

## 2020 Model Practices

### Applicant Information

Full Name:

Dean McEwen

Company:

Denver Public Health Department

Title:

Data Applications Supervisor

Email:

Dean.McEwen@dhha.org

Phone:

303-602-3682

City:

Denver

State:

CO

Zip:

80204

### Size

Select a size: \*

☐ Small (0-50,000) ☐ Medium (50,000-499,999) ☒ Large (500,000+)

### Application Information

Local Health Department/Organization Name: \*

Denver Public Health

Title of Practice: \*

Opioid Continuum of Care Model

Submitter Name: \*

Dean McEwen

Submitter Title: \*

Data Applications Supervisor

Submitter Email: \*

Dean.McEwen@dhha.org

Submitter Phone Number: \*

303-602-3682

City: \*

Denver

State: \*

Colorado

Zip Code: \*

80204

## Practice Categories

Model and Promising Practices are stored in an online searchable database. Applications may align with more than one practice category. Please select the most relevant category that applies most to your practice: : \*

- |  |   |  |   |  |
|--|---|--|---|--|
| <input type="checkbox"/> Access to Care                    | <input type="checkbox"/> Advocacy and Policy Making     | <input type="checkbox"/> Animal Control          | <input type="checkbox"/> Coalitions and Partnerships          | <input type="checkbox"/> Communications/Public Relations |
| <input type="checkbox"/> Community Involvement             | <input type="checkbox"/> Cultural Competence            | <input type="checkbox"/> Emergency Preparedness  | <input type="checkbox"/> Environmental Health                 | <input type="checkbox"/> Food Safety                     |
| <input type="checkbox"/> Global Climate Change             | <input type="checkbox"/> Health Equity                  | <input type="checkbox"/> HIV/STI                 | <input type="checkbox"/> Immunization                         | <input type="checkbox"/> Infectious Disease              |
| <input checked="" type="checkbox"/> Information Technology | <input type="checkbox"/> Injury and Violence Prevention | <input type="checkbox"/> Marketing and Promotion | <input type="checkbox"/> Maternal-Child and Adolescent Health | <input type="checkbox"/> Organizational Practices        |
| <input type="checkbox"/> Other                             | <input type="checkbox"/> Primary Care                   | <input type="checkbox"/> Quality Improvement     | <input type="checkbox"/> Research and Evaluation              | <input type="checkbox"/> Tobacco                         |
| <input type="checkbox"/> Vector Control                    | <input type="checkbox"/> Water Quality                  | <input type="checkbox"/> Workforce               |   |  |

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| <input type="checkbox"/> Community Involvement  | <input type="checkbox"/> Cultural Competence            | <input type="checkbox"/> Emergency Preparedness         | <input type="checkbox"/> Environmental Health                 | <input type="checkbox"/> Food Safety                     |
| <input type="checkbox"/> Global Climate Change  | <input type="checkbox"/> Health Equity                  | <input type="checkbox"/> HIV/STI                        | <input type="checkbox"/> Immunization                         | <input type="checkbox"/> Infectious Disease              |
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## Overview: Provide a brief summary of the practice in this section (750 Word Maximum)

Your summary must address all the questions below:

- Brief description of LHD- location, demographics of population served in your community.
- Describe public health issue.
- Goals and objectives of the proposed practice.
- How was the practice implemented/activities.
- Results/Outcomes (list process milestones and intended/actual outcomes and impacts.
- Were all of the objectives met?
- What specific factors led to the success of this practice?
- Public Health impact of practice.
- Website for your program, or LHD.

Denver Public Health (DPH), a department within Denver Health, is a nationally recognized public health agency committed to innovating practice and improving health for everyone by working with communities and partners. DPH embraces partnerships with Denver's diverse communities, through education and health promotion activities, informatics, epidemiology, evaluation, direct clinical care, and other disease prevention services. DPH serves the 717,796 residents of the City and County of Denver and provides many services to a larger community of about 3.2 million residents within the seven county Denver metro area.

The integration of a public health department within the Denver Health safety-net health care system is unique: it permits broad integration and coordination of public health and personal health activities. It also enables the use of local health data to drive actionable steps to improve the health of Denver's diverse communities. The integration of DPH within Denver Health has created opportunities for DPH to assist the larger organization's focus on substance treatment services through utilizing the DPH expertise in informatics and evaluation services.

In 2017, the United States experienced more than 47,600 opioid overdose deaths, over two-thirds of all drug overdose deaths. Within Colorado, there were 1,012 drug overdose deaths in 2017 and 974 deaths in 2018. Denver County recorded 172 drug overdose deaths in 2018. Drug overdose deaths and the treatment of substance use disorder have become a prominent public health concern, both locally and nationally.

The purpose of this project was to develop a continuum of care model for opioid use disorder, similar to the HIV Care Continuum initially created by Dr. Ed Gardner, a DPH physician, and has been adopted nationally and internationally. The scope of the project was to initially develop it using Denver Health data, and then make it more generalizable so that it could be adopted by other healthcare organizations, public health departments, and other jurisdictions. The same model could also then be modified for other substances, such as cocaine, methamphetamines, alcohol, etc. This continuum of care model would identify the number of individuals with opioid use disorder, how many were referred to treatment, how many initially engaged in treatment, and how many continued in treatment over time.

The project objectives were not only to quantify the extent of the opioid use disorder (OUD) problem and the number of individuals engaged in treatment, but also to identify the gaps along the continuum where engagement in treatment declines. Through analysis and evaluation of the continuum of care metrics, further investigation can identify areas where individuals tend to no longer seek treatment and determine methods to improve retention in care.

The initial step in creating the continuum of care model was developing a comprehensive and accurate definition to identify individuals with OUD. The very first step was utilizing ICD-10 diagnosis codes. Several providers felt those numbers were underrepresented. The next step was to interview key providers within different care settings: emergency department, inpatient, outpatient, and behavior health. These interviews identified a number of places within the medical record where OUD could be documented. This additional investigation created the framework for a comprehensive and accurate assessment of patients with OUD. The effort required reviewing medical charts, becoming expert on the nuances of how medical information is stored within the electronic health record, and collaborating closely with many key partners within the organization.

After validating the OUD definitions, criteria were developed to identify which patients were referred for treatment, engaged in treatment, and who were retained in care. The completion of these efforts established the opioid continuum of care model. Leadership and staff were excited to have a tool that measured the effectiveness of the treatment program for patients with opioid use disorder.

During the continuum of care model development, Denver Health leadership recognized the seriousness of substance use disorder and created the Center for Addiction Medicine (CAM). The DPH efforts of developing the continuum of care model provided the opportunity for DPH to be key leaders within the newly established CAM and provide informatics and evaluation support. The continuum of care model is a key tool in measuring the effectiveness of key interventions implemented by the CAM since the inception in October 2018.

The CAM initially focused on the engagement, care, and treatment of patients with OUD, but is now ready to expand their focus to other substances such as methamphetamines and alcohol. The continuum of care model is well established and will be tailored for use with other substance use disorders.

Websites: DPH (<http://www.denverpublichealth.org>) and Denver Health (<https://www.denverhealth.org>)

## Responsiveness and Innovation

A Model Practice must be responsive to a particular local public health problem or concern. An innovative practice must be -

1. new to the field of public health (and not just new to your health department) OR
2. a creative use of an existing tool or practice, including but not limited to use of an Advanced Practice Centers (APC) development tool, The Guide to Community Preventive Services, Healthy People 2020 (HP 2020), Mobilizing for Action through Planning and Partnerships (MAPP), Protocol for Assessing Community Excellence in Environmental Health (PACE EH). Examples of an inventive use of an existing tool or practice are: tailoring to meet the needs of a specific population, adapting from a different discipline, or improving the content.

Between 2000 and 2014, the United States has experienced an epidemic increase in drug overdose deaths. The number of overdose deaths due to opioids has more than tripled. These numbers continue to increase during the past five years. Drug overdose deaths nationally continue to increase, with a 9.6% age-adjusted rate increase between 2016 and 2017. According to CDC, there are currently 192 drug overdose deaths each day. Trends within Colorado also show an increasing number of drug overdose deaths through the past many years. Although Colorado numbers showed a slight decrease between 2017 and 2018, the City and County of Denver number of deaths increased from 158 to 172.

Overdose deaths represent just the tip of an iceberg with damage including non-fatal overdose, serious infections and outbreaks, other mental health disorders, adverse effects on offspring and other household members, criminal justice involvement, and impaired occupational and housing success.

Denver Health is nationally recognized integrated health care system, which serves one in three Denver residents and 40% of Denver's children. Denver Public Health (DPH), collaborating with other organizations within Denver Health, realized that there are a significant number of patients with opioid use disorder (OUD) and great capability existed to provide meaningful interventions. However, even the number of patients with OUD within the Denver Health system that could potentially be enrolled in treatment was unknown.

This began the investigation on how to more accurately identify individuals with OUD. Beyond simply counting patients, DPH sought to discover which patients were referred to a treatment program, and who successfully remained in recovery over time, describing an entire opioid continuum of care model. This care model was based upon the HIV continuum care model which Dr. Ed Gardner created many years earlier and has been adopted through the HIV care community to describe community success in HIV treatment and viral suppression.

The opioid continuum of care model DPH developed depicts five general metrics: 1) an estimation of the number of individuals within Denver County with OUD, opioid poisoning (OP), or opioid misuse (OM); 2) the number of Denver Health patients identified with OUD, OP, OM; 3) the number of patients receiving medication assisted therapy (MAT); 4) the number of patients continuing on MAT after 90 days; 5) the number of patients retained in MAT for one year or longer.

DPH initially used ICD-10 diagnosis codes to identify the number of Denver Health patients with OUD. When this only identified 220 inpatient diagnoses for one year the inpatient physicians recognized that ICD-10 diagnoses significantly undercounted patients with OUD. This began the investigation on how to more accurately identify individuals with OUD.

The DPH informatics team, with support of two Population Health Workforce Initiative CDC fellows, began investigating how patients with OUD were being documented within the electronic medical record. This involved talking with various care providers within the Denver Health system to understand differing documentation practices within the emergency department, inpatient departments, outpatient clinics, and the behavioral health department. Creating an accurate definition of how to identify patients with OUD (as well as patients who misuse opioids or experience overdose, who might have OUD or high risk of future OUD) was a critical component for the establishment of the opioid continuum of care model. Once the more comprehensive definition was identified and validated, the number of patients with OUD increased from 220 to 739, a 236% increase over ICD-10 codes alone, confirming there was a large underrecognized and underserved population. This was a significant discovery in understanding the scope of OUD within the patient population.

Creating true continuum of care estimates also requires the ability to track the treatment experience of patients over time. The Outpatient Behavioral Health Services (OBHS) department, which provides substance use treatment services and has a methadone treatment program, had metrics on how many patients were in treatment and how many new patients were starting treatment. They had some manual tallies related to how many patients were seeking or enrolled in treatment, but there were no accurate estimates on how many patients were identified with OUD. Several disconnected data systems have had to be integrated to provide longitudinal metrics of engagement and success, the essential ingredient for a true performance improvement system.

The opioid continuum of care model was an innovative approach using an existing tool established for HIV. This new model required careful attention to create definitions for each phase along the continuum of care model. As noted earlier, without a good understanding of medical documentation practices within different clinical settings, the numbers can completely misrepresent the magnitude of a public health issue. Estimates using only diagnosis codes may not be truly showing the true degree of the opioid epidemic.

This tool has been used to assess changes and expansion of services between 2017 and 2018. In 2018, the tool was able to accurately identify the number of patients with OUD (4593), the number receiving MAT (1747), and the retention in care of patients at 90 days (1023) and one year (692). The tool showed that expansion of treatment services has resulted in an increase of 358 patients starting treatment and higher numbers of patients continuing in treatment over a one year time period. This model has been useful to DPH and Denver Health leaders in demonstrating a focused effort to treat patients with opioid use disorder. Prior to the implementation of this tool, these metrics did not exist.

Through the use of this tool, the OBHS staff are able to quickly determine points along the continuum of care where retention in care is lost, and thus improvement is needed. It provides a good measuring device for program monitoring and outcome measures.

## LHD and Community Collaboration

The LHD should have a role in the practice's development and/or implementation. Additionally, the practice should demonstrate

broadbased involvement and participation of community partners (e.g., government, local residents, business, healthcare, and academia). If the practice is internal to the LHD, it should demonstrate cooperation and participation within the agency (i.e., other LHD staff) and other outside entities, if relevant. An effective implementation strategy includes outlined, actionable steps that are taken to complete the goals and objectives and put the practice into action within the community.

- Goal(s) and objectives of practice
- What did you do to achieve the goals and objectives?
  - Steps taken to implement the program
- Any criteria for who was selected to receive the practice (if applicable)?
- What was the timeframe for the practice were other stakeholders involved?
- What was their role in the planning and implementation process?
  - What does the LHD do to foster collaboration with community stakeholders? Describe the relationship(s) and how it furthers the practice goal(s)
- Any start up or in-kind costs and funding services associated with this practice? Please provide actual data, if possible. Otherwise, provide an estimate of start-up costs/ budget breakdown.

Enter the LHD and Community Collaboration related to your practice : \*

This project grew out of overlapping goals of local and federal government and the Denver Health and Hospital Authority, a state-chartered safety-net health system. Denver Public Health was selected as the base for three CDC Population Health Workforce fellows with an interdisciplinary focus on increasing the preventive efficacy of healthcare. The fellows focused on opioids, reflecting a joint commitment of Denver Health and the City and County of Denver to curtail the growing opioid use epidemic. The Denver Department of Public Health and Environment sponsors a multi-stakeholder Collective Impact group on opioid use, which identified Improving Treatment Access and Retention as one of three strategic goals. Simultaneously Denver Health began exploring how its strong substance use treatment capabilities could leverage the system's spectrum of primary, emergency, tertiary, correctional, pre-hospital EMS and behavioral health services to reach more people more effectively, resulting in a bilateral agreement with the city to support some opioid treatment services. Early work on the continuum of care iteratively influenced and was influenced by this broader prioritization and commitment, and benefitted from the input of many diverse stakeholders.

The first step was to better understand the Denver Health Outpatient Behavioral Health Services (OBHS) department. The OBHS department provided a DPH Data Science and Informatics staff members a tour of the processes used for enrolling patients in treatment services and described the data collection points they used. It became apparent that many of their processes which included paper logs, spreadsheets, and a few databases were antiquated. Operational reports were compartmentalized, department specific, and did not link to other system data resources. One of the initial objectives was to understand the data being collected and how best to integrate the various data streams to depict a comprehensive picture regarding the identification of patients with OUD, which patients were being referred to treatment, and the long-term retention in care of patients. Correctly classifying and quantifying the latter questions have required more complex data sources and analysis, but have also become more generalizable, as the Center for Addiction Medicine begins using varied settings for treatment, such as primary care clinics. This work led to the identification of the foundational elements of the opioid continuum of care model, however no definitions yet existed.

One of the key questions being raised by the DPH and OBHS management was regarding the magnitude of opioid use disorder (OUD) within the Denver Health patient population. OBHS had a very good understanding of who were seeking treatment but had no visibility into how prevalent the health issue was among all Denver Health patients, or what proportion were being helped. The DPH team initiated efforts to quantify that patient population. Initially numbers were generated based upon ICD-10 codes, which were quickly dismissed by providers as being underrepresentative. At this point it was determined that discussions needed to be conducted with physicians and counselors in the emergency department, inpatient floors, outpatient clinics, and the OBHS department. These interviews resulted in an in-depth understanding of the documentation practices related to identifying OUD diagnoses within the different medical service areas.

Over a period of many weeks criteria for identifying OUD were documented, investigated, and validated. A periodic evaluation meeting was held every 2-4 weeks with stakeholders from DPH, OBHS, and various care providers to discuss the details pertaining to the opioid continuum of care model and provide communication and feedback. Meanwhile, DPH staff were creating programs to extract the pertinent OUD data from the electronic medical record. Over the course of one year the definitions for the various stages of the continuum of care were refined. Throughout the process significant collaboration and discussion was necessary to achieve consensus on valid definitions and accurate measurements.

As the opioid continuum of care model was being developed in these meetings led by DPH, Denver Health executive leadership initiated a new primary objective to focus on substance use treatment. This initiative created the Center for Addiction Medicine in October 2018 which is co-chaired by the Associate Director of DPH and the Director of OBHS department. The Center for Addiction Medicine is working to expand treatment services to better address the increasing opioid health issues being seen within the community. During a several day retreat in April 2019 used to develop long-range strategic plans, four key strategic areas were identified: Knowledge Management, Fiscal Growth, Inclusive and Compassionate Care, and Full Continuum of Care. DPH was selected to manage the Knowledge Management strategic area, which includes evaluation and research components, based upon the value of the continuum of care model and the data integration capabilities that it represents.

The purpose of the Knowledge Management team is to develop strategic infrastructure to systematically improve processes, generate new knowledge, and drive organizational outcomes. The Knowledge Management team looks at very detailed elements, such as data

stored in EHRs, and relates them to more complex processes, such as bringing together information from different sources to inform program practices and evaluate impact, or proposing changes to optimize Center for Addiction Medicine processes and care workflows. The ultimate goal of the Knowledge Management strategic focus area is to leverage data science, infrastructure, and investigator-initiated research to improve care of patients and communities dealing with addiction. The team provides support to all four strategic focus areas and strives to ensure information consistency by the various stakeholders within Denver Health who are involved in care services related to OUD.

The earlier established periodic evaluation meetings were integrated into the new Knowledge Management team meetings. The Knowledge Management team, in addition to continuing development of the opioid continuum of care model, began collaborating with the other three strategic focus areas and providing data support for their specific needs. The foundational work from the opioid continuum of care model pertaining to definitions, data extraction, and data integration facilitated meeting the informational needs for these other strategic areas. The opioid continuum of care model provides important metrics and underlying data that are used to assess financial costs, retention in care, and clinical areas where referrals for treatment are most frequent.

Another collaborative effort was initiated between DPH staff and the Denver Health paramedics division. The Denver Health paramedics respond to the majority of 911 medical calls within Denver County. In 2018 they responded to more than 112,000 calls and transported more than 75,000 patients. The collaboration between DPH and the paramedics was to evaluate the number of calls related to opioid use disorder. DPH reviewed trip report data and developed machine learning algorithms to properly identify which calls were related to opioids. The objective of this analysis was to better understand the scope of opioid misuse in the community. An important finding was that opioid issues identified in the field often go undocumented and addressed during emergency department and subsequent care, resulting in missed opportunities to address gaps in the care continuum.

The development of the continuum of care model required part-time efforts by a data analyst, a business analyst, and an evaluator within DPH. A considerable amount of time during the first year was required in discovery, itemizing requirements, developing programs to extract and merge data sources, and conduct evaluation sessions with key stakeholders. An estimate of personnel costs for these developmental activities was approximately \$100,000 over the course of the first year. Once the infrastructure was established ongoing costs for producing the continuum of care model using various date ranges has been minimal. As the Center for Addiction Medicine expands to other substances, it may require 0.1 FTE of a data analyst to make the modifications necessary to address a different substance and treatment regimen.

## Evaluation

Evaluation assesses the value of the practice and the potential worth it has to other LHDs and the populations they serve. It is also an effective means to assess the credibility of the practice. Evaluation helps public health practice maintain standards and improve practice. Two types of evaluation are process and outcome. Process evaluation assesses the effectiveness of the steps taken to achieve the desired practice outcomes. Outcome evaluation summarizes the results of the practice efforts. Results may be long-term, such as an improvement in health status, or short-term, such as an improvement in knowledge/awareness, a policy change, an increase in numbers reached, etc. Results may be quantitative (empirical data such as percentages or numerical counts) and/or qualitative (e.g., focus group results, in-depth interviews, or anecdotal evidence).

- What did you find out? To what extent were your objectives achieved? Please re-state your objectives.
- Did you evaluate your practice?
  - List any primary data sources, who collected the data, and how? (if applicable)
  - List any secondary data sources used. (if applicable)
  - List performance measures used. Include process and outcome measures as appropriate.
  - Describe how results were analyzed.
  - Were any modifications made to the practice as a result of the data findings?

Please enter the evaluation results of your practice : \*

The primary objective of this project was to develop a continuum of care model for opioid use disorder that could be generalized to be used by other healthcare organizations, public health departments, and other jurisdictions, the way the HIV care continuum has helped create comparable metrics of program success at program and population levels across the US and the world. The pilot phase of developing the model was focused on opioid use disorder using data from the Denver Health organization. Once that model was established and validated for opioids, it will also be modified for other substances, such as cocaine, methamphetamines, alcohol, etc.

Other objectives were not only to quantify the extent of the opioid use disorder (OUD) problem and the number of individuals engaged in treatment, but also to identify the gaps along the continuum where engagement in treatment declines. Through analysis and evaluation of the continuum of care metrics, further investigation can identify areas where individuals become disengaged from treatment, and used to evaluate methods to improve retention in care. Thus, another important objective has been to improve the quality and success of treatment services and retention in care.

Early in the process a logic model was created to provide some structure and framework on the key information sources, activities, and short-term and long-term outputs. As the DPH team became more knowledgeable about the different clinical processes, the logic model continued to evolve and expand to address these additional areas. Definitions, data sources, activities, and desired outputs were adjusted and refined. A number of additional outputs desired were identified. However, the project scope needed to remain relatively



constant so that the primary objective, creating the opioid continuum of care model, would be achieved. Many other desired outputs were identified for future enhancements once the continuum of care model was established.

The primary objective of creating the opioid continuum of care model was achieved. The model went through a number of early revisions to address subtle use cases which were identified through in-depth analysis of the data. One example, of these types of scenarios was categorizing patients who may have stopped treatment for a brief period and then reengaged. Through discussion with the key clinical stakeholders a consensus was reached and incorporated into the model. The periodic Evaluation and Knowledge Management team meetings were instrumental in maintaining open dialogue and developing a strong and adaptive continuum of care model.

Another objective, expanding the use of the model to other systems or jurisdictions, is currently being pursued. Once the model was completed, meetings were held with other organizations who desired to apply this continuum of care model to their opioid treatment services. The DPH team worked jointly with these new partners to apply for a grant where DPH staff would provide consultation services to these other healthcare organizations to utilize their data to develop the opioid continuum of care model for their patient population.

The expansion of the continuum of care model to other substances is also being developed. Programs have been written to extract those patients who have been identified as using methamphetamines and also patients who have alcohol use disorder. After having the initial experience with opioids, the process for defining how patients are referred, engaged in treatment, and retained in care will take less time and be enhanced. The development of these continuum of care models is currently being actively pursued.

As mentioned previously, the use of only the ICD-10 diagnosis codes was inadequate in identifying the patients with OUD. The data source for identifying patients with OUD is the electronic health record (EHR), but it required extracting data from various elements. The criteria includes: ICD-10 codes, a Clinical Opioid Withdrawal Score (COWS) assessment, medication assisted treatment (methadone or buprenorphine dosing used for addiction treatment), laboratory test results indicating positive heroin use, opioid notes in the medical history, and provider and substance counselor notes with specific key words pertaining to opioid use. These definitions, especially utilizing key words in provider notes, required careful scrutiny and exclusion terms so that false positives were not included in the final identification of those patients with OUD.

The number of patients receiving medication assisted therapy is based upon two data sources. The EHR contains prescription information on buprenorphine and some methadone. In addition, there is a separate database that contains daily dispensing information of methadone. These two data sources are merged together to identify those initially receiving MAT. These data are also utilized, along with counselor visit information, to identify the number of patients continuing on MAT after 90 days and those who are retained in treatment for a year or more.

One of the first analyses used the continuum of care model for inpatients discharged during 2017. Following that analysis the definitions and criteria were further refined to ensure that all patients within the Denver Health system, both inpatient and outpatient, were appropriately included. The first validated and complete version was for the first six months of 2018. The data were examined and various scenarios and use cases were reviewed to ensure that they were addressed appropriately.

Once the model was validated, opioid continuum of care statistics were created for the years of 2017 and 2018. Comparison of these two years helped assess what impact various interventions have had on the number of patients receiving treatment and their retention in care over time, including the operationalization of the Center for Addiction Medicine in October 2018. It has been instructive to see objective metrics of the increasing numbers of patients receiving treatment during the start-up of the Center.

The results of these two opioid continuum of care models are the following:

#### Year 2017

Estimated opioid use disorder, opioid misuse, or opioid poisoning in Denver County	6688
Identified opioid use disorder, opioid misuse, or opioid poisoning at Denver Health	3930
Received medication assisted treatment at Denver Health	1392
Retained in care for greater than or equal 90 days of MAT	939
Retained in care for greater than or equal one year of MAT	653

#### Year 2018

Estimated opioid use disorder, opioid misuse, or opioid poisoning in Denver County	7010
Identified opioid use disorder, opioid misuse, or opioid poisoning at Denver Health	4593
Received medication assisted treatment at Denver Health	1747
Retained in care for greater than or equal 90 days of MAT	1023
Retained in care for greater than or equal one year of MAT	692

These results demonstrate that more patients were enrolled in care during 2018 and that the number of patients retained in care has

increased. This provides evidence that improved access to expanded service capacity is helping more people affected by the opioid epidemic.

These two years of analysis also provide information to address one of the other objectives: identify the gaps along the continuum where engagement in treatment declines. The first gap to examine was the gap between the estimated number of opioid use disorder, opioid misuse, or opioid poisoning in Denver County versus those identified with opioid use disorder, opioid misuse, or opioid poisoning at Denver Health. The 2017 gap was 41.2% (6688-3930/6688) and the 2018 gap was 34.5% (7010-4593/7010). This indicates that an increasing proportion of the county's population with opioid use problems are finding their way into the Denver Health System, hopefully, in part, because of a welcoming treatment system.

The next gap to evaluate was the gap between Denver Health patients identified with opioid use issues versus those receiving MAT. In 2017 the gap was 64.6% (3930-1392/3930) and in 2018 the gap was 62.0% (4593-1747/4593). This is also a positive trend showing that the gap is decreasing, which suggests more individuals are being referred and engaging in treatment.

The third gap evaluated was the number receiving MAT versus those continuing to receive MAT after 90 days. In 2017 the gap was 32.5% (1392-939/1392) versus the 2018 gap of 41.4% (1747-1023/1747). This suggests that there has been a decline in those continuing on treatment. Discussion with OBHS staff and care providers in the emergency psychiatric department identified that one contributor to this decline was referring patients to treatment facilities outside the Denver Health system when those facilities were more convenient for patients, which increased in 2018. Since the continuum only currently measures Denver Health treatment, these cases are unaccounted for, illustrating the importance of extending the continuum of care model from a single isolated health system to data from across the entire referral network. Efforts are being made to pursue data sharing with these outside treatment facilities to better represent accurate retention in care metrics for those being referred elsewhere. Information is currently being extracted on who were referred to outside organizations but getting information on care retention at these facilities is not currently possible.

The final gap evaluated is the number receiving MAT versus those being retained in care and receiving MAT after one year. The 2017 gap is 53.1% (1392-653/1392) and the gap in 2018 is 60.4% (1747-692/1747). This decline is similar to the previous gap and can be explained by the significant number of referrals to outside treatment facilities during 2018.

The opioid continuum of care model has been extremely useful in identifying the success of enrolling patients into care and their retention in care over time. This model has been presented at the highest levels of Denver Health leadership and is a key tool for measuring and evaluating the effectiveness of the opioid treatment services.

Another evaluation activity once the continuum of care model was established was to look at newly identified patients with OUD. The 2017 and 2018 numbers represented earlier included patients who may have had OUD for a number of years. An evaluation was conducted to identify only patients who have no previous history of OUD and develop a continuum of care model for that population. The programs were modified to review the past medical history of patients to identify only those who were newly identified during the time period of January – June 2018. The continuum of care model was then calculated for this unique population. The results show:

Identified opioid use disorder, opioid misuse, or opioid poisoning at Denver Health	907
Received medication assisted treatment at Denver Health	218
Retained in care for greater than or equal 90 days of MAT	116
Retained in care for greater than or equal one year of MAT	50

This version of the model will help identify if newly diagnosed patients with OUD are being referred and engaged in treatment more often and if their retention in care is improving over time. It will also provide information about whether the number of newly identified patients with OUD is increasing or decreasing over time.

## Sustainability

Sustainability is determined by the availability of adequate resources. In addition, the practice should be designed so that the stakeholders are invested in its maintenance and to ensure it is sustained after initial development (NACCHO acknowledges that fiscal challenges may limit the feasibility of a practice's continuation.)

- Lessons learned in relation to practice.
- Lessons learned in relation to partner collaboration. (if applicable)
- Did you do a cost/benefit analysis? If so, describe.
- Is there sufficient stakeholder commitment to sustain the practice?
  - Describe sustainability plans.



Please enter the sustainability of your practice : \*

The business analysis, creating and validating definitions, and developing and refining the programs for extracting and merging data from the EHR and other data sources were the most labor intensive and time consuming activities. With those foundational activities completed, the resources needed to generate the opioid continuum of care model for different time periods are fairly minimal. The main additional maintenance that may be required in the future is if the forms or templates being used for opioid treatment are modified within the EHR. Presently one of the strategic objectives of the Knowledge Management team is to continue the standardization of EHR documentation practices across all of the practice areas: emergency department, inpatient, and outpatient services. This standardization will continue to improve data accuracy and less reliance on word searches of provider notes will be needed in identifying patients with OUD.

One of the most significant lessons learned was the realization of how understated the number of patients with opioid use issues by only using the ICD-10 codes. Without taking the effort to diligently explore and understanding EHR documentation practices by the various clinical settings, a significant portion of the patients with OUD would have been missed. The collaboration between DPH and the providers within the various clinical settings within Denver Health was extremely valuable in developing a tool and model that accurately portrays the opioid issues with this patient population.

Another lesson learned was that developing relationships with other departments such as OBHS and the paramedic division, resulted in benefits for all. DPH became a key partner with the OBHS department when the Denver Health organization initiated the Center for Addiction Medicine. The initial steps in seeking a better understanding of OUD treatment by the OBHS department has led to a strong working relationship between DPH and the OBHS department. Each team recognizes the strengths of the other team and together many accomplishments have been achieved. The informatics and evaluation strengths contributed by DPH are now a key strategic component for addressing substance use disorder throughout the entire Denver Health organization and the Center for Addiction Medicine.

There is strong support for sustaining and expanding the continuum of care model. DPH and Denver Health desire to utilize this model for performance assessment of the Center for Addiction Medicine, as well as to assess the care burden and treatment effectiveness for several substances besides opioids. The CEO and executive leadership of Denver Health are extremely supportive of the Center for Addiction Medicine and the role that DPH has in providing informatics, evaluation, and research leadership to enhance patient care and long-term retention in care for various substance use disorders.

In addition to some financial support from Denver Health, a number of grants related to opioid use disorder treatment are being realized which also support this effort and the expansion of services to other populations. It is anticipated that the informatics and evaluation services supporting the Center for Addiction Medicine will be incrementally increased in the near future through additional grant funding opportunities. The HIV Continuum of Care has helped drive goal-setting (e.g. the 90-90-90 goals) and measurement for local, federal and international care. The opioid continuum stands prepared to do the same once generalizable, generic and measurable components can be validated across multiple systems and communities.

Additionally, as DPH supports the Knowledge Management strategic initiatives of the Center for Addiction Medicine, there are plans to enhance the continuum of care model so that various care service areas (emergency department, inpatient, and outpatient) can see how patients who initiated care in those areas are now progressing through retention in care efforts. There is also a registry of patients with opioid use issues being developed by the Denver Health information technology department which will then be leveraged to provide more real-time feedback to providers about patients so that appropriate care and treatment can be coordinated throughout the organization. The foundation of that registry was established through the definitions and criteria developed by DPH for the opioid continuum of care model. Stakeholders throughout Denver Health and Denver Public Health are very committed to supporting these efforts and utilizing them to improving patient care and patient outcomes.

## Additional Information

How did you hear about the Model Practices Program?: \*

- |   |   |  |  |   |
|---|---|--|--|---|
| <input checked="" type="checkbox"/> I am a previous Model Practices applicant           | <input type="checkbox"/> At a NACCHO conference | <input type="checkbox"/> Colleague in my LHD | <input type="checkbox"/> Colleague from another public health agency | <input type="checkbox"/> E-Mail from NACCHO |
| <input type="checkbox"/> NACCHO Publication (Connect, Exchange, Public Health Dispatch) | <input type="checkbox"/> NACCHO Website         |  |  |   |

Have you applied for Model Practices before?: \*

- ☐ No, this is my first time applying.    ☒ Yes, I have applied in the past.

If you answered yes to the question above, please let us know the year and award type. :

2008 Model Practice - STD Electronic Messaging and Lab Reporting, 2006 Model Practice - Clinical Information System (HealthDoc)

