUT naloxone shipments increased, and shipments for Community Health and Community Events decreased. Multiple counties and state-level regression analyses showed no relationship between the variables of targeted naloxone and opioid overdose death for the evaluation period.
Strengths of the evaluation include a thorough review of the literature that gave perspective for a system-level framework depicted in a logic model. After a thorough search was conducted, and many stakeholders were approached for information on the topic, it was determined that no such model existed for the state-funded, naloxone distribution program. Logic models can focus a program, and the creation of a logic model strengthened the focus of the evaluation (Centers for Disease Control and Prevention, Program Performance and Evaluation Office, 2019). The program was evaluated based on “tests” outlined in the logic model by assessors unrelated to the project, and therefore there is a low risk of bias, cognitive, confirmation, statistical, or otherwise related to any conflicts of interest. Statistics were independently checked by three separate assessors whom all agreed that no relationships could be found between community naloxone distribution and opioid overdose death between 2017 and 2018. The Run chart for accidental opioid overdose did show that there was some type of change in the death dataset. Run chart evaluation with 2019 data will hopefully provide more conclusive insight into potential shifts or trends on the run chart.

**Interpretation**

ASAM recommends targeted naloxone distribution to persons at high risk of witnessing or having an opioid overdose (American Society of Addiction Medicine, 2019). Studies show that naloxone is cost-effective (Coffin & Sullivan, 2013) and reduces opioid deaths (Bird et al., 2016; Walley et al., 2013) provided target users have access to kits and proper training (Clark et al., 2014). Although this evaluation did not provide evidence for a statistical reduction in opioid overdose deaths, there was a statewide decrease in opioid overdose deaths. Attributing the reduction in deaths solely to naloxone distribution is not recommended. Many confounding
variables, anomalous data, and, more obviously, antithetical trends were uncovered during the evaluation.

Before 2017, there was a dramatic decline in the rate of opioid prescriptions, see Appendix D (NIDA, 2019). Data for the opioid prescribing rate was not readily available to account for the time frame of this evaluation. Decreasing prescriptions could have a varying effect on the opioid death rate unrelated to naloxone. One plausible scenario may be that those decreasing opioid prescriptions, coupled with cheap illicit alternatives, drove more people to black-market sources of pain management (Dasgupta et al., 2018). These factors potentially boosted the opioid overdose death rates, especially for synthetic opioid overdose. Although Dasgupta et al. suggest that the decreases in prescription opioids did not result in a decrease in prescription death, therefore, it is more likely the latter alternative. The complex interplay between prescription opioids and illicit pain management alternatives that have filled a gap result in an interesting confounding variable.

Another possible confounder is people who use drugs (PWUD) increasing awareness of current market trends in drug supply potency. Drug deaths in 2017 hit their peak, with most of these deaths attributed to the synthetic opioid fentanyl (NIDA, 2019). Fentanyl use is most commonly found in the communities of Hillsborough and Strafford counties (Marsch, 2017). There are conflicting thoughts as to whether a lack of awareness was a driver for increasing opioid deaths or that deaths were attributed to people actively seeking fentanyl (Marsch, 2017). The argument that a lack of awareness caused an increase in overdose deaths may explain a modest decrease in deaths in 2018. Anecdotal evidence from the Queen City Exchange participants in Manchester, NH, suggests that awareness of fentanyl in the supply chain is now almost universal. When asked, “What drugs are you injecting?” clients will answer fentanyl or
reply, “Heroin. Well, it is all fentanyl now anyway, isn’t it?” Participants have a keen awareness of the supply market now, as corroborated by Marsh 2017. Other anecdotal reports from stakeholders suggest that during these periods of increased drug potency, “There is a higher self-reported rate of opioid reversals using naloxone and that these reversal statistics seem to decrease by the next week as participants become aware of the supply potency,” SSP volunteer.

Two additional factors that possibly impact the evaluation of naloxone’s effect are suicides and incidence of opioid use. If the incidence of opioid drug use is increasing over time, the overall effect of community naloxone distribution may appear less effective. Rising incidence rates may negate the visible naloxone gains in reducing opioid overdose deaths. This is a challenging statistic to obtain but it is worth mentioning as a possible confounding variable. Another data confounder is suicide. There is a community of thought that suicides may be undercounted (Dasgupta et al., 2018). Accounting for this possibility would mean that there would be fewer accidental deaths than presently reported. For the 2017-2018 year, there were 68 suicides and 13 unknown causes of death. These numbers could conceivably be higher, meaning fewer accidental overdoses than reported, allowing for a higher chance of opioid reversals utilizing naloxone.

There are perplexing anomalies in the data where counties that had minimal increases in targeted naloxone distribution have the most significant decreases in death. Coos County, for instance, had a 51% decrease in opioid overdose death while not increasing its targeted naloxone at all. There were no state-funded community naloxone shipments to SUT during this period, and SSPs do not exist in this county.

One aspect to note that may be important for future naloxone distribution patterns is the age demographic of people who use opioids. According to the NH OCME in 2017, 20-39-year-
old people were the largest cohort of opioid overdose deaths. Population demographics show that Coos and other northern New Hampshire counties had older median ages than southern counties see Appendix E. Coos and Grafton had the highest percent decreases in opioid deaths and some of the quantities of targeted naloxone. Age and other social demographics may play a part in this phenomenon, but this is outside of the scope of this evaluation. It may be worthwhile to examine larger forces about what causes a community/population to engage in drug use (i.e. poverty, unemployment, lack of social capital, high rates of untreated mental health disorders) in future studies.

The creation of SSPs in the state brought about a shift in the ability to distribute naloxone to the target user group. Belknap County, described as a “resource desert,” had the highest opioid overdose death rate. This county would be a prime choice to implement an SSP program. SSPs began distributing in Grafton County and Strafford County the third quarter of 2017.

Strafford County SSPs began receiving their own shipments of naloxone in first quarter of 2018. Prior to this they were distributed through The Health and Safety Council of Strafford County which was categorized as Substance Use Treatment distribution category. Hillsborough was the final county to initiate an SSP program, but the program did not receive shipments of naloxone kits from the state until the second quarter of 2018. Due to lag times between organizations receipt of shipments and delivery to the end-user, it is unclear how many kits were accessible during the early months of 2018, so it is unclear whether SSPs will have a significant impact on opioid overdose reversal under the present distribution system. Based on evidence from studies that show favorable results from widespread access to naloxone, especially naloxone in the hands of target users, it is hypothesized that the SSP distribution of naloxone will have an effect, but it is yet to be realized (Walley et al., 2013).
The Walley et al., 2013 study showed that opioid overdose deaths decrease at a kit delivery rate exceeding 100 per 100,000 persons. Another study states that the optimal naloxone kit target number should be 14 times a cities overdose death rate (Madah-Amiri et al., 2017). Rates this high were only achieved three times throughout the evaluation period, 2017 in Carroll and Hillsborough, and 2018 in Rockingham. In a final example, a study investigating naloxone cost-effectiveness found that 101 naloxone kits would need to be distributed to prevent one death (Open Society Foundation, 2013). Open Society Foundation continues, stating that making naloxone accessible to 20% of heroin users would decrease the rate of overdose deaths by 10.6% in the first 5 years of a program. Each county did see non-statistically significant decreases in opioid overdose deaths. A greater effect may have been observed if the targeted naloxone distribution rate was 14 times more than the opioid overdose death rates. Even at distribution rates of 101 per opioid overdose death, naloxone distribution would be cost-effective for the State of New Hampshire.

One challenge for the New Hampshire naloxone program was that widespread community access was reliant on the state’s policy to work solely with the Department of Health and Human Services (DHHS) funded providers. A stakeholder lamented that “Because the state only distributed to DHHS-funded treatment/recovery providers (but had no restrictions on ‘social safety agencies’), areas that were resource deserts (Keene and to a lesser extent Laconia/Tilton) got much worse over time,” (Anonymous personal conversation 2020). The higher death rates in these counties may have been a byproduct of this decision. Successful program models have had specific target distribution quantities. Studies from Scotland and Massachusetts have shown success when setting distribution targets, kits per number of deaths or naloxone education and distribution rates per population, opioid overdose deaths declined (Bird et al., 2016; Walley et
al., 2013). The Bird et al., 2016 study showed that kit distribution rates of nine times the number of opioid overdose deaths reduced the rate of their target population, post-prison release persons, by 36% (Bird et al., 2016).

Cost-benefit analysis is a necessary aspect of any program evaluation, establishing that naloxone programs cost approximately $421 and $2429 per life-year gain in populations with opioid use disorder (Open Society Foundations, 2013). Part of the education given to participants at SSP and other training programs is that when witnessing an overdose, it is vital to call 911 (New Hampshire Harm Reduction Coalition, 2017). Despite this recommendation, anecdotal data from SSP participants suggests that there is still fear about calling 911. Participants often report, “We didn’t call we just used more Narcan,” and “Nah, we didn’t want any trouble. The Narcan worked, so it was all good.” EMS opioid reversal data shows a decrease in 911 calls between 2017 and 2018 by approximately 435 responses (Center for Excellence, 2019). The average cost of ambulance transport in NH is between $800 and $1200 (Marchocki, 2015; New Hampshire Insurance Department, n.d.). At a conservative estimate of $1000 per transport, the savings between 2017 and 2018 could be up to $435,000. Whether or not this could be partially or wholly in relationship with naloxone administration is a topic for future study. If calculated out, similar comparisons could be made for ED cost savings if data on opioid overdose. ED cost savings include cost of resuscitation efforts, costly ICU hospitalizations for anoxic brain injuries, losses for worker productivity, and bereavement costs (Florence et al., 2016; Premier, 2019).

**Limitations**

This program evaluation project would have benefited from a collaboratively designed logic model in coordination with stakeholders at BDAS. Collaboration produces a thoroughly
comprehensive framework for accurately measuring the effectiveness of agreed-upon outcomes of importance. It would also have helped to discuss in detail the Agency Use categories for which the naloxone distribution data was sorted. Evaluators made reasonably accurate assumptions about whether organizations receiving naloxone were in Community Event, Community Health, SST, or SSP groupings. However, without precise recordkeeping from each organization, it is difficult to understand whether naloxone was ending up with target users.

It is unknown whether the organizational distribution of naloxone occurred within a reasonable amount of time from the ship date. Naloxone shipped in mid-July 2018 may have been warehoused until the end of 2018 or late, making it impossible for these kits to affect the opioid overdose death rates. The assumption that naloxone shipment dispersal occurred within no more than a few months-time post shipments and were in the possession of target-users lacks validation and is, therefore, another limitation of the project.

It was challenging to obtain direct death data. The OCME was only able to provide comprehensive overdose death data from 2017 and 2018 due to changes in recordkeeping and databases. The original plan was to look at death data from 2014-2018. Ideally, a comparison between 2016-17 and 2018-19 would have been ideal to more accurately capture the changes in distribution models that SSP and SST focus created.

Interestingly, the CDC data for opioid deaths, Figure 1, did not align with the New Hampshire opioid overdose death data from the Death Data Sheets, Figure 5. Discrepancies possibly result from the lack of inclusion of pending toxicology deaths in the CDC data. Conversely, this evaluation excluded several data points and is unsure if this was the discrepancy between the death data sheets and this report. Other state data and vehicle deaths not affected by naloxone should skew the overall death tallies. Categorization errors make the death datasheets
questionable, warranting further evaluation and interviews to understand the discrepancies. Drug death and naloxone distribution data underwent multiple screenings and statistical reviews by independent reviewers.

Confounding variables affecting internal validity were discussed. They included interconnections between prescription drugs and inexpensive illicit drugs affecting opioid overdose deaths, how drug market knowledge and understanding drug potency may have increased over time, and how these factors worked to prevent overdoses. Another potential confounder is the idea that the rate of opioid use disorder could have been increasing at a dramatic rate therefore causing more people to use potentially deadly drugs and overdose, so even if naloxone distribution were successful in saving lives, the total number of overdose deaths was not dramatically reduced. Social determinates presenting confounding variables must be considered. Finally, the evaluation discussed how undercounting suicides would confound opioid overdose datasets.

There are positive factors that promote external validity and detractors, as well. The lack of multiple years of data detracts from the usefulness of community access to naloxone. Each study found in the Available Knowledge section shows that community naloxone distribution should have a more significant effect than demonstrated here. Despite this, the evaluation highlights many areas for improvement in record keeping and data tracking that makes the work highly generalizable. One of the biggest strengths of the evaluation is in recognizing the capacity for DE and implementing a continuous quality improvement plan and universal data tracking for all naloxone distribution organizations that utilize a logic model to meet target outcomes.
Conclusions

This program evaluation consisted of a two-phase process. In the first phase, the current state of New Hampshire’s community naloxone distribution was described, and the associations between opioid overdose death rates and naloxone access and distribution were analyzed. No apparent correlations between opioid overdose death and community naloxone distribution could be obtained based on the statistical analysis.

The data and information gathered throughout the evaluation were used to formulate recommendations to optimize naloxone distribution in the community further. The main recommendations include 1. improving transparency and data tracking 2. improving knowledge about county opioid use demographics and social determinants, and 3. using standard outcome measures to understand progress toward meeting statewide program goals.

This program evaluation sheds light on the need for better data tracking and transparency between organizations. It was exceedingly difficult for the New Hampshire Harm Reduction Coalition stakeholders to gather critical information related to naloxone distribution and death. There were multiple queries and requests submitted before obtaining data. Data reporting must reflect a consistent effort across all stakeholder programs to account for naloxone kits, and opioid overdose deaths, and this information should be easily accessible. Transparency is required for DE and continuous quality improvement. Implementation of run charts will help track trends and shifts alerting stakeholders of variation that may indicate changes in processes of interest.

The CDC recommends that programs utilize a logic model to guide program evaluation for all projects that utilize public health dollars. New Hampshire’s state-funded naloxone distribution program is no exception. Program goals should be acknowledged and easily
accessible. There were stipulations on who could be involved in state-level meetings and policy decisions around naloxone distribution (Bureau of Drug and Alcohol Services, 2017). The state, according to the Naloxone Distribution Information for Regional Health Partners, also placed prerequisites around who was permitted to distribute naloxone (Office of the Inspector General, 2019). Open policy for distribution is beneficial, providing organizations produce transparent, accurate, and consistent data management practices that align with state program goals and target outcomes.

In order to reduce confounding in the data sets, individual identifiers for participants and large-scale studies are needed to track naloxone usage at the target user level. Identifiers will help to understand demographic confounders and allow predictive distribution instead of flooding areas where there may not be a need. This prospect is challenging because of the necessity to protect anonymity of participants utilizing SSP services. If possible, studies should provide analysis of participant usage patterns, statistics for numbers of kits per reversal, and information about EMS use. To gather high-quality data requires direct questions and interrater reliability of surveyors, which is less likely when doing convenience sampling. Carefully designed studies are less prone to bias and the researcher’s interpretation demonstrating greater internal and external validity. Participants must understand the impact of poor data and the repercussions of inflating or underestimating the usefulness of naloxone. The information gathered from carefully conducted studies can be used to strategically target distribution and reduce costs by eliminating waste of expired products and random distribution to people unlikely to encounter an opioid overdose. Information from population and opioid use studies in the state can pinpoint hot spots that would benefit from naloxone outreach programs such as SSPs.
Cost-effective distribution is imperative for the sustainability and effective management of the state-funded naloxone program. Studies looking at cost-effectiveness stressed the importance of adequate distribution in order to see decreases in death. New Hampshire is below evidence-based distribution targets. The state should work with organizations to achieve the most cost-effective alternatives and widespread distribution models for naloxone kits. This way, valuable resources can be funneled into other harm reduction activities, treatment programs, or used for the development of much-needed programs in underserved areas.

This program evaluation gave an unbiased look at the history, data, and efforts of New Hampshire’s state-funded community naloxone distribution program between 2017 and 2018. The recommendations and interpretations from this evaluation can guide stakeholders when using a developmental evaluation perspective to support innovative study and continuous quality improvement. This practice will optimize the access and distribution of naloxone to decrease morbidity and mortality and the cost burden related to opioid use in the state of New Hampshire.
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Appendix A

CDC Program Evaluation Model
Appendix B

New Hampshire Community Naloxone Distribution Program Post-Factum Logic Model Model Design

**NH’s Community Naloxone Distribution Program**

**Logic Model**

**Public Health Goals:**
1. Sustained decrease in morbidity and mortality related to opioid overdose in New Hampshire,
2. Improved health for people who use opioids,
3. Reduced burden on the healthcare system

**Naloxone Community Distribution Program Goals:** Improved naloxone access in rural and urban New Hampshire

**Impact/Goals**

**Resources Needed**
- Favorable legislation and support for community naloxone distribution
- Funding/Grants for naloxone kits, training, and start-ups
- Increased collaboration with emergency services to reduce stigma
- Advertisement of Services
- Target-user education
- Data tracking and evaluation
- Best Practice Guidelines

**Activities**
- NH HB 271- Standing Order
- NH HB 270- Good Samaritan
- SB 447- Narcan Study Commission

**Outputs**
- Increased utilization of 911 services
- Increased program participation
- Increased knowledge of life-saving response
- Increased evidence of adequate training around naloxone administration
- Interrater reliability and quality data measurement of program outcomes

**Short Term Goals**
- Increased number of opioid reversals
- Increased number of ED visits
- Increased number of community partners distributing naloxone
- Establish sufficient data systems and responsive data tracking

**Long-Term Goals**
- Decreased opioid overdose death and morbidity
- Decreased burden on the healthcare system

**Tests**
- Decrease in rate of opioid overdose deaths
- Decreased utilization of Emergency Departments for Opioid Overdose
- Increased utilization of EMS services for overdose reversal
- Increase in naloxone distribution, rural and urban
- Campaign branding and design studies
- Program Evaluation
Appendix C

NH Emergency Department Opioid Visit Data

Data Source: NHI Division of Public Health Services, Automated Hospital Emergency Department Data; New Hampshire Drug Monitoring Initiative, New Hampshire Information & Analysis Center, February 2019
Appendix D

New Hampshire Age Adjusted Opioid Prescription Overdose Deaths and Opioid Prescription Rate (NIDA, 2019)
Appendix E

NH Population by Median Age 2010