



UTAH DEPARTMENT OF COMMERCE

Division of Professional Licensing

UTAH PDMP OVERVIEW FINAL REPORT

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ENVIRONMENTAL SCAN

OVERVIEW

Nationally all fifty states and many of the American territories have some form of Prescription Drug Monitoring Program (PDMP). Where a PDMP is present there are laws or rules that require pharmacies to submit prescription information for substances that are considered higher risk for addiction or potential for abuse. All PDMPs nationally are housed digitally on some form of software platform or combination of software packages that allow for the reception, storage, and sharing of medication data. The vast majority of PDMPs use Bamboo, a software vendor that specializes in PDMP functionality. There are a small number of PDMPs who have developed their own proprietary software with which to run their databases. Utah is one of those states that has developed their own and is referred to as the Controlled Substance Database (CSD). Additionally, there are vendors who specialize in assisting non-Bamboo PDMPs to connect and share data with each other and with customers in their own states. RxCheck is one such vendor who is sponsored by the Bureau of Justice Administration.

Currently the CSD has two key components: 1. The data repository that gathers and cleans the data from the pharmacies and 2. The user interface dashboard which presents the information to the healthcare workers. The data repository is an Oracle database stored in an AWS cloud platform.

An initial needs assessment was completed in 2019 with participants primarily from Intermountain and the University of Utah Healthcare systems. This report provided an analysis of what was working well and what could be improved in the system at the time. Additionally, in May of 2021 an Academic Detailing Performance Evaluation Report was also completed that examined low utilizers of the CSD and what could be done to improve their low usage rates. Since the release of these reports, many of the points identified have been corrected through improvement of the system and addition of new functionality.

Another feature of the CSD that has recently increased in use is accessing data directly from the database via an EMR-CSD connection. This connection type makes integrating querying the CSD into clinical workflow much easier thereby saving physician time and increasing access to the database. Though the direct connection decreases the number of clicks to gain access to CSD data, it does not provide all the information available via the CSD portal including drug conviction information, clinical decision support tools, medical examiner information, and overdose information. A healthcare provider can create this connection in one of three ways: 1) building a customized connection either in-house or by outsourcing the work, 2) working with RxCheck to connect to their hub, or 3) working with Bamboo Health to build access to their PMP Gateway.

PURPOSE

Using funding from a Bureau of Justice Assistance (BJA) grant, this report was requested to gather information about the features and types of data used by other PDMPs nationally, determine how Utah compared with them and provide a list of features and data points Utah could work to develop or acquire in the near future. This report is to provide recommendations on whether in-house development or outsourcing responsibilities to a vendor would be preferable, based on community needs and Utah culture. Finally, it is intended to investigate the use of integrated connections to the CSD and users current level of satisfaction with those connections.

METHODS

INFORMATION GATHERING

Information and data were gathered from multiple sources to develop a complete picture of the environment surrounding the PDMP both nationally and locally. The data sources were primarily web based and focused on national PDMP organizations, grant funding organizations, and state's Department of Health, PDMP, and Health Information Exchange (HIE) websites when applicable. The data gathered was then used to supplement or verify information gathered through interviews and questionnaires as described below.

PDMP ADMINISTRATORS

INITIAL CONTACT

An initial list of contacts from various PDMPs nationally was obtained from the PDMP Training and Technical Assistance Center (TTAC) website along with their email addresses. All PDMP administrators were divided into three groups based on their vendor and geographic location:

1. Bamboo customers who lived in neighboring states or had customized features in some way. (special circumstances)
2. Bamboo customers with no extraordinary qualifications.
3. All PDMPs who either had their own solution or had another vendor other than Bamboo.

A form email requesting time for a one-on-one interview was sent to all non-Bamboo customers and Bamboo customers with special circumstances from the first group. For those Bamboo customers with no extraordinary qualifications, a form email was sent asking them to complete a short questionnaire about the types of data they were collecting, and which data points they required. They were also asked to indicate any data points they were preparing to collect.

INTERVIEWS

All interviews were conducted via Zoom and recorded for transcription and coding purposes. The following questions were consistently used in every interview:

1. What is the healthcare dynamic in the state? (i.e., one main system, multiple systems, etc.)
2. What are the laws regarding controlled substances? Require PDMP reporting? Must physicians review before prescribing?
3. Why did you choose the vendor you selected?
4. How pleased are you with your current vendor?
 - a. Any complaints from users?
 - b. Do you feel like you are valued?
 - c. How quickly do they respond to feature requests or complaints?
 - d. Any issues (uptime, security, identity resolution, etc.)?
5. How was the contracting process (difficulty, length of time, any surprises)?
6. How was the implementation process (difficulty, length of time, roadblocks)?
7. How is receiving data from pharmacies? (difficulty of building new connections? any issues cleaning up data? how much automation vs manual intervention is there in the process?)

8. Which of the following are part of your feature set:
 - a. Morphine Equivalence
 - b. MPI partial name matching/searchability
 - c. Proxies?
 - d. Analytics
 - e. Auditing (Proactive?)
 - f. Data governance
 - g. Additional Information (urine, criminal records, pain contracts)?
 - h. Other medication sources (cannabis, marijuana, naloxone, vet, etc.)?
 - i. Comments on the user interface?
9. Direct connections
 - a. How many
 - b. What type (FHIR, PIQ, etc.)
 - c. Does data persist in the EHR after the query is complete?
 - d. What does the document look like on their side?
 - e. What is the cost per connection?
 - f. How often are direct connections used by clinicians? Do they increase the number of queries to the PDMP databases?
 - g. Can you accept proxies?
10. Do you have the ability to access data from other states? How much does it cost to acquire that data connection?
11. Data governance:
 - a. How difficult is it to access your data for other uses outside the platform?
 - b. How difficult is it to retrieve your data and move to another vendor or develop your own?
12. Anything you would like to change and/or improve with your system or your customer support?
13. Would you recommend them as a vendor?
14. What sort of grants have you received? How have they been used?

INTERVIEW CODING

After each interview was completed, the recording and the transcription were analyzed and coded for specific recurring themes. Any information about feature sets, data points, or analyses were highlighted for future exploration. During the coding process, if any gaps in information were discovered that were present in other interviews, the interviewee from the PDMP was contacted via email for clarification.

QUESTIONNAIRES

The focus of the questionnaires sent to Bamboo customers who did not participate in interviews was to gain a better understanding of the functionality their community was using from the Bamboo feature set. They were asked to indicate which features were most frequently utilized of those that were available in the Bamboo platform. The form used for the questionnaire can be found in Appendix A.

UTAH INTEGRATED EHR CONNECTIONS

The second group interviewed were users who resided in Utah and used a connection to the Utah CSD that was integrated directly into their EHR. The following sections discuss how information was obtained from them through interviews and questionnaires similar to those outlined above.

INITIAL CONTACT

Initial contact was made with all members of the technical support contact list provided by the CSD staff via email. Initially four sites responded and agreed to participate in an interview and two declined to participate. After completing the interviews, it was determined that the same information could be gathered via a short questionnaire. All sites who had not responded were then sent the questions via email. Of the remaining group of six, two completed and returned the questionnaire while four did not respond.

Responses	Count
Interviewed	4
Questionnaire	2
Declined	2
No response	4
Total	12

INTERVIEWS

All interviews were conducted via Zoom and recorded for coding purposes. The following questions were used in every interview:

1. How long was the process to connect? Any major obstacles?
2. Are there any statistics or data that is being tracked?
3. Have you been able to measure if there's been an increase in usage?
4. Were there any security or privacy concerns you encountered? Have there been any issues?
5. Has there been any training to your providers on how to use the new connection through the EMR? Any announcements or advertising?
6. Have you received any feedback from physicians or nurses who have used the connection? Have you received any complaints or celebrations? Have you received any feature requests?
7. Did you use the CSD portal through the website previously? What are the pros and cons to switching?
8. Are you having any patient identity resolution or Master Patient Index data quality issues?

INTERVIEW CODING

After the interview was completed the recording and the transcription were analyzed and coded for specific recurring themes. No further contact with interviewees was required for clarification.

QUESTIONNAIRES

After completing the initial four interviews, it was determined that certain questions could be dropped because of the consistency and manner in which they were answered during the interviews (questions three and four from the list above were removed). The following questions were sent to the remaining six participants:

1. How long did it take you to build the connection from the EHR to the CSD?
2. Were there any big obstacles or delays?
3. What kind of training was done for the users?
4. Are the users pleased with the connection? Any complaints? Any compliments?
5. Are there any requests for specific features or desired information not currently present?

6. How often is the system down?
7. How often does the system report that no records can be found?
8. Are you auditing or monitoring access to the CSD?

RESULTS

ENVIRONMENTAL OVERVIEW

LAWS AND REGULATIONS

The following guidelines, laws, and rules were gathered from interviews with PDMP administrators and from state government websites. Below is an outline how often pharmacies are required to report dispensing medications and how often prescribers are required to check the PDMP.

1. All states require pharmacy reporting.
 - a. Most within 2 business days
 - b. Some nightly
 - c. Shortest time is within 2 hours
2. Most states require the physician to check the PDMP before prescribing:
 - a. Previous to initial prescription
 - b. Before refill prescriptions at various intervals:
 - i. Every prescription
 - ii. 30 days
 - iii. 60 days
 - iv. 90 days
 - v. 180 days

PDMP ENGAGEMENT

There are three different levels of engagement displayed by PDMPs that govern how forward thinking they are with adding new features or data types. Some PDMPs are happy to work with the features they have as long as they meet the requirements of state and national regulations. Conversely, other PDMPs push to have features and datatypes that keep them at the forefront of technology. Typically, the level of engagement determines whether the PDMP builds their own solution or purchases an out of the box solution and if purchased how closely they work with their vendor in development. PDMPs can generally be clustered into three general groups:

1. Out of the box is sufficient: PDMPs who purchased the software and used the features they had purchased without requesting new features.
2. Out of the box with additional features: PDMPs who purchased the software but actively engaged with the vendor to add new features.
3. Need flexibility and freedom: PDMPs who value the freedom of developing features according to their own time-line and priorities.

VENDORS

There are primarily three vendors currently in the PDMP space who actively pursue new customers:

- a. Bamboo – Vendor which has been around the longest and holds 90% of the market share.

- b. Logicoy – Vendor who initially was focused on helping clinics and hospitals get connected to PDMPs but recently has begun selling their own PDMP platform. They currently have one customer.
- c. LeapOrbit – This company developed the RxGov tool that the CSD uses to import controlled substance files from the pharmacies. They have recently undergone an ownership realignment, which has greatly improved their customer satisfaction. They currently have two customers in the United States and one in Canada.

CONNECTIVITY

INTERSTATE

There are two hubs through which to connect to other PDMPs across state borders and share medication information via a query pull of data: PMP Interconnect Hub (PMPi) and RxCheck Hub. PMPi is managed by Bamboo Health. Of the 49 states that have interstate connections (CA has no interstate connections), 46 are connected to at least one other state via the PMPi Hub (NE and CA, plus MO due to their new law which doesn't allow for interstate data sharing). The RxCheck Hub is owned and managed by Bureau of Justice Administration and of the 49 states that have interstate connections 35 have at least one connection via the RxCheck Hub.

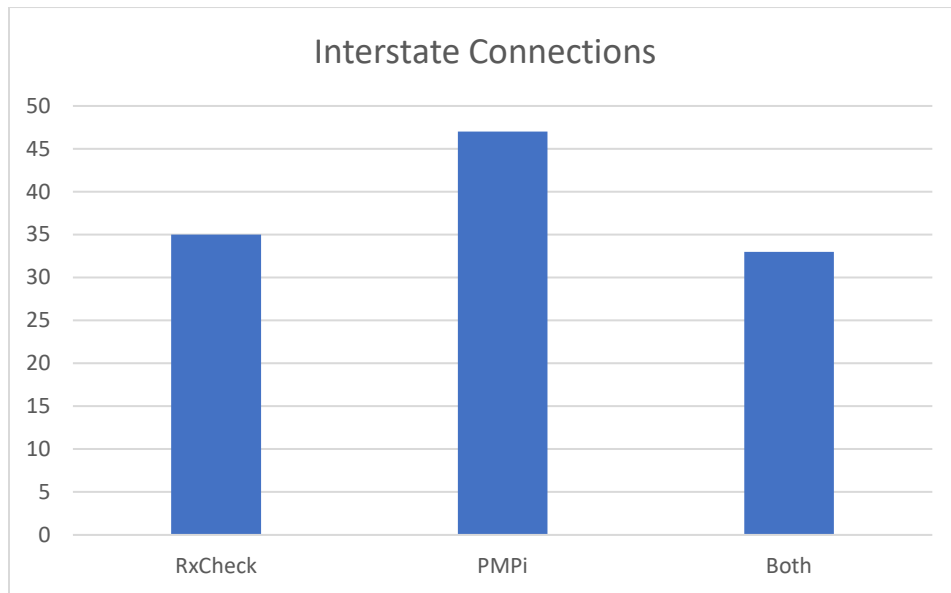


Figure 1 - The number of connections by type nationally. 35 states have an RxCheck connection; 47 states have a PMPi connection; and 32 states have both types of connections.

EHR INTEGRATION

Nationally, PDMPs report that integration has increased usage to the point of being the primary form of retrieving information from the system. Even for states where the minority of physicians have access through their EHR, the vast majority of queries are made via the direct connection with some states reporting a ten-fold difference. The following graph shows the number of states by percentage range for number of integrated connections in their state.

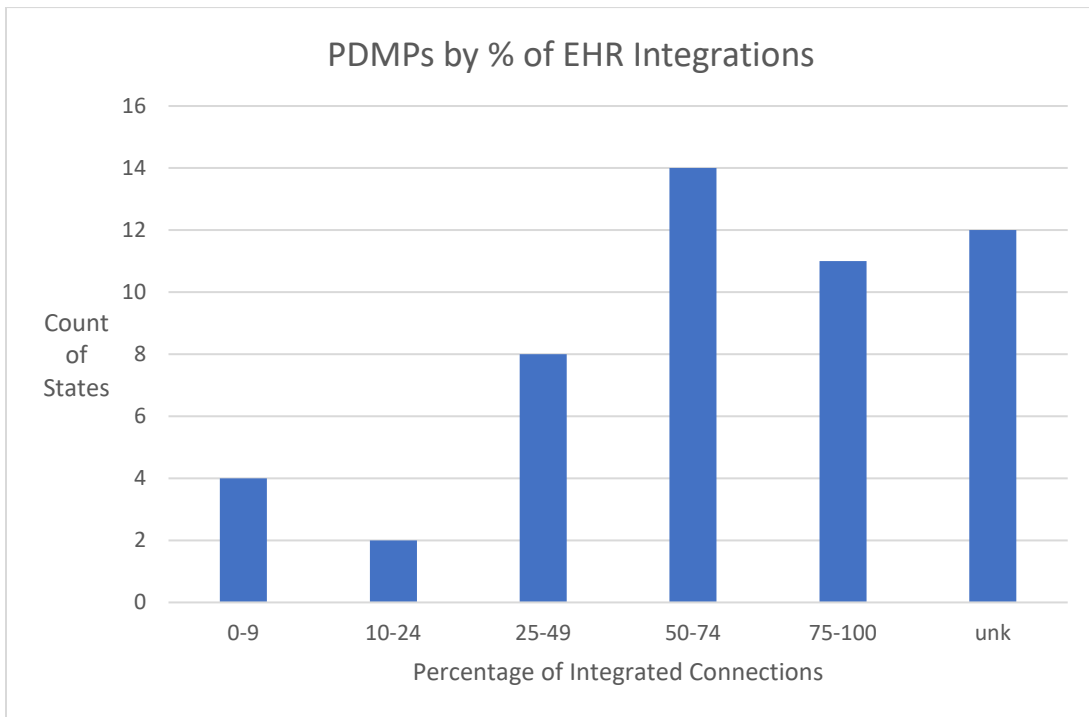


Figure 2 - This graph represents the number of PDMPs that fall within certain ranges of percentages of EHR integrations. For example, there are 4 PDMPs that have between 0 and 9 percent of their clinics integrated with the PDMP via the EHR.

Utah PDMP has integrated connections with numerous health systems throughout the state. All systems have reported increased usage of the PDMP through the integrated EHR connection in comparison to how frequently records were accessed only through the online portal. Of the six sites who were interviewed or responded to the questionnaire, five indicated they were very pleased with the integrated connection and all comments they had received from physicians were positive. When asked about the length of the integration process, only one of the six could remember how long the process took to implement the connection but all others made statements like: “I don’t remember it taking too long at all.” When asked about additional requested features, three sites reported a desire to access interstate records through the integrated connection and one identified that feature as being “critical” to the success of the connection.

Downtime of the system was another topic covered in the discussion. All sites reported it had been about the same as when they used only the portal, except one site reported an issue that had been resolved but it had taken an unexpectedly long time to do so. One site mentioned being aware of some identity resolution issues, but did not have an estimate of the severity of the issue.

HEALTH INFORMATION EXCHANGES

A Health Information Exchange (HIE) is an entity that builds connections with clinics and hospitals with the purpose of collecting and/or sharing medical data for use in medical care and administrative healthcare needs. Nationally, 33 states report having at least one HIE. Of the states that have an HIE, thirteen are connected to query and retrieve information from the state PDMP. Among the thirteen there are two PDMPs that are partnered with their HIE to

develop a method where a single query from an EHR will gather information from the HIE and the PDMP simultaneously and present it in a single view to the querying healthcare provider.

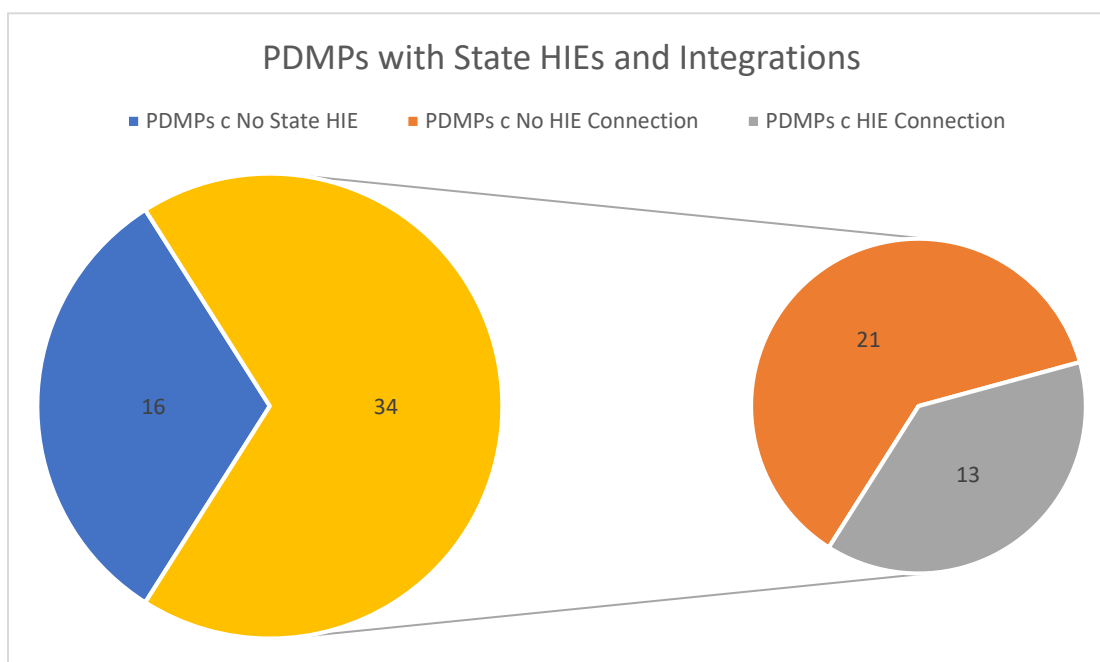


Figure 3 - Of the 50 states there are 34 that have an HIE; of those there are 21 that don't have a connection to the PDMP and 13 that do.

For those PDMPs connected to the HIEs, two saw an increase in the number of queries to the system. Both of these PDMPs partnered with the HIE to simultaneously query both systems via an application within the EHR. For all the other states the benefit of connecting the PDMP to the HIE was primarily to increase usage of the HIE. In WA, the state mandated that all integrated connections go through the HIE to the PDMP in an effort to increase HIE adoption. This required a complex architecture with multiple intermediaries to complete the connections. State auditing rules requiring querying physicians be identified and recorded had to be relaxed because the HIE could only report the location the query was coming from not the individual performing the query. The HIE mandate has since been revoked and Washington has begun making direct integrated connections.

DATA

Demographic Data and Identity Matching

A variety of demographic data is collected about the patient to ensure proper identity matching. There are a small number of PDMPs that only collect name, DOB, and gender and base all associations on those three data points. Across all PDMPs there are primarily two methods of identity resolution: Matching algorithms on entry and pick-list on exit. Matching algorithms use either probabilistic or deterministic matching algorithms to associate different records under a common identity based on some proprietary algorithm. When records are retrieved in this method, demographic information is entered and all records previously associated with the identity that matches the search criteria will be returned. In the Pick-list method, when information is retrieved from the system a list of records is provided and the user has the ability to select multiple records to view.

There have been no studies on the comparative accuracy of one method of identity resolution over the other. Because of the large number of PDMPs using Bamboo, most use the algorithm method. In all but a couple instances,

direct EHR integration feeds use the matching algorithm method also. The two exceptions in Utah use a new interoperability standard called Fast Healthcare Interoperability Resource (FHIR) whose technology allows the user to utilize the pick list option when selecting records to view.

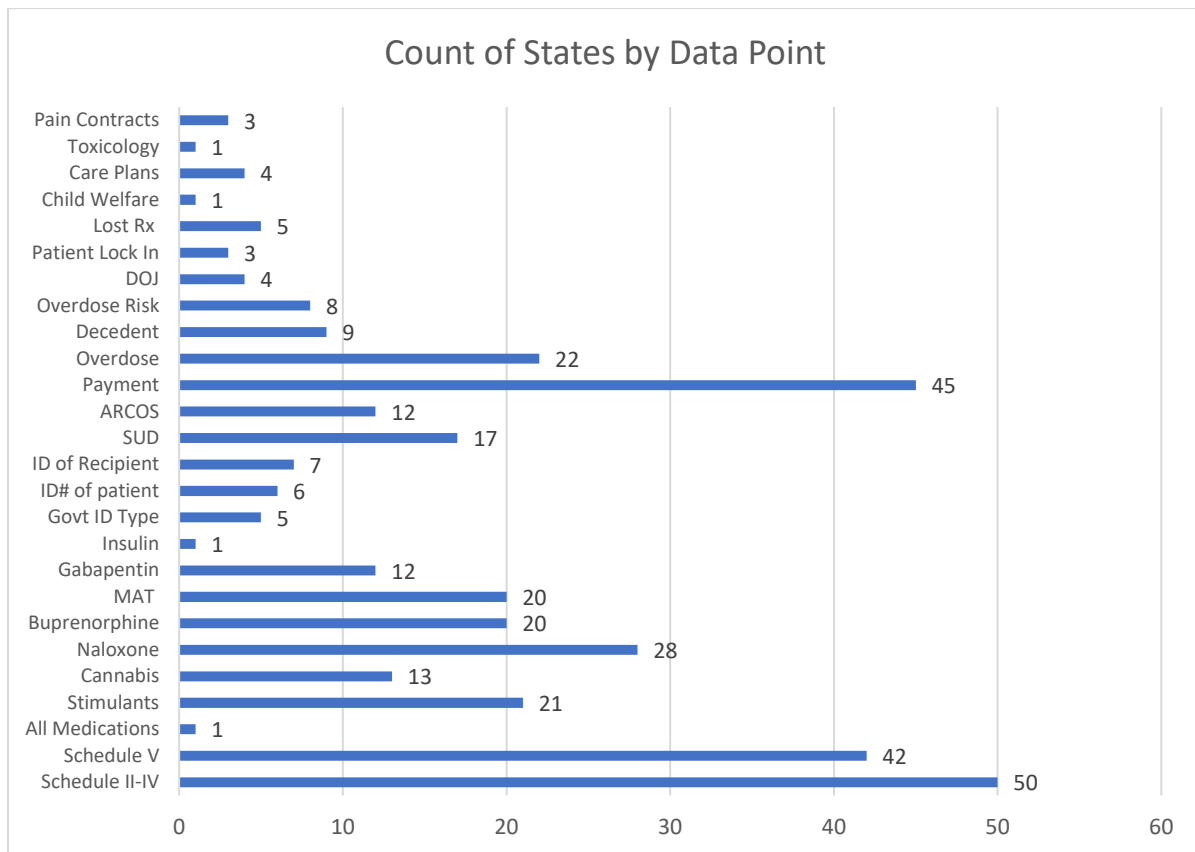
Data Quality Issues

All interviewees were asked specifically about any recurring data quality issues. All responses were surprisingly homogenous. They described data errors as being one of four types:

1. Incoming data not matching the required standard but was fixed before making it to the system.
2. Incoming data matching required standard, but errors still enter the system and upon discovery must be removed and the feed fixed.
3. Data completeness: Missing records that the physician “knows” are supposed to be in the system but can’t be found. More commonly reported in EHR integration searches.
4. Identity resolution issues that inaccurately associate two records or fail to match multiple records to the same individual.

PREVALENCE OF DATA TYPES

The following chart lists all the data types collected by all PDMPs nationally along with the count of PDMPs who have that data available. The definitions for each of the data types are listed in the following section below.



DATA POINT DEFINITIONS

All Medications: The PDMP receives all medications filled by the pharmacy regardless of schedule

ARCOS: data collection system in which manufacturers and distributors report their controlled substances transactions to the Drug Enforcement Administration (DEA)

Buprenorphine: The PDMP receives information about prescriptions for the medication Buprenorphine typically used in the treatment of opioid addiction.

Cannabis: In most instances this indicates the PDMP has information about a patient's cannabis card but in some states, it indicates cannabis prescriptions filled. The separation is unclear.

Care Plans: The PDMP has the physician treatment plans uploaded to the PDMP database, but they aren't necessarily required to be sent.

Child Welfare: Provides access to the child of the patient's welfare case reports or to the case reports of the patient if the patient is a minor.

Decedent: Information indicating if the patient is deceased and any overdose information if pertinent.

Department of Justice (DOJ): Any records or link to records regarding a patient's criminal record including all drug court documentation when available.

Gabapentin: The PDMP receives information about Gabapentin (Neurontin) prescriptions

Govt ID Type: Some states require the use of an official government ID to receive medications.

ID of Recipient: ID number of the individual picking up the medications from the pharmacy which is required to report to PDMPs in some states.

ID# of Patient: Some states require a Driver's License number, Social Security Number, or other identifying number to be sent to the PDMP.

Insulin: Pharmacies are required to send information about Insulin prescriptions

Lost Rx: When a patient loses a controlled substance prescription or medication, they are required to report that to their physician or the pharmacy which then reports it to the PDMP.

MAT: Medication Assisted Therapy. Typically, Buprenorphine is the treatment for Opioid addiction.

Naloxone: Used for the treatment of opioid overdoses. Some states record this information as Naloxone use while others record it as Naloxone prescription filled.

Overdose Risk: A calculation to determine the risk of a patient overdosing based on their attributes and medication profile.

Overdose: Whether a patient had a fatal or non-fatal overdose of opioids.

Pain Contracts: When a patient is in a care relationship with a provider for chronic pain, they will often sign a pain contract that indicates where they can receive care and medications. These are shared with the PDMP in some states.

Patient Lock In: A patient can be restricted to using one pharmacy usually by a Payer, but it can also be done by a physician. In the PDMP this indicates which pharmacy a patient is restricted to.

Payment: How the patient paid for the prescription (e.g., cash, insurance, credit card, etc.) is sent to the PDMP.

Scheduled III – V: Medications whose use and distribution are tightly controlled because of their abuse potential or risk.

Stimulants: Medications that stimulate the Central Nervous System (e.g., Adderall, Ritalin, etc.) The vast majority are scheduled medications.

SUD: Substance Use Disorder treatment information is shared with the PDMP.

Toxicology: Reports on the measure of drugs in urine or blood of a patient shared with the PDMP.

VETERINARIAN PRESCRIPTION DATA

Veterinarians have the authority to prescribe controlled substances for animals. This information is managed by PDMPs in three different ways:

1. **Required:** In states where the vet and the pharmacy are required to report filled pet prescriptions the pet is tracked by owner’s name, pet name, and owners DOB and their information is part of the owners PDMP record.
2. **Displayed:** Where vets are not required to report, the pharmacy will still send pet-controlled substance information with all the other controlled substance filled prescriptions. The PDMP then associates it with the owners record and indicates the information is available with a pet icon on the dashboard.
3. **Clutter:** In other states that vets are not required to send prescription data, the pharmacy send the information with the other filled prescriptions, but it is not associated with the patients record and becomes clutter in the system or accidentally gets associated with the owners record as being their medication. Which path the data follows depends on how it is recorded by the sending pharmacy.

This figure shows the breakdown of the number of PDMPs from each group type:

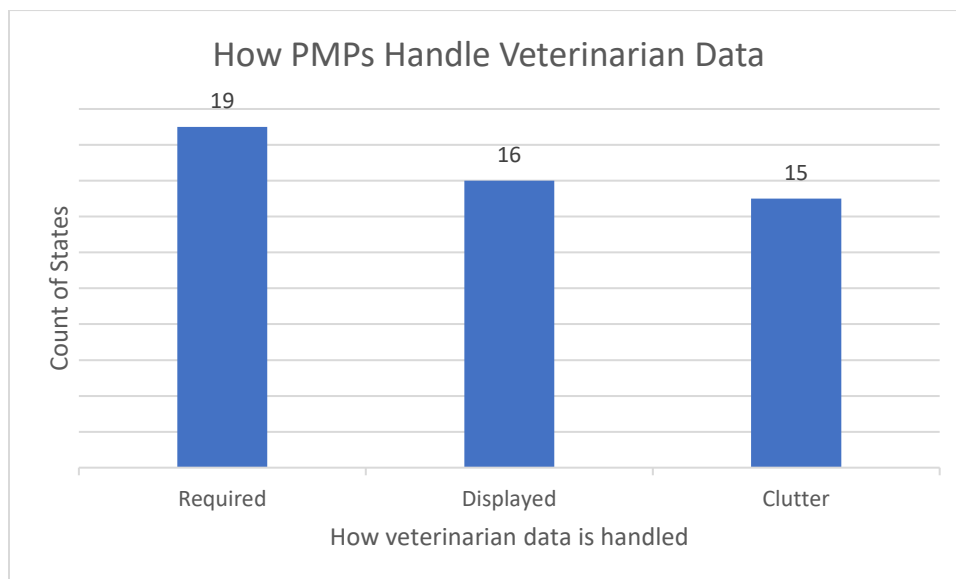


Figure 4 - Veterinarian data is handled by PDMPs in three ways: Required: the state requires vets to report controlled substances; Displayed: PDMPs receive vet controlled substance data and make that data available; Clutter: a PDMP doesn't make data available

DASHBOARDS

The following tables list the different charts or analyses available on dashboards of other PDMPs throughout the country. The column heading at the top of each table is the genre of dashboards where the information is typically found. Dashboards are found online either within the PDMP platform or on a separate page that can be accessed by the specific user. Prescriber dashboards are specifically designed for clinicians and their proxies. Pharmacist dashboards are designed for pharmacists to be used along side medication filling software in the pharmacy. Pharmacy submission dashboards are used to track file submissions from the pharmacy to the PDMP. PDMP dashboards are administrative dashboards to track connections between PDMPs and facilities and PDMPs and other connections across state borders.

Prescriber Dashboards
MME Calculations
Overdose Risk Score
Drug Overlap Warning
5/5/6 Alert
Drug Combo Warning
Multiple Provider Reports
Number of PDMP Queries in last 2 days
Days Prescription Held Trend
Buprenorphine Equivalents
Lorazepam Equivalents
Possible Aliases
Instant Message with other MDs
Instant Message with Pharmacists

Pharmacist Dashboards
MME Calculations
Overdose Risk Score
Drug Overlap Warning
5/5/6 Alert
Drug Combo Warning
Multiple Provider Reports
Number of PDMP Queries in last 2 days
Days Prescription Held Trend
Buprenorphine Equivalent
Lorazepam Equivalent
Possible Aliases
Instant Message with other MDs
Instant Message with Pharmacists

Pharmacy Submission Dashboards
Avg number of submissions
Number of errors and error rate
Data Errors corrected
Errors by error type
Current status of previous submissions
Data Quality Score Benchmarked
Outstanding Submissions
Avg time to submission
Warnings by pharmacy

PDMP Dashboards
Failed Queries
Connection Up-times
Successful Queries
Interstate Queries
Data Errors
Portal Queries by facility
New vs. Refill
Prescribers by specialty
Dispensers by License Type
Prescribers by License Type

REPORTS

The following tables list the analyses and charts available in reports provided by PDMPs. Each column heading identifies the genre or reports intended audience. Reports can be found online, emailed, or printed and delivered through mail or in person. Dispenser reports are sent to pharmacies and prescriber reports are sent to clinicians who use the PDMP. State/County reports can be posted for the public to view and are sent to representatives in government entities that range from elected officials to public health employees.

Dispenser Reports
Pre-dispensation PDMP check
Checks compared to dispensations
5 MD & 5 Rx in 6 months Patients
Average Days Supply
Number days supply over 30
Number of Lock-In Patients
Number of Patients at Risk
Dispensations by payment type
Dosage Units Dispensed
Prescriptions Filled
Prescriptions Filled by class
Prescriptions Filled by Schedule
Risk factor stats over time
At risk pts by risk factor

State/County Reports
Prescriptions Filled
By Schedule
By Class
By Specialties
By Age Group
Medication Trends
Out of State Prescriptions
Out of State Patients
MME/patient trends
Geo-mapping of Prescriptions
Overdoses Over Time
Hospital Admissions for Overdose
Patients in OTP/MAT
Statewide CDC indicators
patients c 5+ rx from 5+ pharms in 6 mos
patients c 90+ MME on avg day
patients with Benzo and Opioid overlap
Queries by region
Queries by Specialty

Prescriber Reports
Average Patient MME
Number of Patients by Class
Average Patient Overdose Risk Score
Number of Patients at Risk
Pre-Prescription PDMP Checks
5 Drs & 5 Rx in 6 months
Prescriptions by Class
Dosage by Class
Dosage by Schedule
Benchmarks against specialty
Benchmarks against region
Benchmark against population type
Number of PDMP Queries
Average Days Supply
Number days supply over 30
Dispensation by payment type
Total Prescriptions Filled
Risk Factor Stats over time
At risk patients by risk factor
List of Proxies
Overlapping Prescription Days
Benzo/Opioid Overlap

DATA EXTRACTION/GOVERNANCE

Certain cases arise where it is beneficial to work with the raw data underlying the PDMP platform. In most instances, this is for additional analysis or epidemiological studies. It is also necessary when switching platforms to have access to the raw data to load the newer system. To accomplish these tasks, all vendor solutions use nightly or weekly extracts that can be used to populate databases or uploaded into analytical/statistical software. Some home-grown platforms provide access to the underlying databases through APIs or ODBC database connections.

FUTURE GROWTH

The following features were mentioned when asked about data points that are being discussed as additions in the future or future trends the interviewee believes will soon have an impact.

FUTURE FEATURES

1. Increased connectivity including
 - a. Incorporation of medical information
 - b. Integrating data from PDMP into Clinical Decision Support tools within the EHR
2. Expansion of cannabis and cannabis card tracking.
3. Wider variety of medications including the possibility of getting all meds for medication reconciliation.
4. Increased/Improved extraction of data for research and epidemiology.

NEEDS REQUIREMENT REVIEW

INTRODUCTION

The purpose of this review is to do an overview of the current state of the CSD, propose areas of future growth, analyze the various paths to arrive at the proposed goals, and provide recommendations on which path to follow. Both the current state and proposed future state analyses will include a review of the staff resources, the available data elements, the platform, and the analytics and reporting tools. Additionally, a risk assessment for the current CSD is included along with suggestions on how those risks can be mitigated through future planning.

After presenting the current state and a possible future state, the final section of this document will analyze two paths to make that move possible. This will be accomplished in three sections: 1. An in-house development analysis, 2. a market analysis report, and 3. a build vs. buy comparison analysis. Based on the information outlined in these three steps, a list of final recommendations will be presented as the concluding section of this document.

CURRENT STATE ANALYSIS

UTAH'S POSITION

Population wise, Utah is slightly below the U.S. median state population number of 4.58 million with 3.27 million according to the 2020 census. As with the population size, the number of prescribers and dispensers are also below the national median. There are 16,389 Utah prescribers compared to the U.S. median of 24,218 and 549 Utah pharmacies compared to the 1,015 national median. See the figures below (outlying states with large populations were removed from the chart to better visualize Utah's relation to other states).

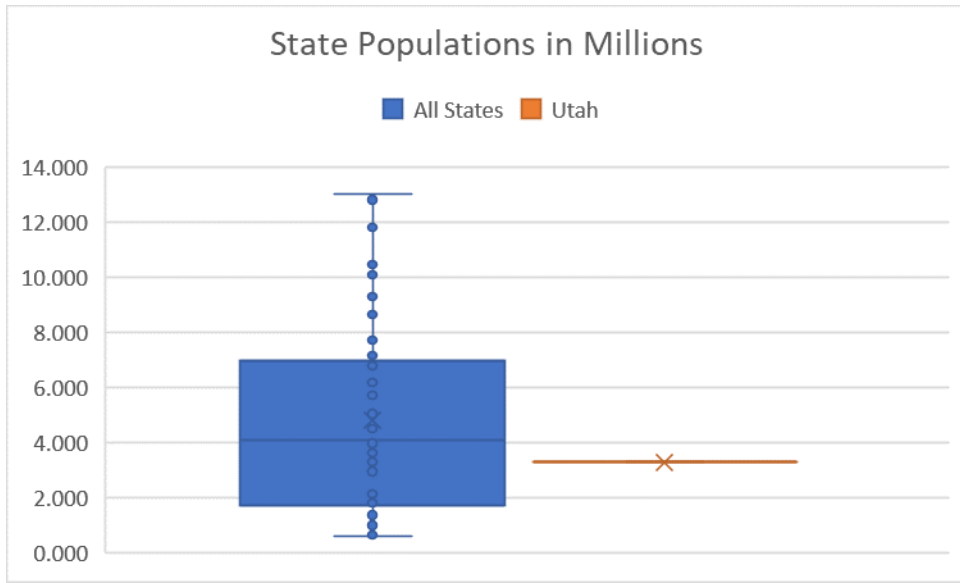


Figure 5 - The population of Utah compared to the other states. Utah falls just below the median for state populations. **Outlying states with large populations were removed from the chart to better visualize Utah's relation to other states.**

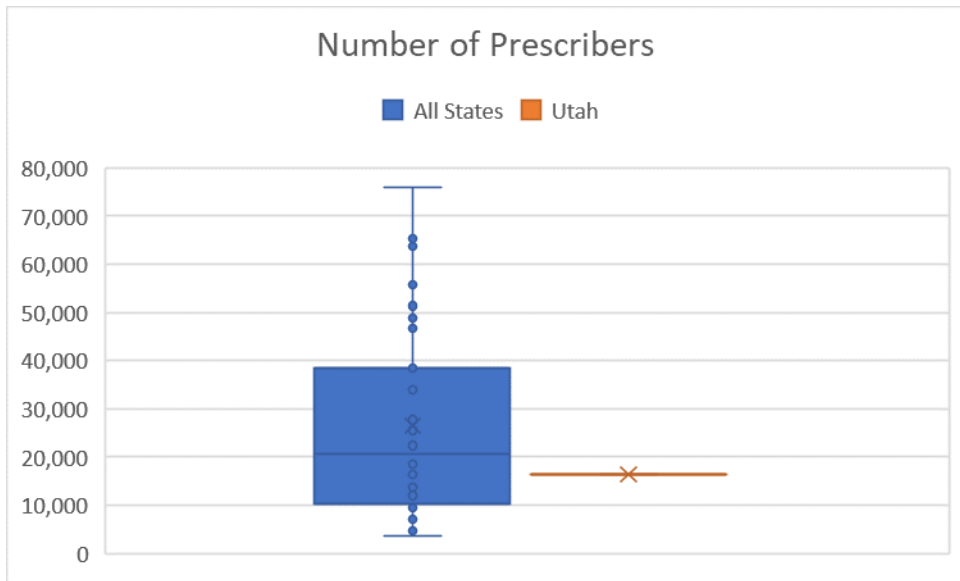


Figure 6 - The number of prescribers in Utah compared to other states. Utah falls below the national median of number of prescribers. **Outlying states with large populations were removed from the chart to better visualize Utah's relation to other states.**

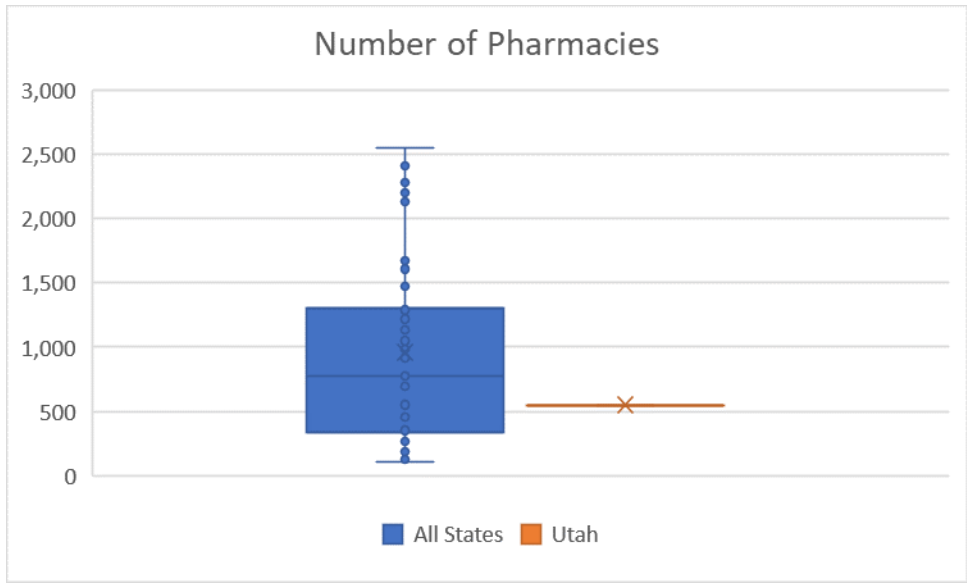


Figure 7 - The number of Utah pharmacies compared with other states. Utah falls below the national median for the number of pharmacies. **Outlying states with large populations were removed from the chart to better visualize Utah's relation to other states.**

CSD TEAM

The CSD team is composed of the following positions:

Organization/Position/Title	Time	Position Type	Funding
D O P L			
Public Health			
Manager II	50%	Analytical	state
Program Specialist III	15%	Analytical	mixed
Program Specialist III	15%	Analytical	grant
CSD Team			
CSD Administrator	100%	Operational	mixed
Office Specialist I	100%	Analytical	state
Office Specialist II	100%	Operational	state
Senior Health Informaticist	100%	Analytical	grant
Program Specialist I	100%	Operational	grant
CSD Analyst	100%	Analytical	mixed
Division of Technology Services – dedicated to work on the CSD			
IT Analyst II	100%	Technical	grant
IT Project Manager	50%	Operational	grant
IT Master Engineer	75%	Technical	grant
Division of Health and Human Services			
Health Program Manager I	10%	Operational	mixed

Six full-time staff places Utah just above the median value of 5.5 employees. For Utah, nine of the staff are primarily operationally focused, two are technical, and three are analytical. For the technical team members about 55% - 60% of their time is spent on maintaining the current system with the remaining 40% - 45% used on the development of new features and functionality. This team is supported by an annual budget of \$1.7 million which is above the national median of \$1.2 million and within the 75th percentile range for budgets nationally.¹ That being said, these numbers are highly suspect due to the grant funding nature of PDMPs nationally. The year-to-year budget variability for a state is in the millions of dollars, so much so that when asked in interviews most administrators were unsure of what their budget was this year. Also, even though budgets are publicly available on the TTAC website, there is no consistent information on how much of that budget includes grants, membership dues, or just state funding. Every PDMP administrator interviewed reported using grant funds as part of their annual budget.

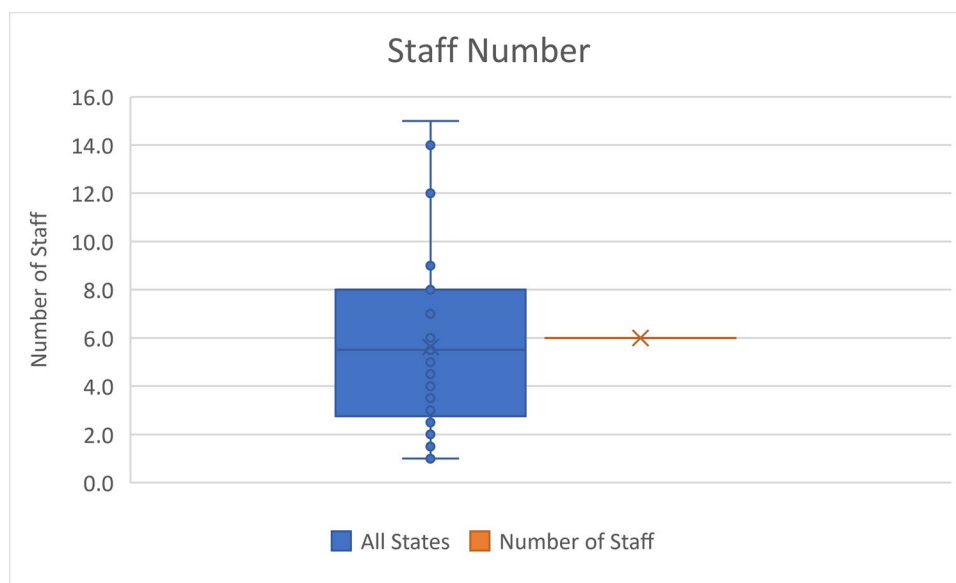


Figure 8 - The number of staff working on the Utah PDMP is slightly higher than the median number nationally.

The amount of work required to run a PDMP is more closely correlated to the number of users of the system (i.e., the number of prescribers in the population). In fact, the rate vendors charge for licensing their software is based on the number of prescribers covered by the PDMP. As with the budget vs the state population, in Utah the count of staff members compared to the number of prescribers in the state is slightly above the mean line but well within the national grouping range and isn't an outlier.

¹ This chart doesn't include CA, IL, KY, LA, MD, MI, MN, and NY.

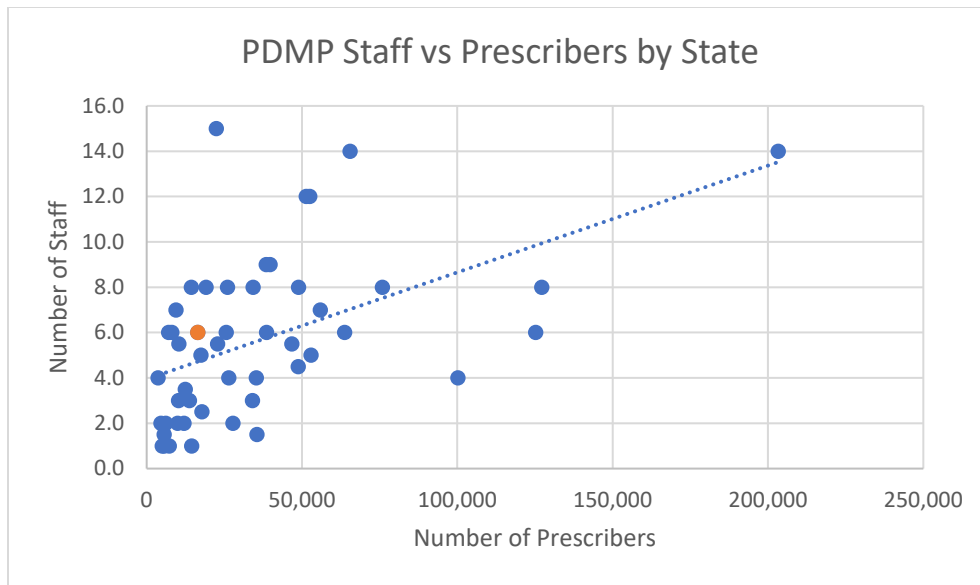


Figure 9 - The number of staff for PDMPs nationally relative to the number of prescribers in the state.

Even though Utah’s budget is slightly higher than the median and the population is below the national median, the budget-to-population ratio is only slightly above what is predicted and well within the cluster of grouping for all states. As mentioned previously, because of the unreliability in PDMP budget data and budget variability from year to year due to grant awards, any ratio that fell within two standard deviations of the trend line would be considered average.

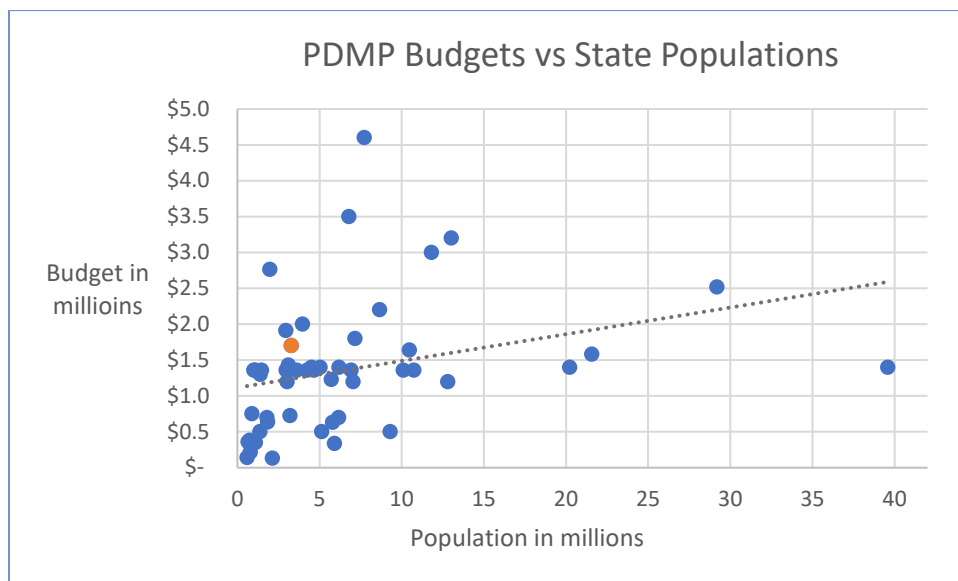


Figure 10 - The PDMP budgets in millions of dollars relative to the population of the state in millions. Comparing Utah in orange with all other PDMPs nationally.

DATA POINTS

Currently the Utah CSD collects the following data points from pharmacies and shares them with prescribers:

1. Demographic data (name, dob, address, etc.)
2. Schedule II – V medication information (name, dosage, frequency, etc.)
3. Gabapentin prescriptions
4. Veterinarian prescriptions*
5. Prescribing physician
6. Pharmacy filled information

*Veterinarian prescriptions are only collected if they are filled at a pharmacy not if they are filled at a veterinary clinic or hospital.

The CSD also has the ability to receive or access the following data points from data sources other than pharmacies:

1. Cannabis card holder information
2. Patient drug related court or arrest information
3. Overdose hospitalization and emergency information
4. Overdose death information

DATA QUALITY

PRESCRIPTION INFORMATION ACCURACY

The quality of the data in the CSD is currently verified in two different cases. The first is when a data source, usually a pharmacy, is initially connected and goes through the onboarding process. Strict adherence to the American Society for Automation in Pharmacy (ASAP) standard along with completing a list of data quality verification steps is required before a feed is added to production data repositories. The second verification process occurs when CSD users report, via email or a phone call to the CSD office, that specific information is missing from the system. In these instances, a review of all the data associated with the complaint is investigated and any errors are corrected. In the vast majority of cases, the complaint is unable to be verified and the quality of the data is verified. In some instances, the missing information may not have arrived from the pharmacy at the time of the query but is present upon review.

IDENTITY DISAMBIGUATION

Another data quality issue involves the resolution of patient identities. Currently, the CSD does not have a technology of its own (i.e., a Master Patient Index or MPI) that associates different identities with a specific individual. It does connect with the Utah Department of Health Master Patient Index (DOHMPI) to assist in identity resolution, but this is only used for population health reporting and epidemiology. Conversely, the CSD itself relies on the physician or pharmacist to resolve the identity during the patient look up process by selecting all the identities they believe belong to the patient to whom they are providing care; this is known as a “Picklist” method. Typically, this method is more accurate because it requires manual intervention in every decision. But, it can have issues when the data entered to generate the initial list of identities is too constrained. In other words, many of the identities that should appear when a patient is searched for are not provided in the selection list when an exact match of the patient’s name and date of birth is required. This happens because of mistyped inputs or slight variations in the name or date of birth. Systems have overcome this flaw by making it possible to decrease the number of characters

entered into the last name and first name search fields. They then have the program find all identities that match the initial characters that are entered and any following sequence of characters. For example, a user searching for a patient can enter the letters “con” in the first name field and the list of patients returned would include patients with first names of Conner, Connie, Confluence, Constance, and Constantine. Thus, by decreasing the number of characters entered, the user increases the sensitivity of the search and uses a manual method to increase the specificity thereby significantly increasing the overall accuracy. Doing this increases the size of the list returned enabling them to find all identities associated with the person of interest.

Using the method corrects the issue while using the search function through a manual interface like a portal, it does not translate well to automated patient matching. When an Electronic Medical Record (EMR) that is connected electronically to the database (i.e., an integrated connection) searches the CSD for a patient, it uses the patient’s full name and date of birth. This constrained search can leave out identities as described above. Without compensating in some way to capture those missed identities, a user would have no idea they were getting an incomplete set of identities. To correct this error, larger systems with sufficient technological resources have adjusted their queries so they only search for the first few letters of the first and last name and then create a virtual picklist inside the EHR. Unfortunately, smaller clinics and hospitals who don’t have the same access to technical resources rely on the exact match and no information is available on the accuracy or completeness of the results returned. Some of the potential consequences of this situation are presented in the “Risks” section below.

THE CSD PORTAL

The CSD provides access to filled medication information through two primary means: the CSD portal and integrated EHR connections. This section will give an overview of the portal and the following section will cover integrated connections. The portal is accessed on average approximately 8,000 times a day and gives prescribers, pharmacists, and their proxies access to controlled substance information one individual at a time. Individuals are chosen by entering patient demographic information and then selecting the appropriate identities from a list (as explained in the previous section). Once the desired identities are selected the following information is provided to the user:

1. Identifying information of the patient, physician, and pharmacist
2. Prescription written and filled date information
3. Number of active medications with active medications indicated
4. Icons indicating if there is associated information with the patient:
 - a. Veterinary data
 - b. Court or arrest data
 - c. Cannabis card information
 - d. Hospital overdose information (non-fatal)
 - e. Overdose death information (from Office of Medical Examiner)
5. Data analysis figures:
 - a. Morphine equivalencies (MMEs)
 - b. Number of different prescribers in the last six months
 - c. Number of different pharmacies used in the last six months
 - d. Overlapping Benzodiazepine – Opioid medication prescriptions

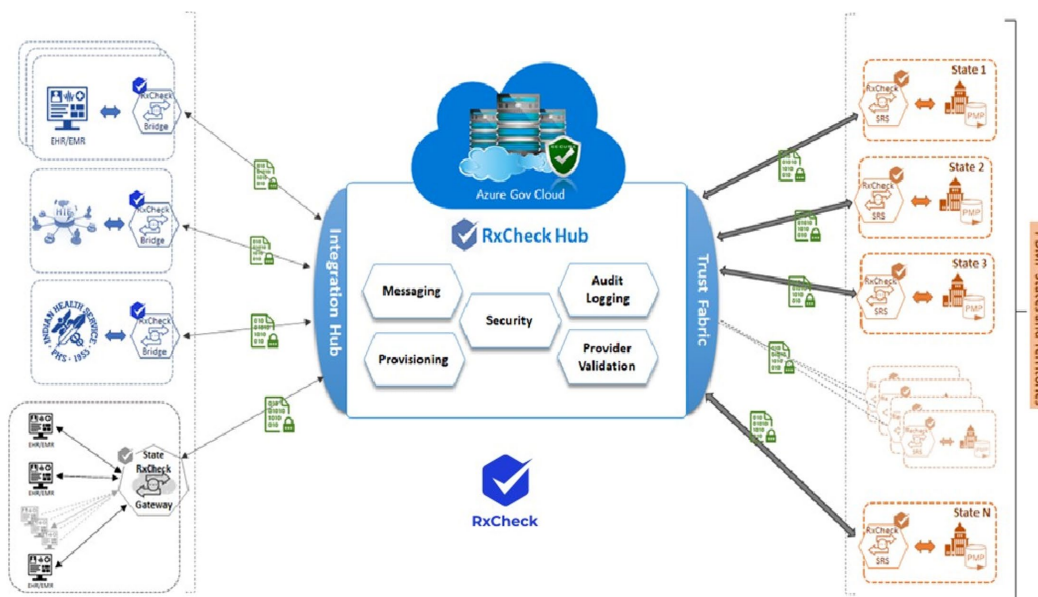
The prescriber also has the ability to access reports specific to them that analyze their prescribing habits, their use of the CSD, and the characteristics of their patient population. These also contain benchmarks comparing their scores with other prescribers stratified by occupation, specialty, and location. Examples of those measures include:

1. Number of controlled substance prescriptions
2. Number of CSD queries
3. Percentage of CSD queries to prescriptions
4. Number of patients with 90 MME or more
5. Number of patients with Benzodiazepine – Opioid overlapping medications
6. Number of patients with three or more prescribers in the last six months
7. Number of patients with three or more pharmacies in the last six months

INTEGRATED FEEDS

As mentioned in the previous section the second method for gaining access to CSD data is through an integrated connection between the EHR and the CSD. There are two hubs to which clinics and hospitals can connect to retrieve information and make it available to the caregiver or pharmacist. The first is the PMP Gateway managed by Bamboo Health and is primarily used by Bamboo PDMPs, but it can be purchased and used by clinics or hospitals who aren't Bamboo customers. The second hub is through RxCheck which is free hub created and maintained by the Bureau of Justice Assistance (BJA). In 2022, the PMP Gateway averaged 10,936 queries a day from the CSD compared to the RxCheck hub that averaged 12,891 queries. Even though Bamboo charges clinics for using the PMP Gateway, they do all the work that goes into building and maintaining the connection. With RxCheck, the healthcare entity must use internal resources to make the connection and maintain it or they must hire an outside vendor to handle those processes for them. The most widely used vendor for this is Logicoy.

RxCheck Integration Architecture



From initial conversations with CSD staff, it is assumed Logicoy uses the model outlined in the diagram above, but their actual method of connection is slightly different. They have built their own connection to the RxCheck Hub, but they don't connect healthcare entities to the hub itself. Instead, Logicoy actually pulls data from the hub into their own portal and then allows EHR users to access their portal without having to enter a username and password through a single sign-in method that uses a digital token transmitted by the EHR.

Another method used to capture information via the hub is to use a healthcare data exchange standard called Fast Healthcare Interoperability Resource (FHIR). Two of the largest clinical healthcare providers in the state, Revere Health and Intermountain Healthcare, use this method to help resolve identities before accessing CSD data and provide a picklist from which users can select the correct patient. It also allows them to structure the data in the correct format, provide analytics in the interface, and even add clinical decision support tools all seamlessly within the EHR.

Building an integrated connection can be very beneficial to the healthcare entity as well as the CSD. For the healthcare provider it reduces the impact of checking the CSD by decreasing the number mouse clicks and making the information directly accessible in the patients record. It helps the CSD because it has been shown to increase the number of queries from an institution to the database ten-fold within a few months of implementation. Alongside all these benefits there are also some drawbacks to this type of connection. As outlined in the initial paragraph of this section, one major obstacle to widespread adoption of the integrated connection is the cost of either paying internal staff or an outside vendor to build and maintain the connection. For smaller clinics or clinics with smaller profit margins this cost can prevent them from having access to this tool. Another downside is the loss of access to many of the valuable analytics and tools accessible via the CSD portal.

REPORTS AND ANALYTICS

Currently reports are prepared for numerous stakeholders in the Utah community ranging from physicians and pharmacists to legislators and state leaders. The following list captures those reports and the associated analyses:

1. Clinical Alerts
2. Provider Level Dashboards
3. Patient Level Dashboards
4. Drug Trend Reports
5. Geo-mapping of Prescription Data
6. Licensee Reports to Licensing Board
7. MME Calculations
8. Multiple Provider Episode Reports
9. Overdose Reports
10. Patient Query Lists to Dispensers
11. Patient Query Lists to Licensing Boards
12. Patient Query Lists to Patients
13. Patient Query Lists to Prescribers
14. Patient Reports to Dispensers
15. Patient Reports to Law Enforcement
16. Patient Reports to Licensing Boards
17. Patient Reports to Prescribers
18. Patient Reports with Summary Data
19. PDMP Evaluation Reports

20. Prescriber Behavior Reports
21. Prescriber Reports to Law Enforcement
22. Prescription Drug Combinations
23. Registrant Query Lists to Licensing Boards
24. Registrant Reports to Prescribers
25. Statewide Statistics

CURRENT RISKS

The following is a list of different risks that could impact CSD's long-term viability. Each risk is assigned a low, medium, or high score that indicates both the probability of the outcome actually occurring and the severity of the impact if it were to occur.

Intrinsic exposures (Medium) – There are certain risks that all systems face in healthcare that are intrinsic to the nature of the field and the data being used. One example is the risk of a breach or data exposure where information is inappropriately shared either accidentally or expressly. This risk is minimized through frequent audits and access log reviews.

Data Quality (High) – Another intrinsic risk is around data quality. For example, if incomplete data sets are accessed by a physician through the integrated connection and that physician then provides an opioid prescription based on that partial set of data the CSD is at risk of being included in any lawsuit, if that patient then dies from an Opioid overdose.

Loss of expertise/talent (High) – One of the greatest risks facing the CSD is the lack of redundancy with the technical team. Since the current system is developed in-house any serious issues that may arise must be corrected by internal developers. This can be an issue if the only engineer with the knowledge to fix the issue is no longer accessible either through choice or an act of God. The system is currently stable and will likely continue to be even if they were to leave, but before new features could be added a replacement would need to be found, trained, and familiarized with the code. Also, any unforeseen issues that impacted on the functionality of the system would take significantly longer to repair with an untrained engineer. Currently, a second engineer, who helped develop the current platform, is working with the technical team on a temporary basis. If he was moved into a permanent role, it would minimize the risk of loss of expertise and provide excellent insurance for the path forward.

RxGov changes (Medium) – Currently DOPL uses Leap Orbit (who developed the RxGov platform) as a vendor to receive, verify, and clean incoming data from pharmacies in the state. Recently, the company who owns and maintains RxGov announced they will be returning responsibility for the software back to the original developing company. Assuming this announcement indicates that the RxGov platform is unsustainable under the current financial model, this would indicate a major change in cost, functionality, or performance will likely impact RxGov customers in the near future. While this would be detrimental to the CSD, a much greater threat is the actual closure and disappearance of the company. Though this possibility sounds very unlikely, similar situations have happened between state organizations and HIT vendors in the past and if the company goes bankrupt there is little recourse.

Funding (Low) – Another risk facing the CSD is a possible change in funding. While there has been no indication that the BJA nor the CDC are planning on changing their current priorities and begin removing funding from the states but politically things can change, and unforeseen environmental factors can cause rapid priority realignment. Also, since the BJA and CDC grants are of a limited duration they must be reapplied for every couple years. Ideally, there could be a fund that would keep the CSD running if for any reason grant funding stopped.

System upgrade (Low) – The need for a significant update to the system is another risk that must be monitored when development is done in-house. The last rebuild for the current system was done in 2017-2018. Previous to that rebuild, little had actively been done to keep the system up to date with current software changes and updates. When it was no longer compatible with current standards, a complete rebuild was required. Based on current policies and procedures that risk is no longer applicable. Now, continuous upgrades and improvements are made to keep the system consistent with other software programs and exchange standards. The team estimates that the system could continue to perform for another eight to ten years as long as upgrades and maintenance are done appropriately.

NEEDS ANALYSIS

This section first establishes the overarching goals of the CSD leadership and then proposes improvements that could be made in multiple areas that would accomplish those goals. These recommendations are drawn from the document created from the first two stages of this project. For those stages, information was gathered on the current and near future functionality of Prescription Drug Monitoring Programs (PDMP) nationally through interviews, questionnaires, and exploratory research. The areas discussed in the section include data needs, portal functionality, integrated connections, reports and analytics, and risk mitigation.

OVERARCHING GOALS

The overarching goals of the CSD leadership are threefold:

1. Stay at forefront of CSD exchange.
2. Continually improve usage through providing a relevant and trustworthy product
3. Support current staff with interesting and gainful employment.

PROPOSED DATA TYPES

A short list of data types that are collected by other PDMPs nationally and currently are not collected in Utah. Some data is collected from pharmacies via the same feed as other controlled substances, but other data types are uploaded by physicians, nurses, case managers, or pharmacists. This list includes:

1. **Child welfare visits** - Provides access to the child of the patient's welfare case reports or to the case reports of the patient if the patient is a minor.
2. **Clinical data** – Integration of medical data collected from the patient's medical record. In some states, it is related to the specific medication while in others it is more general.
3. **Lost prescription registry** - When a patient loses a controlled substance prescription or medication, they are required to report that to their physician or the pharmacy which then reports it to the PDMP.
4. **Mortality information** (*in process*) - Information indicating if the patient or a prescriber is deceased. Usually includes date of death but not cause unless overdose related.
5. **Pain Contracts** - When a patient is in a care relationship with a provider for chronic pain, they will often sign a pain contract that indicates where they can receive care and medications.
6. **Patient Lock-In agreements** - A patient can be restricted to using one pharmacy usually by a Payer, but it can also be done by a physician. In the PDMP this indicates which pharmacy a patient is restricted to.
7. **Toxicology Screens** – reports on the measures of drug levels found in either the urine and/or blood of a patient.

While not all these data types would be feasible in Utah or even beneficial, it is important to note that these different types of information are being collected at other locations. Any system planning or development should consider the possibility of including these in future versions. Also, many of these data types required some form of development within a PDMP platform and in most cases this development was paid for using grant funds. Therefore, grant approval for development in Utah would likely occur. It would be beneficial to study the interest of community members in capturing and using these types of data.

DATA QUALITY

As mentioned in the previous section there are a couple data quality issues that need to be accommodated for. Even though complaints of missing data tend to resolve themselves, it would be beneficial to capture and analyze all complaints of this nature from the community. They show how delays in reporting have an impact on patient care and could be used to encourage changes in the state rules to expedite medication reporting.

The second issue of data quality around identity disambiguation is a significant risk. More information is needed to better understand the true impact it may or may not be having. Ideally, some sort of tool needs to be in place to resolve identities appropriately. This can either be through some sort of matching algorithm like an Master Patient Index or they can be resolved manually by a user through a virtual picklist. Either solution is acceptable as long as they both can be used through the portal or through integrated connections. Both methods have their weaknesses and are imperfect but, as long as a reasonable effort is made to measure and improve this issue, either would provide a certain degree of legal protection if any errors that occur impact patient care.

PORTAL ACCESS

As with the types of data mentioned previously, it is helpful to compare the current features in the portal with features found in other PDMP portals. This was done through interviews, questionnaires, and vendor demonstrations and the following features were identified:

1. **Clinical Decision Support tools** – tools that alert the prescriber to specific information or actions that could impact the care of the patient.
2. **Prescription fill timelines** – a chart showing a timeline of when prescriptions were filled, how many days were given, and how it relates to other prescriptions.
3. **“Time to Refill” or “Days Prescription Held” analyses** – a score that compares the length of time for which the prescription was written and how quickly the refill prescription was filled. A decreasing or negative score can indicate early addictive behavior patterns forming.
4. **Possible aliases** – a list of possible identities the patient is using.
5. **Number of patient PDMP queries in the last 48 hours** – a count of the number of times a patient has been searched for in the PDMP. Can be an indicator a patient is seeking medications before the information has been reported in the PDMP.
6. **Risk of overdose score** – a score estimating the risk a patient may overdose on opioids based on the data captured in the PDMP database.

INTEGRATED CONNECTIONS

As explained previously, there are two methods that can be used to create a direct connection between an EHR and the CSD, one managed by Bamboo (i.e., PMP Gateway) and one managed by the healthcare facility (i.e., RxCheck). When a facility chooses to use the RxCheck connection, but either can't or doesn't want to build and maintain the connection they will usually outsource the responsibility to Logicoy. This can be a significant financial burden on the

clinic. When Logicoy builds the connection, they actually build it to their own portal. They then work with the EHR vendor to enable a way for the physician to click on a link that takes them to the Logicoy portal, logs them into the system, and pulls up the patient whose record the physician was looking at in the EHR. This is also known as a “single sign-on” connection.

If the CSD could build the same kind of connection that would allow physicians to login to the portal with a single click from their EHR it would be a huge benefit to the community. First, it would prevent many clinics from having to pay an outside vendor to enable that connection. Second, the issues of presenting analytics and dashboards directly to the physician in their workflow via the EHR would also be resolved. Third, the exchange of interstate data via the integrated connection (described above) would also be possible. Fourth, building a connection to share information with the state Health Information Exchange (HIE) would be feasible.

Utah has an HIE that gathers medical data from hospitals and clinics through the state and makes it available for providers and payers. Previous efforts to connect the HIE with the CSD have faltered because of an inability to exchange user identification data for auditing purposes. In addition to solving the problems outlined above, a single sign-on connection would provide a method for HIE users to connect and access CSD data via the HIE portal.

For the CSD portal to implement single sign-on, the necessary technology would need to be integrated for the portal and it would require loosening some of the password restrictions in place for the state. Currently, when a user logs in to the CSD portal they go through the UtahID website. This provides a security layer for two-factor authentication, but the requirements around password management for the UtahID website varies from community members’ policies and recommended guidelines.² This variation prevents the necessary password alignment between the facilities and the UtahID portal because it requires password changes more frequently than participant members’ policies do. To correct this, the policies about password format and length of time between changes would need to be standardized to a community or national best-practices guideline.

For those health systems who preferred not to integrate via the single sign-on method, a FHIR based app connection would also solve the analytics, HIE, and interstate data issues. With these two methods for connection in place and the quality of identity matching ameliorated, two of the major obstacles currently preventing rapid and widespread adoption of integrated feeds would be removed.

REPORTS AND ANALYTICS

As with data points and portal features, comparing lists between reports already generated from the CSD and those produced at other PDMPs the following reports and analyses are yet to be done in Utah:

1. Integrated query tracking
 1. Number of failed queries daily
 2. Number of queries returning multiple individuals
2. New opioid prescriptions vs refills by county/zip
3. List of active proxies
4. Average MME by physician, county, etc.
5. List of patients at risk
6. Number of prescriptions with over 30 days’ supply
7. Error reports
8. Analyses by filtered by facility type
9. Interactive geo-mapping

² National Institute on Standards and Technology (NIST) [Special Publication 800-63B Section 5.1.1.2](#) paragraph 9

RISK MITIGATION

There are currently a number of risks that could have an impact on the performance or future of the CSD. As discussed previously some of those risks are inherent in dealing with health IT but others can be minimized through proper policy or use of technology. From the list of risks for the CSD outlined above many have already been accounted for and therefore don't need an in-depth discussion. Security breaches or data exposures risks have been minimized as well as the need for a major system upgrade in the near future.

Funding is another risk factor in the sustainability of the CSD, but there are no indications that the current state will change and as a risk it is theoretical. Nevertheless, it would be beneficial to begin investigating other grants or funding sources in case an unexpected event occurs. One source would be the CMS Medicaid 90/10 or 80/20 grants for Healthcare Information Technology (HIT) implementation and maintenance projects.

The recent announcement about RxGov support moved this issue from minimally important to a much higher risk level. To ensure the stability of the system in the future, other vendor options should be explored at this time in case support of the current platform simply disappears or new requirements are unsustainable. Another option would be to acquire a grant to develop the necessary tools to replace RxGov and develop them in-house thereby insulating the CSD from this specific risk.

The final two risks, identity resolution and loss of expertise, are a higher risk because they are more likely to occur and if they did, they would have significant impacts. Many of the issues surrounding identity management risk along with proposed solutions are previously described in the "Data Quality" section above. In summary, to minimize the risk of this issue impacting the CSD, a real effort needs to be made to understand how severe the problem is and develop a plan to ameliorate the situation if necessary. It is likely that the use of some form of MPI or virtual picklist will be required.

The final risk factor identified above was the single threaded nature of technical expertise on the platform and infrastructure of the CSD. In an ideal situation, the primary developer would have another developer on the team with enough experience in the code that if anything happened to the primary engineer the secondary engineer would be able to step in without much of an impact on the system. This technical depth can be costly, but that cost can be minimized if resources and workloads can be shared between teams. Having a second developer currently working in the system code is a huge step in the right direction.

VENDOR MARKET ANALYSIS REPORT

There are two paths to take the CSD from its current state to the completed state outlined in the paragraphs above: 1. Purchase a PDMP platform or 2. Maintain the current system and find the resources to add the additional proposed features. This section will evaluate purchasing a new platform, describe the positives and negatives of a "buy" approach and compare the two main vendors in the market.

ADVANTAGES

There are certain advantages to purchasing a software program vs building a platform in-house. The fact that a vast majority of PDMPs nationally have chosen this option testifies to this. There are four main advantages to purchasing a system:

1. **Once installation is complete all responsibilities are on the vendor.** Though this is an exaggeration, it is true of maintaining the system and developing new features. The role of the PDMP moves to holding the vendor accountable to the agreements in the contract.
2. **Development of features are shared between PDMPs.** While this isn't true with all software vendors, this is the policy of the two sole vendors in the PDMP space. If one PDMP gets a grant to develop a new feature, that feature is then shared with all other customers and there is only a charge if work is required to implement the new feature.
3. **Frees up resources to focus on other priorities.** As mentioned in advantage one, once the software is implemented the focus of the PDMP administrators is to hold the vendor accountable. This frees up all other personnel to focus on other priorities like analytics, epidemiology, or steering policy.
4. **The vendor is responsible for being in compliance with local and federal laws.** If new laws are enacted, it is the responsibility of the vendor to be in compliance with those new laws and regulations. This also means they usually stay up to date on what changes are coming so they can plan accordingly.

DISADVANTAGES

A number of disadvantages really depend on the quality of the selected vendor:

1. **Loss of freedom** – Features, functionality, and appearance are all determined by the vendor. The CSD may have the ability to cast a vote or to request certain changes, but the decision ultimately comes down to the vendor. Decisions can be influenced by PDMPs but with the size of Utah it's unlikely specific preferences will be taken into account unless other PDMPs have the same requests.
2. **Increased time for features** - When a new feature is desired the PDMP must submit a work order to the vendor which will go through a Statement of Work (SOW) process to determine the cost and then be prioritized against other projects to determine at what point work will begin. Once resources are assigned and the work begins there can still be delays in development time from innumerable causes.
3. **Little influence on project prioritization** – As mentioned in the previous two paragraphs because of the size of the CSD it's unlikely Utah's preferences will be taken into consideration unless other PDMPs have the same requests.
4. **Implementation time and cost** – With any change to the system platform there will be considerable personnel costs plus there will likely be an initial implementation cost to install the new platform and prepare it for production.
5. **Dependence** – Once the development team has been reassigned to other tasks or departments the CSD becomes wholly dependent on the assistance of the vendor. If the contract doesn't contain ways to motivate the vendor or to ensure that the CSDs needs are met the entire system can be impacted without much recourse because there is no way to make changes to the software.
6. **No going back** – Once the change has been made to move to a vendor solution the software used to run the in-house solution will quickly be outdated. Plus, the staff who are familiar with the code will likely move on quickly after the purchased solution has been moved into production. If for reason there is a desire to go back to an in-house solution after a period of time, it would require a complete rebuild of the system which would be very costly and time consuming. It's unlikely the resources will be available to overcome those hurdles.

RISKS

Purchasing a platform will simultaneously remove risks the system currently faces while introducing new ones. It will have the following impact on current risks:

1. **Eliminates loss of expertise risk** – Because the vendor will handle all technical requirements if developers retire or leave it will have no impact on the functioning of the system.
2. **Mitigates lawsuit risk** – Choosing a vendor with a proven track record provides legal protection in two ways: 1. responsibility can be pushed to the vendor and 2. If most the PDMPs in the country use a vendor, especially if it's the same vendor, the CSD is more protected because it is common practice among PDMPs nationally. If the lawsuit pertains to local laws use of vendor doesn't provide the same level of protection.
3. **Minimizes RxGov risks** – since the vendors have their own tools for capturing data losing support of RxGov would not have an impact on the system.

VENDOR COMPARISON

MARKET PENETRATION

There are three primary vendors who sell PDMP software platforms: Bamboo, Leap Orbit, and Logicoy. At this moment Bamboo customers make up 37 out of the 50 PDMPs nationally while Leap Orbit has two and Logicoy has one.

PDMP CAPABILITIES

The following section compares the capabilities of the three platforms based on their current level of features, experience with data types, ability to resolve patient identities, and analytical tools.

DATA TYPES

The list of data types below was created from the exploratory analysis of the state of PDMPs nationally that was completed in phase one and two of this project. All the types indicated with an X are currently in production with one or more PDMPs. From Table one below, it is evident that Bamboo has the ability to handle significantly more data points than Logicoy and Leap Orbit. While Logicoy states they are in the process of developing the capacity to handle all of the following data types no timeframe could be given when those would be in production. Also, it's important to note that Leap Orbit is the only platform of the three that can currently ingest all medication data instead of just controlled substances.

<u>Data Types</u>	<u>Bamboo</u>	<u>Logicoy</u>	<u>LeapOrbit</u>
Schedule II - IV	X	X	X
Schedule V	X	X	X
Stimulants	X	X	X
All prescriptions			X
Demographic	X	X	X
Govt ID Identifier	X		

ID # of patient (e.g., SSN, DL#, etc.)	X	X	X
ID of individual picking up prescription	X		
Buprenorphine	X		
Naloxone	X		
Cannabis	X		
Insulin	X		
Gabapentin	X		
Veterinarian prescriptions	X	X	X
Toxicology	X		X
DOJ records	X		
Pharmacy Lock indicator	X		
Care plans	X		
Pain contracts	X		
Decedent data	X		X
Overdose information	X		X
Form of payment (e.g., cash, credit, etc.)	X		X
OTP/MAT Data	X		

Table 1 - List of types of data the different PDMP vendors can capture and display in their system.

MASTER PATIENT INDEX (MPI)

The importance of having the ability to disambiguate identities has been stressed in this document previously. To resolve this data quality issue, Bamboo health has developed its own proprietary solution that uses algorithms to determine how identities should be associated. They believe it is one of the best in the industry. Logicoy and Leap Orbit do not have an MPI but Logicoy is integrating with an external MPI from a specialized vendor to fill this gap.

Identity Management	Bamboo	Logicoy	LeapOrbit
MPI	Proprietary	<i>In Process</i>	<i>In process</i>

Table 2 - Type of MPI operated by the vendors.

ACCESS TO DATA

A key issue when dealing with vendors is coming to an understanding of data governance and having the ability to access all the necessary data. This data can then be used with other tools without being dependent on the vendor and having to purchase their products. While Leap Orbit, Bamboo, nor Logicoy provide access to their underlying databases, they do provide “data drops” via SFTP or API. Other PDMPs have used that data for epidemiology and analyses by importing it into a database or directly into analytical software.

<u>Access to Data</u>	<u>Bamboo</u>	<u>Logicoy</u>	<u>LeapOrbit</u>
Database Access			
Data Drop	X	X	X
Cloud Access			

Table 3 - Methods of accessing pharmacy data for external use.

ANALYTICS AND DASHBOARDS

All three vendors provide analyses available in their respective portals. Bamboo also has an add-on package that can be purchased via a subscription. It not only adds additional features to the portal but includes a series of reports and integrates with a leading analytics vendor to create web-based population health dashboards. The following tables compare the abilities of the two vendors to produce specific measures.

<u>Patient Behavior Analyses</u>	<u>Bamboo</u>	<u>Logicoy</u>	<u>LeapOrbit</u>
Overdose Risk	X	X	X
Multiple Provider Episodes	X	X	X
Multiple pharmacy episodes	X	X	X
NARX Scores	X		
Risky medication combos	X	X	X
Prescriptions by providers over time	X	X	X
Time between filling prescriptions	X	X	X

Table 4 - Analyses of patient characteristics that are shown in the portal to assist prescribers in decision making processes.

<u>Physician Behavior Analyses</u>	<u>Bamboo</u>	<u>Logicoy</u>	<u>LeapOrbit</u>
Average daily MME	X	X	X
Total opioid prescriptions	X	X	X
Total number patients receiving opioids	X	X	X
Most common medications prescribed	X		X
All the above compared with peers (Benchmarking)	X		

Table 5 - Analyses for physicians to view the trends of prescribing for their patient population. This includes comparing their scores with other physicians.

<u>Epidemiology</u>	<u>Bamboo</u>	<u>Logicoy</u>	<u>LeapOrbit</u>
State-wide figures	X		
County-wide figures	X		
Total patients	X		
Total prescriptions	X		
% Out of state patients	X		
% Out of state prescribers	X		

Table 6 - Comparison of population wide analyses across the state.

<u>PDMP/Auditing Dashboards</u>	<u>Bamboo</u>	<u>Logicoy</u>	<u>LeapOrbit</u>
Audit dashboards	X	X	X
Pre-Prescription PDMP check			

Table 7 - Analyses and logs used by the PDMPs for administrative tasks and policy adherence processes.

INTEGRATIONS

Both vendors have the ability to connect across state lines and both have experience building connections with EHRs to integrate PDMPs. One difference is that with Bamboo once you connect to their interstate hub you have access to all the other PDMPs. Other than that, they are very similar.

<u>Integrations</u>	<u>Bamboo</u>	<u>Logicoy</u>	<u>Leap Orbit</u>
Cross State	X	X	X
EMRs	X	X	X
Clinical data import			
Pre-fetch integration			X
HIE	X	X	X

Table 8 - Types of connection with which vendors have experience.

IN-HOUSE ANALYSIS REPORT

Like the preceding market analysis, the In-House Analysis will examine the advantages, disadvantages, risks, and options for continuing to maintain and build features “In-House.”

ADVANTAGES

There are certain advantages to maintaining a system in-house and adding additional features especially knowing the system is proven, already stable, and reliable. There are risks whenever there’s a move to a new system include: data loss, functionality loss, and decrease in use.

The greatest advantages to developing a homegrown system are the freedom and flexibility. With the current system, the CSD has the ability to pick the specific features they would like to implement next, plus freedom to choose the design, the function, and the appearance. With this freedom, the CSD can create a very specific product for Utah users. Included in this freedom is the financial freedom to downsize and only maintain the system with minimal staff if there’s a decrease in funding. The opposite is also true when funding abounds, staff can be added, and new features can be developed more quickly when resources are available. If the CSD were locked into a contract the same dues would have to be paid regardless of financial resources.

DISADVANTAGES

Despite the above-mentioned advantages, there are also two disadvantages to keeping the current system. The first group of these was identified previously in the risks section. These risks would need to be improved and would

otherwise be corrected by purchasing a new system. Resolving those risks will take time and money if the system is kept in-house. These will be reviewed in the following paragraph. The second issue is the length of time it will take to add the additional features outlined above in the Needs Assessment section. Since most the developers time is spent in maintenance, and that time will increase as features increase (i.e., technical debt), there will be a tradeoff between the cost of adding new technical staff or taking longer to develop new features that will need to be balanced.

RISKS

The risks that currently exist in maintaining the current system and suggestions on how to minimize those risks have been well covered in the previous section on risk mitigation. The following list reviews and summarizes the risks mentioned and the proposed mitigation strategies that would need to be enacted.

1. Loss of expertise through retirement or otherwise – This risk could be minimized by adding redundancy in technical skill.
2. Changes in funding – Exploration of other grant opportunities or funding sources through federal or state entities would help diversify revenue streams and protect the CSD from loss of funding.
3. Breach/exposure incidence – Many of the necessary measures are already in place for the CSD in this regard.
4. Loss of RxGov support – There would need to be a replacement platform either built in-house through a grant or another vendor would need to be found.
5. Data Quality – There are a couple data quality issues around missing or delayed dispensation data and identity resolution. If a lawsuit arose from an improper medical decision that resulted from missing information in the CSD, DOPL could be included in that lawsuit. To protect itself, the accuracy of identity matching should be studied, and missing prescription data complaints should be tracked and investigated.

ADDITIONAL OPTIONS

There are additional options that are currently used by other PDMPs or their associated partners that could provide the same benefits as the In-house model but could decrease the cost. The first of these is to partner with a university in the state and work with them to add features and maintain the system. The partnership could be with a specific department (e.g., Computer Science, Biomedical Informatics, Information Technology, etc.) or with the University as a whole. It would also increase opportunities to apply for grants and publish academic papers on the work being done at the CSD.

The second option is to outsource the development and maintenance of the platform to either a local, US based, or offshore company. This would provide the flexibility to scale-up and scale-down the size of the team as needed to add new features more quickly. The price savings would vary depending on which option was used with the offshore options being the most cost-effective. As with other solutions there are pros and cons to each that need to be understood before making a decision.

The final option would be to partner with another PDMP who had similar technologies, features, and goals. This partnership could be based on monetary reimbursement or could go as far as a division of labor where each PDMP develops a feature then both are shared with the partner when they are completed. This partnership would

obviously require a significant amount of technical and coding coordination but could speed up the feature development process while decreasing costs.

BUILD VS BUY ANALYSIS

Now that the advantages and disadvantages for both in-house development and purchasing a platform have been explored, along with an analysis of the three primary vendors available, it would be beneficial to compare building vs buying specifically for the Utah CSD. This section will cover an analysis of where Utah stands compared to other PDMPs in relation to state population, budget, prescriber number, and staff size grouped by in-house development vs outside vendor. It will also touch on alignment with Utah CSD goals and what the financial differences are between the three choices.

UTAH COMPARED TO OTHER STATES

To do an accurate assessment of the best path forward, it's important to review Utah's relative position compared to other states in terms of population and the number of prescribers in the state.

As described above, budget numbers are highly suspect due to the grant funding nature of PDMPs nationally. The year-to-year budget variability for a state is in the millions of dollars, so much so that when asked in interviews most administrators were unsure of what their budget was this year. Also, even though budgets are publicly available on the TTAC website, there is no consistent information on how much of that budget includes grants, membership dues, or just state funding. Every PDMP administrator interviewed reported using grant funds as part of their annual budget. Even with federal grants, Utah's PDMP budget is only slightly higher than the expected average but still well within the cluster of other PDMPs.

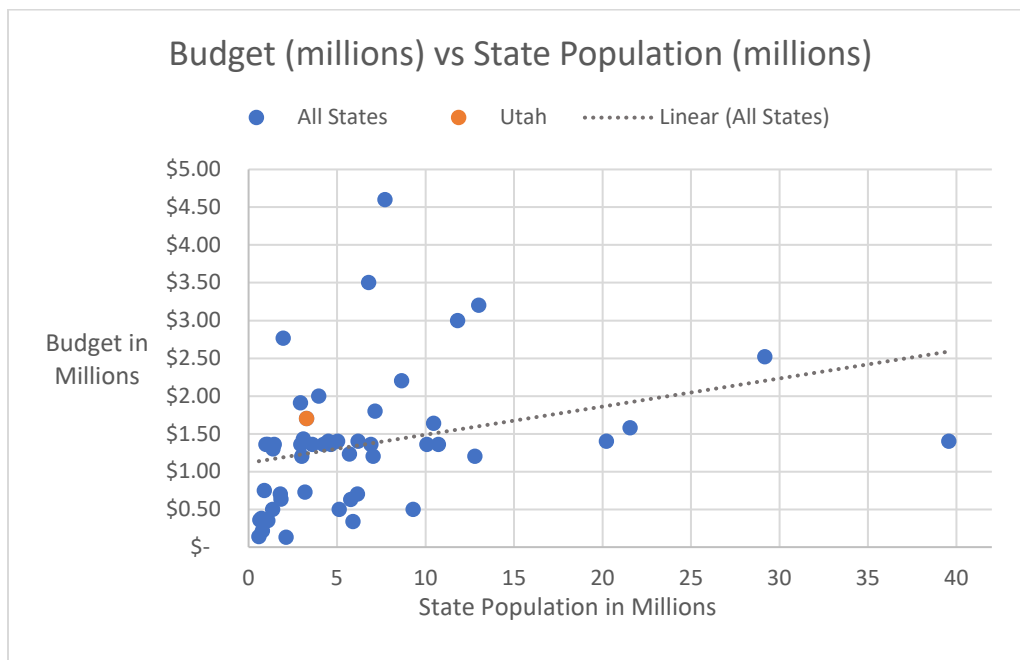


Figure 11 - The budget relative to state population for the Utah CSD compared with other PDMPs in the country.

Comparing the Utah PDMP budget vs. the number of state prescribers against all the other PDMPs has a similar result as the budget vs the population. Even with significant federal grant funding, Utah is still only slightly above the average but well within the expected budget grouping.

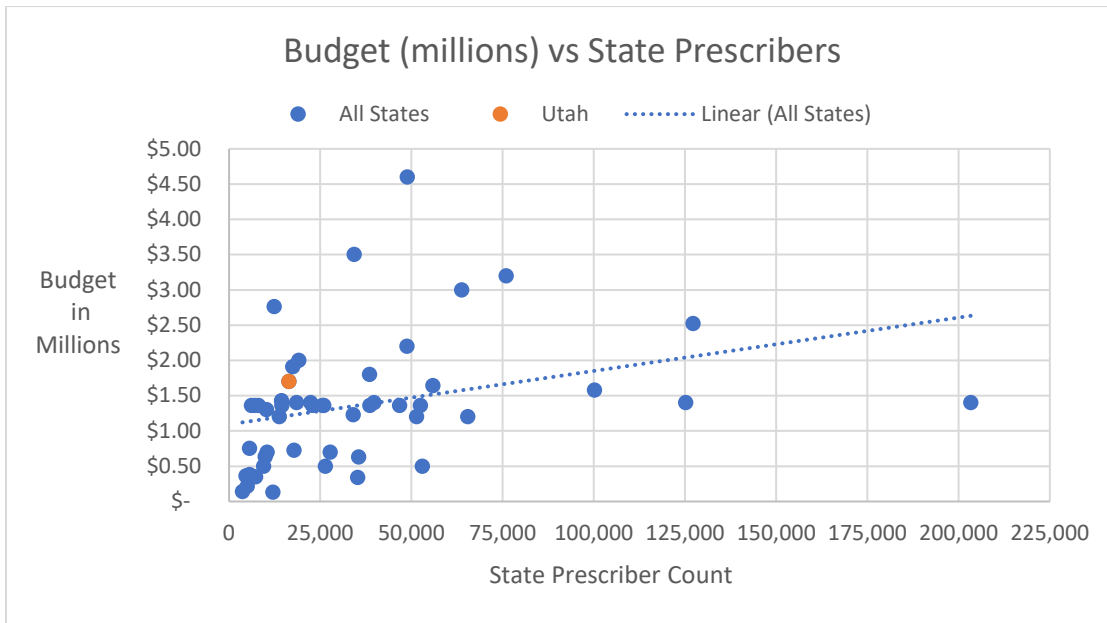


Figure 12 - The budget relative to the number of prescribers in a state for the Utah CSD compared to other PDMPs in the country.

When the number of staff vs number of prescribers in the state in Utah is compared with the other PDMPs, Utah is well within the standard error and follows the predicted mean.

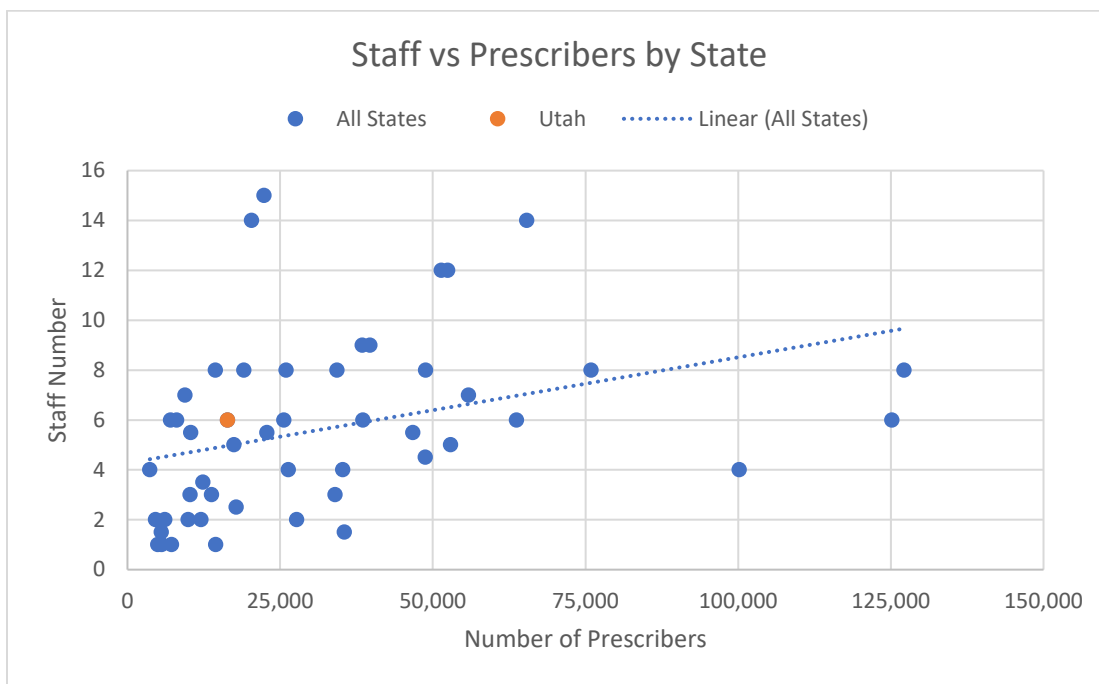


Figure 13 - The number of employees who work on the PDMP relative to the number of prescribers in the state comparing Utah with all other PDMPs in the country.

UTAH COMPARED TO IN-HOUSE STATES AND VENDOR STATES

The following analyses compare Utah with PDMPs from states that build their platform in house and with PDMPs that outsource their platform. These analyses help determine which path is more closely aligned with Utah’s current position and would therefore require less change. Also, they help in identifying what changes would need to happen in Utah to align with the other PDMPs of the chosen platform type.

The first analysis compares the number of employees that work on the state PDMP team and compares that across platform types. While Utah’s number of staff is lower than the median for In-House, it is slightly higher than the median compared with PDMPs who purchased their platform. In other words, if Utah were to switch to purchasing the software there may need to be a compensatory decrease in the number of staff to come in line with the other purchasing PDMPs.

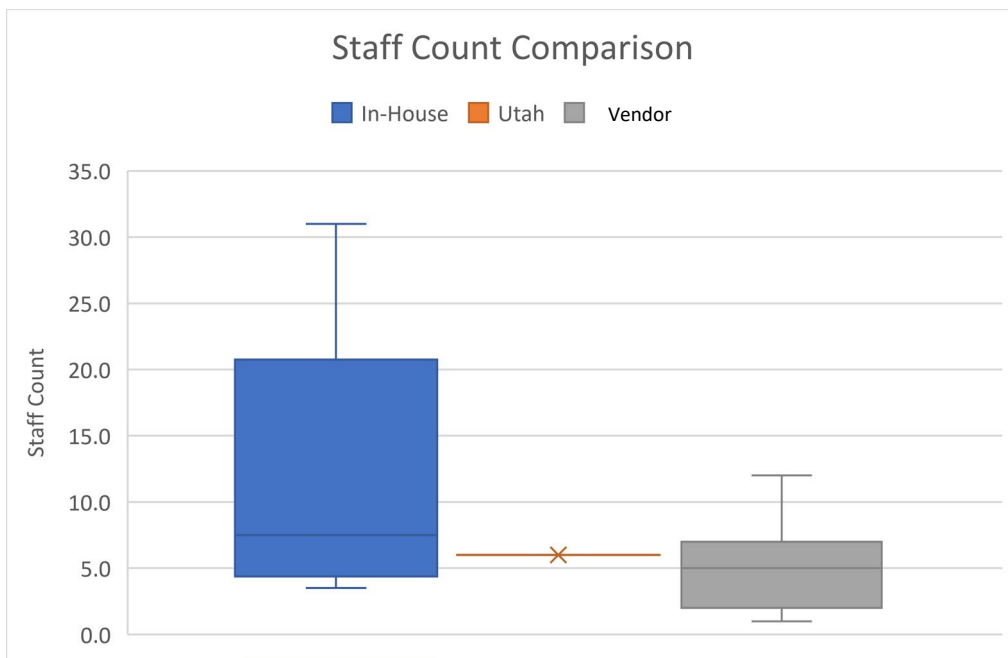


Figure 14 - Distribution of the number of employees who staff the PDMP comparing Utah with PDMPs who purchase their software and with states who build their own.

A decision to move to a purchased platform may not necessarily mean a decrease in staff size for Utah. Those employees whose roles were replaced by the new vendor could be reassigned to other tasks given they had the required skill set. The following chart shows the average number of staff PDMPs have in different roles by platform type compared to Utah. The roles include Operational or Administrative, Technical, Analytical, and Other. Operational roles include administrative management, project management, grant writing and support, customer service, and community outreach among others. Technical staff include engineers, developers, database administrators, data architects, etc. Analytical roles include business, quality, data, and system analysts along with other general analytical positions.

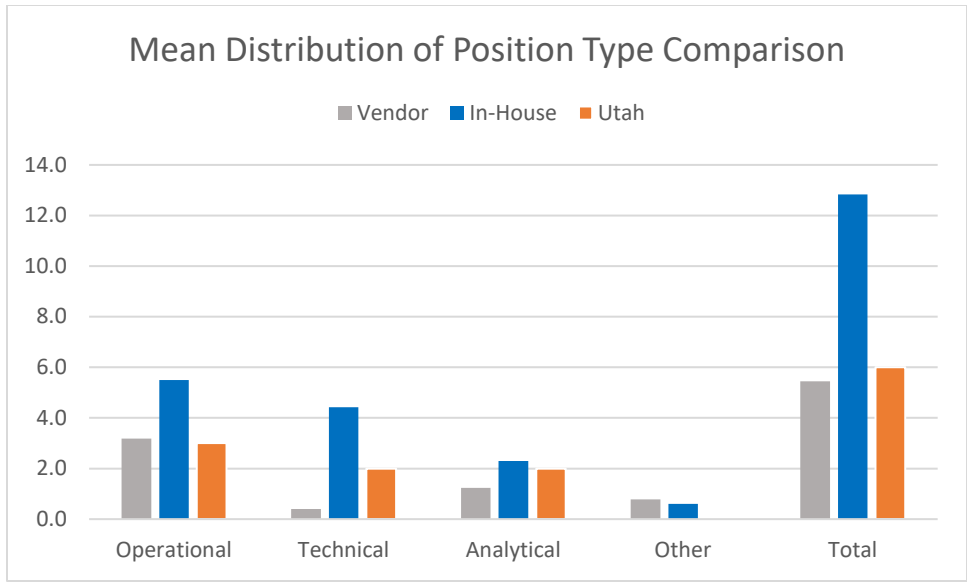


Figure 15 - The average number of staff that work in different roles comparing Utah with PDMPs who have purchased a solution and those who have built their own "in-house."

As mentioned previously, the two PDMP vendors base their licensing fees on the number of prescribers in the state. This is their most closely associated data point with which to estimate the amount of work required to run a functional system. The following chart compares Utah with In-house and Purchased PDMPs by analyzing the ratio of staff count to number of prescribers in the state.

In this diagram, the dotted lines are the expected average for In-house and Purchased employee count. Once again, Utah falls above the predicted means of both groups, but is more closely aligned to the In-house platform PDMPs. This is to be expected because Utah currently maintains their own system but what is interesting is they are well within the purchased group when taking the number of prescribers into account. There wouldn't need to be a dramatic adjustment to the number of employees if Utah were to move to a purchased platform.

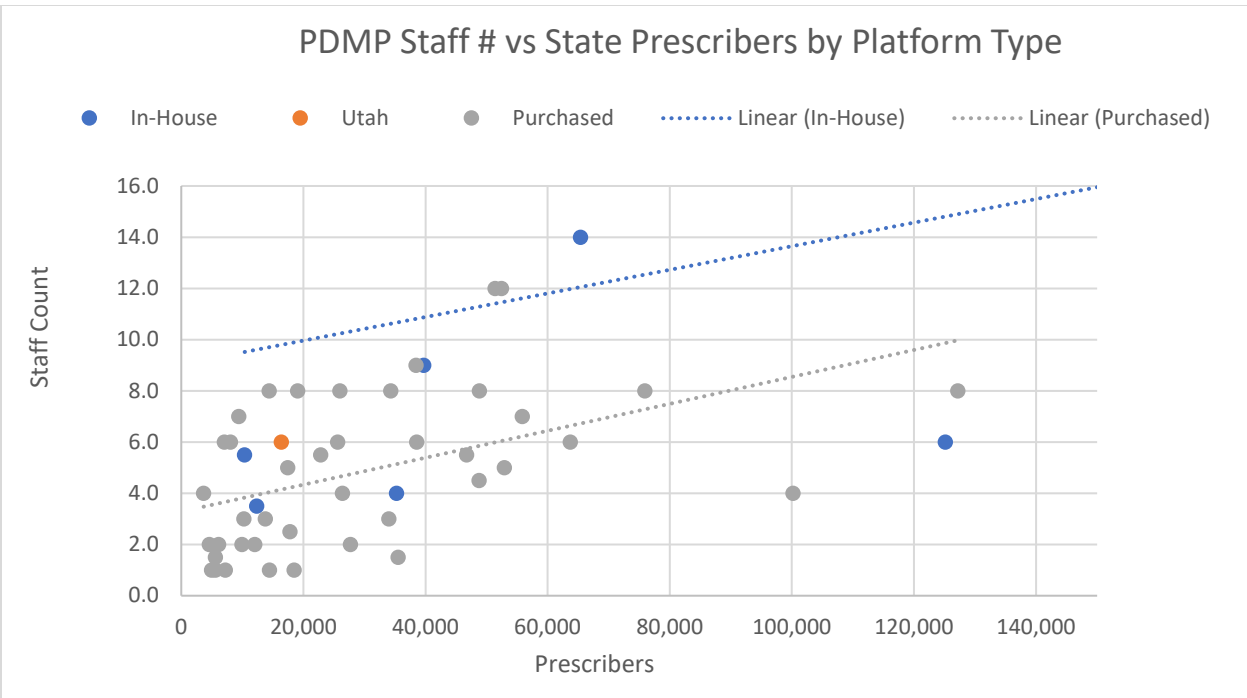


Figure 16 - The number of PDMP staff relative to the number of prescribers in the state. A comparison between Utah, PDMPs who purchased a platform, and those who developed one "in-house." The dotted lines represent the regression lines for PDMP solution types.

UTAH GOALS

Fundamentally, there’s one main goal of the Utah CSD: Provide a clinical tool that helps prevent addictions and deaths caused by controlled substance high-risk medications. The CSD does this through providing patient data and clinical tools to physicians, helping physicians understand their prescribing habits, and providing data to policy makers to enact preventative laws, rules, and regulations. Both continuing to maintain the current system or switching to a purchased platform would achieve this overarching goal with equal efficacy. What has had the largest impact on increasing use of the system is building an integrated connection with the EHR. Every PDMP interviewed reported a ten-fold increase, on average, in the number of queries when comparing portal access to EHR direct access. Since both the vendor solution and the in-house solution use the same technologies for making these integrated connections, either platform will accomplish the desired goal.

One limitation of moving to a purchased product would be the loss of agility and freedom. As mentioned above, any desired new features would have to go through an approval process by the vendor and would likely cost a substantial amount of money to pay for development. Also, once the change was approved, it would have to be prioritized against vendors goals and requests by other, larger, PDMPs nationally. While additional features could be added at a cost, there would be no ability to customize the interface or any of the tools associated with the portal or the integrated connection. Both of these factors would mean a significant decrease in the freedom of the CSD to develop a Utah focused product.

FINANCIAL IMPLICATIONS

Since all three solutions have the same ability to accomplish the mission of the CSD, and there is the risk of losing freedom and agility with a purchased platform, is there a financial benefit that would outweigh that risk? If Utah were to move to a purchased platform there could be a potential decrease in 1.5 – 2 technical employees resulting in an estimated savings of \$300,000 based on national averages. All other employees would likely remain to maintain the current level of service to the community. The price proposed by Bamboo was \$157,000 for an annual license but this only included the base package with no analytics or new document sharing. To get the analytics package added on, it would be an additional \$180,000. Resulting in an annual total of \$337,000.

RECOMMENDATIONS

DATA

DATA QUALITY

There are two proposed improvements for data quality:

1. Identity resolution: Verify that all data for a specific individual is pulled when a query is made from an integrated connection. If not, some form of identity resolution via algorithm or virtual picklist should be developed.
2. Missing or delayed prescription data: Develop a specific written policy and tracking system or ticketing system to capture and monitor complaints of missing data.

NEW DATA TYPE POSSIBILITIES

There are a few additional data types that aren't currently captured but would provide value to the CSD.

1. Buprenorphine
2. Pain contracts
3. Patient lock in agreement
4. Toxicology (Urine and/or blood)

ANALYTICS AND DASHBOARDS

ANALYTICS PLATFORM

While many of the tools used in analytics platforms are available for free in programming languages, finding the right talent to use the tools effectively can be a costly challenge. It is much easier to find a platform that meets Utah's analytical and statistical needs. The specific analytics platform doesn't make that much of a difference because so many of the features and functionality are similar across platforms. The following list are recommendations for what features should be sought in a solution:

1. Interactive and dynamic dashboards – The ability to change filters interactively to look at different views of the data.
2. Imbeddable in a webpage – The ability to imbed dashboards in a webpage while maintaining interactivity.
3. Click and drag functionality – The ability to create analysis through clicking and dragging features and data from lists.
4. Securable – All dashboards can be password protected or secured in websites that are password protected.

ADDITIONAL ANALYSES

The following analyses are currently done by other PDMPs, would be beneficial to CSD users, and can be implemented without significant effort once an analytics platform is in place. All analyses should be interactive and dynamic:

1. Integrated feed auditing (e.g., failed queries daily, queries returning multiple ids)
2. New opioid prescriptions vs refills by county/zip
3. Average MME by physician, facility, zip code, etc.
4. Number of patients at risk for addiction or overdose with patient information
5. Number of prescriptions with over 30 day supply
6. Missing Data reports
7. Analyses filterable by facility type
8. Interactive geo-mapping
9. Number of queries on a patient in last two days
10. State/County wide available through web portal

PLATFORM

PORTAL FEATURES

The following features are available in other PDMP portals and would be beneficial to Utah users. Some could be integrated with the patient's page once an analytics platform is in place while others would require significant development. As other PDMPs have implemented some of these features the most common complaint was that it pushed the medication list down on the page which required scrolling. So, any addition to the portal should not impact the location of the medication list.

1. Prescription timeline with medication overlap
2. List of aliases
3. Number of PDMP queries in last 24 hours
4. Patient specific analyses
5. Messaging tool
6. Opioid addiction handouts
7. Links for addiction counseling referral

IN-HOUSE VS PURCHASE

Taking all the previous analyses into account, it makes much more sense to stay with the current in-house platform than to switch to Bamboo or another vendor. While Bamboo may provide a number of features out of the box, the time to implement the new system would outweigh any time savings from purchasing. In-house also provides the following benefits:

1. Gives the CSD to increase or decrease costs as needed
2. Allows access to a wider variety of grants
3. Permits development of features in which the community is interested
4. Prepare for the inevitable

RISK MITIGATION

As has been mentioned numerous times in this paper, there is the need to prepare for Byron's departure either planned or otherwise. Casey is familiar with the system and has the understanding and skills to take off wherever Byron leaves off. But, if Casey leaves or is reassigned, a backup for Byron should be sought immediately. If that is not an option, Bamboo would be a suitable replacement that is financially similar and, if preparations were made in advance, could be implemented in as short as six months.

INTEGRATIONS

SINGLE SIGN-ON CAPABILITIES

The CSD should develop the ability to accept single sign-on connections from EMRs. The benefits would be:

1. Integrating clinics could save thousands of dollars annually
2. Smaller clinics could connect
3. The CSD would control exactly what information and features were shared
4. It would facilitate the exchange of interstate data
5. A connection to the HIE portal would be possible

Two recommendations to make this possible:

1. Change Utah State system passwords expiration requirements. These requirements are outdated and do NOT follow federal guidelines. Even without two-factor authentication the recommendations are to increase the length of the password and not require expiration. According to the National Institute on Standards and Technology (NIST) [Special Publication 800-63B Section 5.1.1.2](#) paragraph 9 (published in 2017):

“Verifiers SHOULD NOT require memorized secrets to be changed arbitrarily (e.g., periodically). However, verifiers SHALL force a change if there is evidence of compromise of the authenticator.”

2. Build the ability for the CSD to exchange username and password information with connecting facilities.

EXPLORE FHIR

FHIR is the newest standard for exchanging medical data and based on the behavior and statements by the ONC and CMS it will likely be the future of interoperability. Many federal regulations are being created for public health, and vendors, so it will provide access to more types of data and make it easier to acquire data the CSD is already receiving. By exploring FHIR now, the CSD could take advantage of it in the future in the following ways:

1. Integrate analytics and dashboards into EHR connections
2. Combine clinical and pharmacy data into a single view inside the EHR
3. Enable controlled substance clinical decision support tools in the EHR

GRANTS

Most PDMPs receive at least part of their funding from the BJA and the CDC. A small minority of PDMPs have also leveraged partnerships with Medicaid in their respective states to receive grants from the Centers for Medicaid/Medicare Services (CMS). For development projects, these grants require the state or state entities to contribute 10% of the projected budget and CMS will contribute the remaining 90%. Maintenance projects are similar but require an initial 20% and CMS will match with the remaining 80%. To diversify grant revenue streams, CSD leaders should begin to explore the possibilities of these types of grants with Medicaid of Utah.

Appendix A

Questionnaire sent to non-interviewed Bamboo customers

Please indicate which data points are available through your PDMP platform:

Data Types	Available
1. Schedule II	
2. Schedule III	
3. Schedule IV	
4. Schedule V	
5. Stimulants	
6. All prescriptions	
7. Demographic	
8. Govt ID Identifier	
9. ID # of patient (e.g., SSN, DL#, etc.)	
10. ID of individual picking up prescription	
11. Buprenorphine	
12. Naloxone	
13. Cannabis (or cannabis card)	
14. Insulin	
15. Gabapentin	
16. Veterinarian prescriptions	
17. Toxicology	
18. DOJ records	

19. Pharmacy Lock indicator	
20. Care plans	
21. Pain contracts	
22. Decedent data	
23. Overdose information	
24. Form of payment (e.g., cash, credit, etc.)	
Types of Connections	
1. RxCheck	
2. PDMP Interconnect	
3. PDMP Gateway	
4. HIE Connection (via any of the above or stand alone)	
5. FHIR Connection (via any of the above or stand alone)	