Data Quality Monitoring

Findings from 2019-2010

This document contains the final narratives produced during the review of DBHDS source systems (Phase 1), the data warehouse (Phase 2), and key reports (Phase 3).

Technical working papers created during Phase 1 and 2 are available upon request.

Virginia Department of
Behavioral Health &
Developmental Services

Data Quality Monitoring Plan
Office of Data Quality and Visualization
Fall 2019

Data Quality Monitoring Plan

Preliminary Report

Introduction

The Office of Data Quality and Visualization (DQV) is a program within the Office of the Chief Clinical Officer. One of the goals of DQV is to advance the use of data analytics that inform the decision making of the agency. DQV has not been able to provide this universal support due to challenges with data quality. In response, they initiated the development of a Data Quality Plan in the second quarter of SFY 2019. The ultimate goal of the Plan is to inform the establishment of a Data Quality Monitoring System.

DQV applied the clinical quality monitoring framework of Avedis Donabedian to the development of a Data Quality Monitoring Plan. Donabedian was a physician who is considered by many in the industry to be the "father of clinical quality". In 1966 he published the pivotal paper "Evaluating the Quality of Medical Care", providing physicians with the language and process to begin to address clinical quality. Following that article, he published many books on his framework for healthcare quality (*insert citation*).

Quality monitoring, be it for clinical care or data entry and submission, ends with remediation that relies on behavioral change driven by standards and best practices. Therefore, the use of this systematic epidemiological approach, with its foundation rooted in prevention, is appropriate. The following are the steps of quality monitoring established by Donabedian:

1. Determining what to monitor
2. Determining priorities in monitoring
3. Selecting an assessment approach
4. Formulating criteria and standards
5. Obtaining the necessary information
6. Choosing when and how to monitor
7. Constructing a monitoring system
8. Bringing about behavior change

DQV has completed the first five steps which are outlined in this document. The intent is that business owners of the data sources, with the support of DQV, will prioritize the completion of the remaining steps on their respective data sources.

Current Efforts

1. Determining what to monitor

DQV chose twelve data sources as the focus for the development of this Plan. This is not an exhaustive list, but rather, a selection that vary in maturity, scale, and scope all having been identified as providing necessary information for moving towards compliance with the Settlement Agreement. Many of these sources have data accessible through the Data Warehouse, however the descriptions included in this process refer to data in the source system itself. This was a purposeful decision to draw focus to data quality monitoring at the source level. The following data sources are included in this Plan:

Children in Nursing Facilities
Community Consumer Submission (CCS3)
Computerized Human Rights Information System (CHRIS) Human Rights
Computerized Human Rights Information System (CHRIS) Serious Incident
Independent Housing
Individual and Family Support Program (IFSP)
Individual Support Plan (ISP)
Office of Licensing Information System (OLIS)
PAIRS
Post-Move Monitoring (PMM)
Regional Support Teams (RST)
Waiver Management System (WaMS)

2. Determining priorities in monitoring

DQV prioritized key components that either directly, or indirectly, contribute to data accuracy. Accuracy refers to how well the data reflect what they were designed to measure or otherwise represent and is one of the key expectations for data to be considered fit for use. While accuracy is only one attribute of data quality, it is a foundational attribute that if absent, should be prioritized for remediation. The focal areas of this initial step of the Plan are the following attributes of data accuracy:

Unique Identifiers
Asserting uniqueness of the entities within a data set implies that no entity exists more than once within the data set and that there is a key that can be used to uniquely access each entity (and only that specific entity) within the data set. Failure to adhere to this construct of uniqueness results in a loss of referential integrity, reliability, as well as the ability to derive accurate counts.

Data Validations
Processes in place that address accuracy as data is being entered is a best practice for any data system. Front-end validations can take many forms such as edits in the software that restrict certain data types to be required in certain fields; one of the simplest examples of this is prohibiting non-numeric values in a date field.

Documentation
Documentation is the primary method used to ensure that people entering, reporting, and acting on the data share a common understanding of its meaning. Without documentation, proper use of data relies on the knowledge of employees who may leave the organization at any time.

3. Selecting an assessment approach

Three approaches to assessing quality are structure, process, and outcome. This initial inventory focused on structural components of the data sources that effect data accuracy. Attributes of structure are more readily observable and tend to be more stable, thus an appropriate direction for this inaugural effort.

4. Formulating criteria and standards

In an effort to provide data stewardship to the Department, DQV has taken the lead in developing this Plan. A goal of the Plan is to provide general guidelines to the respective business owners concerning the optimum characteristics of data accuracy. These characteristics are the presence of a unique identifier, data validations, and documentation. Business owners may choose to establish more explicit criteria and standards appropriate to the unique state of their data source and this will be discussed further in the "Future Efforts" section.

5. Obtaining the necessary information

The formal planning for this effort began in November 2018. Information was gathered through a combination of meetings with business owners and other subject matter experts, documentation reviews, and review of the data itself. Through this process a form was completed for each data source that includes the following information:

- Contents of the data source
- Who enters the data
- Existing data validation
- Data quality concern
- Status of the solution
- Purpose of analyzing the data
- Unique identifiers and joining
- Existing documentation
- Data quality concern - solution

Future State

The remaining three steps guide the establishment of the ongoing quality monitoring system. Decision-making surrounding these final steps should be led by the business owners. To that end, as they develop their own quality monitoring plans, DQV would encourage them to modify details of the first five steps to better meet their ongoing monitoring needs. The remaining steps are outlined below along with a brief explanation and general recommendations by DQV.
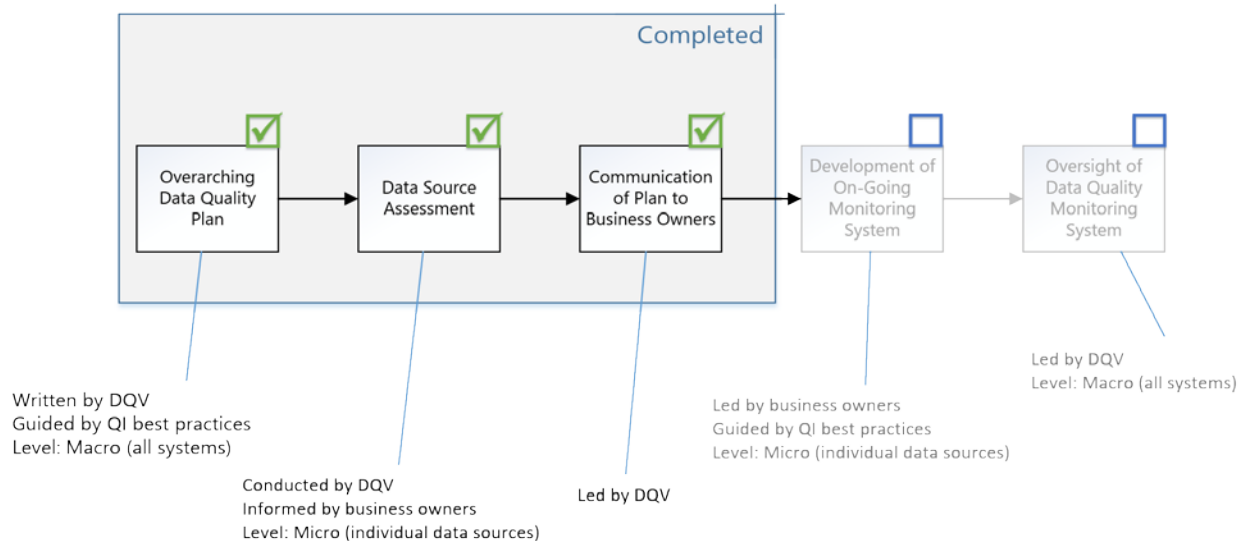
6. Choosing when and how to monitor

There are three main time periods for monitoring; prospective, concurrent, and retrospective. Prospective monitoring attempts to assess and judge an action prior to its occurrence. For data quality monitoring, a prospective monitoring example is the opportunity when software for a new data source is purchased and decisions are made about how a provider will be uniquely identified.

Concurrent monitoring occurs while data is being collected. This may be as a routine process or when triggered by something like a system error. Monitoring concurrently enables timely identification and potentially, remediation however it requires process and infrastructure that may present feasibility issues.

Retrospective monitoring is the easiest to implement and maintain, and the most widely used. While this monitoring is the least timely of the three, by reviewing existing records it allows for learning to occur that can inform future data quality efforts.

There are many ways to address the question of "how to monitor". The choice should be made by the data source owner taking into account their priorities and constraints. The choices of how to monitor will be guided by the decision that was made regarding when to monitor.

7. Constructing a monitoring system

DQV recommends starting the individual source monitoring on a small scale by limiting the focus to the aforementioned aspects of data quality. It is incumbent on the business owners lead in the implementation and ongoing monitoring of their respective quality plans. DQV will provide guidance to the business owners as needed and oversight of the quality monitoring at a macro level. Initial guidance will include an evaluation of the data source using an industry-standard maturity scoring matrix.

8. Bringing about behavior change

The intention of the Data Quality Plan, structural assessment, and maturity model is to provide a framework for demonstrating how data sources compare to established standards of quality and provide a path for remediation. Behavioral change around data quality includes owners of the data sources to adopt quality as a critical component to their processes.

Components of the Assessment

The following are descriptions of the fields collected for each of the data sources. This information will comprise the "structural assessment" component of the process.

1. ## Contents of the data source

   This section is a summary of the key elements within the data source. This is not meant to be an exhaustive list.

2. ## Purpose of analyzing the data

   This section highlights areas of reporting that are currently being done. Data reporting varies from simple data aggregation to more complex analysis.

3. ## Who enters the data?

   This section lists the groups that are responsible for entering data. This is important as data entry should be limited to only those essential to the process.

4. ## Existing data validation

   This section provides a general description of existing data validations. Data validations are processes that are in place to ensure the quality of the data being entered. Data validations take many forms from as simple as having drop-down menus that restrict entry of a particular field, to conditional formatting where only certain fields are accessible based on the data entered. Details of specific data validations were not included in this initial overview. We anticipate this section growing over time as more specific details are gathered about each of the systems.

5. ## Unique identifiers and joining

   This section addresses whether the dataset contains a primary key that identifies both a unique record, as well as individual and provider (where appropriate). This also includes information if there is an identifier present that would enable joining data with other sources.

6. ## Existing documentation

   This section indicates the presence or absence of written documentation of the dataset. Documentation may be in the form of a data dictionary, programming code, or other informal or formal written notes. Documentation of datasets is an essential component in ensuring data quality through standard field definitions.

7. Data quality concern

This section will be used as the foundation of continuous quality improvement. This section lists issues that have arisen when the SME enters, stores, or reports on the data. This section includes a "solution" column that may have already been identified by the SME or that the SME and DQV came to during their interview session. The status and status notes provide insight into how far along the solution is to being implemented.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

Avatar Data Source
June 2019

Data Quality Plan
Source System Assessment

Avatar Data Source

Introduction

As part of its Data Quality Review process, DQV met with the Avatar System Administrator to discuss the Avatar source system and business processes, and to obtain test user access to the front-end user interface. Once test user access was granted, DQV also reviewed the structured tables in AVPMLIVE. Lastly, DQV worked with the ETL Developer in the Data Warehouse to discuss the technical aspects of the data transfer process. DQV asked targeted questions related to the source system and completed an At-a-Glance System Guide.

Avatar is a COTS product, and data feeds into the DWH through AVPMLIVE. This acronym was the original name of the system and originally represented the production environment; there was also an AVPMTEST. Now, the database in both the live and test cache environments is called AVPMLIVE, to ensure portability. The interface is not organized around the individual, but rather hospital events (admission, care, discharge) which are form-based.

ACRONYMS

AVPM	Avatar Practice Management
COTS	Commercial off-the-shelf
DQR	Data Quality Review
DQV	Office of Data Quality & Visualization
DWH	Data Warehouse
ITE	Information Technology Expert
MPI	Master Patient Index
SSN	Social Security Number
UI	User Interface

Strengths

The system features an array of data validation components. Certain data types are strictly enforced through controls such as interactive calendar inputs for dates, yes/no toggles for boolean values, and drop-down menus rather than free-text fields.

Beyond this basic level of data validation, Avatar also incorporates myriad business rules, such as requiring a patient to be admitted prior to being discharged and related date constraints. Some fields, such as ethnic origin, race, primary language, and advanced directives, are conditionally locked/disabled based upon earlier input, such as when a patient declines to respond to an item or does not have advanced medical directives. Perhaps most impressive, when a user selects an "admitting practitioner," this field populates a dropdown list using linked staffing records and even notifies users if a selected

practitioner was not "active" at the time of admission. That said, because there is no technical documentation available for this field, DQV cannot validate the accuracy of the options it displays.

Patients in Avatar have unique identifiers. Prior to admitting a patient, users must search the Virginia Master Patient Index (MPI) for existing entries for that patient. Avatar has several menus that prohibit someone from incorrectly entering patient data. The search for a patient is required at least twice prior to creating a new patient: first within the facility and second within the state system through the MPI.

The practitioner drop-down menus show what appear to be ID numbers. Facility number and episode number are also unique. The facility chart number is an open text field that does not appear to have validation, but this may be a business requirement. Most changes to unique identifying information are tracked and can be rolled back via client maintenance functions.

Data Quality Concerns

Despite its overall commitment to strong data validation, Avatar does not impose any meaningful limitations on the addresses entered into a patient's demographic record. For example, users might select a province in Canada, input a ZIP code in Texas, and select a county in Virginia, all without Avatar displaying any error message or notifying the user of the invalid data. When a user enters a valid ZIP code, Avatar pre-populates a patient's city and state, but not a patient's county. This method of defining a patient's city is invalid, since some ZIP codes correspond to multiple cities and Avatar only displays a single city (if any). Rather than validating address data, this approach actually *produces* invalid entries. Moreover, the values that are pre-populated serve only as suggestions – a user can overwrite any or all of the suggestions that Avatar provides for a patient's city and state. Finally, because each of the values for city, county, and state are independent within Avatar's UI, there are no constraints that prevent a user from entering valid data for an individual's county and invalid data in every other address field. To the extent that reporting relies upon Avatar data for location data, it should be regarded with extreme skepticism.

Additional dropdown menus within Avatar appear to have outdated option lists. For example, the "source of admission" field seems to have missing or archived codes, since the list of options proceeds from 0 to 3-6, then to 8-9. Although not apparent when viewing the front-end UI, various historical data elements in Avatar have inconsistent code-value pairings. Data in Avatar are entered at the facility level, but different facilities have different lookup tables for the same codes (such as gender codes, race and ethnicity codes, and legal status codes). This complicates analysis of the data when it is reviewed across different facilities, as data cannot be consistently grouped into existing values.

The Avatar Data Dictionary MASTER is 40 pages long, yet it was last revised in 2006, features outdated screenshots, lacks a title and contents page, and does not specify an author. Also provided was the ICD Crystal Report Writing Training from 2014. This essentially shows how you translate one ICD10 code to

the other. For UI navigation materials, the ITE instructed DQV to use the Netsmart (vendor) Wiki that provides supports on each page/form; however, this was not functioning in the test environment and therefore was not available during this review.

DQV was not able to access the underlying back-end database within Avatar due to constraints within the software license. These constraints required that DQV assess a "mirror" database of Avatar entitled AVPMLIVE, which itself has no documentation or technical specifications. The systems analyst confirmed there are no documented specifications that support the data delivery. The nightly update job was developed by a DBA who no longer works at DBHDS. On the cache, only some tables are copied over and for larger tables, such as for billing, only specific fields are brought over.

Recommendations

DQV suggests that a designated business reporting analyst for this system review the fields that require external validation on an ongoing basis, specifically the patient search which uses the statewide MPI, and a lookup for ICD/DSM diagnosis content hosted by a third party vendor. DQV also recommends that the location data elements use grouped validation. For example, users should select the state prior to entering other location data, and it should cascade available options accordingly.

The system supports role-based entitlements, but it seems that it only has a single sign-on unique to each facility. If applicable and appropriate, DQV suggests the creation of a single sign-on that would allow users to see other facility information.

DQV suggests the business ensure that documentation is available and current, as well as accessible to all users. In addition to this, DQV suggests the business implement a formalized (documented with a designated accountable person) process for notifying relevant stakeholders (e.g. data warehouse, users who run reports) of planned changes to be made to data file structure, time of delivery, or other relevant changes that may affect downstream use of data. These are change management processes.

Finally, DQV suggests the business attain or create technical specifications for delivering file(s), and assign and train a responsible party to execute the process on a regular schedule (or in response to a trigger event).

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

Children in Nursing Facilities
June 2019

Data Quality Plan
Source System Assessment

Children in Nursing Facilities

Introduction

As part of its Data Quality Review process, the Office of Data Quality and Visualization (DQV) met with the Director for the Office of Integrated Health (OIH) and two OIH nurses to review the database, observe the user interface, and understand the workflow process. This source system stores information for children living in nursing facilities and is simply referred to by the abbreviation, "ChldNurFac." As part of its review, DQV team members asked targeted questions related to the source system, compiled existing documentation, and completed the Source System Maturity Matrix and At-a-Glance Guide.

Strengths

The business owner has done exceptional work on these spreadsheets. Prior to the current leadership of OIH assuming responsibility for this reporting, the business process was tedious and characterized mostly by manual duplication of related records. A proactive improvement process led to the collection of the same data with improved efficiency. Beyond that initial process improvement, the business owner frequently reviews the data source for accuracy and completeness. The business owner also has a thorough understanding of the data collection and reporting process for the children in this dataset.

While the source system itself is a modest collection of Excel workbooks, this system appears to meet all of the core requirements of the business, as well as outside reporting requirements. Data entered through one workbook populates a separate workbook, which is used to create automated reports and pivot charts. Furthermore, because the population of interest is small and subjected to high scrutiny by external reviewers, staff in OIH effectively monitor each individual record closely.

Data Quality Concerns

The principal limitation of this source system is that it lacks documentation. Given that this system is a bespoke solution to a unique business need, technical documentation is particularly significant to orient new and unfamiliar users. Currently, the only documentation available for this system describes the business processes and reporting requirements; there is no technical documentation describing the fields within the workbooks, detailing how data are entered, or how the relationship between the workbooks operates. Moreover, the available documentation does not appear to have been updated recently.

A separate concern with this data source is that the data are stored in Microsoft Excel. ChldNurFac is simply two workbooks linked by lookup functions. This design mirrors an MS Access database, but through a more fragile and customized relationship. During its review, DQV could not obtain a copy of the data due to the perception within OIH that sharing the spreadsheets might jeopardize their integrity. Although it is not practical to obtain a COTS system for such a limited number of records, there are likely alternative methods of capturing the same data that are less precarious.

Recommendations

Recognizing that this is an important but small data source, DQV recommends that relevant OIH staff develop a data dictionary and technical documentation for ChldNurFac. Creating technical documentation for this data source will ensure that new staff and individuals outside of this process can develop some familiarity with the data and how they are stored. This documentation will also need to be reviewed and updated routinely so that it documents the most recent version of the system.

Additionally, DQV advises that DBHDS consider ChldNurFac and data sources like it (e.g. Excel workbooks and Access databases) as individual manifestations of a single broad set of technical requirements. ChldNurFac presents the familiar requirements of collecting and entering data through an approachable user interface while storing and reporting on that data through a separate mechanism. Data sources that utilize this structure within DBHDS are currently developed and maintained within a variety of business areas to varying degrees of success. A better system might use a single centralized solution to address all similar business requirements for form-based data collection and database-level data storage.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

CHRIS - Human Rights
July 2019

Data Quality Plan
Source System Assessment

CHRIS HR – Office of Human Rights Reporting System

Introduction

As part of its DQR process, DQV reviewed the CHRIS HR system interface and workflow process. The DQV team met with the Office of Human Rights, asked targeted questions related to the source system, gathered screenshots, compiled technical documentation, completed the Source System Maturity Matrix and At-a-Glance Guide, and summarized its review in this Results Summary.

Strengths

The CHRIS system is a custom-compiled, web-based application with a user interface and multiple levels of user permissions. The system has constraints on some data fields (drop-down lists, range constraints, radio buttons, and some numeric only fields), and the majority of data are collected within discrete fields. Relationships between Provider, Licensed Service Location, and the Licensing Specialist can be captured. Data are imported to the Data Warehouse for reporting purposes.

ACRONYMS	
CHRIS	Computerized/ Comprehensive Human Rights Information System
DQR	Data Quality Review
DQV	Office of Data Quality & Visualization
HR	Human Rights
OHR	Office of Human Rights
OLIS	Office of Licensing Information System
UI	User Interface

The OHR has a thorough process in place for quality control, which includes reviewing data for accuracy and resolving all data quality issues closest to the point of entry. The OHR monitors trends in data and responds accordingly to ensure quality care measures are being taken.

The OHR trains all new providers on the Human Rights side of CHRIS within 30 days of receiving their license. The OHR offers provider training quarterly in every region and also allows for providers to join the Look Behind/Retrospective meeting where reports/cases are reviewed and the process of documenting the report is reviewed.

Data Quality Concerns

Although the OHR has thorough processes in place to supplement the CHRIS HR System, the processes are both manual and labor intensive; they are band-aid solutions verses fixing the root cause of the issues. Processes supporting the CHRIS system are also split between departments, and as a result ownership and system support are decentralized. This has an adverse effect on the quality of provider reporting (both HR and SIR).

The system attempts to collect unique data elements (Medicaid, Social Security) that could be used to connect CHRIS data to other DBHDS data sets; however, Medicaid and Social Security fields are not required. CHRIS also attempts to identify records by producing a system-generated unique ID; however, the ID is not unique across the system, only at the provider level. Although the CHRIS system has some constraints on individual data elements, the system does not use advanced business rules to prevent erroneous data entry. With respect to data validation, the main areas of concern are:

1. Multiple profiles can be easily created for the same individual.
2. Multiple records/reports for the same case/incident can be created by hitting the save button more than once while the system is "thinking."
3. Records (for individuals and for complaints/reports) can be overwritten easily due to lack of business rules and poor design.
4. Abuse incidents and complaints can be entered to an individual's profile after a death report has been entered.
5. There is a lack of validation controls on the address field in both the abuse and complaint report sections. The address can be selected from a drop-down feature, but the box also allows for free-form text entry which enables the user to type in any address in the format of their choice.

The system UI is not designed intuitively and is both confusing and counter-productive for end users. The design itself (poor navigation, lack of validation on key components, etc.) is one of the reasons erroneous data are often entered. The system architecture is siloed. This means the end user might need to submit a similar report to each department for the same event, if a serious incident or death involves a potential Human Rights violation. Source system reports are also poorly designed and do not contain key data elements necessary for the end users.

The CHRIS system is hosted by Delta, and, per Delta's regulations, the user is only allotted 30 minutes of log in time per session. Users frequently get logged out of the system before their report is complete; as a result, they sometimes hit the save button multiple times. Each time the end user hits the save button, the record being edited can be duplicated. It is also worth noting that the CHRIS system uses other applications (OLIS and AVATAR) to pre-populate certain fields. This is a cause for concern if OLIS or AVATAR go offline or get replaced.

Recommendations

Leadership should assess the CHRIS platform and reporting processes in their entirety to evaluate whether to invest in a new application for both Serious Incident Reporting and Human Rights reporting. If the CHRIS system is not replaced, consider architectural changes to improve the system navigation, ease of use, and data collection. To improve validity of the data collected, advanced business rules and data validation controls should be added such that duplicate records cannot be created for individuals or reports. To give each record a distinct ID, create a system-generated unique ID that is truly unique

across the platform. Add controls to individual fields (such as location) to prevent erroneous data from being entered.

Seek to improve usability (the User Experience) of the source system to streamline the data collection process. This can be done by making enhancements to the interface such as renaming fields, rearranging fields, and adding instructions to the interface if necessary.

One of the challenges with having an application that is not user-friendly is that users need to heavily rely on documentation to successfully navigate the system and enter data. If the need to rely on documentation persists, then leadership should ensure that all documentation is comprehensive, up-to-date, and posted in a central repository that is easily accessible to users. Additionally, to ensure accurate use of the system, end users should be trained on the entire system (not just Human Rights) as part of their "onboarding" process. Continue to try to encourage ownership of end user training from the Office of Licensing. Other improvements can be made by building and documenting processes that support use of the system (internal and external). Examples of processes could include: getting user access/removing permissions, end user training, systems administration, system updates and communications, communicating changes to data structures with the data warehouse.

Making significant changes to the system will be challenging due to an overall lack of architecture, which happened as a result of ad-hoc changes made over time to suit evolving business needs. It may not be practical or cost-effective to "fix" the system. Leadership should consider replacing the CHRIS system with a more modern incident reporting application that meets the needs of the business.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

CHRIS Serious Incidents
July 2019

Data Quality Plan
Source System Assessment

CHRIS SIR – Office of Licensing Serious Incident System

Introduction

As part of its DQR process, DQV reviewed the CHRIS SIR system interface and workflow process. As part of its review, DQV team members asked targeted questions related to the source system, gathered screenshots, compiled technical documentation, completed the Source System Maturity Matrix and At-a-Glance Guide, and summarized its review in this Results Summary.

Strengths

The CHRIS system is a custom-compiled, web-based application with a user interface and multiple levels of user permissions. The system has constraints on most data fields (drop-down lists, range constraints, radio buttons, and some numeric only fields) and the majority of data are collected within discrete fields. Relationships between Provider, Licensed Service Location, and the Licensing Specialist can be captured. Data are imported to the Data Warehouse for reporting purposes.

ACRONYMS

CHRIS	Computerized/ Comprehensive Human Rights Information System
DQR	Data Quality Review
DQV	Office of Data Quality & Visualization
OLIS	Office of Licensing Information System
SIR	Serious Incident Report
UI	User Interface

Data Quality Concerns

The system attempts to collect unique data elements (Medicaid, Social Security) that could be used to connect CHRIS data to other DBHDS data sets; however the Medicaid and Social Security fields are not required. CHRIS also attempts to identify records by producing a system-generated unique ID; however, the ID is not unique across the system, only at the provider level.

Although the CHRIS system has constraints on individual data elements, the system does not use advanced business rules to prevent erroneous data from being entered. With respect to data validation, there are 4 main areas of concern:

1. Multiple profiles can be easily created for the same individual.
2. Multiple records/reports for the same serious incident can be created by hitting the save button more than once while the system is "thinking."
3. Records (for individuals and for complaints/reports) can be overwritten easily due to lack of business rules and poor design.
4. SIRs can be entered for an individual after a death report has been entered.

The system UI is not designed intuitively and is both confusing and counter-productive for end users. The design itself (poor navigation, lack of validation on key components, etc.) is one of the reasons erroneous data are often entered. The system architecture is siloed. This means the end user might need to submit an incident report to each department for the same incident, if the incident involves a human rights violation and/or an allegation of abuse, exploitation, or neglect. Source system reports are also poorly designed and do not contain key data elements necessary for the end users.

The CHRIS system is hosted by Delta, and, per Delta's regulations, the user is only allotted 30 minutes of log in time to submit a serious incident report. Users frequently get logged out of the system before their incident report is complete, so they hit the save button multiple times. Each time the end user hits the save button, the record s/he is editing is duplicated. It is also worth noting that the CHRIS System uses other applications (OLIS and AVATAR) to pre-populate certain fields. This is a cause for concern if OLIS or AVATAR go offline or get replaced. Processes supporting the CHRIS-SIR system are not fully developed and as a consequence, ownership and system support are decentralized.

Recommendations

Leadership should assess the CHRIS platform and reporting processes in their entirety to evaluate whether to invest in a new application for both Serious Incident Reporting and Human Rights reporting. If the CHRIS system is not replaced, consider architectural changes to improve the system navigation, ease of use, and data collection. To improve validity of the data collected, advanced business rules and data validation should be added such that duplicate records cannot be created for individuals or serious incident reports. To avoid duplicate records, create a system generated unique ID that is truly unique across the platform.

One of the challenges with having an application that is not user-friendly is that users need to heavily rely on documentation to successfully navigate the system and enter data. If the need to rely on documentation persists, then leadership should ensure that all documentation is comprehensive, up-to-date, and posted in a central repository that is easily accessible to users. Additionally, to minimize inaccurate data entry, end users should be trained on the system and reporting requirements as part of their "onboarding" process. Other improvements can be made by building and documenting processes that support use of the system (internal and external). Examples of processes could include: getting user access/removing permissions, end user training, systems administration, system updates and communications, communicating changes to data structures with the data warehouse.

Making significant changes to the system will be challenging due to an overall lack of architecture, which happened as a result of ad-hoc changes made over time to suit evolving business needs. It may not be practical or cost-effective to "fix" the system. Leadership should consider replacing the CHRIS system with a more modern incident reporting application that meets the needs of the business.

Virginia Department of
Behavioral Health &
Developmental Services

Data Quality Plan
Source System Assessment

Employment Source System
August 2019

Data Quality Plan
Source System Assessment

Employment – DD/ID Employment Tracking System

Introduction

As part of its DQR process, DQV reviewed the Employment data collection system and workflow process. The review included meeting with the Assistant Commissioner for Developmental Services and asking targeted questions related to the source system, gathering screenshots, compiling documentation, and completing the At-a-Glance Guide.

Strengths

The Employment tracking system consists of individual ESO survey responses, which are consolidated to create a master file.

The business owner accepts accountability for this data collection process and has built a good foundation to grow upon. Although data collection has suffered from compliance issues in the past, the business owner has worked to correct this and has now achieved 100% participation from ESOs for more than one year.

The Community Program Manager for the Office of Integrated Support Services is the business reporting analyst. This individual supports the data cleaning and reporting processes, maintains the spreadsheet on a web-based repository (BOX), and keeps it locked down from editing. Some documentation about the Employment First Program also exists on BOX.

Data Quality Concerns

Since the data collection process is decentralized (surveys), there is a possibility that collection and reporting methods could vary by ESO. Also, because the data collection process is manual (collecting surveys and consolidating them into a master report to build graphs), there is room for human error while transferring the data. When comparing spreadsheets, DQV noted that some of the column headers appear to be different. This is probably because there is no master (template) spreadsheet to work from, meaning the report must be re-built from scratch and/or copied and pasted every time. The spreadsheet does not have many data validation checks or field constraints (e.g. numeric only, date format, drop-down selections). There also appear to be inconsistencies (and/or possible mistakes) in formulas used. The two formulas in question are the age calculation and the hours/month formula.

The data collection and communication processes for this effort seem to be managed well; however they are not formally documented, which could be a risk for the organization. The Employment tool

also has not been reviewed by outside analysts up to this point, meaning the data collection process has not been verified.

Recommendations

To make the data collection process more efficient and reliable, consider building a robust Master Template spreadsheet that is password protected, has locked-down formulas, and contains built-in controls for validation. The master template would be kept as a blank/template version, and a copy would be created to populate data when creating reports. Data validation controls can be added to the spreadsheet, such as making some fields numeric only, adding drop-down lists, and formatting dates.

Consider asking an external analyst to review the formulas, validation controls, and collection processes to make sure the system accurately captures what the business is seeking to measure. For example, in the formula for hours/month, the denominator commonly used (4.3) is a representation of weeks (in a month) and not actually the number of months. In this case either the denominator will need to change or the column heading (hours/month) will need to be changed, based on what is intended to be measured.

Consider choosing a formal, identifiable name for the spreadsheet, and store all related documents and reports on a web-based repository (BOX) where all appropriate users can have access to the documentation. Documenting the business workflow processes will help to create transparency and standardization. Additionally, consider creating documentation that contains details about the tool and measures, as well as data definitions.

The business should also consider new methods to automate this process. If the system continues to grow over time, consider new data collection tools. In particular, the need for truly unique identifiers may become important if the program expands. At some point, it may be beneficial to bring the data into the data warehouse so that analytics can be produced and reports can be pulled on a regular basis.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

IFSP Data Source
July 2019

Data Quality Plan
Source System Assessment

Individual and Family Support Program

Introduction

The IFSP source system consists of an online portal (housed on an internal SQL server), and the data are pulled directly into the DW every night.

DQV examined the back-end tables in the DW and obtained front-end access to the test site, allowing for the assessment of data validation controls. A meeting with the BA and the web developer provided additional context about the IFSP application cycle, past improvements to the online portal, and planned improvements to the online portal for FY 2020.

The DQV analysts also met with the ETL developer assigned to manage IFSP data within the DW. The ETL developer provided details about the data delivery process that were unknown to the BA and web developer. For example, very little data cleaning is done to the source data when it enters the DW. The tables are consolidated to make it easier for those running queries to extract the data from the DW.

Documentation (e.g. FAQs), a record of planned changes for the FY 2020 IFSP application cycle, and an ETL data delivery schema were also obtained and reviewed.

ACRONYMS

BA	Business Analyst
BO	Business Owner
DW	Data Warehouse
DD	Developmental Disabilities
DQR	Data Quality Review
DQV	Office of Data Quality & Visualization
IFSP	Individual & Family Support Program
FY	Fiscal Year
SSN	Social Security Number
WaMS	Waiver Management System

Strengths

According to the proposed business owner definition, the IFSP source system does not have a BO. Nonetheless, the BA accepts responsibility for the system and works to implement changes to improve the source system each FY. For instance, the BA conducts an annual receipt audit to assess the needs of individuals who are on the wait list for DD Waivers. This is done with a sample of 100 individuals who received and activated the prepaid debit cards on which IFSP funds are disbursed. For the upcoming FY 2020 application cycle, the BA has documented planned changes to the IFSP online portal and application in a spreadsheet that is shared with the web developer and other stakeholders on Box.

Data Quality Concerns

While there are ways of identifying individuals (name, address, date of birth, SSN), applicants are not required to provide a truly unique identifier when creating a profile and submitting an application. For instance, as of FY 2019, the 'required' SSN field could be circumvented by entering 777-77-7777. The current design of the system also necessitates manual quality checks. For instance, individuals who are ineligible to receive IFSP funds are permitted to submit an application; eligibility is confirmed after applications are submitted. Moreover, the system allows individuals who have already received the maximum amount of funds for the calendar year ($1,000) to submit additional applications.

Recommendations

The WaMS Person ID should be used as a unique way to identify individuals since all applicants must be on the waitlist for DD Waivers in order to be eligible for IFSP funds. Employing a synchronous request to populate data related to eligibility criteria directly from WaMS would eliminate concerns about uniquely identifying applicants. This would also reduce the delay in processing applications since those individuals who were not eligible to receive IFSP funds would not be permitted to submit an application.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

Mortality Review Committee Form
June 2019

Data Quality Plan
Source System Assessment

Mortality Review Committee Form

Introduction

As part of its Data Quality Review process, the Office of Data Quality and Visualization (DQV) asked targeted questions related to the Mortality Review Committee Form, gathered screenshots, compiled technical documentation, and completed the Source System Maturity Matrix and At-a-Glance Guide.

Strengths

The Mortality Review Form is a Microsoft Access Database used by the Mortality Review Committee (MRC) and is referred to as the MRC Form. This database is split between a front-end form user interface and back-end table. This split interface allows multiple users to read and write data to the MRC Form at the same time, making for a more efficient workflow. The relational structure within the database also supports data validation through a series of lookup tables for fields such as "cause of death" determinations and Medicaid wavier categories. Another benefit of Microsoft Access, as opposed to a static spreadsheet, is that the front-end form interface is more approachable for non-technical users to enter and review data. This also meets a core business need for the Mortality Review Committee, which prints hard copies of the Microsoft Access forms for committee members and relevant stakeholders.

Data Quality Concerns

The most significant data quality concern with the MRC Form is actually external to the form itself. The deaths loaded into the form for Committee review are imported from various external source systems that do not link records together at the level of the individual. A single individual may have several CHRIS death reports, for instance, none of which might reference the individual's WaMS Client ID or contain a valid Social Security Number. The MRC relies upon the Data Warehouse, as well as DQV, to manually de-duplicate these records at the individual level and ascertain the correct information about individual cases, but these are imperfect solutions to a familiar data management problem.

The MRC Form has limited data validation that presents known challenges for data quality. Although the form uses dropdown menus for many significant fields, there are no required fields within the form. In other words, users could pend or finalize a death review in the form without collecting necessary information. Moreover, completed death reviews are not locked when they have a final Committee review date, making it possible for historical data to be overwritten simply by accident.

Furthermore, several of the fields that are manually pre-populated by DQV are unlocked within the MRC Form, allowing the Mortality Review Team (MRT) reviewers and staff to overwrite data directly from the

source systems, without any audit trail to show who changed what and when. This not only compromises the consistency of data within the MRC Form, but also impacts the quality of data within the source systems, because when MRT reviewers correct an error within the form, they leave data within the relevant source systems unchanged.

The data imported into the MRC Form tends to be loaded manually, meaning that records need to be updated individually through manual processes rather than through live and direct data feeds. In particular, this is a concern when dealing with death certificate data imported from the Virginia Department of Health (VDH), which has a known data lag and must be manually monitored and refreshed by members of the Mortality Review Team (MRT) and DQV.

The MRC Form also has a cumbersome user interface that makes routine tasks unnecessarily complex. For one, the form uses a built-in search function that does not limit results to core fields. This complicates the simple task of identifying which death to review, as individuals with names like "Brown" might return several results in which the case summary mentions "Dr. Brown" or the color brown.

Finally, although the MRC Form features a split front-end form and back-end database, there are no entitlement roles restricting users from making changes to the underlying data. Users who know the location of the database file can access the database directly, and any users with a copy of the front-end form can make changes to the underlying data. There is some security on the form based upon the permissions and credentials used to access shared file locations within DBHDS, but the files are shared on a committee drive with less restrictive permissions.

Recommendations

As indicated above, one of the biggest challenges the MRC Form process faces is how the raw source data are captured before they are even consolidated into the Access database. Like several other DBHDS processes, this process requires manually combining relevant data from multiple disparate systems without consistent identifiers for core entities such as individuals.

Unfortunately, the only effective means of addressing these process challenges involves aligning the various teams, sub-processes, and source systems to capture data in a unified and consistent manner. This would also require the introduction of modern enterprise software solutions, with a more holistic approach to capturing key data directly from source systems in a more unified manner, as well as greater cooperation across a number of DBHDS offices.

Independent of these process improvements, five incremental changes can be made to the MRC Form that might improve the quality of data collection and reporting for the Committee. First, the Form might implement "required" field controls, thereby guaranteeing that core data elements are captured for reporting. Second, the Form could restrict the ability of users to edit data, either by locking fields entirely or by establishing roles and permissions for specific users. Third, the user interface could be

adjusted to streamline routine tasks and minimize human errors. Fourth, the back-end database could be migrated to a SQL Server database. Fifth and relatedly, a SQL Server back-end database could enable an audit history to track changes made to data and the user responsible for any changes.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

OLIS Source System
June 2019

Data Quality Plan
Source System Assessment

OLIS - Office of Licensing Information System

Introduction

As part of its Data Quality Review process, the Office of Data Quality and Visualization (DQV) met with a Licensing Specialist to observe the OLIS user interface and workflow process. As part of its review, DQV team members asked targeted questions related to the source system, gathered screenshots, compiled technical documentation, and completed the Source System Maturity Matrix and At-a-Glance Guide.

Strengths

One of the OLIS system's greatest strengths is that it is a custom-compiled application with an interface that has built-in business rules to help users capture and organize much of their work in one place. The majority of data collected are in discrete fields, allowing data to be imported to the Data Warehouse for reporting purposes. OLIS features several prepopulated dropdown lists, eliminating the possibility of typos and saving time, provided those lists are maintained regularly. OLIS provides similar user experiences for tracking both inspection and investigation activities, reducing some of the learning curve when going between the two. OLIS also allows users to export documents, such as Corrective Action Plans (CAPs), to Word documents populated with collected content. Lastly, some of the built-in reports have been identified as helpful and are frequently used.

Data Quality Concerns

During its review of OLIS, DQV identified three primary concerns with the source system.

First, OLIS is an unstable system. During its review process, DQV observed OLIS freezing repeatedly and predictably when performing routine operations. When this happens, users must manually terminate OLIS, and all data from that interaction are lost. The instability of the platform may adversely impact data quality in several ways, including consequences of the informal strategies adopted by users who have lost data, as well as potentially compromising the integrity of data housed within the source system.

Second, the user interface can be cumbersome. Core functions of OLIS, such as tracking providers' responses to investigations and inspections, require users to manually log, copy, and paste electronic correspondence between DBHDS and providers using external applications, such as email and Microsoft Word. Additionally, when licensing specialists assess compliance with regulations within OLIS, the user interface requires users to click multiple different checkbox inputs for each of more than sixty regulations. Even if a provider was found in compliance with all effective regulations, a licensing specialist will require more than an hour simply to complete this portion of a review. Furthermore,

existing fields within OLIS fail to capture all required information such as dates for various types of correspondence. The difficulty of entering data into OLIS has led users to use general comment fields to capture vital information and limits the amount of time licensing specialists can devote to periodic reviews of data quality.

Third, the options in OLIS are sometimes out-of-date, leading to inaccurate data entry. For example, the list of regulations within OLIS is not regularly updated and does not track changes, meaning that two providers that appear to be cited under the same provision using the regulation list within OLIS may actually have been cited under two different regulations. Licensing specialists rely upon an external Microsoft Word document for the latest definitions of the existing regulations, and the processes used to monitor compliance with regulations appear to vary substantially between specialists as a result.

Recommendations

As noted above, one of the biggest challenges for data quality is the need for users to store important information in external applications such as Microsoft Word. If the OLIS system could be modified to house the most current regulations and policies, so that they can simply be selected from a list, the risk of pasting wrong or outdated data into the system would be greatly reduced.

Similarly, all notes collected from on-site visits and all e-mail communications must be copied and pasted into various multi-line data fields in OLIS. E-mail integration capabilities, to speed-up and better track all correspondence between Central Office and Providers, would greatly reduce copy/paste errors (e.g. data omissions and pasting in inaccurate fields) and increase efficiency.

Additionally, though there are pre-populated dropdown lists available, such as locations, they could be more user-friendly. Designating and empowering an OLIS system administrator to better manage these lists – i.e., edit names that support more characters, sort in a more intuitive order, provide quick search, and hide no-longer-valid options – would prevent the selection of invalid choices and the creation of duplicates because existing options could not be found.

While some of the recommended system changes noted above may not be practical or possible to be implemented without completely replacing this system with a more modern solution, some of the data quality challenges may be relatively easy to address by assigning and training a system administrator, with the technical knowledge required, to maintain the system.

Establishing this system admin--capable of making changes to the underlying lookup data and validation rules for OLIS data entry--and training OLIS users on how to report potential defects, as well as help ensure that currently available data entry controls work more effectively, would be helpful.

Other relatively simple improvements would include having subject matter experts conduct audits of existing OLIS control/validation data and document results to identify any stale or incorrect data issues

that the system admin could correct. Likewise, implementing written procedures for requesting, approving, and communicating changes to appropriate parties would improve the data collection process.

The existing licensing system will be replaced with a COTS product provided by a new vendor beginning in 2020. While the new system is expected to solve some problems right away, such as the instability of the application, some of these data quality issues will remain if they are not addressed. The regulations and other drop-down options should be monitored to ensure that they are up-to-date, and information that is currently being stored in e-mail or Microsoft Word should be integrated into the system whenever possible.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

PAIRS Source System
August 2019

Data Quality Plan
Source System Assessment

PAIRS Source System

Introduction

As part of its Data Quality Review process, the Office of Data Quality and Visualization (DQV) met with the director of the Office of Facility Quality Improvement and Risk Management, as well as two analysts, to discuss the PAIRS system and workflow process. As part of its review, DQV team members asked targeted questions related to the source system, gathered screenshots, compiled technical documentation, and completed the At-a-Glance Guide.

Strengths

The PAIRS system is a custom-compiled application with a Microsoft Access front end and SQL Server 2012 backend. There are 3 levels of system permissions: Reader, Manager, and User. PAIRS is also supported by two technical analysts from the IT department for user helpdesk and other application support.

The system UI has some built-in controls for data validation including range constraints on dates, checkboxes, and drop-down lists. Patient demographic data (name, DOB, State ID, etc.) are pre-populated on the form, pulling from the Avatar admissions system, and can be used to uniquely identify the patient. The system collects facility identification data, and relationships between the patient and facility can be captured.

The business owner reviews and audits the data for accuracy on a monthly basis. The audit process includes a review by three other DBHDS resources. In addition to the audit, the business owner also looks at the system on a weekly basis to help correct data issues as they come up. The business owner also offers training to Risk Managers (who are accountable, but not always responsible, for reporting).

Data Quality Concerns

Although there is some validation on the front end, the system does not have advanced validation or business rules to prevent erroneous data from being entered. IT noted that users frequently call in for support because they have created a duplicate report and have no way of fixing the issue. The duplicate report issue seems to happen when users are updating a report on one of the "follow up"

ACRONYMS

DOB	Date of Birth
DQR	Data Quality Review
DQV	Office of Data Quality & Visualization
DWH	Data Warehouse
PAIRS	Protection & Advocacy Incident Reporting System
UI	User Interface
VOPA	Virginia Office for Protection and Advocacy

screens. There seems to be no root-cause analysis on this issue. More concerning is that when records are saved, data are automatically sent to VOPA through an email process. There does not appear to be any data cleaning prior to records being sent, although records containing errors are eventually cleaned manually. There is no system log to for rollback/tracking changes.

Users frequently update incorrect data manually. In doing so, the business owner must read though narrative fields to find the data, and then connect with the user to correct the issue. This is most likely due to a lack of systems documentation available to users. The documentation for the system is not very comprehensive and seems to be outdated. Furthermore, there is no comprehensive user manual that is provided from central office, leaving each facility to interpret procedures and definitions in its own way. Risk Managers are trained on reporting and data entry; however they are not always the ones entering the data in the system.

Ownership of this system seems to be two siloes: the business lacks knowledge of the technical side, and IT lacks knowledge of the business side. There are no formal process documents or communications procedures. There is no one performing the role of a business reporting analyst, and no outside analysts are helping with data collection process improvements.

Lastly, the data collection processes (fields, field values, etc.) have not been changed since the system was created, potentially limiting the relevance and usefulness of the data. The PAIRS application was originally created specifically to report events requiring medical attention beyond first aid to the disAbility Law Center of Virginia (dLCV). The system collects data on injuries and deaths, but it does not collect serious incident data such as emergency room visits, or chronic illnesses.

Recommendations

The PAIRS system is currently being revamped and built into a web-based platform. This is an opportune time to look at the data collection process for and to make improvements. This would include taking a holistic look at the data being collected to consider incorporating new fields to capture data that are not currently being collected.

All data fields should have constraints (numeric only, date controls, drop downs, checkboxes) to prevent erroneous data from being entered into the system. Building advanced controls and business rules into the system will also reduce the amount of manual labor that goes into auditing/fixing data. Consider reducing the number of narrative fields if possible by adding additional dropdowns and/or checkboxes to capture data that are currently documented as free text. A system log should be incorporated to capture all changes to data and for system roll-backs if necessary.

The business owner should consider becoming more familiar with the technical side of the system as well as technical process (e.g. IT support, data delivery to the DWH). Doing so will enable the business owner to easily identify the root cause of issues and make process improvements.

Comprehensive systems documentation should be produced and should be made available to users on a centralized web-based location. Documentation should be produced in central office and distributed to facilities to ensure consistency. Building a robust user manual will enable users to be more self-sufficient and ensure that users all report in the same systematic way. Also, consider adding a data dictionary and data definitions to the documentation library. Process maps should also be constructed to clearly define the system processes as well as parties responsible for executing.

Lastly, data from the new web-based PAIRS system should be pulled into the warehouse via an automated weekly process. Files should be delivered securely in a native format (no manual manipulation) with delivery failure notifications set up to go to both the business and IT. It would be beneficial to document the PAIRS database tables so that table structure is understood and can easily be mapped to the data warehouse.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

REACH Source System
August 2019

Data Quality Plan
Source System Assessment

REACH Source System

Introduction

As part of its Data Quality Review process, DQV met with the Assistant Commissioner for Developmental Services to discuss the REACH source system. DQV also worked with the Data and Development Manager at New River Valley CSB to discuss the technical aspects of the user interface, and an ETL Developer in the Data Warehouse to understand details about the data transfer process.

DQV asked targeted questions related to the source system, and completed an At-a-Glance System Guide.

ACRONYMS

CSB	Community Services Board
DOB	Date of Birth
DQR	Data Quality Review
DQV	Office of Data Quality & Visualization
DWH	Data Warehouse
NRV	New River Valley
REACH	Regional Educational Assessment Crisis Habilitation
SSN	Social Security Number
UI	User Interface

Strengths

The system is a custom-compiled application with a visually appealing and user-friendly interface. A system log captures changes made to the records. Users can hide records but can never delete a record out of the system. Changes made to the records within the source system are reviewed on a periodic basis and may be corrected based on role based entitlements (three levels of user permissions are managed by the systems administrator).

Almost every field has data validation controls in place, generally including drop-down menus and radio buttons. If users try to progress to the next page and required fields are missing, they will receive an alert message explaining what fields are missing or invalid. Also, some advanced business rules are in place to prevent erroneous data entry. For example, the region is determined at login based on the user location.

The system uses universally accepted identifiers (SSN, gender, date of birth) and generates its own unique ID. The record look-up function works well to identify unique individuals across the

state. Users need only enter a single letter in the last name field and the page will return all results containing that letter, rather than just the names that start with that letter. This is a valuable tool to prevent duplicate record creation, especially in crisis services scenarios where limited or varied information (e.g. nicknames) is available.

Data are pulled into the warehouse weekly via an automated SFTP batch load process. Delivery failure notifications are automated and go to the warehouse. Encryption keys are used at the warehouse (not file) level.

The business owner is trained, responsive, and assumes accountability for the system. This includes advocating for program users to use the data warehouse rather than solely relying on spreadsheets or data store reports.

Additionally, the business owner worked with the DWH team to automate both the adult and child crisis reports in Tableau. Currently, they are in the process of validating the data between the spreadsheets, data store, and the data warehouse so that the business can confidently rely on the data warehouse to represent the source system. The system has matured, and the business owner is proactive in her efforts to ensure it's kept up-to-date and functioning smoothly.

All technical and business roles are accounted for, including tech lead, developer, systems administrator, and business data analysts (responsibilities performed by the regional managers). Additionally, there is ample technical documentation including a user manual, data dictionary, and data requirements specifications document, as well as up-to-date documentation about the program.

Data Quality Concerns

The REACH system requires a SSN to be entered into a record in order to create a profile however, the system will accept non-information ('999999'). If the record is not updated with the correct SSN, there will most likely be a linking issue when trying to connect with other data sets in the warehouse.

Drop-down values are manually kept up-to-date, and there are several that are related to established CCS3 data elements. These fields include *type of residence*, *referral source*, *encounter referral source*, and *crisis evaluation location*. There is a risk of these values becoming out-of-date.

There are informal processes in place to notify relevant stakeholders of any changes made to the data file structure or delivery; however, all technical knowledge and developer support is located off site and self-managed at New River Valley CSB. While the system is maintained to the highest standards, this could be a risk to central office if NRV resources change.

Recommendations

REACH has a number of data quality controls. In order to address the issue of dummy or inaccurate SSNs, consider implementing a process to periodically review and clean SSNs. Furthermore, anonymous or informational calls could prove problematic to showing preventative efforts of the program, as these do not require the creation of a record. Consider evaluating whether some of these efforts can be captured individually within the REACH system. The business might also consider a periodic import to check the values manually updated from CCS3, to avoid them becoming outdated.

Every quarter, the two Regional Crisis Managers view reports and audit the data. They also exchange their reviews. These results, along with any issues discovered, are communicated to the business owner. However, business reporting analysts outside of the business area do not have access to these reports. Test user access is not available to anyone in Central Office, including the business owner. To progress to the next maturity level, consider offering this test user access to specific central office staff.

Although the NRV team has thorough processes currently in place, documenting those processes (e.g. process maps, schedule of events, etc.) could mitigate potential risks. Documented processes could also be shared to a web-based repository (e.g. Box) for both NRV and Central Office staff. Another suggestion is to encourage some shared technical responsibility between the developers at the New River Valley CSB and Central Office crisis staff.

If the REACH source system were to grow, new access levels may need to be considered (e.g. data entry and editing) so that specified users do not become mired in corrections work. The business might also consider publishing to a web-based central repository that is searchable and accessible, and building an API for data exchange.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

Regional Support Team Data Source
June 2019

Data Quality Plan
Source System Assessment

Regional Support Team Data Source

Introduction

The DQV analysts assigned to review the Regional Support Team (RST) source system examined the spreadsheet, which was housed on the Post-Move Monitoring shared network drive at the time that the DQR was conducted. By examining the source system itself, the DQV analysts were able to assess the use of data validation controls and other characteristics important for data quality.

After their initial examination of the source system, the DQV analysts met with the BO and BA, who provided information about the RST referral process. The BO and BA also clarified the origination and the purpose of some data elements captured in the source system and detailed how the data are used for reporting purposes. They described their process for reporting quarterly to each CSB and to DOJ and also noted that their RST report is part of the CDR for DOJ.

DQV also obtained a copy of an individualized CSB quarterly report, a copy of the fourth-quarter FY 2019 DOJ report, and static copies of the source system and the RST referral documentation. Finally, DQV analysts attended a webinar on the changes to the RST referral form and VIC (slated to roll out on July 1, 2019), which was geared toward SCs at CSBs.

Note: Business ownership and management of the RST source system changed on July 1, 2019. With the start of FY 2020, oversight of the RST referral process was moved from Community Integration to Provider Development. At the time that the DQR was conducted in June 2019, the system was owned by Community Integration.

ACRONYMS	
BA	Business Analyst
BO	Business Owner
CDR	Consolidated Document Review
CSB	Community Services Board
DOJ	Department of Justice
DQR	Data Quality Review
DQV	Office of Data Quality & Visualization
OLIS	Office of Licensing Information System
RST	Regional Support Team
SC	Support Coordinator
VIC	Virginia Informed Choice Form
WaMS	Waiver Management System

Strengths

Prior to the transition in ownership, the BO and the BA clearly expended a lot of effort to assess for data quality issues manually. In order to perform these assessments, the BO and BA not only examined the raw data being input into the source system (RST referral forms) but also verified pertinent information

using other source systems (WaMS and OLIS). They also contacted SCs directly to assess the accuracy of data. The BO and BA readily incorporated SCs feedback into their redesign of the referral forms used to initiate the RST process in an attempt to head off data quality issues in the source system. The BO and BA also noted being conscientious about informing CSBs of any errors found in their RST referral forms with the aim of using re-education to prevent errors in the future. It is also worth noting that, at the time of the DQR, the quarterly reporting process was not automated. The BO and the BA continued their extensive manual efforts to ensure that accurate data was reported not only to DOJ but also to each CSB individually.

Data Quality Concerns

The primary data quality issue that was revealed through the DQR is the absence of truly unique identifiers for key data elements. For instance, the field "Unique ID" (used to identify individuals) varies by CSB, meaning that the identifiers are not universally unique. Moreover, there is no standard process for deriving the "Unique ID"; therefore, one CSB may use a concatenation to derive a "Unique ID" while another CSB may use a random series of numbers.

Recommendations

The WaMS Person ID should be used universally as a unique way to identify individuals since all individuals eligible for RST referral are receiving DD Waivers.

During the DQR meeting, the BO noted that the plan moving forward is to discontinue use of the RST spreadsheet and to integrate the RST referral process into WaMS. The planned integration of the RST referral process into WaMS would address the issue of the unique identifiers. The integration would also allow for additional data validation controls (e.g. logical checks against historical data) that are not feasible in Excel.

At the time of the June 2019 DQR, the BO did not have a target completion date for the migration to WaMS.

**Virginia Department of
Behavioral Health &
Developmental Services**

Data Quality Plan
Source System Assessment

WaMS Data Source
August 2019

Data Quality Plan
Source System Assessment

Waiver Authorization Management System

Introduction

The DQV analysts assigned to review the Waiver Authorization Management System (WaMS) began by examining the UI through the QA/Auditor role, which has limited permissions.

To gain access to other parts of the system, the DQV analysts reached out to the WaMS Administrator who provides training for new users in addition to serving as the technical expert for the system and liaising between DBHDS and the system's vendor, FEI. The WaMS Administrator used dummy data in a staging version of the WaMS system, which consists of an online portal, to demonstrate the data entry process for the SC and the service provider roles. The WaMS Administrator was also able to elaborate on recently implemented and pending changes to the source system.

On July 2, 2019, v3 of the ISP was released in WaMS. With the launch of this new version, SCs are no longer be able to upload Parts I through IV of the ISP as PDF attachments. Instead, the information must now be input directly into WaMS, either through manual data entry or secure data share with CSBs' EHRs. The onus has been placed on each CSB to ensure that its EHR can interface with WaMS since various EHRs are used by the CSBs. It is also worth noting that all previous versions of the ISP (v1.8, v2) will be locked in WaMS once CSBs start using v3. This means that any amendments to non-v3 ISPs (for instance, in response to a change in status or needs) will have to be made by uploading an attachment.

It is also worth noting that, as of August 8, 2019, there was a change order request to integrate the RST referral process into WaMS. Per the WaMS Administrator, this will likely entail creating a FEI Dynamic Forms version of the Virginia Informed Choice form, which is an integral part of the RST referral process. There is no target completion date for this integration as of yet.

ACRONYMS

CSB	Community Services Board
EHR	Electronic Health Record
DMAS	Department of Medical Assistance Services
DQR	Data Quality Review
DQV	Office of Data Quality & Visualization
ISP	Individual Support Plan
MES	Medicaid Enterprise System
QA	Quality Assurance
RST	Regional Support Team
SA	Service Authorization
SC	Support Coordinator
SSN	Social Security Number
UI	User Interface
VAMMIS	Virginia Medicaid Management Information System

Strengths

There is ample documentation (user guides, FAQs, etc.) available in the Home section of WaMS, though the usability of these materials is hindered by the fact that a user must be logged into the system to access them. Upcoming changes that are relevant to end users are displayed in the Announcements, which are clearly visible to users once they log in. WaMS is a permissions-based system, so the appearance of the UI (and what can be edited) varies based on the user's assigned role (QA/Auditor, CSB/SC, service provider, SA, etc.). In addition to the limitations imposed by the user's assigned role, there are extensive data validation controls and logic checks in place throughout the system. For instance, when entering her/his portion of a SA, a SC cannot enter an end date that precedes the start date. Moreover, a SC will receive a pop-up error message if s/he attempts to create a new profile with a SSN that already exists within the system. It is also worth noting that data entered into the system at the beginning of the process auto populates in other relevant parts of the system to minimize duplicate data entry; this is especially true for the new v3 ISP.

Data Quality Concerns

While there are extensive data validation controls already in place, there are some deficiencies that could impact data quality. For instance, SCs can enter an end date that extends beyond the "expiration date" of the ISP (i.e. longer than one calendar year) into the SA. This can be especially problematic if the SA team does not catch this error manually before approving the payment pre-authorization and sending it to DMAS through VAMMIS.

One significant issue is the fact that SCs must use placeholder text—such that all required fields have text in them—in order to save their progress when working on ISPs. The SCs' progress is not automatically saved, so all work will be lost if the system and/or browser times out before the SCs save manually. Often, SCs forget to update their placeholder text.

Given that WaMS interfaces with a variety of other vendor-supported systems, it is likely that insufficient data validation controls in those systems will impact WaMS data quality. For example, CSBs use a variety of EHRs that likely have varying levels of data validation controls and logic checks. In a similar vein, the transition from VAMMIS to MES has the potential to incite data quality issues. Multiple vendors will be responsible for the various components of MES. This piecemeal management of the system may lead to technical or other issues. Per the WaMS Administrator, there is currently no target completion date for the transition from VAMMIS to MES.

Recommendations

Altering the source system so that SCs' progress is automatically saved—eliminating the need to use placeholder text and to click a save button manually—should be the first priority. Assessing the data validation controls on data that is imported directly from other systems, some of which are external to DBHDS, should be the next priority. WaMS could also be improved by adding single sign-in capability

to allow users (especially within CSBs) to access multiple sources of data using a single set of login credentials.

Lastly, the business should continue to inform end users of pending and recently implemented changes to the source system.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

Findings and recommendations
from an agency perspective
January 2020

Data Quality Plan
Source System Assessment

Findings and recommendations from an agency perspective

Background

In 2019, the Office of Data Quality & Visualization (DQV) conducted source system assessments in support of its Data Quality Plan. This report offers a deeper dive into the systemic issues facing DBHDS's data capture processes identified during the Phase 1 review. The rationale for this report is to provide a holistic perspective for recommendations that will lead to comprehensive solutions beyond the incremental source system improvements.

Key Findings

Problem #1: The current "spaghetti" approach to source system development and data warehouse integration is risky and costly to maintain.
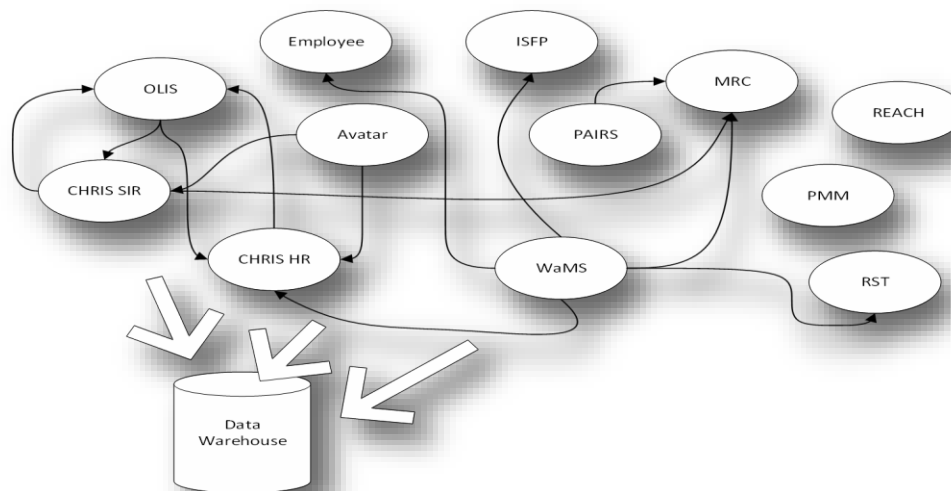
As noted in the Phase 1 Summary, most source systems demonstrated a low level of maturity. This was not surprising, since nearly all source systems were created with a narrow scope of use in mind. Over time, systems have outgrown their original purpose as needs have changed. Most systems are planned or on-track for replacement; unfortunately, they are researched and selected independently of one another.

A similar issue, discussed later in this document, is that most systems have some overlapping core data collection that is redundant to other systems.

Solution #1: DBHDS needs a global business perspective. Develop a supporting architecture plan created with efficiency and scalability in mind.

A number of source systems are currently under review (or are already slated) for upgrade or replacement which makes it an opportune time for DBHDS leadership to adopt a unified systems strategy, driven by the business areas that include global outcomes. This approach would be intentional about how data is collected from the start, with controls in place that ensure global use of all data collected from end-to-end, rather than trying to tie multiple disparate systems together after-the-fact.

Before proceeding with purchasing and upgrading new systems, IT should take an enterprise-level look at those systems to identify where there is overlap and determine which applications should be kept, replaced, retired, and consolidated. If these are approached as unrelated systems, the way it has been done in the past, the process of updating or replacing is quite daunting, expensive, and time consuming. However, adopting a new global understanding of the redundancies and common data elements will empower DBHDS to take a more practical and effective approach that will not only contain costs, but potentially improve overall data quality, performance, ease-of-use, security, and maintenance.

Problem #2: Lack of business ownership and shared data stewardship

The expectations of business ownership, as it relates to source systems, are not clearly defined. IT has not provided business owners with expectations and thus, they cannot be held accountable. This is consistent with the Phase 1 findings that a generally accepted definition of source system business ownership did not exist. Two of the larger systems did not have an identified business owner or reporting analyst. In some cases, developers were acting as the owner. Furthermore, most systems did not have a dedicated reporting analyst or IT expert.

Although several of the identified business owners had very thorough processes for data management and a strategy for their data collection, other owners did not know what is expected of them and lacked visibility into other business areas that might also use their data. This is due to an operational gap regarding strategy. Without regular maintenance, strategy and ownership, these source systems will continue to suffer.

Solution #2: All source systems should have a Business Owner. Complex systems should have also have a Business Analyst and an IT Expert.

Senior Leadership should come to a consensus on the definition of the term "Business Owner," identify one for each source system, and clearly communicate these new responsibilities to the designee.

Business ownership (responsibilities allocated to a specific individual within a business area) would ensure that new and existing source systems feature custom configurations designed to meet the business' needs. Defining what those assumed responsibilities look like will help to produce clarity where it is lacking. In addition, since analytical resources are not always embedded in the business, business owners must have a shared sense of data stewardship. This includes not only being responsible for the collection and storage of quality data within source systems, but also being responsible for preventing negative downstream impacts to systems or reports in other business areas which are relying on their source system data. Business owners should also share accountability with the Data Warehouse for ensuring that source system data is mapped to the warehouse appropriately.

It should be noted that many of the source system business owners and subject matter experts (SMEs) who were interviewed during this process were very cooperative and supportive of this quality assessment effort. Many attempt to review data quality via monitoring reports or audits and described developing manual processes in the absence of any automated reporting.

Problem #3: Lack of key system documentation

Most source systems have very limited documentation available. Documentation that does exist appears outdated in most cases. This lack of core business knowledge safeguarded within documentation contributes to failed processes for data entry, maintenance, and change management. The absence of a data dictionary can also lead to confusion with terminology and what the data intends to represent. This confusion is then amplified when the data is ingested into the warehouse.

Solution #3: Create standards for documentation

Create business process mapping diagrams and other essential materials that function to empower business leaders, optimize resources, and drive requirements more effectively.

Examples of standard documentation that should be maintained to support the systems include:
- User Manuals
- Process Maps
- Business Requirements Specification Documents, and
- Data Dictionaries.

This information should be developed within each program area before it is integrated into a master resource.

Problem #4: Lack of advanced point-of-entry controls

Many of the source systems are lacking any kind of advanced controls or business rules; for example, a Microsoft Excel spreadsheet, used for data collection, has few validation controls available. Because most systems do not have controls, data is not always collected in the same format, is sometimes collected incomplete, and can often be duplicated (e.g. incidents, individuals). Most business owners do regularly review the quality of the data, but these processes are manual, time consuming, and weigh down productivity.

Solution #4: Enable front-end modifications to source systems and gather detailed requirements for new source systems

For source systems that remain and continue to have data quality collection issues, the front-end controls should be modified to prevent bad data from being entered into the system of record. A simple way to do this would be to prioritize system enhancements based on key business data that is compromised at the point of entry. Instead of modifying the entire front-end, small fixes can be applied to specific fields.

For source systems that will be replaced, adequate requirements specifications are critical to building a system that captures data in a systematic and controlled way. Having built-in system controls helps to automate data quality process and saves time gained by the business areas, who would have otherwise spent it cleaning and correcting data.

Since most source systems do not have a reporting/systems analyst, there is a gap in analytical and technical knowledge living in the business. Analytical resources from the department should be pulled into the requirements process for systems being replaced in order to provide strategy on data collection methods and controls. These staff can also participate in the end-user testing process to ensure fields capture data appropriately.

Problem #5: Duplication, redundancy, and manual linking

As mentioned n Problem #1, a number of common data entities (e.g. Provider, CSB) appeared across multiple systems. In many cases, this information is manually entered by users into multiple systems, even though the data already exists elsewhere. This makes identifying the most accurate/current data impossible for the Data Warehouse or analysts. The problem of having several systems structured like this—*each acting as its own core books & records for shared entities*—is quite apparent.

Furthermore, whenever this data is sourced from elsewhere, it is typically coming from other source systems directly--*which are not always kept up-to-date*--instead of coming from a centrally managed repository. Whenever corrections are made, they are made downstream and the original sources are left incorrect. This can cause discrepancies and confusion.

Another problem is the fact that most source systems do not have relevant unique identifiers *(data relationship keys)* to support better integration with related data from other source systems. Four systems were identified that essentially capture the same type of information (serious incidents), with slightly varying attributes for each of different business areas.

Solution #5: Develop an operational data store

Establish centrally managed, shared key common data into a real-time Operational Data Store. This resource would house key commonly shared business information. Identify business owners for the core data elements to address discrepancies, review/approve business rules, and have appropriate tools to self-manage related code mapping cross-walk/lookup data. Like the global systems perspective, develop an enterprise-level data collection strategy.

Problem #6: User experience and permissions are lacking

Many users do not have adequately managed user rights (limitations on what can be viewed/changed by whom) and/or lack audit history (to track what got changed, when, and by whom). Most source system business owners have little or no change management communications procedures in place to ensure business owner approval and effective notifications to impacted consumers of data when changes made, even after system changes have been implemented. In some cases, business owners have little to no oversight and control over what changes are made to source systems for which they are responsible. IT developers set priorities, and/or take direction from users without review & approval from business owners.

In some cases, the source system user interface unintentionally encourage users to create new data entries for key data already stored, use/select outdated data (e.g. Locations or Providers that aren't valid), shorten their narrative information because of field size limitations, or utilize open text fields to capture data that should be in discrete fields.

Due to these limitations on the user-end, significant effort is spent on "cleaning" the data, and many systems require human interaction to transform and load data, identify errors, and correct issues.

Solution #6: Simplify data collection to improve quality

Most systems do little more than collect and report data; no special calculations or complex business processing value exist that justify use of specialized vendor software. To their credit, business users creatively stretch the capabilities of their source system by capturing as much relevant data as they can to comments or other freeform fields because the root causes of the errors have not been effectively addressed (e.g., poor user interface/experience). The detailed results from the Phase 1 reviews highlight which systems noted ongoing problems.

DBHDS has resources available to assist with process mapping, which entails a review of the process flow of information and the business practices that this process supports. A formal process map often reveals gaps, redundancies, and areas that require more clarity, which in turn empowers business owners to implement improvements or streamline efforts.

Conclusion

To summarize these recommendations, DBHDS should identify and implement a holistic enterprise strategy, including a solution that captures business processes with accountability for business data from collection through to consumption. This perspective should be one that imposes documentation requirements for all applicable business rules and data needed to support DBHDS's critical operations. This strategy also directly bonds the above documented business processes with data capture interfaces and entitlements to achieve appropriate security and data governance goals.

In order to implement this type of more scalable, efficient, and operationally sound enterprise solution, the following steps should be considered.

1. Commit to definitions for critical business parties *(business owner, reporting analyst)* and identify appropriate person(s) for each data source system.

2. Assess current business processes and core needs of each:
   a. Prioritize based on impact to other systems (e.g., Licensing, Waivers) and criticality of data collected to the agency.
   b. Create current state process maps for each.
   c. Identify future state reporting needs to better target core business data relationships.
   d. Identify appropriate business owners of key common data.

3. Identify tool that integrates actual business processes with the ability to capture required data and route it accordingly:
   a. Select a smaller business process from prioritized list above for proof-of-concept.
   b. Create electronic process map for selected proof-of-concept business process.
   c. Create integrated data collection forms to gather data required by process.
   d. Map flow and reporting requirements of collected data for integration into an ODS (Operational Data Store.

4. Establish a UAT (user acceptance test) Operational Data Store to support real-time, captured data from above user interface forms and for sharing key common data.

5. Deploy initial proof-of-concept to validate selected enterprise solution's viability; and if a success, conduct a couple more iterations to gain experience with the tool and the agile DevOps (developers and business operations partnership) approach of rapidly developing and delivering valuable product.

6. Conduct a post-mortem review with IT, senior leadership, and key business owners to determine if a larger scale development and deployment initiative—a full blown project—is appropriate and justified.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Source System Assessment

Findings and recommendations
December 2019

Data Quality Plan
Source System Assessment

Background

In June 2019, the Office of Data Quality and Visualization (DQV) sponsored an assessment of DBHDS data systems. The assessment was conducted to identify the origins of the department's core data quality issues and was broken down and conducted in three separate phases due to the complexities of the systems and the logical flow of data:

> Phase 1 - Source System Assessment
> Phase 2 - Data Warehouse Assessment
> Phase 3 - Reports Assessment

Findings and recommendations from the Source System Assessment are outlined in this document.

Purpose

The objective of reviewing the department's critical data systems was to assess the systems maturity in order to provide digestible recommendations to improve source systems for enhanced data quality. When source systems lack sufficient controls, business rules, and data validation features, data can be compromised at the point of entry. If data are not captured, stored, or retrieved correctly from the source system, data quality issues will arise.

Overview

In order to create an ongoing Data Quality Plan, DQV needed to understand where data quality issues were originating. By gauging the maturity of the organizations systems, DQV would then be able to make strategic recommendations for remediation to the business, IT, and Data Warehouse teams. Since the logical flow of data begins with data collection in the source system, DQV started the assessment of source systems first.

The Plan

The Team selected Source systems that were determined to be critical (collecting developmental disability incident or services data) for review. These systems ranged in maturity and type and were classified as a COTS application, custom compiled application, or Excel spreadsheet used to collect data in absence of a sourcing tool.

The following DBHDS systems were assessed:
- Avatar
- Children in Nursing Facilities
- CHRIS – HR (Human Rights)

- CHRIS – SIR (Serious Incident Reporting)
- Employment
- IFSP (Individual and Family Support Program)
- MRC Form (Mortality Review Committee)
- OLIS (Office of Licensing Information System)
- PAIRS (Protection and Advocacy Incident Reporting System)
- REACH (Regional Educational Assessment Crisis Habilitation)
- RST (Regional Support Team)
- WaMS (Waiver Management System)

Note: The Post-Move Monitoring (PMM) Team's Excel tracking spreadsheet as well as the CCS3 data system were initially considered; however, these systems did not qualify for a review. The PMM team is no longer planning to use the same tracking spreadsheet, and CCS3 is not a true source system, but rather extracts of health records provided by Community Services Boards (CSBs).

DQV contracted with the consulting firm ImpactMakers to develop a maturity matrix based upon CMMI (Capability Maturity Model Integration) standards with customizations to meet the unique requirements of DBHDS. The DQV Office Director contacted all Business Owners to inform them of the upcoming assessment. The communication included details regarding the purpose of the assessment as well as information about the project schedule, plan, and expectations. DQV identified the Business Owner, Business/Systems Analyst, and IT expert for each source system; in some cases, these roles did not exist.

The Project

Two DQV members reviewed each source system. The assessments consisted of one or more interviews, analysis of the front end of the system, and review of any existing system references/documentation to include User Guides, Data Dictionaries, Data Requirements Specifications, Program Guidelines, etc. Most systems did not have current or existing documentation available.

12 Source Systems were assessed by the DQV team.

DQV conducted interviews with the Business Owners, Business/Systems Analysts, and IT experts. During the interview, DQV asked the Business Owner, SME, or Analyst to walk through the data entry process on the user interface of the source system. The DQV teams documented details about the interface related to built-in data validation and controls including:

- Drop-down fields
- Radio buttons
- Required fields for key data
- Range constraints for validating data
- Validated dates
- Number/Currency fields validated for number only

- Warnings/Error messages
- Uniquely identifying data (SSN, NPI, Medicaid Number, Birth Date)
- Consistency in data types

Additionally, during the interview, DQV asked the SMEs questions that aligned to the matrix capabilities (see appendix).

> The team conducted 19 interviews with 29 employees (Business Owners Technical Owners, Analysts, and SMEs) or other identified designees.

Results from the interviews were documented in the interview template and were also used to score the source system in the maturity matrix. The maturity matrix measured systems against four main attributes, including several supporting sub-categories:

1. Validity
   a. Data Validation Processes
   b. Data Origination Source Type
   c. Data Uniqueness
2. Reliability
   a. Data Delivery
   b. Source Provider Change Management Practices
3. Verifiable & Owned
   a. Business Ownership
   b. Business Reviewed & Approved
4. Documented
   a. References Availability

The matrix captured the systems level of maturity for each attribute and sub-category. Based on the highest level of maturity satisfied, recommendations were prescribed from the matrix. The DQV team wrote a "Results Summary" document with recommendations to improve each system's data quality and produced an "At-A-Glance Overview" document for each source system reviewed. This document serves as a one-stop place where users can get a high-level overview of the source system, including details about the following:

- Business Processes supported
- Business Owner
- SME (Subject Matter Expert)
- ITE (IT Expert)
- Output
- Purpose/Use
- Key Data Elements Collected
- Calculations
- Filters/Criteria
- References/Documentation Available
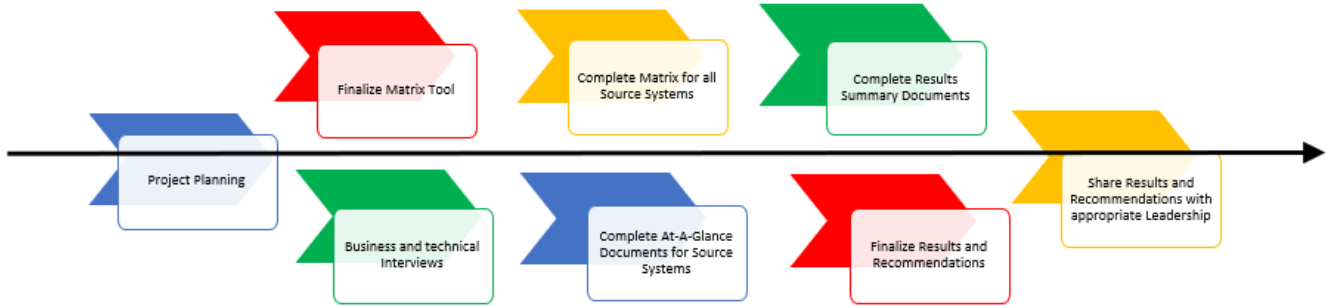
Effort

Activity	Amount
Interview meetings required	19 interviews
Average time length of interview	1 hour
Number of Business Owners & SMEs interviewed	29 employees
Number of source systems reviewed	12 systems
Average maturity score of source systems	<2
Project team size (# of resources)	6
Project planning and delivery hours required	500
Total estimated resource hours to complete documentation: Matrix, At-A-Glance Docs, and Recommendations Summary documents	92.5

Overview of Findings

Maturity
Systems have outgrown their original purpose and system needs have changed. Most of the systems demonstrated a low level of maturity; this was expected as nearly all source systems were selected and implemented with a narrow scope of use in mind.

"Point of Entry" controls
While most data collection systems do have front-end constraints, controls, and discrete fields, most are lacking advanced controls and business rules. Some systems are more thorough than others while other "systems" are limited in the controls that they can apply. In the case of systems using Word or Excel for data collection, little to no validation controls are available. Because most systems do not have advanced controls, data is not always collected in the same format, is sometimes collected incomplete, and can often be duplicated (e.g., incidents, individuals). Most Business Owners regularly review the quality of the data, although these processes are manual, time consuming, and weigh down productivity.

Key System Documentation

Most all source systems have very limited documentation available. Documentation that does exist is outdated in most all cases. Due to the lack of documentation, there are not uniform processes for data entry and maintenance, change management, or business ownership. Lack of data dictionary documentation can also lead to confusion with terminology and what the data intends to represent. Furthermore, that leads to more confusion when the data is ingested into the warehouse. Examples of standard documentation that should be maintained to support the systems includes User Manuals, Process Maps, Business Requirements Specification Docs, and Data Dictionaries.

Operationalized Business Ownership

All source systems should have a Business Owner and systems that are more complex should have a Business/Systems Analyst and IT Expert. Most systems did not have a dedicated Reporting/Systems Analyst or IT expert. Even more, two of the larger systems did not have an identified Business Owner or Reporting Analyst. In some cases, Developers were acting as the System Owner. Some Business Owners have very thorough processes and own the strategy of their data collection tool while others do not seem to understand what is expected of them. This is largely due to an operational gap regarding source system strategy and maintenance. Without regular maintenance, strategy and ownership, systems will suffer. Examples of how the business can be negatively impacted are:
- System data values (drop-down selections) become outdated and aren't maintained
- System enhancements and changes can have negative downstream impacts if dependencies are understood and communicated

User Experience

In some cases, source systems have ineffective and confusing user interfaces which unintentionally sway users to create new data entries for key data already stored, use/select outdated data (e.g., Locations or Providers that aren't valid), use free-form text fields to capture data that should be in discrete fields.

Other Key Observations

There is duplicate functionality in multiple systems, and DQV identified systems that capture the same type of information (incidents). Most systems have some overlapping core data collection that is redundant to other systems. Since systems were originally designed to meet the needs of the individual office/departments, this is a natural and common problem.

Several systems are planned or on-track for replacement with IT and the business areas researching and selecting solutions independently of others.

Manual linking of cross system data is required. Most source systems do not have relevant unique identifiers *(data relationship keys)* to support better integration with other related data from other source systems, despite the fact that many are often collecting the same data for different purposes from different sources.

Strengths Observed

Source system business owners and subject matter experts who were interviewed were very cooperative and supportive of this quality assessment effort. Many attempt to review data quality via monitoring reports or audits. Some systems have many manual processes in place for ensuring data quality, which is better than having none, but often these are necessary because the root causes of the errors have not

been effectively addressed (e.g., poor user interface/experience). To their credit, business users creatively stretch the capabilities of their source system by capturing as much relevant data as they can to comments or other freeform fields. Unfortunately, these non-discrete data fields cannot be usefully automated or analyzed.

There are some strengths within the source systems themselves. Several of the systems are web based or locked down Access front-ends with point-of-entry quality controls in place, user roles/permissions, and an enterprise type database for storing data on the backend. Some systems currently implement quality controls by leveraging point-of-entry validation (e.g., dropdown lists). A number of source systems save data to an enterprise type database and share their data with the OneSource Data Warehouse. A majority of the source systems incorporate discrete data fields, making filtering, sorting, and in some cases joining data possible.

Recommendations

Application Rationalization

A number of source systems are collecting similar types of data and sharing functionality. Many of those systems are currently under review or are already slated for upgrade or replacement.   Before proceeding with purchasing and upgrading new systems, DBHDS should consider taking an enterprise-level look at those systems to identify where there is overlap and to determine which applications should be kept, replaced, retired, and consolidated.

Enterprise Data Strategy

In concert with rationalizing the organizations source systems, and enterprise-level data collection strategy approach should be taken versus the current fragmented approach. This will allow the agency to have a streamlined data collection strategy and eliminate an abundance of overlapping data that can be confusing to end-users trying to produce analytics.

Front-end Modifications to Source Systems

For source systems that remain and continue to have data quality collection issues, consider modifying the front-end controls to prevent bad data from being entered into the system of record. A digestible way to do this would be to prioritize system enhancements based on key business data that is compromised at the point of entry. Small fixes can be applied to certain fields verses modifying the entire front end.

Detailed Data Requirements for New Source Systems

For source systems that IT will be replacing, adequate requirements specifications are critical to building a system that captures data in a systematic and controlled way. Having built-in system controls helps to automate your data quality process and saves time where the business is otherwise burdened with manually fixing data. Since most source systems do not have a Reporting/Systems Analyst, there is a gap in analytical and technical knowledge living in the business.   Analytical resources from the department should be included in the requirements process for systems that IT is replacing in order to provide strategy on data collection methods and controls. Analytical resources can also participate in the end-user testing process to ensure fields collect data appropriately.

Business Ownership and Shared Data Stewardship

The expectations of Business Ownership, as it relates to source systems, are not clearly defined by IT in such a way that the Business Owner understands expectations or can be held accountable to those expectations. Defining what those assumed responsibilities look like will help to produce clarity where it is lacking. In addition, since there are not analytical resources embedded in the business in all cases, Business Owners must have a shared sense of Data Stewardship, which includes not only being responsible for the collection and storage of quality data within source systems. This also includes being responsible for preventing negative downstream impacts to systems or reports in other business areas which are relying on their source system data. Business Owners should also share accountability with the Data Warehouse for ensuring that source system data is mapped to the warehouse appropriately.

Documentation

Key source system documentation should be produced, maintained, and stored on a centralized location where all users have access. Standard documentation should be as follows:
- User Manual
- Source System Data Dictionary and Metadata
- One-Page System Overview
- Architectural diagrams
- Business Requirements

Conclusion

Like so many organizations today, DBHDS is faced with the complex challenge of effectively integrating data management technology with an ever changing clinical and business landscape, in an environment where funding is limited and operational maturity has not traditionally been valued by policy makers and leaders. As a result, the agency is now struggling with highly manual, duplicative, and time consuming Central Office operational processes, with low satisfaction, low confidence levels in data, and high costs. Compounded by the lack of process mapping documentation, portfolio management practices for business processes, and in some cases lack of accountability, new agency leaders must deal with long learning curves to understand the strengths, weaknesses, opportunities, and threats their offices face. The lack of quality data significantly hampers their ability to make effective leadership decisions, further perpetuating the problems.

Appendix

Sample Set of Interview Questions

1. Do you have access to documentation for this system? *Examples:*
   a. *Vendor provided user manuals, configuration guides, contract/licensing agreement*
   b. *"How-to" guides or FAQs*
   c. *Internal procedural instructions for use of system*

2. Is this source system:
   a. vendor built and supported software, or
   b. custom build software *(compiled application)*, or
   c. simple electronic free-form document; *e.g., Excel spreadsheet, Word form, or PDF form*?

3. Does most every data element have a specific field where it is appropriate to enter? Or are there some items that have to be entered into a catch-all text box, like notes, description, comments?

4. Are there constraints on the type of data than can be entered? For instance, can letters be entered into a field that should only contain numbers?

5. Which fields are required?

6. Does the system get data from other systems to prepopulate fields and/or dropdowns?

7. Does the system capture generally accepted unique identifiers or any PHI? *(e.g., SSN, NPI, and Medicaid number, birth date)*

8. Are newly entered values compared to historical data in order to check for logic?

9. Is any data (e.g., Medicaid number) imported from an outside source?

10. Are there any fields that are populated based on a calculation (and, thus, are dependent on other fields)?

11. Is it possible for one individual to have more than one record in the system?

12. Are changes tracked such that errors could be undone? For example, is there any audit history so that incorrect or corrupted data can be rolled back and corrected?

13. How does the interface change based upon the user's role?

14. If a user is editing (or creating) a record, is her/his progress saved automatically?

15. Are technical specifications available for delivering the files? If so, has a responsible party been assigned to deliver the files?

16. Please describe the ETL process.

17. Are delivery failure notifications sent to business owner of data source?

18. Is all data delivered (from outside organization's secure network) via an encrypted protocol (e.g. https, sftp, etc.)?

19. Is data delivered via automated processes with notification logs for success/failure (e.g. scripted exports run routinely)?

20. Are data file(s) available for retrieval/delivered in self-documenting format (e.g., XML, JSON) and/or contains metadata for ensuring no data loss/corruption?

21. Are there any formal or documented processes in place to notify relevant stakeholders of planned changes or active changes made to data file structure, time of delivery, etc.?

22. Is there informal testing that occurs for planned changes to file structures, prior to implementation, and test results are documented and provided to business owner?

Virginia Department of
Behavioral Health &
Developmental Services

DATA QUALITY PLAN
DATA WAREHOUSE ASSESSMENT

FINDINGS AND RECOMMENDATIONS
FEBRUARY 2020

Data Quality Plan
Data Warehouse Assessment

Findings and recommendations

Background

In September 2019, the Office of Data Quality and Visualization (DQV) and the Office of Information Technology (IT) partnered to provide DBHDS with a review of the Data Warehouse to assess its strengths and weaknesses across the enterprise. The DQV assessment would focus on business and data quality to better understand the usefulness, quality, and data management practices within the Data Warehouse (DW). IT needed a technical evaluation of the Data Warehouse because its current platform (SQL Server 2008R2) is no longer supported by Microsoft as of July 2019.

DBHDS engaged the consulting company, Impact Makers to support this review in October and November 2019. This document, created by the Office of Data Quality and Visualization, includes findings from both assessments and presents the findings of Phase 2 of its Data Quality Plan.

The Data Warehouse was created in 2013-2014 to improve data usage and sharing across the agency. It was funded to support compliance with the data requirements included in the Department of Justice Settlement Agreement (DOJ-SA). Impact Makers sought to address both the business and technology aspects of a well running, valuable Data Warehouse environment. The review focused on assessing the current state of the following areas:

- Value proposition
    The value the Data Warehouse brings or has the opportunity to bring to the business
- Architecture
    The overall design and structure of the system
- Data
    Data Quality - The delivery of well structured, valid, accurate data

    Master Data - The management of core data entities (individuals, providers, addresses, etc.)

    Metadata - The delivery of data definitions to aid in the consumption and understanding of data

- Application Lifecycle Management
    - The technical processes surrounding the maintenance, enhancements and delivery of the system
- Security
    - The physical assets, security of data, and user access across the system

I. Value Proposition

Business Value
The Impact Makers team conducted 18 interviews across DBHDS to gain an understanding of the current state of business usage and value being realized from the Data Warehouse.

Positive themes of the interviews:
- The Data Warehouse team tries to understand the business need
- Some of the Data Warehouse team members are very responsive to requests
- Reports being leveraged are mostly descriptive analytics, meaning they look backward at what has happened (i.e. count of individuals served by CSBs last quarter)
- The Data Warehouse team seems technically proficient
- Self-awareness that business users are not data experts and do not have the background to use data to improve operations, drive insights etc. Additional help is welcome and necessary to get the most from a Data Warehouse environment.

Negative themes of the interviews:
- Low understanding of what the Data Warehouse offers – what data is contained in the warehouse which could be useful in daily decision making, strategic planning, insightful analysis
- Frustration at the lack of reliable data for the agency's most important entities - individuals, providers, services, locations, addresses
- Low trust that requests for data can be completed in a timely manner, leading business users to discontinue making requests and resort to alternative solutions outside of the warehouse
- Difficulty in finding out transparent information about the Data Warehouse team's work queue and progress of requests
- Business users do not know the difference between the Data Warehouse team and Data Quality and Visualization team and what each do for the agency or can do for them
- Challenging and time-consuming process is required to get desired data outputs such as simple reports; the request and delivery process has a key skill gap in business data analysis
- The Data Warehouse currently does not include key data needed for some business users and therefore it is not used (i.e. WAMS)
- Low trust in the quality of the data as compared to the actual source data

There is an opportunity for DBHDS to leverage the Data Warehouse as the cornerstone of improving to a data-driven organization but the value has not been fully realized. Examples of the specific opportunities for DBHDS to drive insights from data include (some of these were provided via interviews):

- Understanding the journey of individuals through DBHDS\CSB provided services
- Leveraging historical data to predict the outcome of individuals based on previous activities
- Preventing recidivism through improved understanding of intervention methods
- Using analytical insight to provide better case management services
- Having quality control/management capabilities over providers
- Research based use cases such as location focused services, epidemiology, advanced planning for services based on aging etc.
- Leveraging the warehouse to automate reporting for critical agency data including key performance indicators going to Department of Justice, Legislature etc.

Most of the business is not leveraging the warehouse for analytics or even simple reporting and manual work around processes are weighing the business down and causing decreased productivity. Enhancing the usability and reliability of the platform will increase business usage, allow for greater productivity, and equip the business with the data necessary for decision making and quality control.

Organizational Success Factors

One of the major pitfalls of Data Warehouse projects is the assumption that a Data Warehouse is an IT driven project and IT problem when issues arise. Business involvement, leadership and time is required to make all Data Warehouses successful. Throughout the assessment some of the clear success factors holding back full realization of value from the Data Warehouse include:

1. Shared Goals
   The business strategy and capabilities for the warehouse is an ongoing and collaborative effort that requires IT, the Data Warehouse team, and the business to work together. These teams are operating in siloes and therefore an Enterprise business focus does not exist for the Data Warehouse to align.

2. Strategic Leadership
   Focus from leadership is necessary to drive the strategy, help keep projects on track, and to help remove barriers.

3. Strategic Prioritization

Having a business-driven warehouse requires being in alignment with business priorities, driven from a strategic level of representation from the business. The Data Warehouse team does not receive strategic direction around work prioritization. The result of this is a high level of work-in-progress, daily shifting priorities, and little that is driven to completion.

4. Clear Processes
   The processes which exist are based on email messaging and hallway conversations causing a lack of transparency and focus. The result is that many tasks are dropped at the point of hand-off due to a lack of clear responsibilities and ownership at the process level. An example of this is the LIDS data exchange, further explained in the Data Quality section.

5. Accountability and Commitment
   Ongoing enhancements to the warehouse and data practices in general require ownership. Clear expectations, objectives, and responsibilities should be aligned across the various teams and business partners to drive improvement in accountabilities and results.

6. Transparency and Traceability
   In order to drive accountability and commitment there should be transparency into the work queue, including persons responsible for executing the work as well as insight to where the work is in process. There is no transparency into the queue of work leading to finger pointing and frustration.

7. Training and Adoption
   To increase adoption and usage of the DW, business user training is necessary. Many business users are unaware of available data, how to use the warehouse or what more they can do with data in general to assist with their operations, reporting or strategic initiatives.

Operating Model

There is a siloed operating model surrounding data capabilities at DBHDS. Lack of transparency exists due to lack of structured process for managing requests for data, enhancements, and identified issues. There is a 'throw it over the wall' culture where multiple hand-offs exist just to fulfill simple requests and much of this work is handled via email. For instance, business users send emails to the Data Warehouse team and may not hear back for months. In addition, the responsiveness differs based on which users make the request.

The Data Warehouse team has created a charter by which it governs itself and its involvement in data initiatives throughout DBHDS. The current purpose and scope of the DW is to extract, transform, load, and model data onto an offline analytical Data Warehouse. Direct customer support is offered by the DW team to assist with effective collection and usage of data for Ad hoc report requests after the source data has been ingested and modeled. The following list represents the services covered by the team:

- Ingesting new data sources
- Modifications, changes or upgrades as existing data sources change
- Report development and enhancements
- Ad hoc development
- Technology/Hardware planning and recommendations

The initial design and intent of the DW was to be self-service by the lines of business however this has not occurred. There is a lack of federated report writers in each line of business to autonomously handle report development. This is further hampered by the lack of Views that would enable a self-service model. A successful modern data program relies on self-service capabilities in the business due to the voluminous nature of analytical needs. A major gap at the agency exists – there is no team responsible for assisting with driving improved business usage of the warehouse, improved knowledge of the warehouse or improved data analysis skillsets in the business.
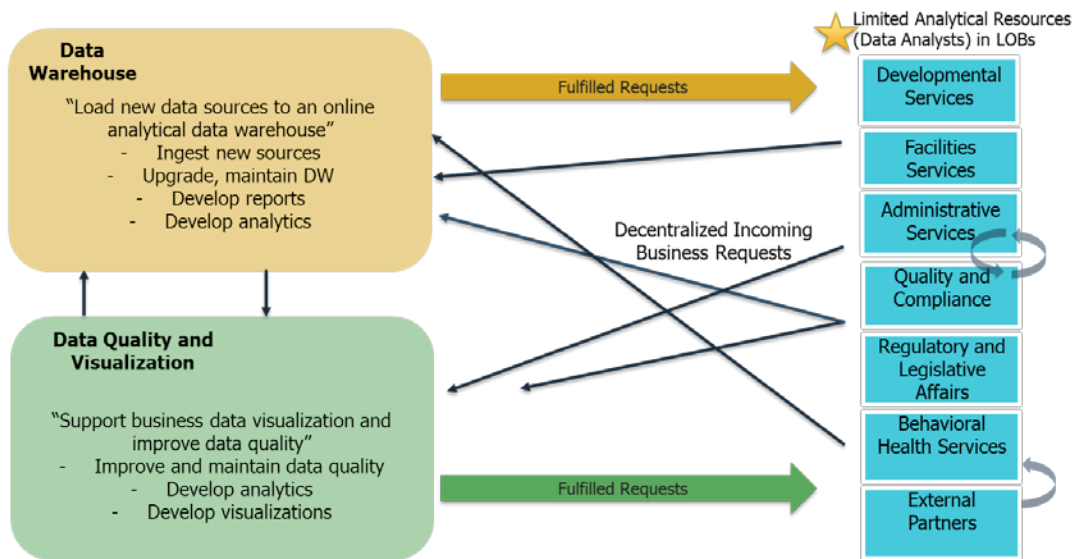

Figure 1: Current Operating Model

All work goes into one of two queues managed by the DW team; a source system priority queue (also called the Data Governance queue) or the general queue. The consultative and support work is generally managed outside of both of these queues and is treated like overhead.

The Data Governance queue is managed by the DW Director via excel spreadsheet and has a committee of the deputy and assistant commissioners that prioritize the work. The projects governed in this queue are primarily requests for new data sources. Business outcomes or capabilities are neither managed by this queue nor any other governance process.

The general queue contains small items which are prioritized in the lines of business and generally sent via email request to various members of the DW team. A resource from the team is assigned to work with requestors to identify the high-level business intent and potentially specific use cases or reports. The assigned resource will usually profile the source data for any concerns (related to modeling, data issues (completeness, consistency, etc.).

- If the source system data has challenges, the process is impeded here.
- If there are no impediments the work to begin staging will start.
- An SME review and design review are offered as the work progresses.
- A User Acceptance meeting is offered upon completion.

The absence of source system subject matter expertise can lead to additional cycles between the DW team and the requestor of the data. The results of building out an analytical environment in this manner generally lead to data models and solutions based upon the best assumptions of the data and how it could be used when delivering business capabilities that are difficult to understand much less leverage and leaving parties feeling frustrated on both sides.

The general queue does not have a published list or priority leading business customers to have no understanding of where their smaller requests are in the process. Most business users interviewed were frustrated at the lack of visibility into the request queue and reported that they had stopped making requests of the DW team. A visual of this process is provided below.
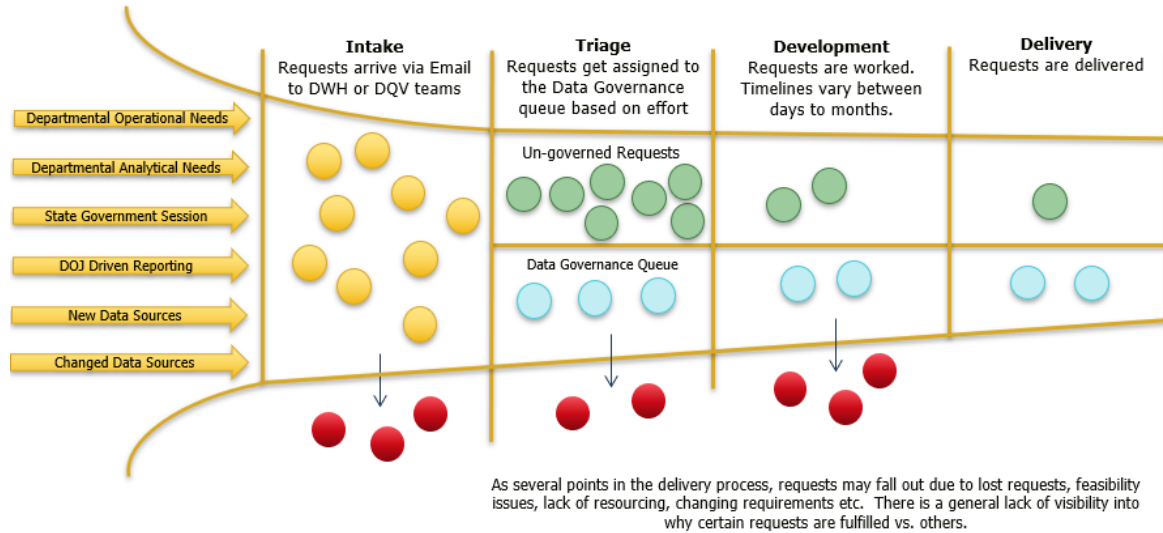
Figure 2: Analytics/Reporting Demand Management Diagram

Two simple opportunities for the DW to improve the workflow that could be very impactful to the business is to implement a ticketing system for transparency and support of business power users throughout the agency.

II. Architecture

The Impact Makers team approached the assessment of Data Warehouse objects by selecting a sample of reports, storage objects and ETL packages to evaluate. The team compiled a set of evaluation criteria to provide quantitative results of each object assessed. The team began with a list of the most used reports based upon the SSRS usage statistics and interviews with the DQV team and business users. From the sample list of reports, another list of common database objects (table, stored procedures and views) was compiled and used as a sample of database objects to be evaluated in the Data Objects criteria spreadsheet. The team then compiled a list of ETL packages that fed the sample database objects (fact and dimensions). Also included in the evaluation of ETL packages were example packages that included both the original (CapTech) design pattern as well as the newer design pattern currently utilized by the DW team. The following is an overview of the DW architecture and the results of those assessments.

Conceptual View

The Data Warehouse environment architecture has remained fairly steady since its creation. The DW team has described its scope/charter is to extract, transform and load and model data onto

an offline analytical Data Warehouse. Although the team possess licenses to a data modeling tool (Erwin) there are no existing data models of any of the databases.

Data Extraction and Staging

There are multiple staging areas in use depending on the data source types and the pattern for usage is not standardized. Ideally, only a few patterns of ingestion would exist, one for files, one for database tables to avoid confusion, data quality issues and overall system complexity.

Staging areas uncovered during the assessment

Name	Description	Server
SMTP Landing Zone	A secure file transfer protocol site that external sources utilize to upload and receive data extract files. (Behind the DBHDS DMZ)	SFTP01.DBHDS.virginia.gov
File Landing Zone	An internal facing file server that is utilized for transferring files received from external sources in the SFTP Landing zone.	\\wap01236*
SQL Server File Share	A shared folder on a database servers local hard drive that facilitates access to stage files for faster ETL processing	\\WNR01010\WarehouseImport\
SQL Server Staging	An interim SQL server instance containing dedicated databases (AVATAR, WAMS and CCS3) for ETL processing into the DW	WSQ03054, WNR01010
DW Staging	A conventional SQL Server instance for staging of fact data before it is loaded into the DW	WNR01010
DW Transformation Staging	A conventional SQL Server instance for staging of dimension data before it is loaded into the DW	WNR01010

ETL

The Data Warehouse utilizes SQL Server Integration Services (SSIS) in Visual Studio 2008 R2 as their primary enterprise data integration tool for Extract, Transform, and Load (ETL) processing and ingesting data. Predominately, an extract, transform and load model is leveraged for bulk/batch loading of data.

Two basic implementation patterns are utilized in all SSIS packages. The core SSIS packages originally developed make extensive use of data flows and multiple native SSIS tasks such as lookups, merges, splits, and derived values. As the DW team assumed ownership of the vendor created solution, the design approach for SSIS packages shifted from the initial design to a design methodology that consisted mostly of SQL script tasks.

There is a consistent configuration design pattern implemented for promoting SSIS packages through the development, test, and production environments. SSIS packages are commented in a consistent fashion and a standardized design and pattern of process and error logging is consistent across SSIS packages.

For all packages reviewed, the most common performance tuning parameters are set at default, e.g., DefaultBufferMaxSize, DefaultBufferMaxRows and Network package size is set using the SQL Server Default. Additionally, many packages do not utilize parallel processing (DWStagingMasterLoad, DMASDWLoadWaiver) and opt for serialized processing (e.g., core WAMS tables are processed sequentially). Most SQL script tasks contain in-line SQL and do not leverage optimized stored procedures.

Error handling and notifications are at a very basic level. All package errors are logged to an error table via an SSIS script task. Some notifications/errors do not alert when a file does not arrive for DBHDS to load in (i.e. LIDS missing 3 months of data in 2018). Bad data and errors are not managed and conveyed to the user. Consumers of the DW have to contact the DW team when data anomalies are noticed as there are no pro-active or automated notifications of missed or erroneous loads.

Raw Data

A raw data store in the form of a data lake, data vault, persisted staging area or operational data store does not exist as part of the current architecture. There are a few persisted staging tables in use for data which is externally sourced from third parties – these are located in the DBHDS schema in the Data Warehouse. A raw data store could be useful to the agency in the future to help drive improvements in operational\production reporting such as daily counts from source systems which do not have strong reporting capabilities. The raw data store could be leveraged for this operational reporting while the Data Warehouse could maintain its focus on analytical, historical uses and enterprise level conformed data. Instead, the Data Warehouse is being expanded into more of a source specific asset instead of a consolidated\enterprise asset.

Dimensional Data

The majority of Data Warehouse tables are structured in dimensions and facts. There are a variety of patterns being used to develop dimensions. Most of the tables are structured in a Snowflake schema or are aligned to a third normal form data model, as they are very normalized. Examples include:

- Bridge tables as cross walks between like attributes in dimensions
- Type 1 dimensions instead of Type 2 – Type 2 dimensions allow for tracking of history
- Source specific dimensions and facts instead of enterprise conformed dimensions and facts

Highly normalized dimensional models have disadvantages from a business usage perspective as users must join across many tables as they would in a third normal form environment. Additionally, most dimensions reviewed are not tracking history, in other words they are not considered slowly changing dimensions but are rather the 'current' snapshot of the data. Two Type 2 dimensions were found out of the ten dimension tables reviewed.

There is a mix of conformed\enterprise data and specific source focused data within the Data Warehouse. A new pattern of development has created source focused facts and dimensions to accommodate user requests which do not require a mash-up of multiple source data objects. This data may be more useful in a different structure, such as an operational data store or raw data store with useful source-based data views for daily reporting. At minimum there should be a clear delineation of conformed data and source specific data within the warehouse to provide better clarity to business consumers and ensure data used are better understood.

Reporting

The DW reports are organized into several folders in the SQL Server Reporting Services portal which can be accessed through Internet Explorer. There is a total of 107 reports in the portal. Of the 107 reports, 14 are deprecated. The top level '_Enterprise' folder is unique in that there are 19 reports in that folder with additional sub-folders nested individually.

The Impact Makers team reviewed the SSRS logs and noted the following statistics of reports being viewed for a two month period from July 26, 2019 through September 23, 2019. These statistics indicate low usage of the reporting portal as 40% of reports were not opened in a two-month timeframe. Some reports may be for annual or quarterly reporting so further research is necessary to rationalize reports which may be removed from the system (the period of analysis did cross two quarters). 93 reports were considered in the following statistics, since 14 are deprecated:
- 5 reports were viewed between 400 and 800 times in the period – 5 %
- 3 reports were viewed between 100 and 399 times in the period – 3 %
- 7 reports were viewed between 50 and 99 times in the period – 8 %
- 17 reports were viewed between 10 and 49 times in the period – 18 %
- 24 reports were viewed between 1 and 9 times in the period – 26 %
- 37 reports were not viewed between the period – 40 %

The DW does not use stored procedures for all reports. When SQL code changes are needed throughout multiple reports, developers are required to update each singular report one by one, as opposed to updating a single stored procedure. This manual activity requires developers to intimately know how many reports contain certain similar query logic and manually make updates. This process is error-prone and can cause data quality issues in reporting.

III. Data

Data Quality

Data Quality in the DW is a direct reflection of the quality of the data it receives from the source systems. The DW does not contribute any additional layers of data quality to source system data. Therefore, bad, missing and erroneous data from the source systems is reflected in the DW. Late and untimely data from the sources systems also adversely affects the quality and trust of data in the DW. Source system data can be improved with an effort from DBHDS to create processes to identify data issues, come up with remediation plans, and then remediate within the internal applications or third-party vendors. Since there is no process or ownership for this today, this is a substantial opportunity for improvement.

The DW can negatively impact data quality in the form of missed loads, late loads, loads in error, missing tables and columns, and improper source to target mappings. The lack of tracking and communication of these issues contributes to the lack of trust in the data integrity. Additionally, the DW has a negative effect on data quality due to its poor or missing linking algorithms. Data quality reports can be created to automatically detect anomalies, out of range values etc. This process would entail creating data business rules and an automation process to evaluate data based on these rules.

Another concern lies in the value the DW provides to its consumers. Poor documentation, lack of transparency into process and error logging, and mistrust of the data in the DW along with source system data quality and the above potential data quality failures contribute to the lack of utilization and embrace of the DW. It is imperative that the validity and reliability of data in the warehouse remain paramount focuses to all involved.

Through both interviews and analysis, gaps in data quality were discovered. Themes discovered pertaining to data quality include:
- The DW team cannot log into the front-end source systems in many cases and merely ingest data from file extracts as is.

- No quality checks are performed by the DW team to ensure that file extracts from source systems are accurate and complete
- There is no reporting back to consumers of the Data Warehouse of failed or missed loads. The onus is on the consumer(s) of the data to investigate failed or missed loads and data inconsistencies
- The current DW system is designed to fail or break due to any errors or inconsistencies with data loads
- Data about individuals is not reliable
- There are no high-level entities such as individuals, providers, services, etc. and there is only a partially functioning person key (DBHDSID) making analytics impossible
- There are multiple places to retrieve a listing of states, zip codes, cities/localities (i.e. Dim.Address, Dim.IFSORegionCity, Dim.IFSPORegionCounty, Dim.IFSPOStateZip, Dim.WAMSCounty, Dim.WAMSStateProvince, Dim.VHIGeographicInformation)
- Data outliers are not remediated in a timely manner
- Some tables are empty (i.e. Dim.AgeGroup)
- Data delivered on CD from hospitals does not match data that is in the Data Warehouse

A major component in the framework of the Data Warehouse as it relates to usability is the data quality application (DQA). The DQA is supported by 2008 R2 Microsoft SQL Server Master Data Services. The DQA was developed by CapTech consulting company and implemented as a number of SSIS packages and SQL scripts in concert with R2 Microsoft SQL Server Master Data Services. The following observations of the DQA and Master Data Services as they relate to the DW include:

- The Data Quality Application (DQA) is not understood by the DW team and has not been changed or updated since the original release of the system
- Lack of understanding of how the DQA is affecting data quality due to inefficiencies in matching and linking rules.
- DW does not provide a single source for Provider, Individuals, Services, etc. This has not been improved since original implementation
- Data stewards charged with "linking" records are no longer able to do so (due to an unknown defect in the system) and no short-term fix has been provided.
- Original source system ID is not propagated through to the data warehouse leading to lack of traceability from source system to DBHDSID
- The full dataset of individuals is rechecked, remapped too frequently; the job runs for hours

Master Data

Master data such as individuals, providers, addresses, regions, facilities etc. is not currently conformed in the Data Warehouse. There are multiple sources of truth within the warehouse for

some of these enterprise entities. Additionally, the DW is adding source specific facts and dimensions for some of these entities maintaining the siloed data constructs which reside in the source systems.

The Data Warehouse Director would like to implement a master data management COTS package to assist with alignment and maintenance of master data across DBHDS.   This approach could be valuable in extending current functionality required for matching individuals and other master data entities and providing data back to sources as well as improving conformity across the enterprise. At this time there is no COTS package chosen or procured to manage master data (or other data governance processes). Until a vendor package is chosen and implemented, which would take several years, DBHDS can get better value and use from the DQA with fixes to the matching processes.

Metadata

There is no metadata currently in use describing data within the Data Warehouse or other data across DBHDS. No consolidated repository for metadata exists leading to lack of understanding of what data is offered, how it is calculated, what the source is, who to contact with issues, etc.

Additionally, most source systems also lack metadata or documentation. The lack of source system metadata exacerbates challenges with data ingestion into the warehouse and is an impediment to the DW team to maintain and create metadata in the existing warehouse.

IV. Application Lifecycle Management

Design

Some development patterns are documented for use by the DW team and appear to be adhered to including a standards document and release management process document. With the exception of onboarding new sources into the DQA development patterns such as naming conventions, file management processes and staging processes do not have documentation. To the extent possible these patterns are followed by existing code examples and communicated by word-of-mouth.

Development and Testing

While the process for promoting code and adding new sources for the DQA are documented, there are a few gaps such as developer on-boarding and development pattern communication.

Legacy patterns inherited by the DW team from the original vendor have been modified in some cases such as the standard approach for ETL development mentioned in the ETL section in this document.

The DW team leverages Microsoft Team Foundation Server for source control of various components on the data ecosystem. Code is modified via Visual Studio 2008 or other versions depending on what is being developed. While the application code "state" for the Data Warehouse is only partially stored in source control all changes to the application code "state" are kept in source control via release management scripts which contain the incremental changes to the database.

The Database schemas, SQL Server Agent Jobs, and control data is managed through migration changes where the incremental changes to the environment are source controlled instead of the application code "state". The database "state" is defined as the content of a database at a moment in time. The DW team does not maintain the database state via SQL scripts and Visual Studio database projects which is a best practice and provides the ability to get to a more automated deployment methodology in future software releases. While the resulting business capability at the end of the development process is more important than the process itself; working from an application code base that is entirely source controlled as a "state" has advantages including traceability, reliability with promotion, and faster, more frequent, development cycles.

The Analysis Services, Reporting Services, and Integration Services code base is well managed via source control. Integration Services code includes configurations for common parameterized values providing flexibility to the development and deployment teams and also follow best practices for the SQL Server version of the current ecosystem. Improvements to functionality in future software releases will provide enhanced capabilities for parameters and control values making code promotion, management of environmental change and deployment validation more straight forward.

Testing is performed by a dedicated tester who adheres to standard test processes.

Deployment & Change Management

All deployments are handled by the Production Support Database Administrators (DBAs). Currently there are ten to fifteen deployments per week to the QA environment. All QA deployments are approved by the DW director. There are three to five deployments per week

deployed to the Production environment. DW developers are not on call during deployments. Deployments are logged in SharePoint in the Release Calendar.

Per interviews with the Production Support DBA, there are often problems with deployments. Often the deployment fails on promotion or functions differently than intended necessitating further cycles. The cause of deployment difficulty can be attributed to:

- Differences in the data and schema between DEV, QA and Production environments
- The nature of a manual process with multiple steps
- Lack of unit testing by developers ahead of promotion requests
- Lack of integration testing by developers ahead of promotion requests

The Development and QA environments have not been refreshed with production data in over a year leading to deeper gaps between developer experience during coding and how the developed components will react in further environments.

Infrastructure & Operations

The underlying infrastructure of the Data Warehouse environment is based on Microsoft technologies including Windows Server and Microsoft SQL Server. The database instances reside on SQL Server 2008 R2 which has been out of extended support since July of 2019. Since the environment is currently out of support, the system is vulnerable to security attacks, corruption or general data loss due to bugs. Microsoft will not respond to any software or hardware issues on the system leaving DBHDS to make any fixes or recover from a failure.

The assessment of infrastructure included a deeper look into the Data Warehouse servers, configuration, memory, fail over settings, etc. The results of this activity can be found in the Technical Database Review document.

V. Security

To the extent possible the Data Warehouse application leverages role-based security for individuals to access the data as well as service accounts for extracting, loading and running services. Service accounts are segmented by environment, ensuring one environment is not affected by another.

The data stored by the SQL Server database engine is secured at rest by Microsoft's Transparent Data Encryption (TDE) feature of SQL Server. The data stored within the Analysis Services cube

is not encrypted at rest. The only data that is encrypted at the column level are the SSIS configurations on the ETL Instance.

Encrypted connections to the database are not enforced leaving open the possibility for a data being intercepted and viewed in transit.

User access to the Data Warehouse database is achieved through role-based security via membership in an Active Directory group and that group being a member of a database fixed role. Users that can access the database directory have read-only access to all the data regardless of the sensitivity.
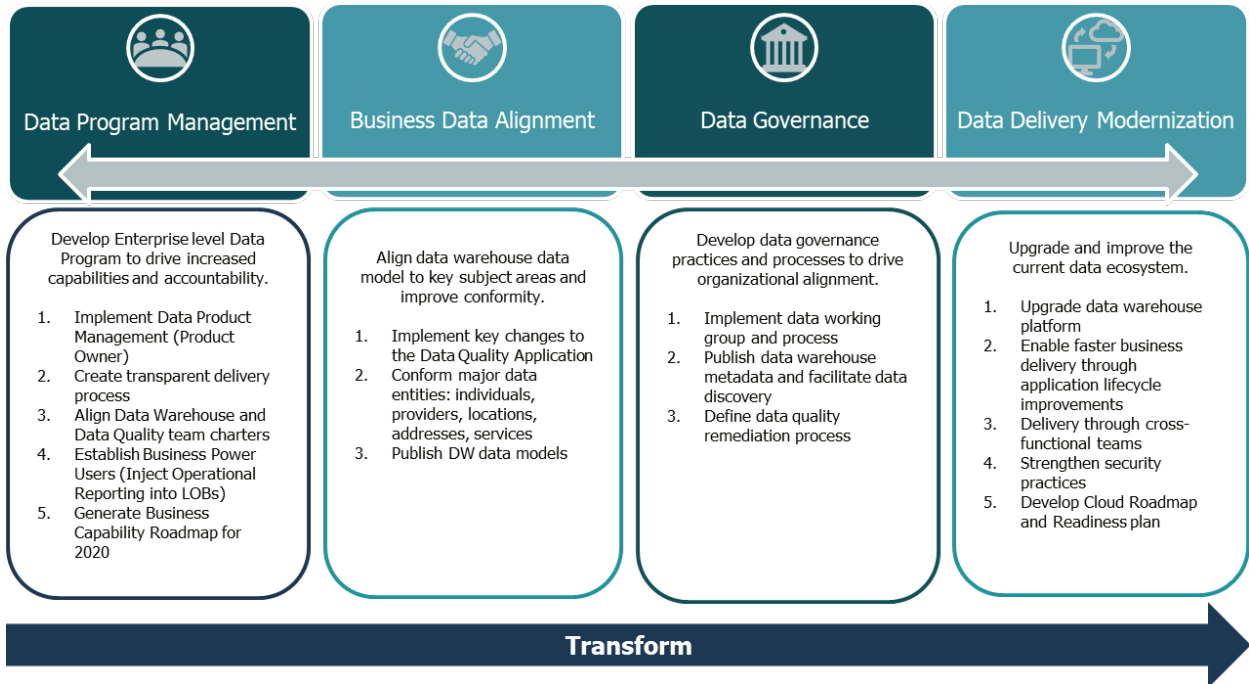
VI. Next Steps

The findings and recommendations throughout this report present areas of opportunity for the Data Warehouse ecosystem that align with four key categories:

1. *Data Program Management*
   Develop an Enterprise level Data Program to drive increased capabilities and accountability.
2. *Business Data Alignment*
   Align Data Warehouse data model to key subject areas and improve conformity.
3. *Data Governance*
   Establish data governance practices and processes to drive organizational alignment.
4. *Data Delivery Modernization*
   Description: Develop data governance practices and processes to drive organizational alignment.

Focusing on these areas, DBHDS can improve the usage, reliability and business value of the Data Warehouse and data program for the agency. While some technical issues are holding the agency back, a large portion of organizational, process and skill opportunities exist which will require strong leadership buy-in, organizational change management and long-term commitment.

Data Program Management	Business Data Alignment	Data Governance	Data Delivery Modernization

Develop Enterprise level Data Program to drive increased capabilities and accountability.

1. Implement Data Product Management (Product Owner)
2. Create transparent delivery process
3. Align Data Warehouse and Data Quality team charters
4. Establish Business Power Users (Inject Operational Reporting into LOBs)
5. Generate Business Capability Roadmap for 2020

Align data warehouse data model to key subject areas and improve conformity.

1. Implement key changes to the Data Quality Application
2. Conform major data entities: individuals, providers, locations, addresses, services
3. Publish DW data models

Develop data governance practices and processes to drive organizational alignment.

1. Implement data working group and process
2. Publish data warehouse metadata and facilitate data discovery
3. Define data quality remediation process

Upgrade and improve the current data ecosystem.

1. Upgrade data warehouse platform
2. Enable faster business delivery through application lifecycle improvements
3. Delivery through cross-functional teams
4. Strengthen security practices
5. Develop Cloud Roadmap and Readiness plan

Transform

Virginia Department of
Behavioral Health &
Developmental Services

DATA QUALITY PLAN
DATA WAREHOUSE ASSESSMENT

REPORT DOCUMENTATION
JANUARY 2020

Data Quality Plan
Data Warehouse Assessment

Purpose

The Data Warehouse Assessment provided DBHDS with a roadmap of recommendations to improve the data quality. The Office of Data Quality and Visualization (DQV) identified an opportunity to support business areas by documenting the Data Warehouse reports and providing the DW team with a template to continue this process as new reports are created.

A data warehouse report document is a form of meta-data. It contains plain language descriptions to inform the reader about the data in the report. It also captures important details about the report owner, the purpose of the report, and its business use. For these reasons, the document is co-owned by both the warehouse team (typically the developer) and the business contact (typically Director-level).

Meta-data promotes data quality by offering a standard interpretation of the data fields for both the business users and the data analysts. Its helps both teams track key elements during report development, through maintenance, and during important transitions. It also uses a standard template and answers many of the basic questions users have about reports.

The Plan

DQV first began by identifying which older reports would require supporting documentation. An IT request was required to gain access to the reports documentation folder on the data warehouse drive. After access was granted, the list of current reports documentation was reviewed to identify which reports in production were missing documentation. DQV focused effort on the first 48 reports in production.

> The team identified 48 reports in need of documentation.

Next, DQV investigated which staff were using these reports. The Data Warehouse Office Director provided a query export that showed the user alias associated with the staff who ran the report, as well as the number of times they ran it. Aliases were looked up individually using Microsoft Outlook to identify the staff associated with the alias. If the staff who ran the report could not be identified by their alias, or they were no longer employed at DBHDS, the second most frequent user of the report was

identified. Instances where that staff member was recognized as either DQV or Data Warehouse staff were noted but disregarded, since neither are considered report owners. These criteria resulted in a list of DBHDS staff who ran these reports either last, or most frequently.

Finally, the DQV Office Director emailed all Office Directors associated with the staff list. The communication included details about the project, the plan, and the proposed outcome. DQV and Impact Makers staff followed up with each Director by forwarding a subset of the reports thought to be owned by their office, along with a calendar invitation to discuss.

The Project

DQV emailed twelve Office Directors, or their select designees, and scheduled interviews to help assist with documenting each report.

> The team interviewed 12 Office Directors, or select designees.

In some instances, the Office Director was not familiar with the report and did not agree that they were the owner. In these cases, DQV staff asked about who else to contact. In most cases, these alternative owners were identified and interviewed; however, in 9 cases, no owner was ever identified for a report. Without such a contact, these reports could not be documented.

For the remaining 39 reports, DQV worked with each Office to elicit basic information about each reports' current business use. Office Directors were asked who the owner of the report is (the person responsible for producing the output). If the report was not owned by them, the Directors were asked to identify another user. DQV created a rule that each report was allotted two possible owners. At that point, if no owner could be identified, the report would be eligible for archive.

Once ownership was established, the team moved on to asking vital questions about its business use. These questions included:
- The purpose of the report (the original problem the report was designed to address)?
- How the report is currently used in the business area?
- Whether it supports any other external reporting?
- Who is the audience for the report?
- Are there other parties interested in the report output?
- Are there calculations or logic used in the report that is relevant to the business area?
- How frequently is the report used?
- Are there any issues/problems noted with this report?

If the Director could not answer these questions, they were asked to identify someone who could.

Currently, this type of business-use information is filled out by the business are on the new request template:

- **Requested by**: Name of person who initially requested the report.
- **Contact**: The Office Director who currently owns the report.
- **Requested Date**: Initial date the report was requested by the business office.
- **Needed By Date**: Date the report is needed in production by the business office.
- **Requested Report Name**: Name of the report, as requested by the business office.
- **User Request**: This is a short description of what is being requested in a report. In older reports, the description itself is used.
- **Business Use**: This is a description offered by the business owner/users that describe in detail how this report is used by business office and for what purpose.

After the interview, the Impact Makers team would translate responses from each question into the details for the documentation template items listed above.

Next, the team ran each report to examine the output. This deep dive into the data would reveal information related to the technical details of the reports documentation template:

- **Columns**: Discrete data elements/fields shown in report
- **Sorts**: Columns to be organized in ascending or descending order
- **Grouped By**: Columns to be grouped together
- **Pre-defined Filters/Defaults**: Ways to limit data being returned
- **Aggregate/Summary data**: Rollup of calculated data over a range or grouping
- **Calculations**: Formulas used to calculate aggregate/summary date results
- **Population**: Type, scope, or grouping of people this report applies to
- **Time Period**: Applicable range/grouping of time; e.g., 30d, 60d, yr, etc.
- **Business Rules**: Any insights from the business owner or office
- **Criteria**: Filters, calculations, groupings, etc. as provided by requester
- **Report Type**: Detail or summary
- **Related Reports**: Other reports that may have similar business uses or association
- **Notes**: Any additional supporting information to help with the creation of this report
- **Frequency**: How often this report is run/used
- **Parameters**: Criterial/filter data or other information passed to database during report run

As a final step, the team reviewed the query to capture any other technical details not readily apparent in the report output.

- **Main detail**: Core data used to display on report

- **Supporting filter data**: Data used to help limit results being displayed on report
- **Report Screenshot**: Picture of what report looks like with data
- **Report Created by**: Name of developer who created the report
- **Report Completed Date**: Date report development was complete
- **Last Update Date**: Date report was last modified

The Outcome

In the course of this report inventory documentation process, DQV analysts identified a list of reports to archive. The team also noted reports that may need to be modified but advised Business Owners to follow-up with the developer responsible for execution of changes.

At the conclusion of this process, DQV e-mailed business owners to offer gratitude for their assistance, list which reports were left orphaned, and which reports would be archived. This ensured that all Office Directors received a follow-up email informing them about the outcomes of the project.

Lastly, all collected materials and notes resulting from this process kept on Box were transferred to the data warehouse team so they may follow-up with appropriate actions, as well as continue maintenance of documentation going forward. It is understood that the continued maintenance of this Report Inventory documentation is not the responsibility of the DQV team, whose involvement in this process is a one-time effort to aid the data warehouse team with addressing the backlog that exists, and to efficiently respond to DOJ's findings (and SOIG's identification) of this noted gap in documentation.

Timeline
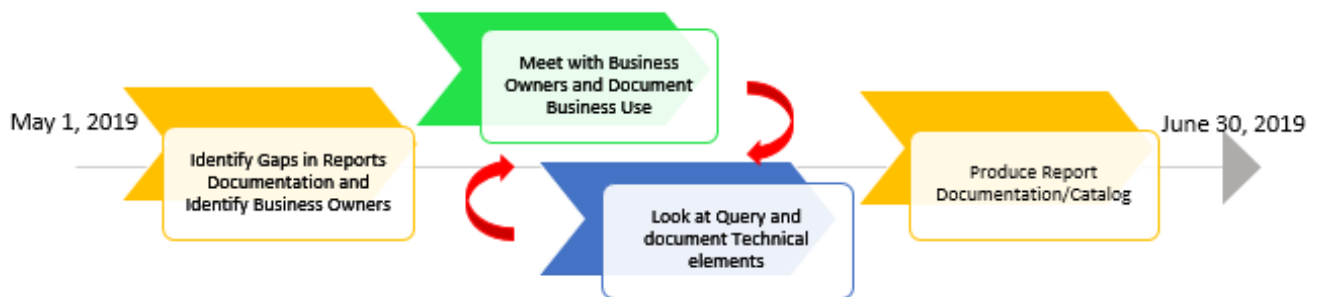
Effort

Activity	Amount
Interview meetings required	17
Business owners & SMEs interviewed	22
Average interview time	1 hour
Total Reports Reviewed	48
Average time/report to document	2 hours
Reports identified with errors	7

Reports identified to archive	10
Reports identified as historical	9
Misc project management hrs required	46 hours
Project team size *(# of resources)*	3
Total estimated resource hrs	157

Insights

- The term "Report Owner" is not understood.
  - They often didn't know about a report or its appropriate use, and therefore did not feel comfortable with ownership.
  - They expressed interest in learning more about reports or "seeing what is out there," but were unsure about the process for requesting updates/corrections/modifications to an existing report.
  - They voiced a distrust for reports they suspected had flaws.
- Ownership may change.
  - Training and knowledge transfer does not occur.
  - New ownership transfer is not communicated to DW team.
- Reports may linger after initial development:
  - Developed but not updated.
  - Codes are not reviewed, even after broad system changes.
  - Reports were never archived.
  - Reports may simply go unused.

Suggestions

- Define what "Report Owner" means to the warehouse team and clarify expectations.
- Ensure Report Owners understand their role and responsibilities:
  - Make reports documentation easily accessible through a Box folder.
  - Articulate expectations during meetings/communications.
  - Consider training Business Owners on how to appropriately use a report (e.g. offer an overview of how multiple filters interact during the acceptance meeting).
  - Publish a protocol for how/when owners should report bugs/request modifications.
  - Add a Report Owner signature sign-off to the reports documentation template.
- Explore a process for code review, such as an annual consistency check.
- Examine the current folder structure and consider creating new folders (e.g. Historical IDOLS).

Virginia Department of Behavioral Health & Developmental Services

**Data Quality Plan
Reporting Assessment**

**Case Management Data Metrics
Report
May 2020**

Data Quality Plan
Reporting Assessment

Case Management Data Metrics Report

Overview

The Case Management Data Metrics Report is used by the DBHDS Case Management Steering Committee to monitor the community services boards' (CSBs) case management services, especially Enhanced Case Management (ECM) and Individualized Service Plans (ISP). The reported data focus on the individuals who actually received these services, rather than the eligible individuals, in order to identify areas for improvement in key case management metrics.

Users

The internal users include Quality Improvement, Developmental Services, the Case Management Steering Committee, and the Attorney General's Office. The external users include the CSBs, the Data Management Committee, the Developmental Services Council, and the DOJ SA attorneys.

Ownership and Authorship

The report owner is the Director of Community Quality Improvement. The report is primarily developed by two Data Warehouse analysts who work closely with the report owner.

Data Source

The data source for this report is the CSB data extracts that are in the Community Consumer Submission 3 (CCS3) application. The data are stored in the data warehouse since CCS3 does not have a user interface.

Settlement Agreement Alignment

Measures and Indicators

The case management-related indicators and measures are in III.C.5.b.i, III.C.5.b.ii, III.C.5.b.iii, III.C.5.c, V.F.2, and V.F.4. The measures below are focused on Enhanced Case Management, employment goals, and community engagement goals.

- The Commonwealth tracks the number, type and frequency of case management contacts. DBHDS will establish a process to review a sample of data each quarter to determine reliability and provide technical assistance to CSBs as needed. (V.F.4)

- The data regarding the number, type, and frequency of case management contacts will be included in the Case Management Steering Committee data review. Recommendations to address non-compliance issues with respect to case manager contacts will be provided to the Quality Improvement Committee for consideration of appropriate systemic improvements and to the Commissioner for review of contract performance issues. (V.F.4)

- The case manager completes face-to-face assessments that the individual's ISP is being implemented appropriately and remains appropriate to the individual by meeting their health and safety needs and integration preferences. (III.C.5.b.iii; V.F.2)

- At least 86% of individuals (age 18-64) who are receiving waiver services will have a **discussion** regarding employment as part of their ISP planning process. (III.C.7.a)

- At least 50% of ISPs of individuals (age 18-64) who are receiving waiver services include **goals** related to employment. (III.C.7.a)

- At least 86% of individuals who are receiving waiver services will have a **discussion** regarding the opportunity to be involved in their community through community engagement services provided in integrated settings as part of their ISP process. (III.C.7.a)

- At least 86% of individuals who are receiving waiver services will have **goals** for involvement in their community developed in their annual ISP. (III.C.7.a)

Case management indicators are also mentioned as data that the KPA workgroups should review in V.D.3.b (Health, Safety, and Well Being KPA workgroup) and V.D.3e (Community Inclusion / Integrated Settings KPA workgroup) in addition to other data.

Core Metrics

Enhanced Case Management (ECM): Individuals receiving active case management qualify for ECM if they meet certain criteria, including:

- Receiving services from providers with a conditional or provisional license
- Having high health or behavioral needs as defined by the Supports Intensity Scale® ("SIS")
- Experiencing an interruption in services greater than 30 days
- Encountering the crisis system for a serious crisis or for multiple less serious crises within a three-month period
- Have transitioned from a Training Center (TC) within the previous 12 months
- Residing in a congregate settings of 5 or more individuals

Individuals who meet any of these criteria must receive at least one face-to-face visit monthly, with no more than 40 days between visits (30 days, plus a 10-day grace period). This metric measures the number of individuals meeting criteria for ECM who received face-to-face visits no more than 40 days apart.

In-Home ECM: Face-to-face visits for individuals meeting ECM criteria should occur in the individual's place of residence at least every other month.

Employment discussion: Support coordinators are expected to discuss employment with individuals in the appropriate age range (18-64) at the annual ISP meeting. This metric measures the percentage of individuals, age 18-64, who had a discussion about employment at their ISP meeting.

Employment goals: If the individual is interested in finding employment, the SC should work with the individual to develop goals. These goals should be included in the ISP. Then, the SC should facilitate access to employment.

Community engagement discussion: Support coordinators should discuss opportunities for community engagement at the annual ISP meeting. This metric measures the percentage of individuals who had a discussion about community engagement at their ISP meeting.

Community engagement goals: If the individual is interested in community engagement, the SC should work with the individual to develop goals as part of the ISP.

Figure 1. Logic for core metrics

CORE METRICS IDENTIFIED

In-home Enhanced Case Management (ECM):

Denominator = Number of individuals with valid CCS3 Consumer Designation code 923 (Developmental Enhanced Case Management)

F2F Numerator = Number of individuals with code 923 receiving Program Area 200 (Developmental services), Service Code 320 (Case management), **Service Modality = 1 (Face-to-face)** within no more than 40 days of previous visit.

In-Home Numerator = F2F Numerator + Service Location code is 01 (Consumer Residence), 04 (Local or Regional Jail), 05 (Local or Regional Juvenile Detention Center), 11 (Assisted Living Facility), 12 (Nursing Home), 13 (Shelter), or 15 (CSB or CSB-Contracted Residential Facility).

Employment discussion and goals:

Denominator = Number of individuals with valid CCS3 Consumer Designation code 920 (Medicaid Intellectual Disability (ID) Home and Community-Based Waiver Services) receiving Program Area 200 (Developmental services), Service Code 320 (Case management), **age 18-64**, who had an annual F2F ISP meeting. (ServiceSubtypeCD='14')

Discussion numerator = Number with CCS3 Data Element 91 01-04 (Employment discussion)

Goals numerator = Number with CCS3 Data Element 92 = Y (Employment outcomes)

Community engagement discussion:

Denominator = Number of individuals with valid CCS3 Consumer Designation code 920 (Medicaid Intellectual Disability (ID) Home and Community-Based Waiver Services) receiving Program Area 200 (Developmental services), Service Code 320 (Case management) who had an annual F2F ISP meeting. (ServiceSubtypeCD='14')

Discussion numerator = Number with CCS3 Data Element 100 = Y (Community Engagement Discussion at Annual F2F ISP Meeting)

Goals numerator = Number with CCS3 Data Element 101 = Y (Community Engagement Goals at Annual F2F ISP Meeting)

Compliance Status

DBHDS is currently in compliance for face-to-face visits and in-home visits for individuals meeting ECM criteria. Both of these metrics were consistently above 86% in FY2019.

In FY2019, the metric for community engagement discussion was above 86% statewide (88%) but the percentage with community engagement goals was below the target at only 38%.

Similarly, for employment discussion, the metric was 93% for FY2019, but only 32% recorded employment outcomes.

Reporting

Processes

The 40 CSBs are required to produce and transmit extracts to DBHDS each month containing data on all services provided. CCS3 receives these flat-file extracts, and the data are loaded into the Data Warehouse. Two members of the DW team, Cynthia Zhang and Rhonda Newsome, run the reports using SQL queries that have been developed for each of the metrics. The results of these queries are entered into a Microsoft Excel workbook that breaks the data down by CSB and region.

Quality Control

CCS3 is required by DBHDS and governed by the CSBs. Because of this, CSBs may not adhere, either inadvertently or unknowingly, to the business rules and data definitions outlined in the CCS3 Extraction Specifications Document developed by DBHDS and the Data Management Committee of the Virginia Association of CSBs. In addition to this, the system lacks data validation measures that would ensure data are entered according to business rules. This puts the burden on the people rather than having a system or automated practice in place that checks and corrects for validity errors.

The monthly extracts cause additional data quality issues, in particular when it comes to identifying individuals who meet criteria for ECM. Since consumer records are extracted monthly, they will contain information about individuals at the time the extract is run. It is possible that an individual's status may change more than once during a month, but those changes will not be captured in the extract.

There were some quality control processes in place whereby Susan Elmore worked directly with the CSBs to address coding issues. However, it was later reported by Challis that Susan was no longer reviewing coding issues with the CSBs. No other quality control process is in place for CSB coding issues at the time this report was written.

Documentation

The CCS3 Extract Specifications Document is a 115-page user guide that is maintained and updated regularly. This scope of this document covers the 84 required data elements from CSBs, which is beyond the scope of this report. However, the Specifications Document provides information on extract files and descriptions of the consumer designation codes related to this report. The Specifications are written for the CSB staff and CSB IT vendors involved with collecting, reporting, and using data about individuals receiving services from CSBs.

No documentation has been developed on how to interpret and make sense of the CM data metrics report for user groups like the Case Management Steering Committee.

Recent and Pending Changes

Since the ISPs are now required to be entered into WaMS, DBHDS will no longer be dependent on CCS3 for reporting on employment discussion and goals, or community engagement discussion and goals. WaMS has unique identifiers, data validation, more timely reporting capabilities, and a better ability to detect and correct errors.

However, the current barrier to using WaMS is that a majority of the Support Coordinators have not completed the data entry in WaMS as required, in part because they are reluctant to "submit" their work which locks the ISP and prevents future changes. The QI Specialists are working with the CSBs to provide training and to increase the percentage of ISPs that are complete in WaMS. If training is successful, reporting will be able to transition from CCS3 to WaMS.

Currently, CCS3 is the only source of ECM data.

Recommendations

Transition reporting to WaMS: For community engagement discussion and goals, and employment discussion and goals, DBHDS should transition to reporting from WaMS as soon as possible. Since there is no alternative for ECM, this metric must continue to be reported using CCS3 until new technology is procured.

Document reporting processes. There is no documentation of processes among the data warehouse and business users that outlines the structures in place, the frequency of reporting, and the stream of activities until the final delivery of the report. Additionally, the exact filters used for these metrics are complex, and should be documented in plain language so that users understand who is, and is not, included in the denominator for each metric.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Reporting Assessment

Semi-Annual Employment Report
May 2020

Data Quality Plan
Reporting Assessment

Semi-Annual Employment Report

Reporting Period
This point-in-time report is compiled and disseminated semi-annually. The two points of data collection are June 30 and December 30.

Report Delivery
The report is available publicly as a PDF posted on the DBHDS website. Internally, the report is emailed as a PDF.

Overview

This point-in-time report counts the total number of individuals on a Developmental Disability Waiver or waitlist who are employed. The report also includes demographics, the type of employment, the current wage, and the typical number of hours worked per week.

Users

Internal users include the Deputy Commissioner of Developmental Services; the Quality Improvement Committee; and the Key Performance Area workgroups

External users include the Employment Service Organizations (ESO): VA Access, ARC of VA, VA APSE, Employment Organizations, Department of Aging and Rehabilitative Services (DARS), Department of Education, Partnership for People with Disabilities, and Virginia Board for People with Disabilities

Ownership and Authorship

The Deputy Commissioner of Developmental Services, is the business and data owner. A Business Analyst cleans the data and produces the visualizations for this report.

Data Source

The data sources for this report include ESOs and DARS. A portion of the data are gathered from DARS data through a data-sharing agreement on individuals receiving services through Extended Employment Services and Long-Term Employment Support Services, which are funded by DARS.

Each organization submits data via an Excel spreadsheet ("Employment Data Survey Form"). These submissions are stored in a shared folder on Box and later compiled into one spreadsheet by the Office of Developmental Services.

Settlement Agreement Alignment

Measures and Indicators

Data for this report are used to demonstrate compliance with indicators in section II.C.7.a:

The Commonwealth has established an overall target of employment of 25% of the combined total of adults age 18-64 on the DD waivers and waitlist. Compliance with the Settlement Agreement is attained when the Commonwealth is within 3% of that target. (III.C.7.a)

New Waiver targets established with the Employment First Advisory Group for Individual Supported Employment (ISE) as well as Group Supported Employment (GSE). Compliance with the Settlement Agreement is attained when the Commonwealth is within 10% of the targets. (III.C.7.a)

New Waiver targets established with the Employment First Advisory Group: FY2020 Total: 1486, ISE 936, GSE 550.

Employment data will also be monitored in the Community Inclusion / Integrated Settings Key Performance Area Workgroup (V.D.3) and reported in the DBHDS Annual Quality Management Report and Evaluation (V.D.6).

Core Metrics

Table 1. Core Metrics

CORE METRICS IDENTIFIED
Percentage of DD individuals on the waiver or waitlist, age 18-64, who are employed
Number of individuals receiving Individual Supported Employment (ISE)
Number of individuals receiving Group Supported Employment (GSE)

Compliance Status

The Independent Reviewer's 15th report to the court states:

On December 30, 2016, for the larger group of all individuals with IDD who receive employment services funded by the Commonwealth, DBHDS set a target for employment in both ISE and GSE. Its target was that by June 30, 2019, 4,218 individuals would be employed. This target was determined as 25 percent of the total number of individuals with IDD between the ages of 18 and 64 who are either on the waivers or on the waiting list (16,871). As of June 2017, 3,806 of these individuals were so employed, which was 23 percent of this total number. As of June 2018, 4,262 individuals were employed, which achieved the target goal one year earlier than DBHDS had set for June 2019.

As of June 30, 2019, there were 17,964 individuals with DD, ages 18 to 64, on the waiver or waitlist, generating a target of 4,491 individuals employed to achieve 25%. The report states that as of June 30, 2019, 4,331 or 24% of individuals on the DD waiver or waitlist were employed.

The same report indicates that DBHDS was below target for the number of individuals receiving Individual Supported Employment (target = 661, actual = 555) and for the number receiving Group Supported Employment (target = 550, actual = 523).

Reporting

Processes

The Deputy Commissioner of Developmental Services, sends out a data request twice per year to the ESOs and to DARS to request the point-in-time data for December 30 and June 30. The 40 responses are emailed back in an Excel spreadsheet template.

The 40 spreadsheets are cleaned so that only waiver requirement providers are included. Additionally, Developmental Services verifies that all agencies have sent the data using the WaMS report. Data are then consolidated into one spreadsheet.

The primary data elements that are collected include:
- Unique Identifier
- Date of Birth
- Employment Start Date
- Type of Employment (Individual, Group, Sheltered)
- Current wage per hour
- Typical hours worked per week
- The primary disability (ID or DD)
- Funding source (Waiver, DARS, Other)

A Business Analyst copies and cleans the data into a password-protected master spreadsheet that has complex built-in calculations and visualizations for the narrative report. These charts are then copied into the final report.

Documentation

The Deputy Commissioner of Developmental Services has developed a document that outlines each step in the reporting process. In addition to this, the "Instructions" tab of the spreadsheet sent to ESOs and DARS to collect data includes detailed definitions for each field.

Quality Control

The process is cumbersome and requires a great deal of manual work, which creates the risk of human error impacting data quality. However, the manual processes also allow Developmental Services to review, check, and correct the data.

The WaMS Analyst runs a report that includes any individual who has an employment service authorization under the waiver. This report is used to verify that all data are included and to reconcile any reporting gaps. There is a 100% return rate across all providers because of these extensive efforts.

The quality of data collection has improved greatly due to the standardization of the data collection process and the data validation with the WaMS report. The number of blanks/nulls/not reporting have gone from 100+ to single digits. Additionally, data are collected on a spreadsheet template that has built-in functionality and visualization to minimize manual counting. The reporting tab can filter on dates in order to view an older report version by date.

Data quality check
Measures were calculated independently in order to check for any errors that may have occurred in the original tabulation. There were four data recounts conducted:
   1. Number of individuals on ISE
   2. Individuals age 25-40 on ISE Number/Percentage of RST Referrals by Reason being referred
   3. Individual worked 11-20 hours per week on GSE
   4. Individuals on GSE receive a wage that is above minimum wage (> $7.25/hour)
For all four measures, the number in the report matched the independent recount. However, the analyst who performed the recount noticed that two different formulas were used to calculate age.

The data survey workbook used by DBHDS calculates age by taking the difference between the person's birth date and the current date and dividing by 365. The spreadsheet containing Extended Employment Services and Long Term Employment Support Services data uses the Excel DATEDIF function with the option "y" to produce the difference in years. The first calculation does not take leap years into account, a difference that is very minor but could potentially result in a discrepancy if someone happened to have a birthday very close to the report date.

Recommendations
The current process involves a great deal of manual work in Microsoft Excel. While the template provided to ESOs and DARS includes detailed instructions, it lacks data validation controls that would ensure uniform data entry and catch erroneous data entry. Data validation controls would improve the quality and reduce the amount of manual correction required. Additionally, the formula for age should be calculated consistently and take leap years into account to ensure that everyone in the relevant age range is counted correctly.

Ideally, there would be an automated solution that would reduce the amount of manual work (and potential for manual errors) at the source and at DBHDS. For example, the agency could develop a web portal with a form-based data entry solution that all of the ESOs and DARS could use to submit employment data. A web form could have built-in data validation controls to prevent erroneous, duplicative, or contradictory data entry.

This would reduce the amount of manual work required, and the accuracy of the report would no longer depend on having a knowledgeable staff member at DBHDS to review and correct the data. While the current staff know the data well, a more automated solution would ensure continuity if the staff members who currently work on the report were to leave the agency in the future.

Virginia Department of Behavioral Health & Developmental Services

**Data Quality Plan
Reporting Assessment**

**Integrated Employment/Day
Services Report
May 2020**

Data Quality Plan
Reporting Assessment

Integrated Employment and Day Services Report

Overview

The Integrated Employment and Day Services report displays the number of individuals authorized for five integrated employment and day services over time since 2016. The data represent the number of individuals who are authorized to receive these services, not the number of actual recipients of these services.

Users

Internal users include the Deputy Commissioner, Developmental Services, and the Director, Provider Development. External users include DMAS, the Department of Justice, and the Independent Reviewer.

Ownership and Authorship

This report is authored by the Waiver Management Systems (WaMS) analyst in the Office of Integrated Supports Services (OISS) in the Division of Developmental Services. The manager of OISS oversees the production and requirements.

Data Source

The report uses WaMS data collected from CSB and providers' electronic health records (EHR). The data are exported from the OISS data mart layer and then stored in Box. The WaMS analyst copies the data to Microsoft Excel to generate the report.

Settlement Agreement Alignment

Measures and Indicators

The Settlement Agreement states, "To the greatest extent practicable, the Commonwealth shall provide individuals in the target population receiving services under this Agreement with integrated day opportunities, including supported employment." (III.C.7.a.)

DBHDS and the DOJ agreed on the following indicator to show compliance:

> III.C.7.a.iv: DBHDS service authorization data continues to demonstrate an increase of 3.5% annually of the DD Waiver population being served in the most integrated settings as defined in the Integrated Employment and Day Services Report.

The indicator also notes that currently, about 500 additional individuals per year should receive these services to maintain compliance.

Core Metrics

Table 1. Core Metrics

CORE METRICS IDENTIFIED
Unduplicated number of persons on the DD Waiver receiving integrated employment and day services
Annual percent increase in the number of persons on the DD Waiver receiving integrated employment and day services

The report also breaks down the number receiving each service. Integrated employment and day services include:

- Individual Supported Employment (ISE)
- Group Supported Employment (GSE)
- Workplace Assistance
- Community Engagement
- Community Coaching

Compliance depends on the unduplicated number of individuals receiving any of these services; an individual receiving multiple services will only be counted once.

Compliance Status

DBHDS is currently in compliance with the indicator with an annual reported increase above the required 3.5%.

The unduplicated number of persons on the DD Waiver receiving these services increased from 2,952 to 3,628 from September 30, 2017 to September 30, 2018 (23% increase) and from 3,628 to 4,098 (13% increase) from September 30, 2018 to September 30, 2019.

Reporting

Process

The WaMS analyst runs this report twice per year by pulling the report from the data layer. The analyst then copies the data into Microsoft Excel. Each data table is formatted with a time stamp, and the total record counts are calculated across the columns. Nulls and zeroes are deleted from the table.

Summary counts for each service, and for the unduplicated number of individuals receiving services, are produced in Excel. In order to obtain the number of unduplicated individuals, the analyst uses Excel to manually de-duplicate by WaMS Client ID.

Quality Control

Data are pulled from WaMS instead of from the data warehouse due to concerns about the quality of WaMS data in the warehouse. Specifically, the data in the warehouse are from the previous day (instead of live), and the DBHDS ID used to identify clients is not guaranteed to be unique.

WaMS is a mature system with extensive data validation controls and logic checks to ensure that data are not duplicative, inconsistent, or in violation of business rules. The system also assigns permissions based on a user's role, which reduces the ability of users to edit data accidentally or inappropriately. In addition to these features, the WaMS analyst monitors trend lines from several dozen tables that show stable reporting from WaMS.

The formulas used in Microsoft Excel reduce the need for manual data calculations that could lead to error. However, the use of formulas also means that the spreadsheet may be vulnerable to errors in the formulas themselves that cannot be seen in the final report. Additionally, pasting the data into Microsoft Excel is a manual process requiring manual oversight.

Documentation

The WaMS analyst maintains a "provenance" document for this report which documents where each data element comes from and the processes and methodology by which it was produced. This document is detailed but also very technical in nature; it would not be comprehensible to someone who is not familiar with the systems or with the report processes. Additionally, it does not contain the formulas used to generate the main tables in the report.

The report itself includes documentation to clarify the meaning of the numbers. Specifically, it states:

1. Because each individual can receive multiple services, the apparent total is greater than the unduplicated total.
2. Quarterly service authorizations are valid as of the date the authorizations were queried.

The report also contains a table that crosswalks the name of each service to the Office of Licensing and DMAS names, plus a column that defines and explains each service, plus a column that indicates the applicable waivers.

Recommendations

Show annual target and compliance status: The report does not include the target set in the indicator (a 3.5% increase or greater), most likely because this indicator was agreed upon recently, in January 2020. Additionally, since point-in-time data from both March and September are included in the report, it is unclear which data points are used to measure the annual increase. Future versions of the report should explicitly state the annual target (generated based on the previous year's number, according to the indicator) and the actual number and percent increase.

Produce technical documentation in plain language: The provenance document is very technical and does not spell out processes or definitions in language that can be understood without familiarity with WaMS. A document that is easier to understand would ensure continuity if the current WaMS analyst were to leave the agency.

Consider improving WaMS data in the warehouse: If the data warehouse contained reliable WaMS data, the report could be run using a stable and well-documented query that eliminates the need for any manual procedures such as pasting data and de-duplicating by ID. This would allow the exact procedure used to be accessed easily, and it would eliminate the possibility of errors caused by manual actions.

Virginia Department of
Behavioral Health &
Developmental Services

Data Quality Plan
Reporting Assessment

Provider Data Summary
May 2020

Data Quality Plan
Reporting Assessment

Provider Data Summary

Overview

The Provider Data Summary, which is also referred to as the State of the State, provides a semi-annual update on the availability of home- and community-based services (HCBS) waiver service providers and the Office of Provider Development's (OPD) activities. In providing these updates, the report communicates the Commonwealth's successes and challenges in meeting Department of Justice Settlement Agreement (DOJ SA) provisions. The Provider Data Summary is fundamentally an engagement tool that facilitates the development of strategies to remedy service gaps.

Users

The report is owned by the Director of the OPD, which is situated in the Division of Developmental Services. He also authors the report semi-annually, using datasets provided by the Office of Integrated Support Services Statistician. The report is used by OPD staff the DBHDS Provider Capacity and Competency Key Performance Area workgroup, but it is primarily designed for the external stakeholders who comprise the HCBS waiver provider. The report is also essential for the Community Services Boards (CSBs) as they provide support coordination/case management services to waiver recipients and individuals who are on the waiver waitlist.

Data Source

For the November 2019 Provider Data Summary, Regional Support Team (RST) data was included for the first time. Individuals receiving HCBS Waivers are referred for RST intervention when they are having difficulty finding service providers or are at risk of residing in a non-integrated setting. See the RST Quarterly Report profile for detailed information about the origination of the RST data.

The majority of the data presented in the Provider Data Summary originates from the Residential Settings report and the Baseline Measurement Tool. Both data sources are compiled by the OISS Statistician using data from the Waiver Management System (WaMS). The Residential Settings report summarizes the living situations of individuals receiving one of the three HCBS Waivers from a June 30, 2019 baseline to the present report date. The living situations are classified as integrated and non-integrated, and the data is broken down by Support Intensity Scale© (SIS) level[1].

The Baseline Measurement Tool is an Excel workbook that details the availability of HCBS Waiver service providers based on data obtained from serviced authorized in WaMS. It details the number of providers available not only by service type but also by Developmental Services Region, CSB, city/county, and SIS level. The data are collected at six-month intervals, starting from June 2018 when the tool was first developed. The Baseline Measurement Tool consists of Master sheets that provide counts of providers and MasterDelta sheets that highlight the change in the number of providers from the preceding snapshot to the current snapshot. The MasterDelta sheets are color coded so that users can readily identify increases (green to indicate a positive change) and decreases (red to indicate a negative change). The Provider Data Summary introduction encourages providers to explore the Baseline Measurement Tool, which is publically available on the OPD [webpage](#).

It is important to note that WaMS is not the only source of provider data at DBHDS. Provider data is also captured in the Office of Licensing source system, which is in the process of transitioning vendors and platforms (from OLIS to CONNECT). The Office of Licensing captures provider data for all providers who are licensed to offer HCBS Waiver services. The provider data are then communicated to the Department of Medical Assistance Services (DMAS), the agency responsible for reimbursing DBHDS-licensed providers for services rendered.

Service authorizations must be approved by DMAS whenever a HCBS Waiver recipient wants to receive services from a DBHDS-licensed provider. The DBHDS WaMS source system and the DMAS Medicaid Management Information System (MMIS) interface to facilitate the authorization approval process. It is the provider data from approved service authorizations that is used to populate the Baseline Measurement Tool. It is possible that licensed providers are not included in the counts. A provider who is licensed to offer waiver services may not currently have any HCBS Waiver recipients using the services, meaning that there would be no service authorizations for the provider in WaMS. The way in which provider data is captured and

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[1] The SIS is a tool used to quantify the level of support needed in order for an individual with developmental disabilities to thrive in the community. Individuals are evaluated when they are awarded a HCBS Waiver and annually thereafter.

reported is in the process of changing due to several source system upgrades. See the [Pending Changes section](#) for more information.

Settlement Agreement Alignment

The Provider Data Summary is a key piece of evidence needed to demonstrate compliance with **Provision III.D.1**: "The Commonwealth shall serve individuals in the target population in the most integrated setting consistent with their informed choice and needs." This overarching provision has been operationalized with fifteen compliance indicators. Some of the compliance indicator stipulations include:

- data must continue to indicate an annual 2% increase in the overall DD waiver population receiving services in the most integrated settings (indicator 1a);
- data must continue to indicate that at least 90% of individuals new to the waivers, including for individuals with a "support needs level" of Levels 6 and 7, since FY 2016 are receiving services in the most integrated setting (indicator 1b); and
- DBHDS must continue to compile and distribute the Semi-annual Provider Data Summary to identify potential market opportunities for the development of integrated residential service options (indicator 2).

Several compliance indicators related to the Provider Data Summary were only finalized in January 2020. One such indicator associated with **Provision III.D.6** requires that the Provider Data Summary include RST data. As was noted above, the OPD preemptively included RST data in its November 2019 report. Another newly finalized compliance indicator that is associated with **Provision V.D.6** explicitly cites the Provider Data Summary as a source of data on the quality of HCBS Waiver services. Provision V.D.6 mandates that the Commonwealth publicize the availability and quality of waiver services at least annually. The site for this public reporting is the soon-to-be-implemented DocuLibrary, an online repository for DOJ SA evidence.

The Provider Data Summary is also provides evidence that the Commonwealth is adhering to **Provision III.B.2**. This provision stipulates that individuals shall not be excluded from the target population "due to the existence of complex behavioral or medical needs or co-occurring conditions." Individuals with complex needs, denoted by a SIS level of 6 or 7, are explicitly included in the data reported in the Provider Data Summary.

Compliance Challenges and Status

The provisions with which the Provider Data Summary is associated are overarching. Collectively, they have dozens of compliance indicators that involve process other than those reported on in the Provider Data Summary. While many of the compliance indicators have been satisfied—including Provision III.D.1 compliance indicators 1a, 1b, and 2, according to the November 2019

Provide Data Summary—others have not yet been met. Thus, the Commonwealth has not yet achieved compliance with the provisions related to the Provider Data Summary.

Reporting

Processes

The current reporting process was established in June 2018. The process is initiated when the OISS Statistician provides the Residential Settings report and the Baseline Measurement Tool to the OPD Director. As the Provider Data Summary is a semi-annual report, the data are extracted twice a year. Generally, the OISS Statistician sends the Residential Settings reports on April 30th and September 30th and the Baseline Measurement Tool on April 30th and October 30th. The Residential Settings report is formatted as a Word document, complete with data tables that the OPD Director can directly insert into the Provider Data Summary.

Once the OPD Director receives the data from the OISS Statistician, he reviews it for accuracy. While writing the Provider Data Summary, the OPD Director expends significant effort ensuring that the data are reported regionally. He summarizes some key state-wide data points, particularly those associated with DOJ SA provisions and indicators, in narrative. However, he primarily relies on visualizations to communicate the data, especially the data originating from the Baseline Measurement Tool. For the November 2019 Provider Data Summary, the OPD Director used an online creative platform to generate the visualizations included in the report.

It is important to note that, throughout the report, baseline data is included so that progress can be shown. The baseline date varies by metric. This is due to the fact that the OPD's activities and data collection processes have evolved over time to comply with the DOJ SA provisions and compliance indicators. Per the OPD Director, the baseline date for DOJ reporting is September 30, 2016, while the baseline date for Baseline Measurement Tool -dependent metrics is June 2018. This may make it difficult for unfamiliar readers to interpret the data, even though the baseline dates are clearly noted in the Provider Data Summary visualizations.

Quality Control

The OISS has quality control standards for the data it releases. Additionally, the OPD Director reviews the data he receives from the OISS Statistician for face validity. There are no documented quality control process for the writing of the Provider Data Summary itself. The OPD Director does review the report with stakeholders, through a semi-annual provider webinar, before releasing the report publically. Errors or inaccurate interpretations may be caught during the webinar.

Documentation

The OISS Statistician has data provenance documents detailing how to extract WaMS data in order to generate the Residential Settings report and the Baseline Measurement Tool. It is difficult for one who is not familiar with the source system to interpret. Regardless, it is intelligible to those who routinely manipulate WaMS data. In contrast, there is not currently documentation detailing how to transform the Baseline Measurement Tool data into the metrics and visualizations included in the Provider Data Summary.

Pending Changes

There are several changes—in varying stages of planning and implementation—that could impact the Provider Data Summary. One such change is the pending transition from the MMIS to the Medicaid Enterprise System. The impact of these changes is not yet known. Per the OPD Director, the Medicaid Enterprise System will use a location ID to uniquely identify service providers instead of the National Provider Identifier (NPI) number and site number, which is currently used. This could be problematic when the Medicaid Enterprise System interfaces with WaMS. Per the OISS Statistician, the data transparency changes mandated by the recently announced CMS Interoperability and Patient Access Final Rule[2] could also have a substantial impact on the reporting process. One smaller change that will be readily apparent beginning with the June 2020 report is OPD's use of DBHDS Regions instead of Developmental Services Regions. This will align the geographical classifications with those used by other offices in the agency.

Recommendations

Disseminate a data dictionary. Publishing the Baseline Measurement Tool online helps make the reporting process transparent. Unfortunately, the utility of the tool is diminished by the fact that it does not include a data dictionary. Some of the acronyms may be opaque, particularly to new providers. Additionally, the color coding could be misinterpreted. An effective data dictionary should also include appropriate (and inappropriate) uses of the data to ensure that providers are not drawing erroneous conclusions.

Include a table of contents to orient readers. The final paragraph of the Provider Data Summary introduction provides an overview of the report's diverse offerings. Nonetheless, the information-dense report would benefit from a table of contents. Including a table of contents

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[2] The rule calls for Patient Access API and Provider Directory API for Medicaid, Medicare Advantage, CHIP, and federally facilitated Exchanges. See here for more information.

would allow providers to navigate quickly to data that are most relevant to the services that they offer.

Streamline data visualizations. The bold visualizations included in the November 2019 Provider Data Summary differ substantially from previous iterations of the report and reports disseminated by other DBHDS offices. The chart types are varied to draw one's attention to certain changes in the data, but some chart types are difficult to interpret. Moreover, the use of color is distracting as it is not used strategically to emphasize key information. Since much of the data are reported by region, it would be ideal to include geospatial visualizations, such as those used in the June 2019 report.

Articulate the rational for varying baseline dates. As noted above, the baseline dates vary throughout the Provider Data Summary. This is to be expected as the OPD has changed its practices as the compliance indicators for the DOJ SA evolved. Nonetheless, this key information should be clearly articulated early in the report's narrative as it may not be apparent to newer providers. Moreover, it could lead readers to make inaccurate comparisons.

Virginia Department of
Behavioral Health &
Developmental Services

Data Quality Plan
Reporting Assessment

Quality Service Reviews
May 2020

Data Quality Plan
Report Assessment

Quality Service Reviews-Year 4

Key Acronyms	
DOJ	Department of Justice
FGI	Family/Guardian Interview
II	Individual Interview
IR	Independent Reviewer
ISP	Individual Support Plan
ISP QA	Individual Support Plan Quality Assurance Checklist
PCR	Person-Centered Reviews
PI	Provider Interview
PQR	Provider Quality Reviews
PRR	Provider Record Review
SA	Settlement Agreement
SCI	Support Coordinator Interview
SCRR	Support Coordinator

Overview

The Quality Service Reviews (QSRs) are a quality improvement and risk management process. The QSRs are designed to identify gaps, weaknesses, and strengths in service provision for individuals with developmental disabilities (DD) who are receiving one of the three home and community-based services (HCBS) Waivers. Though the QSR process is not DBHDS' only service quality monitoring initiative, it is the only process that captures individuals' perceptions of the services that they receive through the HCBS Waivers.

The QSRs consist of Person-Centered Reviews and Provider Quality Reviews. Both the PCR and PQR processes involve multi-stage auditing using seven data collection tools: Family/Guardian Interview, Individual Interview, Individual Support Plan Quality Assurance Checklist, Provider Interview, Provider Record Review, Support Coordinator Interview, and Support Coordinator Record Review[1]. The audit tools are completed through face-to-face interviews with individuals; interviews with individuals' families, guardians, support coordinators, and direct service providers; and reviews of ISPs and other records.

Users

The QSR process is conducted by auditors employed by a DBHDS contractor and its sub-contractor. Interim and final reports are generated by the contractor as well. Nonetheless, there are ongoing collaborations among DBHDS office

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[1] Note that the names for the audit tools are used inconsistently throughout the fourth annual QSR report. The most commonly used names are listed here. The Provider Interview is also referred to as the Staff Interview, and the Provider Record Review is also known as the Administrative Policies and Procedures Review.

directors, senior leadership, and the contractor. Historically, those collaborations are led by the Director of Community Quality Improvement and her team of quality improvement specialists. The findings generated from the QSR interim and annual reports are intended to be the primary data source on the eight domains (DOJ SA Provision V.D.3.a-h), which are encapsulated within the three DBHDS Key Performance Area workgroups (DBHDS KPAs) [see Figure 1]. The KPA workgroups then report to the DBHDS Quality Improvement Committee.

Figure 1. DBHDS KPAs and their Associated Domains

DBHDS KPA	Domain
Health, Safety, and Well-Being	Domain 1: Safety and Freedom from Harm Domain 2: Physical, Mental, and Behavioral Health and Well-being Domain 3: Avoiding Crises
Community Integration and Inclusion	Domain 4: Stability Domain 5: Choice and Self-Determination Domain 6: Community Inclusion
Provider Competency and Capacity	Domain 7: Access to Services Domain 8: Provider Capacity

Settlement Agreement Alignment

The QSR process features prominently throughout the DOJ SA provisions. Provision V.D.3a-h details the eight domains (see Figure 1). Provision V.D.4, designated as an "overarching provision" in the IR's reports to the court, asks DBHDS to collect data on the agency's risk management system from a variety of sources. Provision V.E.3 requires the agency to use the QSR process and its results to assess service providers' quality improvement strategies and to target those that need technical assistance. Provisions V.I.1-4 indicate components of providers' performance that should be assessed in addition to standards that the QSR methodology should meet (e.g., an inter-rater reliability process). Finally, provision IX.C indicates that records should be kept demonstrating "adequate implementation" of the DOJ SA.

It is worth noting that, since the writing of the fourth annual QSR report, compliance indicators that explicitly call for the use of QSR data have been finalized by the judge (c.f., January 2020 filing). For example, the PCRs must now evaluate whether individuals are using DD Waiver-provided transportation to facilitate their integration into the community (Provision III.C.8.c), and the PQR summary results must be posted publically (Provision V.I.2). Currently, DBHDS is at a transition point: A new contractor has been hired to implement the fifth annual QSR process.

Therefore, the integration of these newly finalized compliance indicators will coincide with an overhaul of the QSR process.

Data Quality Assessment

As noted above, the QSR process has been studied on several occasions by the IR and his consultants. They have often organized their critiques of the QSR process into five areas of concern: definition of standards and terms, definition of methodology, criteria for compliance, auditor qualifications, and components. For one to have confidence in the QSR process and its results, the audit tools' standards must be clearly defined in order to ensure inter-rater reliability. Moreover, the standards should be mapped to DBHDS policies so that there is no variation in the methodology or data sources used to assess whether standards are met. The scoring criteria must be delineated within the audit tools and/or in auditor manuals so that the thresholds for meeting standards are clear and applied consistently, regardless of auditor. Ensuring that auditors have training that qualifies them to make the assessments necessary to complete the audit tools is also an important factor in generating valid, reliable results. Finally, the audit tools must include sufficient components or dimensions to create a comprehensive assessment of DD Waiver providers. DBHDS agrees with these findings and has considered them as part of this assessment.

DQV Assessment Findings

The audit tools used to generate data for the fourth annual QSR report were poorly structured. Most of the tools include one column of questions (labeled suggested protocols, probes, or expectations) and a second column of standards. There are vague instructions advising the auditor to guide their interview or record review with the probes in the first column and to use the standards in the second column for scoring. The relationship between the probes and the standards is not clearly defined (see Figure 2).

Figure 2. Missing Relationships

From the annual report, one knows that the audit tools' standards are aggregated to develop indicators that are further aggregated to create contractor-devised key performance areas (QSR KPAs), which do not align with the SA-endorsed DBHDS KPAs (see Figure 3). After review of the audit tools, it is not clear how the standards are scored as the instructions only briefly indicate

that some standards are graded with a binary *yes* or *no* while others are scored using a four-point Likert scale. In the annual report, the scoring criteria become more opaque as *yes*, *almost always*, or *frequently* are the desired responses for indicator-level performance ratings, but *yes* and *almost always* are the preferred responses for QSR KPA ratings.

Figure 3. QSR KPAs

QSR KPA[2]		QSR KPA Sub-Group
Person-Centered Practices		
1a	*Person-Centered Practices*	Offering Education on Choice and Planning Offering Informed Choice and Acting on It Plan Participation and Review Provider/Support Coordinator Efforts to Know the Person
1b	*Taking Ownership of Healthcare*	Chooses Health Providers Informed Consent Addressed Provided Education on Health Provided Education on Medications
1c	*Self-Directing Safety*	Abuse, Neglect, and Exploitation Education Provided Handling Emergencies Response to Abuse, Neglect, and Exploitation Safety Education Safely Navigating in the Community
Needs are Assessed and Met		
2a	*General Needs are Met*	Access to Services Plans Updated as Needed Satisfied with Service Service Implemented as per ISP
2b	*Health Needs are Met*	Access to Health Care Services and Supports Expressed Health Needs Addressed Plan Updated with Health Status Changes Provider Follow-Up Risk Management Satisfied with Health Services

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[2] The names are listed as they were first presented in the annual report's introduction (p. 6-7). Note that the QSR KPA names are not used consistently throughout the annual report and its appendices. There are slight variations in the naming of QSR KPAs 2a, 2b, and 2c within Appendix 4. Similarly, QSR KPA 1b is referred to as "Taking Ownership of Healthcare," "Taking Charge of Healthcare," and "Taking Charge of Health."

QSR KPA		QSR KPA Sub-Group
2c	*Safety Needs are Met*	Abuse, Neglect, and Exploitation Addressed Assessed/Addressed Potential Risk Protocols are in Place Assistive Technology and Environmental Modifications for Safe Mobility Addressed Back-up/Safety Plans and Risk Protocols are in Place Behavioral Health Support Emergency Case Management Follow-up Assessment Completed Transition Planning from Training Center

QSR KPA		QSR KPA Sub-Group
Integrated Setting		
3	*Integrated Setting*	Barriers Addressed Offered Interactions with People Living in the Community Preferences are Being Addressed Provider Supported to Explore Integrated Settings Skill Development Referral to CRC/RST as Needed Transition Planning
Community		
4	*Community Inclusion*	Circle of Supports and Development of Meaningful Relationships Contributions to and Participation in Community Groups Person's Preferences are Addressed Social Roles Development Technology Support

It is important to note that QSR KPA 1b (Taking Ownership of Healthcare) was deemed unreportable. The contractor asserted it was acceptable to suppress QSR KPA 1b as it had a "sample size"[3] of fewer than ten indicators associated with it, so the results are not discussed in the body of the report. Nonetheless, QSR KPA 1b's indicators and sub-groups are included in Appendix 4d. Still, the lack of transparency in the methodology and scoring criteria prevent one from using the indicator data to work backwards to reproduce the scoring and aggregation process in an attempt to recover actionable, data-driven insights due to the unclear relationships diagramed in Figure 2.

The indicators and audit tools used to generate data for each QSR KPA and its sub-groups are listed in the report's Appendix. Unfortunately, one is unable to ascertain the relationship between the audit tools' standards and the reported indicators. Moreover, when mapped (see Figure 4), another unusual trend emerges that suggests key dimensions (or components) are not

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[3] This is a non-standard use of the statistical term *sample size*.

being measured: Some of the QSR KPAs do not use any data from the FGI. Furthermore, the ISP QA is not reported on in the body of the annual report or listed in the appendices; thus, it is unclear why the tool is being used.

Figure 4. QSR KPAs and Audit Tools

	Person-Centered Practices	General Needs are Met	Taking Ownership of Healthcare	Health Needs are Met	Self-Directing Safety	Safety Needs are Met	Integrated Settings	Community Inclusion
FGI	✓	✓		✓	✓	✓		
II	✓	✓	✓	✓	✓	✓	✓	✓
ISP QA								
PI	✓	✓	✓	✓	✓	✓	✓	✓
PRR	✓	✓	✓	✓	✓	✓	✓	✓
SCI	✓	✓	✓	✓	✓	✓	✓	✓
SCRR	✓	✓	✓	✓	✓	✓	✓	✓

For the fifth annual report, the most obvious way to improve the definition of standards, the clarity of the methodology, and the criteria for compliance is to use terminology that is consistent with that used by DBHDS. Referencing DBHDS guidance and licensing regulations or DOJ SA provision and compliance indicator language is another key way to ensure that both auditors and providers have clarity on the standards assessed in the audit tools. DBHDS has facilitated this by bolstering its risk and case management regulations for licensed providers and expanding its repository of guidance. Most importantly, DBHDS has mandated that the new contractor map audit tools' questions, protocols, or expectations to DBHDS Office of Licensing and Office of Human Rights regulations, HCBS Settings Rules, and other existing policies.

Sampling Design

Apart from the audit tools' structure, a key challenge with the QSR process has been determining how many individuals and providers to sample for the PCRs and PQRs, respectively, to ensure that the sample is representative and the data can be used to draw conclusions about the quality of service provision across the Commonwealth. In the past, a proportionate stratified random sample, with the DBHDS Regions as the strata, of 400 individuals has been pulled for the PCRs. For the PQRs, only 50 of the HCBS providers who offer the eligible service type—which has varied from residential supports in year three to community engagement in year four—have been randomly sampled. This sampling design will not persist for the fifth annual QSR process.

For the fifth annual process, the Commonwealth (in consultation with the IR, the Department of Medical Assistance Services, and HCBS Waiver service providers) has decided to review all providers, regardless of service type. Then, a sample of eligible individuals will be selected from providers' rosters such that a random sample, stratified by provider service type, is generated. The Commonwealth believes that this sampling design will provide a more comprehensive assessment of providers' ability to meet individuals' needs and honor individuals' wants and desires. Moreover, this new approach will help ensure that there are data-driven insights on the individual level, the provider level, and by service type.

Key Findings

Though the fourth annual report is flawed, it is not devoid of insights and recommendations that are useful regardless of whether the data are generalizable from a statistical perspective. A primary theme throughout the report is ensuring that each individual is not only 'at the table' but also has a voice. To that end, the contractor recommends that the Commonwealth work to enhance individuals' access to assistive technology designed to aid persons with DD with communication. In a similar vein, they concluded that individuals should be empowered with more education regarding how to identify and respond to emergencies (exploitation, stranger awareness, vehicle incidents, caregiver health crisis, etc.). The contractor also states that additional effort should be made to ask individuals if they are interested in competitive employment and volunteering—activities that are likely to cultivate natural supports— throughout the year, not only during the annual ISP meeting. DQV endorses these recommendations based on their reasonableness in ensuring that an individual is involved in all aspects of their care.

The contractor also recommended several ways in which DBHDS can set providers up for success. For one, DBDHDS could developed a risk trigger system that would prompt providers to update individuals' ISPs in response to status changes. It was also suggested that DBHDS revise the service definitions for Group Day and Group Residential so that providers have more specific guidelines regarding how to skill build and foster independence in the individuals that they serve. Per the contractor, one approach is to focus on the development of new social roles. The contractor acknowledged that, given their heavy workloads, additional directives could be burdensome to providers. As a solution, the contractor proposed that DBHDS employ regional community liaisons to create a mentoring program or to orchestrate community events, providing opportunities for individuals with DD to form community connections. Similar efforts have already begun and thus DQV finds a consistency between the contractor's recommendations and previously established priorities. Figure 5 includes additional recommendations made by the contractor from an Individual, Provider, and System level that DQV would recommend for consideration.

Figure 5. Recommendations

Level	Proposed Quality Improvement Initiative
Individual	- Educate individuals about social roles. - Enhance individuals' awareness of their disabilities and medical diagnoses. - Cultivate individuals' medication management skills. - Provide individuals with emergency preparedness education.
Provider	- Educate support coordinators about social roles. - Implement targeted training for support coordinators on the assessment of safety needs. - Enhance support coordinator training on obtaining informed choice (consent or assent) from individuals with DD, regardless of whether the individual has a legal guardian. - Discuss emergency preparedness at regional meetings to identify and share best practices. - Add post-secondary education resources in the Support Coordination Manual. - Bolster support coordinator training on documenting changes in individuals' needs or statuses on the Person Centered Review Quarterly Report Format. - Ensure that pre-ISP planning tools (namely, the PC ISP Module 2 Before the Meeting, the Person Centered Thinking® One Page Profile and the I Want a Good Life Workbook) are being used by providers to strengthen individuals' positions in ISP meeting. - Update Chapter 8 of the Support Coordination Manual to bolster support coordinators' training on ensuring individuals are satisfied with service. - Encourage support coordinators to facilitate individuals' participation in their chosen religious communities.
System	- Alter Part V of the ISP so that support coordinators must offer additional education on health diagnoses and treatment management. - Consider policy changes that empower individuals to initiate modifications in their ISP throughout the year in response to changes in dreams, wants, and goal progression, not only changes in needs or status. - Discuss best practices on assessing and meeting safety needs at Regional Quality Councils. - Generate a risk trigger system that would alert providers to alter ISPs in response to changes in needs or status.

Virginia Department of
Behavioral Health &
Developmental Services

Data Quality Plan
Reporting Assessment

REACH Quarterly Data Report
May 2020

Data Quality Plan
Reporting Assessment

REACH Quarterly Data Report

Overview

The Regional Education Assessment Crisis Habilitation (REACH) Quarterly Data Report summarizes the scope and performance of crisis support programs for children and adults with developmental disabilities (DD). Procedurally, data for children and adults are aggregated analyzed as two separate reports prior to being distributed as a single summary. The report aims to measure the extent to which the REACH program meets the requirements of the Settlement Agreement (SA) as serves as a benchmark for ongoing quality improvement.

Users

The primary internal users of the report are the Director of Community Support Services and the REACH Crisis Managers. The external users include the Independent Reviewer, regional directors of the community services boards (CSBs), the Children and Adult Directors of the five regional offices, state facilities, members and staff of the General Assembly, private hospitals, and the general public. The REACH Quarterly Data Report is publicly available as a PDF on the DBHDS website.

Ownership and Authorship

The Acting Deputy Commissioner for Developmental Services, is the report owner for the REACH Quarterly Data Report. The report is co-authored by the two Crisis Managers

Data Source

Data summarized in the REACH Quarterly Data Report originate from CSB staff in each region - primarily CSB regional directors or individuals designated by the CSB leadership. The five regional directors each submit child and adult program data separately to the Crisis Managers through Microsoft Word documents. The original source of data submitted in the Word

documents varies between regions; some rely on the REACH Datastore (reviewed in Phase I of the Data Quality Plan), while others use internal spreadsheets.

To ensure standardized reporting across regions, data submissions use a structured template with operational definitions and a column for quarterly data. Notably, this template does not include data validation features or form elements. These submitted documents are the underlying data source for the quarterly report.

Although the REACH Datastore is a more mature and reliable system than user-generated spreadsheets and Word documents, the Datastore does not contain all of the data elements required for the quarterly report. As a result, users developed internal methods of tracking additional data until the Datastore is updated to align with reporting requirements.

Settlement Agreement Alignment

Measure and Indicators

The REACH Quarterly Data Report is used to establish compliance with Section III.C.6 of the DOJ SA. Two indicators have been agreed upon to assess compliance with this Section with respect to the REACH crisis programs:

> III.C.6.a.i-iii: 86% of children and adults who are known to the system will receive REACH crisis assessments at home, the residential setting, or other community setting (non-hospital/CSB location).

> III.C.6.a.i-iii : 86% of individuals with a DD waiver and known to the REACH system admitted to CTH facilities will have a community residence identified within 30 days of admission. This indicator is also in III.C.6.b.iii.B.

Although the REACH report currently does not report on other indicators related to Section III.C.6.a.i-iii, it may be repurposed to report on additional indicators as an interim process.

Core Metrics

In January 2020, the report authors identified critical and commonly studied data points within each report, hereafter referred to as the core metrics. The core metrics were the primary focus for the data validation, recounts, and narrative reviews. For the adult REACH data, the two core metrics are Crisis Therapeutic House (CTH) days at capacity and CTH bed utilization. For the child REACH data, these metrics are mobile support crisis cases and mobile support prevention cases.

Figure 1. Core Metrics Identified during Interviews for REACH Quarterly Data Report

	CORE METRICS IDENTIFIED
ADULT	**Crisis Therapeutic House (CTH) Days at Capacity:** The total number of days in a month during which every bed in a CTH is occupied by a guest. For each month in a given quarter, regional directors report the number of days that month in which all six beds in the home were full. For example, if all six beds in a CTH were occupied 23 of 30 days in a month, 23 is reported. Importantly, capacity does include the clinical population of the CTH when an admission is requested.
	CTH Bed Utilization: The total number of beds occupied in a CTH for a given quarter divided by the total number of beds that were available during that quarter (n=552). For example, if all six beds in a CTH were occupied for 80 days of a quarter and only four beds were occupied for the remaining 12 days of the quarter, $utilization = {(80*6)+(12*4)}\big/{(92*6)} = 0.96$
	Crisis Assessments by Location: The total number of face-to-face crisis assessments administered in a quarter grouped by the location where the assessment *began*. Data are reported using the following categories of locations: Individual Home/Family Home; Hospital/Emergency Room; Emergency Services/CSB; School; Residential Provider; Other; Police Station; Day Program.
CHILD	**Mobile Support Crisis Cases:** The total number of *new to this quarter* individuals who received community-based, in-home crisis services as an immediate result of a crisis event and creation of a crisis services plan. Follow up visits to target preventing future crises are not included in this number.
	Mobile Support Prevention Cases: The total number of *individuals* who received face-to-face community-based, in-home REACH who are not included in "Mobile Support Crisis Cases." This includes individuals who were referred in a non-crisis situation, those who stepped down from mobile support crisis, or those who access face-to-face community-based in-home services not immediately following a crisis situation. This may include individuals who were new to mobile support prevention, those who carried over from previous quarter(s), and those who were re-admitted.
	Crisis Assessments by Location: The total number of face-to-face crisis assessments administered in a quarter grouped by the location where the assessment *began*. Data are reported using the following categories of locations: Individual Home/Family Home; Hospital/Emergency Room; Emergency Services/CSB; School; Residential Provider; Other; Police Station; Day Program.

The SA indicators for Section III.C.6.a.i-iii (above) make reference to two additional metrics for both children and adults: (1) the location of crisis assessments and (2) the length of time individuals admitted to CTHs stay in those facilities without an identified community residence.

While the first of these metrics is currently reported on for both children and adults, the second does not appear to be tracked or reported for either population.

Compliance Status

The Independent Reviewer has not yet found the Commonwealth to be in compliance with Section III.C.6 of the SA.

Compliance Challenges

One key area that continues to be a challenge for the success of REACH is the number of psychiatric hospitalizations for persons in crisis. The historical pattern and precedent in Virginia are for persons in crisis to be removed from their home or community setting and taken to a location such as the CSB emergency department or to a hospital emergency room to be assessed. REACH has more likelihood for success in assessing for crisis in the home if the person is already linked up with the REACH program and the person or their family calls the REACH hotline for REACH to come to the home. If someone presents in crisis and is unknown to the REACH program, or the person is known to REACH and they don't call the hotline, it is more likely that emergency services or law enforcement involvement may lead to removal from the home to be assessed in a hospital or at the CSB, which increases the likelihood of hospitalization. Hospitalization data are monitored (collected in the Excel form) within the REACH report, and REACH is active throughout all known psychiatric admissions, including attending commitment hearings, attending treatment team meetings, providing supportive visits, and consultation to the treatment team.

Reporting

Processes

This report is completed once at the end of each fiscal quarter. The CSB regional directors or CSB staff submit the completed Word template to the two Crisis Managers at DBHDS. The template defines 47 variables and describes how CSB staff should calculate each field.

Figure 2. The REACH Data Submission Template

QUARTERLY REPORT DATA SUMMARY**

OPERATIONAL DEFINITIONS/DATA SUBMISSION FORM

REFERRAL DATA			
Item Number	Variable	Definition	Data
1	# of Referrals	This is the total number of written/typed, call, fax, email, etc. referrals (i.e. requests for service) received regardless of whether or not they resulted in service delivery. These are counted at the time of the first contact with REACH. Because some may not result in service delivery, a full intake process is not needed to count as a referral.	Total Referrals=
2	Type of Referral

Crisis + Non-Crisis= total referrals | This designates a referral as Crisis or Non-crisis. Referrals designated as crisis must adhere to the definition of crisis stabilization as defined in the program standards as "direct intervention (and may include one-to-one supervision) to persons with ID/DD who are experiencing serious psychiatric or behavioral problems which jeopardize their current community living situation... The goal is to provide temporary intensive services and supports to avert emergency psychiatric hospitalization or institutional admission or to prevent other out-of-home placement."

Crisis referrals require a face to face response according to the Urban/Rural average response rate.

Non-crisis referrals are those that do not require an immediate crisis response. | Crisis Referrals=
Non Crisis Referrals= |
| 3 | Referral Source | This is the breakdown of the total referral pool by | Emergency services = |

**Please note that each data element refers to data gathered from the quarter under review. Cumulative totals are not required unless noted.

Last update: 9/9/19

There are two data submissions per region each quarter – one for child program data and one for adult program data. The CSB regional directors (or CSB designees) submit the completed document by the ninth day following the end of the fiscal quarter.

The Crisis Managers then manually copy the child and adult datasets into separate Excel spreadsheets saved to Box. The Crisis Managers use these spreadsheets to manually summarize and plot data for the initial report drafts. This process takes between two and three days. The Crisis Managers then review each other's draft reports and verify the results prior to publishing. Results of the quarterly report are released within six calendar days.

Quality Control

Most quality controls for this report are manual and rely upon the institutional knowledge of program staff.

The data submission template used to collect data from each region defines how users should enter data but does not utilize available features to enforce valid and complete input. If a

regional director submits inaccurate data, the error will only be detected during the Crisis Managers' review when it might otherwise have been identified at the point of entry. Additionally, the Word template requires users to calculate values for certain fields, such as bed utilization, rather than prompting them for the numerators and denominators for such calculations. Requiring users to make these calculations increases the risk of human error and limits the transparency of the data reported to the Crisis Managers. Under the current data collection process, the primary safeguard against poor data quality remains the limited circulation of the data submission template rather than its functionality.

The two Crisis Managers work together to review each other's work via manual exchanges and data quality inspections, such as reviews for outliers and anomalies. If the Crisis Managers identify any data quality concerns, they address them through communication with the CSB regional directors. Given the strict timelines required for this report, data validation at the point of entry and automated data quality checks would likely have a high impact on this reporting process.

One possible means of validating data submitted to the Crisis Managers is the REACH Datastore housed at New River Valley CSB. The Office of Data Quality and Visualization assessed the Datastore in Phase I of its Data Quality Plan and found it to be relatively mature with strong data validation. However, the Datastore does not contain all data elements required for this report and therefore cannot currently be used to verify users' submissions.

Rather than relying on a centralized datastore, CSB programs each have their own data sources that they utilize when reporting quarterly summaries. These sources include different electronic health record systems (EHRs). At this time, there is no process in place for quality checks on the data collected from the CSB program sources.

Documentation

The "REACH Data Dictionary Tool" is a 15-page document that defines the data collection process for this report. It was last updated September 9, 2019. The Data Dictionary document describes each data element, the operational definitions, and the quarterly process for counting the referral data. This serves as guidance for the regional directors.

There is no existing documentation that describes how to analyze the data once it is received from the regional directors.

Recent and Pending Changes

Since the REACH Datastore does not include all data elements required for reporting, Crisis Managers have adjusted the Word template used to collect data in order to meet their reporting requirements. Most recently, the Crisis Managers added fields to the template to capture information on the Mobile Supports Prevention services. Prior to this change, REACH provided this service but was not reporting on it. This new data element will provide insights related to preventive aspects of Crisis Supports.

Both Crisis Managers have advocated to use the REACH Datastore as the single point of data entry for the data form. However, the Datastore must be changed to include additional data elements in order to meet reporting requirements. The Datastore is housed in New River Valley CSB and exists outside of the direct control of DBHDS Central Office, limiting control and access to the system.

Data Validation and Narrative Review

This review of the REACH Quarterly Data Report examined the core metrics in the report as outlined above. A random selection of data points used in the core metrics were chosen based on conversations with subject matter experts (SMEs) and the availability of data. For example, if a metric did not require calculation by users or analysts, another data point was selected for review. The reviewer was intentional about choosing and comparing high and low data points, as well as points in between. The reviewer examined all calculation logic, formatting, and narrative text related to those selected data points.

As noted above, the two REACH Crisis Managers copy and paste data from a series of data forms into an Excel spreadsheet. The managers shared two spreadsheets for review, one including child data, and one including adult data. Both spreadsheets include manually manipulated summary tables organizing data by regions and metrics. The spreadsheets include basic calculations of averages and percentages, but do not take advantage of Excel's native analysis tools, such as queries and pivot tables.

Data Recounts

Data recounts were conducted on six core metrics; four related to the adult data, two related to the child data. All recounts used REACH data from the Crisis Managers' spreadsheet for the first quarter of State Fiscal Year (SFY) 2020. Although CSB regional directors prepare their submissions to the Crisis Managers using raw data from internal sources, those data were not available for review.

The core metrics reviewed for adult REACH data are:

1. Admits/stab
2. Average Length of Stay
3. Number of Beds Used
4. Percent of Bed Utilization

Figure 3. Reported Charts for REACH Adult Data, Q1 SFY 2020

CTH Utilization: Admissions and Discharges w/in Quarter

	Region I	Region II	Region III	Region IV	Region V
Admits/stab	11	2	3	16	4
Admits/prevention	0	3	0	2	0
Admits/stepdown	0	5	4	8	10
Readmits/stab	0	0	0	0	0
Readmits/prevention	0	0	0	1	0
Readmits/stepdown	0	0	0	2	2
Avg. LOS for crisis stab admits/readmits	10	28	53	18	22
Avg. LOS for prevention admits/readmits	0	27	0	7	0
Avg. LOS for step-down admits/readmits	0	53	19	18	25

CTH Capacity

	Region I	Region II	Region III	Region IV	Region V
Waitlist in Bed Days	0	0	0	0	0
Waitlist: Number of Individuals	0	0	0	0	0
Days the CTH was at capacity out of 92	48	64	75	66	18
% of days at Capacity	52%	70%	81%	72%	20%
% Bed Utilization for quarter	91%	94%	97%	92%	76%

The recount revealed that the values reported in all four adult core metrics aligned between the Crisis Managers' spreadsheet and those reported publicly. Although the metrics aligned between these sources, the spreadsheets do not include all of the data necessary to verify the calculations as reported.
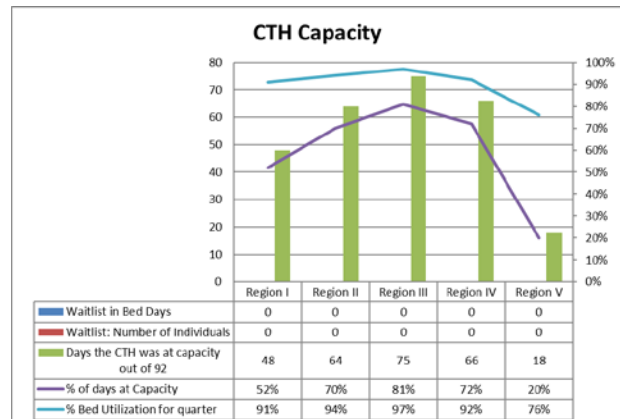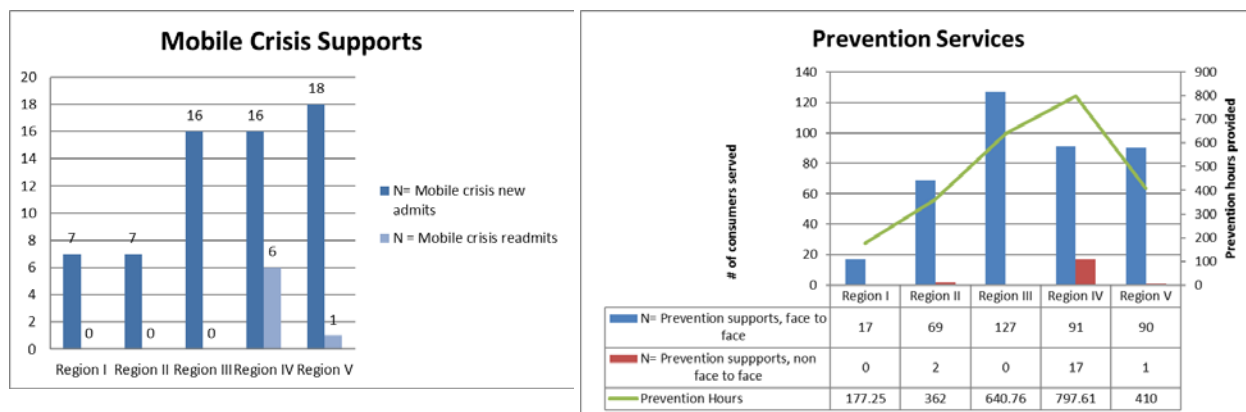
The core metrics reviewed for child REACH data are:
1. Mobile Crisis Supports
2. Mobile Crisis Prevention Supports

The recount revealed that the values reported in both child core metrics aligned between the Crisis Managers' spreadsheet and those reported publicly. As with the adult REACH data source, the spreadsheets do not include all of the data necessary to verify the calculations as reported.

Figure 4. Reported Charts for REACH Child Data, Q1 SFY 2020

Mobile Crisis Supports

(Bar chart showing Region I through Region V)
- N= Mobile crisis new admits
- N = Mobile crisis readmits

Values shown: Region I: 7, 0; Region II: 7, 0; Region III: 16, 0; Region IV: 16, 6; Region V: 18, 1

Prevention Services

	Region I	Region II	Region III	Region IV	Region V
N= Prevention supports, face to face	17	69	127	91	90
N= Prevention suppports, non face to face	0	2	0	17	1
Prevention Hours	177.25	362	640.76	797.61	410

Narrative Review

Each report provides extensive background on key concepts and offers a summary of the data while remaining objective about findings. The narrative sections do not provide explanatory narrative on understanding the data. It also does not provide insight on trends over time. It was stated that 'remaining objective' was a DOJ safety strategy.

Recommendations

Improve data collection processes: Until all data elements relevant to reporting are loaded in the REACH Datastore or an operational data store (ODS) in the DBHDS Data Warehouse (DW), efforts should be made to improve the data collection process. Data reported through Word documents should include form elements to capture and validate input. Ideally, there would be an enterprise-level solution at DBHDS that allows for streamlined data collection from external users.

Automate reporting processes. There are 57 graphs and charts in the REACH Quarterly Data Report, few of which involve sophisticated calculations. The current visualizations are designed in Excel and meticulously counted without formulas. Efforts should be undertaken to automate the creation of these reports, either using Excel formulas or other data visualization software. With the time saved, the report authors could focus on conducting more advanced analyses that describe patterns and trends over time.

Effectively maintain data in the Data Warehouse. REACH data are loaded into the DW but do not currently meet business requirements related to timeliness and validity. Given the level of interest in these data within DBHDS and externally, the agency should prioritize meeting the requirements of business users so these data might be used for streamlined reporting and analysis. This is especially significant for analysts interested in measuring the efficacy of REACH programs in meeting individuals' needs in more integrated settings.

Make report more user-friendly. The quarterly reports are lengthy and might be improved with a table of contents that outlines content and links to specific sections. Additionally, callout boxes could be used to highlight or describe key findings. Narrative text might also make reference to historical trends, baseline information, or target values to add additional context to the reported data.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Reporting Assessment

Regional Support Teams Report
May 2020

Data Quality Plan
Reporting Assessment

Regional Support Teams Quarterly Report

Overview

The Regional Support Teams (RST) Quarterly Report is a compilation of data from the RST referrals submitted throughout the reporting period. The RST process was developed to identify individual, regional, and system-wide barriers that prevent individuals with developmental disabilities (DD) from receiving services in the most integrated setting of their choice. Support Coordinators (SCs) are required to submit a referral to the RST whenever an individual with DD meets certain criteria, such as moving from a more integrated group home (<= 4 beds) to a less integrated group home (>5 beds). Insights gleaned from the RST Quarterly Report are used to make recommendations for remediating barriers.

It is important to note that the RST process was initiated to facilitate training center residents' transition to community-based residential settings. Though the core aim of the RST has continued to be eliminating barriers to living in integrated settings, the process has evolved. The primary impetus of this evolution has been the Commonwealth's success in closing its training centers. With the dwindling number of training center residents, the RST process now focuses on ensuring that community-dwelling individuals with DD reside in the most integrated settings possible.

Users

The RST Quarterly Report is currently owned by the Director of the Office of Provider Development (OPD), which is situated within the Division of Developmental Services. OPD staff, especially the community resource consultants (CRCs), are the primary internal users of the report. In fact, one CRC (hereafter, the RST Coordinator) has been charged with managing RST referrals, aggregating the data, and generating quarterly reports. The community integration

managers (CIMs) within the DBHDS Division of Facility Services Office of Community Integration (OCI) are also key to the RST referral process, particularly as it relates to training center residents' transitions. The DBHDS Office of Integrated Support Services (OISS) has supported the OPD in its newly established ownership of the RST reporting process by providing technical solutions designed to minimize duplicative manual data entry and transformation. External stakeholders, such as the community services boards' (CSBs) support coordinators (SCs) and developmental disability directors, are also essential to the RST process.

Data Source

The primary sources of data are the RST referral forms[1] that are submitted by SCs to DBHDS whenever individuals on their caseloads meet one or more of the referral criteria[2]. These forms are delivered, as Word documents or PDFs, to DBHDS via encrypted emails to a secure, dedicated email account (rst.referrals@dbhds.virginia.gov) that is monitored by the RST Coordinator. Though the RST referral form must be completed manually, data validation controls (drop-down menus, checkboxes, and calendar for date fields) that are available in Word have been enabled. These controls, which were added by the previous owner of the RST reporting process, help to ensure that data are being collected in a standardized way, regardless of which SC completes the form.

Once the RST referral forms are received by OPD, the RST Coordinator inputs the information into a master spreadsheet, called the RST Dashboard[3], using manual data entry. Currently, the RST Dashboard is the definitive source system for the RST process. Though its capabilities are limited by the flat file type, the OISS has helped the OPD stretch the limits of Excel's functionality using macros and formulas. This basic automation reduces the manual effort required to aggregate and visualize the data in order to generate a report each quarter.

Settlement Agreement Alignment

The RST process is explicitly cited in several provisions of the Department of Justice Settlement Agreement (DOJ SA). **Provision III.D.6** of the SA dictates that "no individual in the target population shall be placed in a nursing facility or congregate setting with five or more individuals unless such placement is consistent with the needs and informed choice and has been reviewed by the Region's Community Resource Consultant (CRC) and, under circumstances described in Section III.E below, the Regional

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[1] As of the writing of this report, the Word RST referral form is available on OPD's webpage.

[2] The criteria for RST intervention are detailed here and here. These resources are available on the OPD webpage.

[3] The RST Dashboard is one of the source systems reviewed for Phase I of the Data Quality Plan. The at-a-glance document for the source system as it existed prior to the change in ownership is available here.

Support Team (RST)." **Provision III.E.2** stipulates that CRCs must be able to consult with the RST at any time to resolve barriers and determine appropriate placement in an integrated setting. One indicator for **Provision V.D.6** calls for the creation of a publicly posted, annual report that uses RST referral data to enumerate barriers to integrated services.

In order to achieve compliance with the DOJ SA provisions, DBHDS must meet all associated compliance indicators. Some provisions, like III.E.2, do not have any compliance indicators. In contrast, Provision III.D.6 has thirteen compliance indicators as of a final January 2020 hearing with the DOJ SA judge. One of the original III.D.6 compliance indicators dictates that "86% of all statewide non-emergency referrals, as such referrals are defined in the DBHDS RST Protocol, meet the timeliness requirements of the DBHDS RST Protocol." A newly finalized III.D.6 compliance indicator calls for DBHDS to "require CSBs to submit corrective action plans through the Performance Contract when there is a failure to meet the 86% criteria for 2 consecutive quarters for submitting referrals or timeliness of referrals." Another newly finalized compliance indicator for Provision III.D.6 mandates that RST referral data be incorporated in the Provider Data Summary[4], a semi-annual report that is produced by OPD.

Core Metrics

Per the Director of Provider Development, there are three core metrics related to the DOJ SA provisions and compliance indicators that are included in the RST Quarterly Report. The first is the number of timely RST referrals for individuals residing in the community or at a training center. Referrals are timely when they are emailed to DBHDS within five calendar days of a qualifying event. The second core metric is the number of RST referrals for each of the following qualifying events:

- difficulty finding services in the community within three months of receiving a waiver slot,
- moving to a group home with five or more individuals,
- moving to a nursing home or intermediate care facility,
- pattern of repeatedly being removed from home,
- difficulty finding resources in the community within any timeframe, and
- dissatisfaction with services.

This second core metric is also reported for referrals made for individuals residing in the community or at a training center, if applicable. The third core metric is the percentage of late referrals within the reporting period. A referral is considered late if (a) an individual moves to a less integrated setting prior to a scheduled RST meeting, (b) an individual is planning to move to a less integrated setting without sufficient time to consult with CRC/CIM or implement RST

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[4] The Provider Data Summary, also known as the State of the State, is one of the reports that was reviewed for Phase III of the Data Quality Plan.

recommendations, or (c) an individual moved to a less integrated setting without the CSB notifying DBHDS before the move.

Compliance Status

The Commonwealth has been in sustained compliance with Provision III.E.2 since the Independent Reviewer's December 2019 report to the court. Other provisions associated with the RST referral process have not yet been satisfied. For instance, in FY20 Q2, only 63% (117/186) of all non-emergency referrals meet the timeliness criteria delineated in the DBHDS RST Protocol. Recall that, to achieve compliance with the DOJ SA, at least 86% of non-emergent referrals need to be timely.

Compliance Barriers

The aforementioned timeliness metric is an example of a long-standing compliance indicator that DBHDS has been working toward since the inception of the DOJ SA by overhauling the service delivery system. However, there are several indicators that were only enumerated halfway through FY20. The infrastructure and policy changes required to facilitate compliance with the newly finalized indicators are still in progress. One key change that will facilitate timely reporting is integration of the RST referral process into an online data collection system. See the Pending Changes section for more information.

Reporting

Processes

As mentioned above, the RST Coordinator receives referral forms in a designated email inbox. The cadence of these referrals is highly variable and unpredictable since individuals may meet criteria for RST intervention at any point throughout the fiscal quarter. Once the RST Coordinator receives a Word referral form, she manually enters the information into the first sheet of the RST Dashboard. The RST Coordinator often needs to communicate (via email or phone) with the SC who submitted the referral in order to obtain additional information or to correct inaccuracies. If the data provided by the SC are inaccurate, the Coordinator retains the information, rather than overwriting it, so that the discrepancies can be used to inform and improve the RST referral process.

Thanks to the OISS Community Program Manager's implementation of formulas and macros, the data are automatically aggregated by DBHDS Region and visualized in stacked bar charts in other sheets of the RST Dashboard. Thus, the RST Coordinator only needs to copy the latest version of the automatically generated visualizations into the quarterly report template before updating the narrative. In addition to generating the quarterly report that is included in the CDR,

the RST Coordinator generates a quarterly Compliance Letter[5] for each CSB. These customized letters detail the number of referrals submitted on-time, the number of referrals submitted late, and the number of missed referrals. The quality control process by which the RST Coordinator is able to identify changes that should have resulted in a RST referral is described in the next section.

Quality Control

The RST Coordinator expends significant effort to identify individuals who were not referred within five days of meeting criteria for RST intervention. At the end of each quarter, she utilizes a WaMS report created by the OISS Statistician to identify changes in residential status that should have resulted in a RST referral. This WaMS report, which is entitled "Individuals whose Bed Size was 5 or more during the Quarter _and_ whose residential address changed or Bed Size increased during the Quarter to non-Integrated, or Bed Size changed and remained non-Integrated," is formatted as a spreadsheet. Thus, the RST Coordinator must sleuth manually to identify late or missing referrals to the RST.

Documentation

The RST referral criteria and submission processes are documented on the OPD [webpage](). There are several resources that clearly denote when and how SCs should seek council from the RST. Conversely, documentation is lacking for the RST Coordinator's role. This is concerning given that generating a coherent report requires extensive manual effort and intimate knowledge of all phases of the RST process.

The quarterly report itself includes some of the key definitions (e.g., three categories of late referrals, alignment with DOJ SA compliance indicators, etc.) that one needs in order to read and interpret the copious amounts of data presented in the report. Still, other essential information, such as what constitutes a timely referral or what makes a referral a non-emergency, is not detailed. This lack of contextualizing narrative could make the report difficult to read and interpret for those who only have cursory knowledge of the RST process.

Recent and Pending Changes

The OPD's ownership of the RST process is fairly recent. Prior to FY20, the process was owned by the OCI. Once the OCI had largely fulfilled its mission to transition individuals with developmental disabilities from the training centers to the community, it was determined that the OPD would be the most appropriate home for the RST process.

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[5] Note that ascertaining the process by which the RST Coordinator generates 40 CSB-specific Compliance Letters is beyond the scope of this assessment.

Since the transition in ownership, the RST Dashboard has been revamped. While it has always included data validation controls that minimize the introduction of errors during initial data entry, its capabilities have been enhanced. As noted above, the OISS Community Program Manager has added hidden formulas and macros to minimize the manual data aggregation and manipulation required to generate the metrics and graphs that are included in each quarterly report.

Though the OISS has significantly decreased the manual effort required to monitor and report on the RST process, the use of an elegant spreadsheet is still a short-term solution. The process would be streamlined and more efficient if it were completely automated: from referral form submission to report generation. At the final January 2020 hearing, this need for automation was added as a stipulation for achieving compliance with Provision III.D.6. The judge determined that integrating the RST process into the Waiver Management System (WaMS) would be most prudent. WaMS is the source system that is used by DBHDS and SCs to monitor individuals' service provision, so it is a natural home for the RST process. Per the WaMS Application Administrator, the RST process will be integrated using an online form created and maintained by an existing vendor.

As has been discussed, the RST Quarterly Report is currently available to the public through the OPD webpage. The mode of dissemination will soon change as the DOJ SA judge has ordered (see indicators for Provision V.D.6) that DBHDS create a DocuLibrary where any and all reports demonstrating compliance with the SA provisions and indicators be housed. The DocuLibrary will be accessed through the DBHDS website, but it will be structured such that stakeholders can readily identify reports' alignment with the DOJ SA. As of the writing of this report, it is unclear if the RST reporting period will also change: One V.D.6 indicator refers to an annual report using RST data to enumerate and develop remediation for barriers to integrated services and stipulates that the RST report must be updated at least annually.

Recommendations

Eliminate manual form submission and quality control processes. Despite recent enhancements, the RST process still requires significant manual work to ensure that valid, reliable data are collected and reported in a timely fashion. Incorporating the RST referral form into WaMS would minimize the amount of time that SCs must dedicate to completing the form in addition to streamlining the RST Coordinator's quality control and reporting processes. As SCs and OPD staff already use WaMS in their workflows, utilizing the WaMS source system for the RST referral process should facilitate easy communication between the RST Coordinator, CSBs, and CRCs. Furthermore, alerts, triggers, and extensive data validation could be integrated into

an online form-based system, further automating the RST process. These features would likely diminish the percentage of incomplete, late, and missing referrals.

Compile documentation. The RST referral and reporting processes are intricate and require cooperation among a diverse group of stakeholders. In the event that the RST Coordinator could no longer perform her duties, it would be challenging for anyone who is not intimately involved with the RST and related processes to quickly gain sufficient familiarity to generate the report that is crucial to achieving compliance with the DOJ SA. The details of such an important process should not live in the minds of a select group of individuals.

Consolidate data visualizations and enhance contextualizing narrative. While stacked bar charts can be an excellent tool for facilitating one's understanding of data, they are not always the most interpretable chart type. Visualizations should require minimal explanation and should be readily understood by anyone with basic knowledge of the purpose of the data being displayed. Color should be used strategically to draw readers' attention to key takeaways. Conveying important data points with a smaller, more varied group of chart types may be more impactful. Integrating the quarterly report into an interactive platform that allows users to customize their view of the data based on their primary interests would be ideal.

Virginia Department of
Behavioral Health &
Developmental Services

Data Quality Plan
Reporting Assessment

Incident Management Reports
DW-0080 and DW-0080a
May 2020

Data Quality Plan
Reporting Assessment

Incident Management Reports (DW-0080 and DW-0080a)

Overview

The Incident Management Report is a combination of two Data Warehouse (DW) reports commissioned by the Office of Licensing (OL) – DW-0080 and DW-0080a.

DW-0080 reports historical data related to serious incident reports (SIRs) entered by DBHDS-licensed community providers into the Computerized Human Rights Incident System (CHRIS-SIR). The Risk Management Review Committee (RMRC) uses data from DW-0080 to monitor long-term trends in reported serious incidents from March 28, 2013 through August 4, 2019.

DW-0080a reports data following changes made to CHRIS-SIR on August 5, 2019. The changes to CHRIS-SIR aligned data entry with requirements enumerated in emergency regulation 12VAC35-105-20, but also rendered DW-0080 unusable for all new data elements added to CHRIS-SIR. Rather than update or replace DW-0080, the DW created a new report, DW-0080a, to report on these additional data elements.

Reporting Period

Users can customize the parameters, including the incident enter date, to meet their needs. The Office of Licensing staff run DW-0080a daily in order to triage their caseloads.

Report Delivery

Internally, the report is available online through the Data Warehouse's SQL Server Reporting Services reports manager. External stakeholders receive the report via email.

OL's incident management unit (IMU) and licensing specialists use DW-0080a to monitor the occurrence of Level II and Level III serious incidents reported by licensed community providers and triage incidents as they are reported. Under emergency regulation 12VAC35-105-20, providers that offer DBHDS-licensed services are required to submit a SIR through CHRIS-SIR whenever a Level II incident occurs on their premises or originates during their provision of services.[1] Providers are required to report Level III serious incidents – i.e. deaths, sexual assaults, serious injuries likely to result in permanent impairment, and suicide attempts resulting in a hospital admission - regardless of where they occur or originate.

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[1] Serious incident definitions are detailed in emergency regulation 12VAC35-105-20

Each row in the Incident Management Reports represents a single SIR entered by a provider in CHRIS-SIR. With the exception of death reports, a given SIR might report multiple Level II or Level III incidents, illnesses, injuries, and underlying causes of incidents. While these fields are standardized at the point of entry in CHRIS-SIR using checkboxes, they are concatenated within the Incident Management Reports to limit each SIR to a single row. This presents a challenge for users interested in units of analysis other than SIRs, such as the number of distinct individuals with serious injuries (who might have reports from multiple providers) or the incidence of specific types of serious injuries, illnesses, or causes of incidents. This is especially true when an individual dies (reported in both DW-0080 and DW-0080a) or experiences a different Level III serious incident (reported in DW-0080a only).

To facilitate the RMRC's and OL's surveillance efforts, the Incident Management Reports include filters that enable users to subset SIRs. Both DW-0080 and DW-0080a contain filters for the following parameters: CHRIS report enter date (from date), CHRIS report enter date (to date), incident involved, program service type, region, and licensing specialist. Users have the same options for the "from date", "to date", "incident involved", and "licensing specialist" filters on both DW-0080 and DW-0080a.

While both Incident Management Reports include filters for program service type and region, the options a user may select differ between DW-0080 and DW-0080a. In DW-0080, the program service type filter includes three options: "ID", "NonID", and "Unknown." By contrast, DW-0080a has six options: "BI", "Closed Licenses", "DD", "MH", "SA", and "Unknown." Relatedly, DW-0080a includes "Unknown" as an option for the region filter whereas DW-0080 does not.

Table 1. Report Filters in DW-0080 and DW-0080a

Report Filter	Options in DW-0080	Options in DW-0080a
CHRIS Report Enter Date (From Date)	All dates, including after 8/5/19 changes to CHRIS-SIR	All dates, including before 8/5/19 changes to CHRIS-SIR
CHRIS Report Enter Date (To Date)	All dates	All dates
Incident Involve	"All", "Death", "Serious Injury"	"All", "Death", "Serious Injury"
Program Service Type	"ID", "NonID", "Unknown"	"BI", "Closed Licenses", "DD", "MH", "SA", "Unknown"
Region	"Region 1", "Region 2", "Region 3", "Region 4", "Region 5"	"1", "2", "3", "4", "5", "Unknown"
Specialist (Contains)	Any text input	Any text input

As with all DW SQL Server Reporting Services (SSRS) reports, the results may be exported to various file formats, including .xlsx, .docx, .csv, and .pdf. When exported to .xlsx format, DW-0080a aggregates SIRs by region and licensing specialist on Sheet2.

Users

The Office of Licensing's Incident Management Manager (IMM) is the business owner of the Incident Management Reports. The regional managers who report to the IMM use the DW report daily to manage Level II and Level III incidents within their respective regions, although their ability to do so is hampered by inaccurate regional data in CHRIS-SIR.[2] The licensing specialists within OL also use the report on a daily basis to triage serious incidents that they must investigate within five days.

In addition to the operational value of these reports to OL, the RMRC uses the Incident Management Reports to review and identify trends from aggregated data, conduct ongoing monitoring, and inform risk management initiatives. These longer-term analyses are completed in conjunction with the Office of Human Rights (OHR) and the Office of Data Quality and Visualization (DQV). In addition, the Office of Integrated Health and the Mortality Review Committee (MRC) regularly review and cross-reference the Incident Management Report.

The Incident Management Reports are used regularly by external stakeholders, including the Department of Medical Assistance Services, the Centers for Medicare and Medicaid Services, and the Disability Law Center of Virginia. The Independent Reviewer uses the report twice a year to help determine whether OL is in compliance with its Settlement Agreement (SA) indicators. Finally, OL references these reports in responses to Freedom of Information Act requests.

Data Sources

The data reported in the Incident Management Reports originate from tables in CHRIS-SIR that are subsequently loaded into tables in the DW. Providers enter most data elements in the Incident Management Reports, although licensing specialists enter data in the fields for close date, OL action taken, and corrective action. Data related to licensed provider locations are originally entered within the Office of Licensing Information System and integrated into CHRIS-SIR through a data feed.

CHRIS-SIR has multiple known sources of data quality challenges, including non-trivial user error and common identifiers for core entities. Although DBHDS issues guidance to providers informing them how to enter data into CHRIS-SIR, the sheer number of different providers

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[2] RMRC Meeting Minutes, May 2020. Forthcoming.

licensed by DBHDS leads to variations in data entry. Some users submit the same SIR multiple times, accidentally creating duplicative reports that frustrate analysis and require manual review.[3] Additionally, CHRIS-SIR lacks unique identifiers for incident reports and individuals across the Commonwealth, further complicating analysis and de-duplication of records in the Serious Incident Reports.

Data in the Serious Incident Reports originate from CHRIS-SIR, but the proximate sources for those reports are tables within the DW. While DW-0080 selects data from DW tables in the dim and fact schemas, DW-0080a selects data from a DW view and tables in the report schema.[4] The differences in how data are modelled in the DW between DW-0080 and DW-0080a complicate analysis by requiring complex joins and conditional subqueries when writing queries against these tables. By using a different schema to model more recent serious incident data, the DW continued its departure from efforts to create conformed data entities in favor of reproducing source system tables.[5]

The two Incident Management Reports also use different lookup tables for the program service type field, creating noteworthy inconsistencies between the two reports. The program service type filter in DW-0080 includes only three options, whereas the same filter in DW-0080a includes six options (Table 1, above). Business users interpret SIRs with a program service type value of "ID" in DW-0080 and "DD" in DW-0080a as emanating from providers offering services for individuals with developmental disabilities (DD). However, the services categorized as "ID" in DW-0080 and "DD" in DW-0080a are inconsistent with one another. Nine services categorized as "NonID" in DW-0080 are classified as "DD" services in DW-0080a, while one service categorized in DW-0080a as "Unknown" and one categorized as "Closed Licenses" are both classified as "ID" services in DW-0080.[6]

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[3] A recent review of SIRs from September 2018 through June 2019 found that three percent of all SIRs submitted in CHRIS-SIR during that time were duplicates caused by a combination of user error and insufficient safeguards in the system. See "Serious Incident Data: An Analysis of CHRIS Reports (September 1, 2018 – June 30, 2019)." Presented to RMRC at November 2019 meeting.

[4] Tam Dang provided a previous version of the query for DW-0080a on March 17, 2020. Although the query for DW-0080 was not provided for this review, the DW did not load data from CHRIS-SIR into tables in the report schema prior to the August 5 changes, indicating the report query could not run against those tables.

[5] This trend was identified during Phase II of the Data Quality Plan.

[6] Cursory analysis conducted on May 25, 2020 indicates these discrepancies may be quite consequential for counts of SIRs. Approximately 7,350 SIRs in fact.SeriousInjuryIncident and 2,046 death reports in fact.DeathRecord return as "ID" in DW-0080 and as "Closed Licenses" in DW-0080a. An additional 48 SIRs and 2 death reports are classified as "ID" in DW-0080 and "Unknown" in DW-0080a.
Approximately one death report and 26 SIRs are categorized as "DD" in DW-0080a that are classified as "NonID" in DW-0080.

Table 2. Program and Service Type Discrepancies between DW-0080 and DW-0080a

Service Category	Program Description	DW-0080 Program Service Type	DW-0080a Program Service Type
Residential/ Crisis Stabilization Service	DD Residential Respite Service	NonID	DD
Residential/ Crisis Stabilization Service	DD Center-Based Respite Service	NonID	DD
Residential/ Crisis Stabilization Service	DD Center-Based Respite Service	NonID	DD
Outpatient Service	DD Outpatient Srv/ Crisis Stabilization-REACH	NonID	DD
Respite Services	DD Out-of-Home Respite Service for Adults	NonID	DD
Respite Services	DD Out-of-Home Respite Service for Children	NonID	DD
Respite Services	DD Out-of-Home Respite Service	NonID	DD
In-Home Respite Services	DD In-Home Respite Service	NonID	DD
In-Home Respite Services	DD In-Home Respite Service	NonID	DD
Supportive Services	DD Supportive In-Home Service	ID	Unknown
Case Management	Case Management Service	ID	Closed Licenses

Recent and Pending Changes

Prior to changes made to CHRIS-SIR on August 5, 2019, DW-0080 was the sole Incident Management Report used for internal and external reporting.[7] The August changes satisfied requirements enumerated in emergency regulation 12VAC35-105-20 and inaugurated new data collection practices in CHRIS-SIR and new business processes related to incident management. Given the substantial changes to operations and data collection, the DW elected to create a new Incident Management Report – DW-0080a – rather than update the existing SSRS report.

The primary changes to CHRIS-SIR in response to 12VAC35-105-20 involved creating new fields for Level II and Level III serious incidents and refining options for serious injuries, illnesses, and

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[7] DW-0080 Reports Documentation indicates DW-0080 was originally requested October 16, 2018. This documentation does not include a date at which the report became operational.

causes of incidents to streamline ongoing monitoring and analysis. These changes adversely impacted the utility of DW-0080 at the time, as the report did not include the newly-created fields in CHRIS-SIR. Business users in OL requested that the new fields be depicted in a DW report in August 2019.

Also as a part of the August changes, application developers deleted an outdated static table from CHRIS-SIR used by analysts to distinguish between licensed services for individuals with DD and all other services. In coordination with DW staff, the IMM developed a crosswalk of service and program codes that classify each service in CHRIS-SIR as serving individuals with DD, behavioral health disorders, substance use disorders, and traumatic brain injuries. This crosswalk was loaded into the DW as the table dim.LicensedServiceType in late September 2019. The options in DW-0080a for the program service type filter currently reference a view based upon dim.LicensedServiceType. The program service type filter in DW-0080, by contrast, still references the incident service type field that was deleted from CHRIS-SIR on August 5, 2019.

In addition to the structural changes to CHRIS-SIR, emergency regulation 12VAC35-105-20 led OL to develop an Incident Management Unit (IMU) to triage SIRs as providers submit them. To complete its work, the IMU required near real-time access to data in CHRIS-SIR. The need for immediate access to SIR data was another consideration in the DW's decision to develop a new Incident Management Report rather than updating the existing DW-0080.

Following their initial request for an updated Incident Management Report in August, 2019, the Director of OL and the IMM worked with DW staff to develop DW-0080a. Between August 2019 and February 2020, DW-0080a remained under development. During that time, business users in the Mortality Review Team (MRT) and OL used DW-0080a for routine operations, but the report did not meet the needs of the IMU, licensing specialists, or the RMRC.[8]

On February 24, 2020, the IMM reported to the RMRC that DW-0080a did not include data for the cause of injury and follow-up fields, both of which were required by the IMU and the RMRC.[9] On March 16, 2020, the IMM reported to the RMRC that the DW updated DW-0080a to include the cause of injury and follow-up fields and that the report should meet the requirements of the RMRC for long-term analyses of serious incidents. The IMM also noted that the report still did not meet the requirements of the IMU for near real-time access to data from CHRIS-SIR.[10]

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[8] For example, the MRT and OL worked together to identify death reports eligible for review by the MRC using DW-0080a. This process was not compromised by changes to CHRIS-SIR because it does not rely on new data elements.

[9] RMRC Meeting Minutes, February 2020, p. 2.

[10] RMRC Meeting Minutes, March 2020, p 4.

As of May 2020, the IMM reported using DW-0080a to successfully access and triage SIRs with a one day lag from the date they were entered into CHRIS-SIR. However, she also asserted that the regions displayed in the report were inaccurate. The IMM stated that the inaccurate regions were a product of the CHRIS-SIR, not the DW, and she would be working with a source system developer to rectify the errors. Prior to May, the IMM relied on a manual process to retrieve data from CHRIS-SIR, meet internal needs of the IMU and the Investigations Unit, and respond to external requests.[11] Source system developers built an interim report for the IMM in February 2020, but that report did not include all of the information in DW-0080a.

A full change history of DW-0080a was not available at the time of this review. As of February 24, 2020, DW-0080a was not in source control in the same database as other DW SSRS reports.[12] The limited documentation for DW-0080a that exists does not include the SQL code used to retrieve data.[13] Documentation for DW-0080 also does not include SQL code, making it difficult to reconcile data between the two Incident Managements Reports.

As of May 2020, the DW and OL planned to retain both DW-0080 and DW-0080a in the production environment, with DW-0080 used to display SIRs prior to August 5, 2019 and DW-0080a used for all SIRs following that date. Despite these business rules, both reports return results for dates before and after August 5, 2019 without notifying users of an alternate report. To facilitate monitoring, DQV planned to develop a dashboard version of the Incident Management Reports on Tableau Server once business users could access the platform.

Settlement Agreement Alignment

Measures and Indicators

Multiple offices and committees use the Incident Management Reports to achieve compliance with SA indicators under Sections V.B.5, V.B.9, V.C.1, V.C.6, V.D.3.a, and V.D.4.[14]

OL uses these reports to measure timely reporting of serious incidents (V.C.6) and deaths (V.C.5), both of which are determined using a calculated field in DW-0080 and DW-0080a. Additionally, OL uses the Incident Management Reports as part of its incident review and triage process in furtherance of compliance indicators under Section V.B.9 and V.C.1. In conjunction with the

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[11] RMRC Meeting Minutes, May 2020. Forthcoming.
[12] Email communication with Randy Hipps, 2/24/2020.
[13] See DW-0080 Reports Documentation.
[14] See "Relevant Compliance Indicators" for a full list of SA compliance indicators related to the Incident Management Reports. The indicators included in Table 3 are the most directly relevant to the reports.

MRC, OL reviews DW-0080a when identifying deaths eligible for MRC review and retrieving SIRs for individuals whose deaths qualify for review.

The RMRC uses the Incident Management Reports to review and identify trends related to serious incidents (V.B.5.a), monitor provider compliance with reporting requirements (V.B.5.c and V.C.6), and as part of the serious incident look behind process (V.B.5.d). Similarly, the Health, Safety and Wellbeing KPA Workgroup uses data from the Incident Management Reports in its review of surveillance data and performance measures (V.D.3.a). Finally, DQV analyzes data from the Incident Management Reports in furtherance of compliance indicators under Section V.D.4.

While the Incident Management Reports inform several processes related to compliance with the Settlement Agreement, only five core metrics are easily derived from the reports themselves (see Table 3). Three core metrics relate to SA indicators: the percentage of serious incidents reported within 24 hours of discovery, the percentage of deaths reported within 24 hours of discovery, and the percentage of incidents that OL reviews and follows-up on. Metrics related to timeliness are determined in DW-0080 and DW-0080a using calculated fields. The percentage of incident reports that receive OL review and follow-up can be derived from the close date and LS action taken fields in the reports.

Table 3. Core Metrics for Incident Management Reports

CORE METRICS IDENTIFIED[15]
Timely reporting of serious incidents *V.C.6.* At least 86% of reportable serious incidents are reported within the timelines set out by DBHDS policy
Timely reporting of deaths *V.C.5.* DBHDS requires all DBHDS-licensed providers to report deaths through the incident reporting system within 24 hours of discovery. The DBHDS Licensing investigations Team reviews all deaths of individuals with a developmental disability reported to DBHDS through its incident reporting system
Review and follow-up on 100 percent of incidents *V.B.9.* DBHDS implements an incident management process that is responsible for review and follow-up of all reported serious incidents, as defined in the Licensing Regulations
Timely reporting of incident reports (OL) The Office of Licensing aims for 93% of incident reports to be submitted in a timely manner
Timely closure of investigations (OL) The Office of Licensing aims for all incident investigations to be closed with five days. This is an internal benchmark and not reported externally

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[15] Unless otherwise noted, all core metrics relate to the SA and involve both Incident Management Reports. Metrics that note (OL) are metrics internal to OL.

Compliance Status

The Commonwealth was evaluated as non-compliant with each of the aforementioned Sections of the SA related to the Incident Management Report. In fact, it is for this reason that the Commonwealth has compliance indicators associated with each of these Sections.

As the compliance indicators were not agreed to until late January 2020, the Commonwealth is assumed to be out of compliance with these indicators. Nonetheless, OL has consistently reported to the Independent Reviewer that providers report serious incidents within 24 hours of discovery in 88 to 92 percent of cases. In his report to the Court for April through September 2019, the Independent Reviewer wrote, "[OL's] trending reports suggest… that again in 2019, nine out of every ten reports of serious incidents are submitted within 24 hours [of initial discovery]."[16] Table 4 from that report is reproduced below.

Figure 1. Timely SIR Reporting, Reproduced from Report of the Independent Reviewer[17]

TABLE 4 Timely SIR Reporting		
2016	2018	2019
88%	92%	89%

With the exception of the indicators surrounding timely incident reporting and OL review of all incidents, all of the indicators that rely upon the Incident Management Reports involve additional processes or analysis to achieve compliance. The only compliance indicators *directly* reported on in the Incident Management Reports fall under Sections V.B.9, V.C.5, and V.D.6.

Compliance Challenges

Prior to the completion of DW-0080a in May 2020, the principal challenge to achieving compliance with Section V.C.6 was the extensive manual data processing required in order to retrieve actionable data from CHRIS-SIR. Without a functional Incident Management Report following the changes to CHRIS-SIR, the OL IMU developed tedious manual workarounds that may have compromised the reliability of compliance-related calculations.[18] Furthermore, internal stakeholders outside of OL, such as the RMRC and MRC, had limited access to mission-critical data during this time.

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[16] Fletcher, Donald J. "Report of the Independent Reviewer on Compliance with the Settlement Agreement United States v. Commonwealth of Virginia." April 1, 2019 – September 30, 2019. P. 53.

[17] Ibid. Data for fiscal year 2017 were omitted in the original.

[18] Interviews with OL staff in January 2020 indicated that the inability to use DW-0080a was a barrier to compliance. Specifically, it became difficult to track which incidents remained open and which were closed at any given time.

An additional challenge to measuring compliance is the combination of provider error and poor safeguards within CHRIS-SIR. Providers inadvertently submit duplicate SIRs that appear on the Incident Management Reports, thereby jeopardizing the accuracy of aggregate calculations of timely incident reporting. Analysts cannot accurately determine the percentage of timely incident reports without first removing duplicate SIRs that may distort those calculations.

Reporting

Processes

The raw data for the Incident Management Reports are SIRs submitted by licensed providers in CHRIS-SIR. Once an incident is reported in CHRIS-SIR, an automated notification is sent to the assigned licensing specialist and an Incident Management email account. Prior to the completion of DW-0080a, the IMM copied data from the email notification into an Excel spreadsheet every morning. The IMM then shared the Excel spreadsheet with the Investigation Unit by saving it to Box. The manual processes adopted by the IMM were time-consuming and likely produced inconsistencies between the source system and the Excel spreadsheet.[19]

Existing documentation does not describe the processes the DW uses to extract, transform, and load (ETL) data from CHRIS-SIR to the DW for the Incident Management Reports. This process appears to be different for DW-0080 than for DW-0080a. While DW-0080 retrieves data from tables in the dim and fact schemas from the DW, DW-0080a retrieves data from tables in the report schema and a view in the dim schema.

As of May 2020, the Incident Management Team uses DW-0080a daily to retrieve incident data from CHRIS-SIR with a 24-48 hour lag. All authorized users can run the report on demand from the DW Reports Manager once they select a date range. The IMM runs DW-0080a each weekday and exports data from this report to Excel to review and triage incoming cases, monitor cases in progress, and note incident reports that require additional action before closing.

The process whereby data are reported to the Independent Reviewer and other stakeholders outside the agency was not documented at the time of this review. In interviews, OL referenced manual processes used to aggregate data.

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[19] Providers can update SIRs after they are submitted in CHRIS-SIR, making it challenging for static exports of initial reports to reflect the status of SIRs within CHRIS at the time they are reviewed by licensing specialists.

Quality Control

There are limited quality controls associated with the Incident Management Reports, all of which require manual review. Duplicate SIRs exist in CHRIS-SIR and are subsequently loaded into the DW. Although the IMM makes an effort to have duplicate reports removed from CHRIS-SIR as she becomes aware of them, this process is not documented and remains informal. Prior to analysis of SIR trends, the RMRC and DQV must review row level data for duplicate records through a similar process.

The ETL processes used by the DW to create DW-0080a are not fully documented and appear to have changed over time.[20] This complicates efforts to improve the reliability of DW-0080a as a report on data in the source system. The IMM reported in January 2020 that efforts were underway to build a reconciliation report within CHRIS-SIR to identify discrepancies between the source system and incident data in the DW.

The IMM also noted on multiple occasions that the region field in CHRIS-SIR and DW-0080a is inaccurate and requires improvement. At the time of this review, the region field remained unreliable according to the IMM.

Documentation

The Incident Management Reports have limited documentation. Although there are two separate reports, documentation only exists for DW-0080 and includes some information related to DW-0080a. In addition, this documentation does not include SQL code used to generate either report. At the time this review was finalized, the IMM was developing a process document and data dictionary for the Incident Management Reports. There is no documentation related to the reporting process itself – viz. how external stakeholders receive and are apprised of the latest SIR data.

Recent and Pending Changes

The Office of Licensing will be replacing their Licensing system with Connect in August 2020 and are currently finalizing an RFP for a new incident management system. As these systems become operational, OL staff will need to re-map these systems to the DW in order to run the Incident Management Reports effectively. Planned changes to the DW, such as the addition of an operational data store (ODS), will likely require data from CHRIS-SIR to be modelled differently within the DW for streamlined operational reporting.

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[20] The DW provided a source mapping document for this review, but it does not appear to include all columns in DW-0080a. It also does not describe how or why data are loaded into tables under a different schema once they enter the DW production environment.

Validation and Narrative Review

DQV conducted a limited validation review of the Incident Management Reports in late May 2020. This validation review was limited due to the lack of documented processes within the DW when extracting, transforming, and loading data from CHRIS-SIR, as well as a lack of documented processes for summarizing data from the Incident Management Reports. The validation review included (1) assessing the reporting delay field in DW-0080 and DW-0080a and (2) comparing the output of DW-0080 and DW-0080a against data in CHRIS-SIR and provider compliance data reported to the Independent Reviewer.

Reporting Delay Field Calculation

Both Incident Management Reports include a calculated field to determine the reporting delay associated with each SIR. To align with current regulations, the reporting delay field should be calculated as the difference between the time when a provider becomes aware of a reportable incident (the discovery date) and the date that provider submits an incident report in CHRIS-SIR (the enter date). Although there is no documentation for this calculation, the values in the field indicate that the difference is calculated in whole days.

Thoroughly validating the calculation for this field requires examining the SQL code for both DW-0080 and DW-0080a to ensure this time difference is accurately presented in both reports. The SQL code for DW-0080 was not documented at the time of this review, and the SQL code used to run DW-0080a did not include the calculation of the reporting delay field.[21] Consequently, this review presupposed the accuracy of the enter date and discovery date fields, used those fields to recalculate the reporting delay field, and then validated the reporting delay calculation against the values in the Incident Management Reports as run through the DW Reports Manager. This methodology revealed that the reporting delay field was correctly calculated in 100 percent of SIRs in DW-0080 from January 1, 2016 through December 31, 2019 and 100 percent of SIRs in DW-0080a from August 5, 2019 through April 30, 2020.[22]

Provider Compliance with SIR Requirements

In an effort to validate data as reported to the Independent Reviewer, this used DW-0080 and CHRIS-SIR to measure the timeliness of with which providers reporting serious incidents. While the results in CHRIS-SIR and DW-0080 for the timeframe under review differ from the values

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[21] Instead, the SQL query provided as the source for DW-0080a suggests the calculation for the reporting delay field occurs prior to the data being loaded to the production environment. Validating this calculation as it is run would require a review of the DW ETL processes used to create the table report.CHRISDeathSeriousInjury.

[22] See Validation - DW-0080 - CY 2016-2019 and Validation – DW-0080a – 08.2019-04.2020.

reported to the Independent Reviewer, they are generally consistent with aggregate data reported for 2018 and 2019.

Due to the lack of accurate, up-to-date documentation for both the Incident Management Reports and CHRIS-SIR, all recounts of SIR data are approximate. Nonetheless, it is fairly straightforward to select all SIRs submitted in CHRIS-SIR and to determine the delay in serious incident reporting using the discovery and report enter dates.[23]

As of May 2020, data in CHRIS-SIR indicate lower compliance rates between 2016 and 2019 than were reported to the Independent Reviewer. This is true whether one groups compliance rates by calendar or fiscal year, though the fiscal year percentages in 2016 and 2017 are approximately three points lower than the calendar year rates. These figures align closely with data from DW-0080 during the same timeframe.

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[23] See CHRIS-SIR Validation Query. Identification of DD services in this query is based upon OL business rules and the crosswalk loaded in the DW as dim.LicensedServiceType.

Table 4. Provider Compliance Data Recounts among Providers of DD Services

| Data Source | Year as Reported to Independent Reviewer | | | |
	2016	2017	2018	2019
Initial Compliance Report[24]	88%	-	92%	89%
Compliance in CHRIS-SIR – CY Recount	81%	86%	88%	89%[25]
Compliance in CHRIS-SIR – FY Recount	78%	83%	88%	88%
Compliance in DW0080 – CY Recount	81%	86%	88%	89%[26]
Compliance in DW0080 – FY Recount	80%	83%	88%	88%

Together, these recounts suggest that the Commonwealth may have overestimated the percentage of providers in compliance with timely reporting requirements 2016. Notably, the recounts from CHRIS-SIR and DW-0080 indicate an upward trend toward timelier reporting between 2016 and 2019.

SIRs in DW-0080 vs. DW-0080a vs. CHRIS-SIR

Both Incident Management Reports retrieve similar data from CHRIS-SIR, ostensibly through different processes in the DW. Yet, DW-0080 and DW-0080a display differing numbers of SIRs when run with the same date parameters.[27] For example, when set to retrieve all SIRs between August 2019 and April 2020, DW-0080 returns 13,410 SIRs while DW-0080a returns 13,431 SIRs.[28] Despite their other differences, both Incident Management Reports should show the same number of records for the same date range. Furthermore, neither of these record counts is equal to the 13,348 SIRs in CHRIS-SIR for the same timeframe.

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[24] The provider SIR compliance report originally submitted to the Independent Reviewer was not available at the time of this review. These percentages are reproduced from the Independent Reviewer's report to the Court, Op. Cit.

[25] At the time of the Independent Reviewer's report, these data were not available and therefore could not be the source of his calculations.

[26] Ibid.

[27] The Incident Management Reports are intended to retrieve data from non-overlapping timeframes, but it remains possible to run them for any timeframe. As a result, one report can be used to validate the other.

[28] Reports run 5/26/2020

Recommendations

- **Develop detailed documentation:** The Serious Incident Reports are vital to multiple compliance indicators as part of the SA, yet the reports lack any meaningful documentation. As soon as possible, the DW should develop transparent documentation for both DW-0080 and DW-0080a, including mappings between the source system tables, transformations made when the data are staged in the Warehouse, and an explanation as to why DW-0080a requires a separate table structure and schema compared against the original report. Similarly, CHRIS-SIR source system developers should bolster existing documentation and distribute it to interested stakeholders. Without sufficient documentation, discrepancies between CHRIS-SIR and the DW Incident Management Reports will remain unexplained.

- **Clarify purpose of Incident Management Reports:** The Incident Management Reports play a vital role in achieving compliance with multiple Sections of the SA, some related to basic operations and others related to analysis of long-term trends. These reports should only try to meet one set of requirements – either those of operational staff or those of analysts. Given the ongoing difficulty of the DW to meet OL's requirements for near real-time reporting, it might be advisable to transition operational reporting for the IMU to the source system, both to improve performance and to drive data quality improvements where they matter most. This would allow the DW to target the Incident Management Reports toward analytical users.

- **Develop unified analytical report:** Regardless of whether the DW reorients existing Incident Management Reports to analysts, the demand for long-term trending data from CHRIS is substantial enough to warrant a single combined report including a union of SIR data before and after the August 5 changes to CHRIS-SIR. Such a report should also include a filter for data from the Human Rights side of CHRIS so that analytical users can access a comprehensive account of risk among licensed providers. Additionally, this report might include separate views of data within the report, allowing for dynamic groupings based on Levels and types of serious incidents, causes of incidents, illness types, injury types, and types of abuse complaints.

- **Align program service type options between OHR and OL reports in DW:** Currently, DW reports for OHR use the static table deleted from CHRIS-SIR to distinguish between 'ID' services and 'NonID' services. This categorization is at odds with the current Incident Management Report, DW-0080a, which uses separate categorizations to distinguish the populations served on the basis of the services they receive. The lack of alignment between these reports gives rise to confusion between the OHR and OL teams and militates against the agency's goal of adopting cross-disability approaches to risk management.

- **Add additional column to DW reports that captures exact compliance metric:** Although the Incident Management Reports include a calculated field to determine a provider's delay in reporting a serious incident, this field returns the number of whole days between an incident's discovery date and report date. To streamline compliance reporting, the DW should consider adding a binary column to the Incident Management Reports that captures whether a provider reported within 24 hours or not. This will save business users the extra work of grouping all values greater than one as 'non-compliant' when analyzing trends.
- **Report exact numbers to the Independent Reviewer and share internally:** To facilitate auditing and long-term monitoring of reporting to the Independent Reviewer, OL should not only report a single percentage for provider compliance with SIR requirements, but also the raw numbers of SIRs used to arrive at that percentage. The numbers reported to the Independent Review should also be distributed internally to interested stakeholders.

Virginia Department of Behavioral Health & Developmental Services

**Data Quality Plan
Reporting Assessment**

**Substantiated Cases Report
May 2020**

Data Quality Plan
Reporting Assessment

Substantiated Cases Report

Reporting Period

This DW report is continuously available online for internal stakeholders. OHR reviews the report monthly.

Report Delivery

This DW report is available online for internal stakeholders through SQL Server Reporting Services (SSRS).

Overview

The Substantiated Cases report is a Data Warehouse (DW) report created at the request of the Office of Human Rights (OHR). This operational report is used by DBHDS to monitor reports of abuse, neglect, and exploitation (ANE) that have been substantiated. Before cases can be closed, OHR advocates must ensure that providers have taken appropriate corrective actions. OHR works to close all cases of substantiated ANE within 90 days of the initial report enter date.

Users

The Substantiated Cases DW report is owned by the Director of Human Rights. It is primarily used by the Deputy Director of Human Rights and her Regional Managers. Metrics generated from the report are also used by several internal and external stakeholders, including the DBHDS Health & Safety Key Performance Area (KPA), the Department of Justice Settlement Agreement (DOJ SA) Independent Reviewer (IR), and the Quality Review Team (QRT)[1].

Data Source

The Substantiated Cases report originates from the Computerized Human Rights Information System (CHRIS) tables within the DW. Providers submit reports of suspected ANE to the CHRIS system through an online, vendor-supported portal. Generally, only one provider submits a report on behalf of an individual receiving DBHDS-licensed or operated services whenever there is alleged ANE. Currently, the CHRIS data goes through an extract-transform-load (ETL) process before it is available in the DW. As part of the ETL process, the DW developers assign each individual a DBHDSID, an identifier that is intended to be universally unique across. From the DW tables, the Substantiated Cases report is generated and made available through the online

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[1] The QRT is co-led by DBHDS and its sister agency, the Department of Medical Assistance Services. The committee reviews a diverse set of metrics on a quarterly basis in order to comply with Centers for Medicare and Medicaid Services (CMS) requirements.

SSRS portal. There are plans to transition operational reporting from the DW to the source system in the future. See more information about the proposed transition below.

Settlement Agreement Alignment

Data on the timely closure of substantiated cases of ANE are required to satisfy several DOJ SA provisions. For example, Provision V.C.3 stipulates:

> The Commonwealth shall have and implement a process to investigate reports of suspected or alleged abuse, neglect, critical incidents, or deaths and identify remediation steps taken. The Commonwealth shall be required to implement the process for investigation and remediation detailed in the Virginia DBHDS Licensing Regulations. (Document 364-1, PageID 10228)

Due to OHR's thorough process for ensuring corrective actions are taken once an ANE allegation is substantiated, DBHDS has been in sustained compliance with this provision since the IR's December 2019 report.

In January 2020, additional compliance indicators for several provisions were finalized by the DOJ SA judge. One of the newly finalized compliance indicators for Provision V.D.1 mandates the QRT to review the substantiated cases data at least quarterly to assess: "…identification, response to incidents, and verification of required corrective action in response to substantiated cases of abuse/neglect/exploitation (prevention is contained in corrective action plans)" (Document 364-1, PageID 10238-10239). DBHDS's compliance with this indicator has not yet been assessed since the IR releases his report semi-annually; nonetheless, OHR's vetted substantiated cases review process is likely to lead to compliance with this new indicator.

Reporting

Processes

The OHR Regional Managers review the DW report several times each week in order to identify substantiated cases and monitor advocates' progress in closing them. The OHR Deputy Director reviews the DW report biweekly. She also meets at least monthly with her Regional Managers to review substantiated cases that have been open for 60 days. Though CMS guidelines for home- and community-based services (HCBS) waiver programs assert that substantiated cases of ANE must be remediated and closed within 90 days of the report date, OHR has an internal policy dictating that substantiated cases should be closed within 60 days.

In addition to internal work prioritization and monitoring, OHR uses the DW report each quarter to generate performance measures for CMS Appendix G sub-assurances, the DBHDS Health & Safety KPA, and the QRT. There are two performance measures for which OHR is responsible for

CMS Appendix G sub-assurance a: the "number and percent of substantiated cases of abuse/neglect/exploitation for which the required corrective action was verified by DBHDS as being implemented" and the "number and percent of closed cases of abuse/neglect/exploitation for which DBHDS verified that the investigation conducted by the provider was done in accordance with regulations." The latter measure is derived from a quarterly retrospective review process that OHR Regional Managers conduct in order to ensure that advocates are following established protocols when remediating substantiated cases of ANE.

Quality Control

Though DBHDS-licensed providers are required to report ANE allegations, there are instances in which they fail to do so. OHR collaborates with its counterparts in two sister agencies, the Department of Social Services (DSS) and the Department for Aging and Rehabilitative Services (DARS), in order to stay abreast of ANE cases[2] that providers have failed to report to DBHDS. By comparing the DSS and DARS lists to their own, OHR is able to contact providers to request that ANE reports be submitted through CHRIS and to issue citations for failure to report. The DBHDS Office of Licensing (OL) is another source of information since providers' serious incident reports may indicate that there was a human rights issue that should have been reported to OHR.

As noted above, OHR Regional Managers engage in a quarterly look behind process to ensure that advocates followed protocols appropriately before closing substantiated ANE cases. The OHR retrospective review process (sampling design, data collection tool, etc.) was designed in conjunction with the Office of Data Quality & Visualization (DQV). Each fiscal quarter, the OHR Regional Managers review a sample of their respective advocates' substantiated cases from the preceding quarter. The Regional Managers then conduct inter-rater reviews for a sample of each other's retrospective reviews to further assess the validity and reliability of the results.

Documentation

There are currently two versions of the Substantiated Cases DW report within the SSRS portal: DW-0071 and DW-0094. For the earlier version, DW-0071, there is an informational packet detailing the report's specifications (purpose, SQL queries, report fields, etc.) in the DW Reports Documentation. The DW Reports Documentation, which is currently housed on Box, was compiled by DQV and is maintained by the DW. As of the writing of this report profile, there is no documentation describing the origination or the additional filter in the most recent version of the report, DW-0094.

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[2] For example, DSS informs OHR whenever an Adult or Child Protective Services report is received from a community-based, DBHDS-licensed provider.

In additional to documentation of technical specifications, there is documentation describing how the Substantiated Cases DW report is used to generate performance measures for the CMS Appendix G sub-assurances. As detailed above, these health and welfare performance measures are routinely reported to CMS so that the Commonwealth of Virginia can continue to operate a HCBS waiver program. Additionally, the measures are used by several internal DBHDS committees to monitor the health and safety of the waiver population and to manage risk.

Recent and Pending Changes

As was noted above, there are two versions of the substantiated case DW report: DW-0071 and DW-0094. While the original report (DW-0071) only included substantiated ANE reports among individuals with developmental disabilities (i.e., recipients of the HCBS Waivers), the new report (DW-0094) details substantiated ANE reports for all populations: developmental disability, mental health, and substance abuse. Currently, OHR uses both reports. Though there is only one filter that distinguishes these two versions of the DW report on the surface, it is not known how much they differ in their code since there is no documentation for the latest version.

It is important to note that August 2019 changes to the CHRIS source system necessitated alterations to reporting processes for both OHR and OL. These changes primarily impacted the OL side of CHRIS; however, some changes were made to the OHR side of the system. One major change is the use of providers' license numbers to define the population of interest (developmental disability, mental health, substance use disorder, and unknown) instead of the CHRIS Incident Service Type codes. The license number, which is assigned by the Office of Licensing, include a provider's license ID, the program code, and the service code[3]. It is the license number-defined populations that can be used to filter DW-0094.

In addition to the changes to the CHRIS source system, there have been changes to the organization itself. The DW has been reorganized so that it is now under the auspices of the Chief Information Officer. Several changes are planned for the DW now that it is within Information Technology. One such changes is an upgrade from SQL Server 2008 to SQL Server 2016, which will be tantamount to rebuilding the DW. There have also been discussions regarding transitioning operational reporting—such as that done for OHR—out of the DW back to the source system. With DBHDS' pending implementation of Tableau Server, a Tableau dashboard may be the preferred platform to visualize business areas' operational reporting.

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[3] The service codes and program codes are defined in the Community Consumer Extract 3 (CCS3) specifications core taxonomy.

Virginia Department of Behavioral Health & Developmental Services

Data Quality Plan
Reporting Assessment

Unauthorized Seclusion Report
(DW-0070)
May 2020

Data Quality Plan Reporting Assessment

Unauthorized Seclusion Report (DW-0070)

Introduction

The Data Quality Plan Phase III Assessment included a series of focus groups and interviews with the subject matter experts for this report. Information sessions were held with the Director and Deputy Director of the Office of Human Rights (OHR) in January 2020. This document reflects information and perceptions shared within those sessions and from supporting documents provided by the SMEs.

Overview

OHR created this data warehouse report (DW-0070) as an internal operational report to determine if a provider is using unauthorized seclusion on individuals with developmental disabilities and intellectual disabilities in the community setting.

Users

The users of this report are the OHR Director and Deputy Director, the OHR staff and the regional managers who work in the community. Other internal users who receive summarized analysis from this report include the Health and Safety Key Performance Area (KPA) workgroup and the DBHDS Senior Policy Analyst who oversees the CMS compliance report for DMAS.

Ownership and Authorship

OHR developed this report with the expertise of the Director of Data Quality and Visualization. The report was created by Data Warehouse (DW) staff, and the primary business owner is the Director of the Office of Human Rights.

Data Source

The data source for this report is the Computerized Human Rights Information System (CHRIS), which is co-owned by the Office of Licensing and the Office of Human Rights. Data are entered

Reporting Period
The reporting period is the fiscal year, which begins on July 1st. The report is compiled and disseminated quarterly. The report reviewed here was from FY 2019 (December 1 – December 31, 2019)

Report Delivery
The data from this report are shared internally through email. OHR reviews the report in the portal interface.

by providers in the Human Rights side of CHRIS, and they are reported off of the data warehouse.

Settlement Agreement Alignment

Indicator

This report does not directly correspond to an indicator for the Settlement Agreement. There is an indicator for seclusion:

> For 95% of individual service recipients, seclusion or restraints are only utilized after a hierarchy of less restrictive interventions are tried (apart from crises where necessary to protect from an immediate risk to physical safety), and as outlined in human rights committee-approved plans. (V.B.7.f)

However, a different data source, the Local Human Rights Committee (LHRC) reviews of behavioral treatment plans, is used for the Settlement Agreement metric.

Core Metrics

The total number of seclusion cases is a metric that is frequently shared with the KPA work groups and for CMS measure compliance.

"Seclusion" is defined by the Centers for Medicare and Medicaid (CMS) as the involuntary placement of an individual alone in an area secured by a door that is locked or held shut by a staff person, by physically blocking the door, or by any other physical or verbal means, so that the individual cannot leave it. The use of seclusion is completely unauthorized in the community setting.

Figure 1. Core metric for reporting on unauthorized seclusion

CORE METRIC
Number of unauthorized seclusion cases in the community per quarter.

Reporting Processes
The report generates results based on a user-entered date range and region. (All regions may be selected.)

The query searches abuse cases and complaints for the following text strings:
- "lock"
- "isol"
- "seclu"
- "time out"

All cases and complaints with at least one of those strings in the description are included in the results.

The Director of Human Rights reviews every description in the report, and also verifies the case in CHRIS using CHRISID, to determine if it is seclusion or not.

There are an estimated 40-50 rows of potential cases per quarter. By design, the dataset to be screened by OHR will include false positives as to decrease the probability of missing potential cases.

OHR sends any incidents of seclusion identified to the appropriate regional manager for investigation and possible citation for a human rights violation. The number of seclusion cases per quarter is also included in the DMAS DD Waiver Report.

Quality Control

Each case of potential seclusion identified in the report is reviewed manually by OHR. First, OHR determines whether the text describes an actual incident of seclusion, or whether the string appeared in some other context (e.g. "a staff member broke the individual's c**lock**").

OHR also uses CHRIS to cross-check findings using the CHRISID number and to obtain more information on the case, including advocate actions.

In addition to the manual review of CHRIS reports, the Director of OHR reaches out to the regional managers to verify actual cases and to discuss any outstanding cases related to seclusion. After this process, OHR determines whether unauthorized seclusion occurred.

Incidents of seclusion that do not contain one of the four text strings will not be included in the report. However, OHR occasionally encounters seclusion cases missed by the query when reviewing CHRIS reports related to known seclusion incidents (for example, reports involving the same provider or individual) or when reviewing reports for some other purpose.

Documentation

There is no documentation on the seclusion review process and the reporting requirements. However the DW Report Documentation, produced by DQV, provides technical details on the data warehouse report.

Data Validation and Narrative Review

There was no independent review or recount for this specific report because CHRIS, the source system, is not able to generate a report on unauthorized seclusion with the same query function as DW-0070.

CHRIS was reviewed for the DQV Source System Review (Phase I) and several data quality concerns were noted. The system is antiquated and lacks features that would allow for quality control, such as data validation rules preventing incorrect or contradictory data entry. In addition, the system creates duplicate records very easily. For example, a user can inadvertently create multiple records by hitting the save button multiple times while the system is "thinking."

CHRIS allows duplicate records for the same individual or for the same incident, and records can be overwritten easily. Cases can also be entered for individuals who are deceased. There is a lack of data validation for the fields in both abuse and complaint reports, allowing for incorrect data entry and/or data entry that violates business rules.

Recommendations

While the query has been made available, readable documentation that describes the report filters and search strings would enable all DBHDS staff members to understand what is (and what may not be) captured by the report.

In order to ensure that seclusion cases are not regularly missed, cases identified by OHR that are not flagged in the report should be collected to see if any new phrases should be added to the query.

As discussed above and in Phase I, the CHRIS system is outdated and has many limitations. Additionally, it is very time-consuming for the application developers to update the system in order to implement proposed improvements. Ideally, the CHRIS system should be replaced with a system that allows for data validation according to business rules, and that ensures that records are unique.

Virginia Department of
Behavioral Health &
Developmental Services

Data Quality Plan
Reporting Assessment

DD Waiver Quality Assurance
Report
May 2020

Data Quality Plan
Reporting Assessment

DD Waiver Quality Assurance Report

Reporting Period

The reporting period is the fiscal year, which begins on July 1st. The report is completed incrementally each quarter. The report reviewed here was from FY 2019 (July 1, 2018 – June 30, 2019)

Report Delivery

The report is shared with the QRT on a quarterly basis. It is disseminated to the team as a Word document and calculated using an Excel spreadsheet through Box.

Overview

The DD Waiver Quality Assurance report (hereafter, QRT Grid) is designed to demonstrate that the Commonwealth is administering its home and community-based services (HCBS) waivers program in accordance with Centers for Medicare & Medicaid Services (CMS) mandates. Per CMS, the HCBS Waivers provide financial support so that individuals with developmental disabilities (DD) can receive person-centered support and long-term care services in the community. The Commonwealth must provide data demonstrating that its program meets CMS assurances in order to continue to have permission to operate a HCBS waivers program.

Two sister agencies work in tandem to administer the Commonwealth's HCBS waivers program: Department of Behavioral Health & Developmental Services (DBHDS) and Department of Medical Assistance Services (DMAS). To facilitate their collaboration in gathering evidence for the CMS HCBS Waivers assurances, an inter-agency committee called the Quality Review Team (QRT) was formed. The QRT meets quarterly to compile and discuss data for six CMS HCBS Waiver assurances: administrative authority, level of care, qualified providers, service plan, financial accountability, and health and welfare. At the end of the fiscal year, DBHDS compiles the data into an annual report (End of Year Report). Every three years, DMAS produces an aggregate Evidentiary Report that is submitted to CMS.

Users

The report is technically owned by DMAS since it is the agency that has been conferred authority to administer the HCBS Waivers. DMAS has delegated responsibility to DBHDS for compiling the data and overseeing monitoring of the performance areas. Within DBHDS, the Senior Policy Analyst within the Division of Developmental Services Office of Waiver Operations

(hereafter, the QRT Coordinator) is charged with the development and maintenance of the QRT Grid. Since the QRT Grid is a compilation of data from two agencies, there are many users. Several program areas at DBHDS contribute to the report including the Office of Waiver Operations, the Office of Human Rights (OHR), the Office of Licensing (OL), the Office of Community Quality Improvement, and the Mortality Review Team (MRT). The report is also used by the Settlement Agreement Advisor as it is a key piece of evidence required to demonstrate compliance with provisions of the Department of Justice Settlement Agreement (DOJ SA).

Data Source

The QRT Grid includes data from disparate data sources (see Figure 1) from both DBHDS and DMAS. The QRT Grid does not have its own source system. The QRT Coordinator does not obtain the data directly from the originating source systems. Instead, she receives the data from their respective owners in the form of numerator and denominators. The data is usually emailed, though DBHDS contributors often enter their data into the QRT Word document (Grid) that is stored on Box.

Much more is known about DBHDS systems like the Computerized Human Rights System (CHRIS), which is routinely accessed by OHR and OL through Data Warehouse (DW) reports[1]. Several of the source systems that are integral to the QRT reporting process are slated to evolve as DBHDS makes progress toward exiting the DOJ SA. See the Recent and Pending Changes section for more information.

Figure 1. QRT Grid Data Sources

Agency	Data Source	CMS Assurance
DMAS	Annual Medicaid Contractor and Operating Agency Evaluation Reports	Administrative Authority
DMAS	Annual Medicaid Reports	Administrative Authority
DBHDS	CHRIS DW Report 30 [CSB Incidents]	Health & Welfare
Agency	**Data Source**	**CMS Assurance**
DBHDS	CHRIS DW Report 38 [Provider Incidents]	Health & Welfare

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[1] CHRIS and WaMS are two of the source systems that were reviewed during Phase I of the Office of Data Quality & Visualization's Data Quality Plan. Individual CHRIS DW reports have been documented through the DW Reports Documentation; these document includes SQL code used to manipulate the CHRIS data imported into the DW via an extract-transform-load (ETL) process.

DBHDS	CHRIS DW Report 70 [Community Seclusion]	Health & Welfare
DBHDS	CHRIS DW Report 78 [VIDES Completion]	Level of Care
DBHDS	CHRIS DW Serious Incident Report	Health & Welfare
DBHDS	CHRIS DW Report 71 [Substantiated Cases][2]	Health & Welfare
DMAS	Fiscal Agency Reports	Qualified Providers
DMAS	MMIS Claims	Financial Accountability
DBHDS	Mortality Review Committee	Health & Welfare
DMAS	National Committee for Quality Assurance	Health & Welfare
DBDHS	OHR Retrospective Reviews	Health & Welfare
DBHDS	OL Regulation Data [Medication Administration]	Health & Welfare
DMAS	Quality Management Reviews	Financial Accountability Qualified Providers Level of Care Service Plan Health & Welfare
DBHDS	Quality Service Reviews	Health & Welfare
DMAS	Training Verification Records	Qualified Providers
DBHDS	WaMS	Level of Care
DBHDS	Waiver Slot Allocation Committee Reports	Administrative Authority
DMAS	Xerox Claims	Administrative Authority

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[2] Note that CHRIS DW reports 70 and 71 were each reviewed in Phase III of DQV's DQP.

Settlement Agreement Alignment

The performance measures being reported upon for the QRT process are aligned with the CMS waiver assurances but do not necessarily align with DOJ performance indicators. DBHDS is unable to change the performance measures to better correspond to DOJ indicators without approval from CMS. Nonetheless, the QRT functions are written into Provision V.D.1 of the DOJ SA:

> The Commonwealth's HCBS waivers shall operate in accordance with the Commonwealth's CMS-approved waiver quality improvement plan to ensure the needs of individuals enrolled in a waiver are met, that individuals have choice in all aspects of their selection of goals and supports, and that there are effective processes in place to monitor participant health and safety. The plan shall include evaluation of level of care; development and monitoring of individual service plans; assurance of qualified providers; identification, response and prevention of occurrences of abuse, neglect and exploitation; administrative oversight of all waiver functions including contracting; and financial accountability. Review of data shall occur at the local and state levels by the CSBs and DBHDS/DMAS, respectively.

As the Independent Reviewer noted in his June 2019 report to the court, this provision is overarching in that it will not be met until "effective quality improvement processes are in place at the CSB and state levels." Thus, in January 2020, at the final DOJ SA hearing, several compliance indicators were added to help the Commonwealth operationalize compliance with Provision V.D.1. Some of the new stipulations include:

- Remediation plans are written and remediation actions are implemented as necessary for those measures that fall below the CMS-established 86% standard.
- DBHDS will provide a written justification for each instance where it does not develop a remediation plan for a measure falling below 86% compliance.
- Quality Improvement remediation plans will focus on systemic factors where present and will include the specific strategy to be employed and defined measures that will be used to monitor performance.
- Remediation plans are monitored at least every 6 months.
- The QRT will provide an annual report on the status of the performance measures included in the DD HCBS Waivers Quality improvement Strategy with recommendations to the DBHDS Quality Improvement Committee.

Core Metrics

Per the QRT Coordinator, the data points included in the QRT Grid are all crucial to the processes from which they originate. The CMS performance measures included in the QRT Grid are to meet the CMS assurances and are also utilized for other DOJ-related reporting. With that being said, the QRT Coordinator noted that the performance measure for Appendix G Health & Welfare (see Figure 2) are particularly important as the data are also used by OHR, OL, and MRT to demonstrate compliance with their other DOJ SA provisions.

Figure 2. CMS Appendix G Health & Welfare Performance Measures

Performance Measure
G1 Number and percent of closed cases of abuse/neglect/exploitation for which DBHDS verified that the investigation conducted by the provider was done in accordance with regulations
G2 Number and percent of substantiated cases of abuse/neglect/exploitation for which the required corrective action was verified by DBHDS as being implemented
G3 Number and percent of unexpected deaths where the cause of the death/factor in the death, was potentially preventable & some intervention to remediate was taken
G4 Number and percent of individuals who receive annual notification of rights and information to report ANE
G5 Number and percent of critical incidents reported to the Office of Licensing within the required timeframes as specified in the approved waiver
G6 Number and percent of licensed DD providers that administer medications that were not cited for failure to review medication errors at least quarterly
G7 Number and percent of individuals reviewed who did not have unauthorized restrictive interventions
G8 Number and percent of individuals who did not have unauthorized seclusion
G9 Number and percent of participants 20 years and older who had an ambulatory or preventive care visit during the year
G10 Number and percent of participants 19 and younger who had an ambulatory or preventive care visit during the year

Compliance Barriers and Status

The Commonwealth has not yet achieved compliance with the DOJ SA Provision V.D.6. As was noted above, this is an overarching provision that cannot be met until DBHDS has the infrastructure to support a multi-faceted quality improvement system. The construction of such a system has been a challenge given that it necessitates the cooperation of DMAS and the 40 CSBs, all of which have their respective quality improvement processes.

Reporting

Processes

As the QRT Coordinator receives the numerator and denominators from its owners each quarter, she manually enters them into the QRT Grid Word document. The QRT spreadsheet is used to calculate yearly percentages for inclusion in the QRT End of Year Report and the Evidentiary Report that is submitted to DMAS every three years. The measures originating from DMAS data can be broken down by the three waiver types; this is not the case for all measures originating from DBHDS sources. The QRT Grid is used to facilitate discussion during the QRT's quarterly meetings.

Each quarter, the QRT reviews the data for all CMS performance measures. If the measures do not meet the 86% threshold established by CMS (and the DOJ SA), then the QRT will discuss remediation that has occurred, is planned, or recommendations are made for implementing remediation activities. Follow-up activities are reported the next quarter. When the yearly average for a performance measure falls below 86%, a systemic remediation plan must be developed by the QRT. The systemic remediation plan is needed to satisfy requirements for both the DOJ SA and the CMS HCBS Waiver Assurances.

At the end of the fiscal year, using the averaged data from the QRT spreadsheet, the QRT Coordinator develops a QRT End of Year report with narrative explaining the QRT process and summarizing compliance with the performance measures and remediation activities.   Per the QRT Coordinator, the report template is based on the format required by CMS for the triennial summary report.

Quality Control

There are no formalized quality control processes in place for generating the QRT Grid. The data originate from disparate source systems from DBHDS and DMAS, many of which the QRT Coordinator cannot currently access. Once the Coordinator receives the numerator and denominator from its owners, it is assumed correct, with the exception of obvious typographic errors, etc. If the percentages appear to be outliers based on previous quarter's data, the QRT

Coordinator may reach out to the data owner. Occasionally, data owners will communicate with the Coordinator in order to correct an error in their data.

Documentation

Currently, there is little documentation for the QRT Grid itself. The QRT Grid that is used to report the data each quarter does list the name of each data source and its owner. Some of the data points, particularly those associated with Appendix G, are well documented within the context of their originating source systems. Though the QRT Grid is unique in that it is a collection of data from free-standing reports, there are still opportunities to document the compilation process. For instance, the QRT's activities are summarized through meeting minutes, but its deliberation processes could be formalized in operational documentation. This would allow the EOY reporting to focus on activities of the Committee during the respective year rather than standard operating procedures. The need for a better process-oriented tool for compiling, reporting, and tracking compliance with performance measures and remediation activities has been recognized by the QRT Coordinator. As an initial step towards data transparency and in preparation for development of such a tool, she has included a data governance document with relevant content captured in the EOY report that explains the QRT process in detail, describes the various sampling methods for source data, and includes initial definitions for the performance measures.

Recent and Pending Changes

As noted above, many of the source systems from which the QRT Grid data originate are in the process of transitioning. For instance, many fields in CHRIS were changed in August 2019, which impacted the ETL process used to import the data into the DW for operational reporting. While OHR and OL both use the CHRIS source system for the majority of their reporting, the August 2019 changes had more impact on OL's serious incident reporting. Recall from Figure 1 that those data are used for the health and welfare assurances. These changes are compounded by the fact that the DW will soon be restructured and upgraded from SQL Server 2008 to SQL Server 2016. Moreover, some of the CHRIS operational reporting will transition from the DW to the source system, with Tableau being used to visualize the operational reports.

In addition to the technological advancements that are planned for both DMAS and DBHDS source systems, the QRT Coordinator is in the process of changing her approach to managing the QRT data. She has developed a data governance document that will include details about the myriad sources from which the QRT data originate. The Coordinator is also seeking alternatives to manual data entry in both the Word and Excel document. Eliminating manual data entry would not only reduce the likelihood of errors but also allow all QRT members ready access to input their raw data each quarter.

Recommendations

Eliminate manual data collection and reporting. The QRT data collection relies on manual data entry, which is inefficient and prone to error. Moreover, the data must be aggregated every year for the DOJ SA and every three years for CMS. Managing the different reporting needs and schedules would be more efficient if the data collection was automated. Storing the data in a database with an online form-based user interface would be ideal and acquisition of such a database is in process.

Compile documentation. The QRT reporting process is intricate and requires the participation of a diverse group of stakeholders that span two agencies and external entities. The QRT data generally originate from discrete reporting mechanisms, adding to the complexity. Though documentation will not make the process any less complex, it will make it easier to understand and sustain. The QRT Grid is essential for achieving compliance with the DOJ SA and ensuring that the Commonwealth can continue to offer HCBS Waivers. The details of such an important process should not live in the minds of a select group of individuals.