

# POTENTIAL FOR IMPROVED DATA REPORTING AND BUSINESS ANALYTICS

Colorado Client Information Sharing System Project  
(CCISS)

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September 11, 2013

# TABLE OF CONTENTS

## Executive Summary

### Chapter One – Introduction

CCISS Goals and Objectives.....	1
Methodology .....	2
Organization of Report .....	4

### Chapter Two – Current State of Business Analytics in CDHS Programs

Agency Findings .....	8
Technology: Analysis of Current Tools for Data Reporting and Business Analytics .....	18
Conclusion.....	22

### Chapter Three – Potential for Improving Data Reporting and Business Analytics

Introduction .....	23
County Interviews.....	23
Use of Metrics.....	24
Need for Data from Other Programs .....	28
County Capabilities for BI/BA .....	29
Impact of Trails on County BI/BA Capabilities .....	32
Large-County/Small-County Divide.....	34
Advanced Analytics.....	34
Conclusion.....	35

### Chapter Four - Recommendations for Improving Data Reporting and Business Analytics

Introduction .....	38
Consolidate Implementation of Metrics.....	39
Identify and Acquire Business Reporting and Analysis Tool.....	44
Provide Improved Reporting and Basic Analytical Capabilities .....	48

Develop Robust Technology Infrastructure .....	49
Implement Advanced Business Analytics Methods.....	57
Integrate County Capabilities .....	61
Case Example: HCPF Acquisition of Advanced Business Analytics Capabilities.....	63
Conclusion.....	65

**Chapter Five - Conclusion**

Time-Limited Availability of 90 Percent Federal Funding.....	66
Recommended Roadmap .....	66
Interoperability .....	71

**Appendix I: List of Questionnaires**

**Appendix II: List of Interviews**

# EXECUTIVE SUMMARY

## Purpose and Scope

This report presents an assessment of the potential for improving business intelligence and business analytics for the Colorado Department of Human Services (CDHS), with a particular focus on child welfare and behavioral health programs. We have performed this assessment under the auspices of the Colorado Client Information Sharing System (CCISS) project, which has been funded under a state systems interoperability and integration planning grant from the U.S. Department of Health and Human Services. Colorado is one of seven states to receive such grants. This study is the fourth component in the CCISS project.

The scope of the study was Department-wide; it was intended to conduct a broad review of the potential for improving business intelligence (BI)/business analytics (BA) within CDHS. However, the primary focus of the study is improving the information available to guide the management of the child welfare program, with attention to its relationship to behavioral health.

## Methodology

The study is based on:

- A review of reports and relevant documents
- Extensive interviews of 22 CDHS executives and managers; four senior staff from the Governor's Office of Information Technology; four external experts; and 30 county directors, managers, data analysts, and caseworkers from nine different counties
- Best practices for data reporting and business analytics in human services programs

## Data Reporting and Business Analytics in CDHS

Within the past two years, CDHS has made great strides in defining and promulgating metrics agency-wide, measuring outcomes based on those metrics, making policy and procedural changes to improve performance, and driving better outcomes based on performance data measured against programmatic goals. The primary vehicle for these changes has been C-Stat, a metrics definition and reporting process with 64 performance measures for 19 operating divisions and programs.

In child welfare, the agency has collaborated with the counties to develop a Colorado Practice Model (CPM) with an associated scorecard in dashboard format providing outcome data for 21 measures, plus another 20 outcomes related to a federal Child and Family Services Review (CFSR) Performance Improvement Plan. While these scorecards have been produced quarterly and distribution has not been entirely consistent, implementation of a ROM contract with the University of Kansas should result in more frequent dissemination of data and will also provide counties with the means to “slice and dice” their own data.

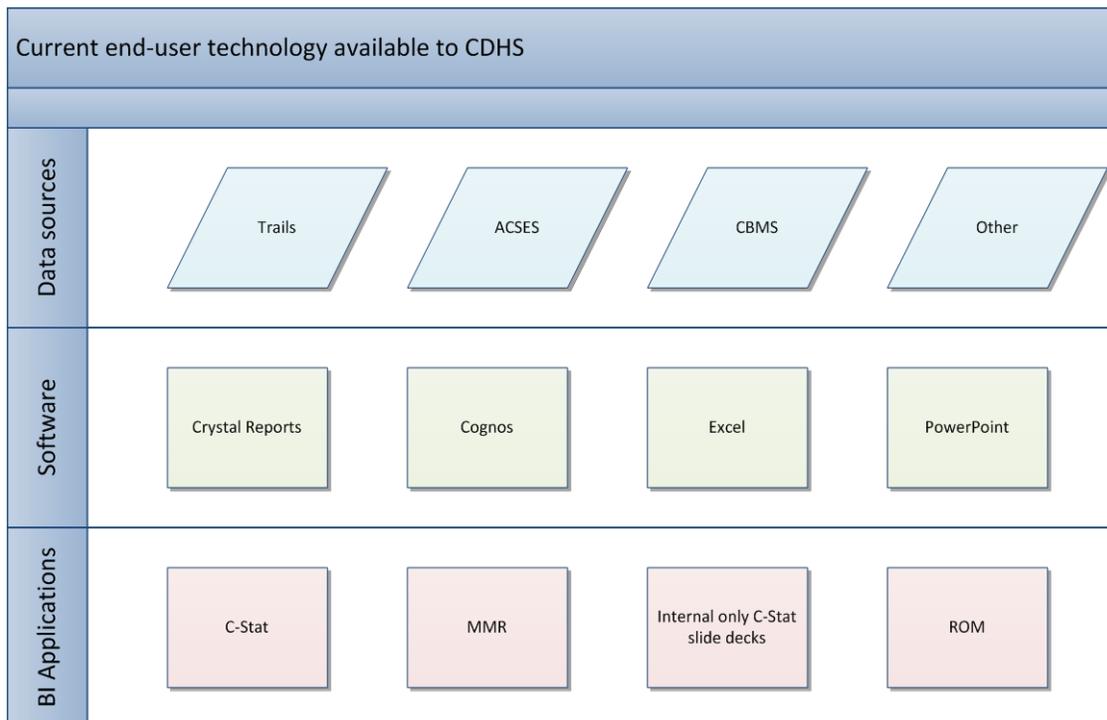
Other programs such as behavioral health, youth corrections, child support, Office of Long-Term Care, and CBMS-supported benefit programs produce reporting data with varying levels of sophistication. Some also have ventured into the arena of advanced analytics.

While the Department has gained substantial momentum in developing metrics-driven approaches to program management, its efforts have been hampered by the lack of adequate technological support. The major issues are:

- Production of C-Stat involves substantial manual efforts which are time-consuming and labor intensive
- The same has been true of CPM scorecard issuance, although this should change with implementation of ROM
- Staff in the Office of Performance and Strategic Outcomes do not have direct access to the extract files from legacy systems
- The ability to develop reports and perform business analyses is severely constrained by the limitations of current technology
- The ability to apply advanced analytical methods, such as predictive analytics, is lacking due to the absence of technological capabilities

Users do have two software packages to pull reports, Crystal Reports and Cognos, but in general the implemented ad-hoc functionality of both packages to do analysis and reporting outside of canned reports is severely limited. Cognos is considered one of the most difficult software packages to implement among end-users and requires a significant investment in initial database configuration to be useful. Interview respondents have indicated that Cognos was never configured properly nor has adequate technical support been provided, so it has not been used.

The following chart displays the current end-user technology available at the CDHS level:



These individual boxes are not integrated nor connected except in purely manual BI applications, such as with the C-Stat Slide Decks.

## Use of Metrics and Business Analytics in the Counties

Because Colorado has a state-supervised/county-administered structure for human services programs, we have devoted a significant part of this study to developing a sound understanding of how the counties use performance metrics and what needs the counties have for improved business reporting and data analytics. Our interviews demonstrate that the counties have been generally receptive to the Department's increased emphasis on metrics-based performance management, especially when counties have participated in developing those metrics. However, we also observed that the implementation of metrics remains a work in progress and that the metrics must evolve further, especially in child welfare, to reach their full potential.

Here are the major findings:

- While there is substantial agreement on most metrics, the state has not yet attained complete alignment as there is resistance to some measures both in C-Stat and the CPM scorecard.
- There was considerable dissatisfaction with access to and timeliness of C-Stat and CPM scorecard reports, some of which may be alleviated with ROM.
- Within child welfare, use of metrics has achieved only a low level of penetration with front-line staff. This suggests a need to translate some management-level metrics to more appropriate measures for casework staff. It also indicates a need to provide training to both supervisory and casework level staff in the meaning and appropriate use of metrics in guiding their work.
- There is a strong desire for data from other programs, especially education, law enforcement, and mental health.
- The large front-range counties have substantial independent capabilities for data reporting and business analytics. They have a strong desire for better access to data and more effective tools to support analysis.
- The smaller counties generally lack the resources for their own data analysis capabilities and are reliant on the state for whatever reports and data analysis they receive.

- The counties perceive Trails as lacking in support for reporting and analytics, although they are hopeful that ROM will mitigate some of the system’s shortcomings. They also have some mistrust of the reports due to input issues that arise due to Trails’ cumbersome worker interface and its excessive demands on worker time for case documentation.
- There is strong interest in advanced analytics, including predictive analytics, and some counties are involved in efforts to apply these advanced tools. Colorado State University is collaborating with some of these efforts.

As the State pursues further interoperability in data access and business analytics, it is important to recognize that counties are acutely interested in these issues. Especially the larger counties are interested not just in data-sharing, but also developing sophisticated tools to assess the cumulative impact of their programs on their clients. This interest is consistent with the holistic service model that counties espouse under which they are pursuing a more integrated approach to service delivery.

## Recommendations for Improving Data Reporting and Business Analytics

Through its major initiatives in the past two years, CDHS has clearly demonstrated that it recognizes the value of rigorous data reporting in its programs. By establishing quantifiable outcomes, setting goals, measuring progress toward those goals, and laying out performance improvement plans when efforts fall short, the Department is driving improved performance across the agency.

To maintain this momentum, it is essential that CDHS work to consolidate its use of metrics while acquiring and deploying needed new technology to support improved data reporting and business analytics. Our specific recommendations are summarized as follows:

- ***Consolidate implementation of metrics.*** The foundation for metrics-driven programs is having agreed outcome measures that accurately capture the most important results. Implementation of metrics is an evolving process and it must engage all levels of the program delivery structure, from State managers down through county managers and county front-line staff who

actually deliver the services. To have maximum impact, we recommend that CDHS:

- Work to firm up alignment on key metrics and support these with consistent reports
  - Prioritize a limited group of metrics for child welfare
  - Develop cascading metrics for front-line staff that can be incorporated into their daily casework while contributing to the outcomes desired by the agency
  - Provide guidance and training to supervisors and caseworkers on the meaning of the metrics, how they affect agency performance, and how to use them to help manage their daily assignments
- ***Identify and acquire business reporting and analytics tool.*** CDHS previously acquired Cognos as its primary analytical tool, but it has not been effectively used for a variety of reasons. It has supplemented Cognos with Crystal Reports, Excel, and other means of extracting and compiling program data.

Deploying a technologically current analysis tool should substantially reduce the excessive manual effort within the Department to support C-Stat. It would also facilitate expanded data reporting and business analytics by the divisions as well as by the counties. Particularly important are ad hoc reporting and the ability to develop performance dashboards down to the worker level.

The tool should: 1) have an open platform so that it can integrate readily with the full range of data sources that users will need to tap; 2) strong reporting functionality to create the types of reports such as C-Stat that are needed by the Department; and 3) have a large menu of reporting functionality such as easy chart/graph creation, trend analysis, and basic statistical analysis such as correlations and other descriptive statistics. There are many reporting/analysis tools on the market, but examples of tools that meet these criteria are the Microsoft Stack, Tableau, MicroStrategy, and SAS BI. One use of the tool would be to develop management and worker dashboards down to the caseworker level.

- ***Develop robust technology infrastructure.*** We concur with the recommendation by Deloitte to implement fully the Enterprise Service Bus (ESB). Doing so will open the access points to multiple production environments and their source data.

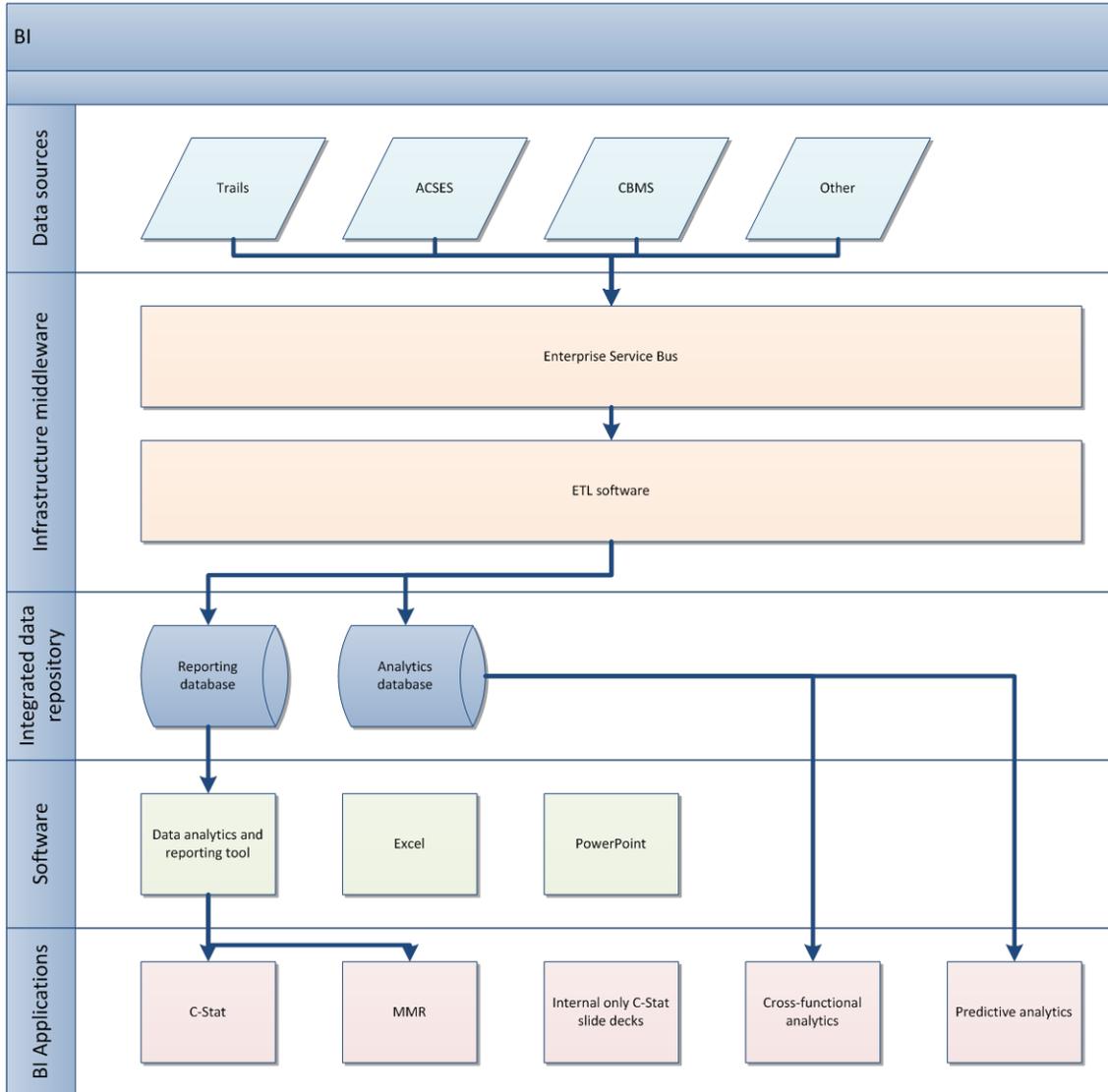
As a next step, acquiring an ETL (Extract, Transform, and Load) tool will enable CDHS to standardize metrics definitions across users.

In addition to the ETL, the ESB could facilitate development of an integrated data repository to house analytical data across departmental programs and facilitate cross-program analyses with other departments. An integrated data repository provides a number of benefits:

- A discrete reporting database to eliminate drag on the production database from the intensive activity of running reports
  - Data analysis optimization
  - Interoperability – would facilitate cross-program analysis for departmental programs while enabling links with data repositories for other agencies that would aid in cross-agency analyses
- ***Acquire a statistical analysis tool.*** This will be used for more sophisticated analyses of program operations and ultimately to support capabilities for predictive analytics and other advanced business analytics methods.
  - ***Implement advanced business analytics methods.*** Using Department staff augmented by contracted resources, the Department should develop capabilities to use its new infrastructure for improved program management and service delivery. This would include predictive and other advanced analytics.
  - ***Integrate county capabilities.*** Given the dynamics of a state-supervised/county-administered human services system, it would be beneficial to improve integration of county capabilities into business analytics planning and deployment

Development of a robust technology infrastructure would create a more mature BI infrastructure, as shown below.

## Matured BI Infrastructure

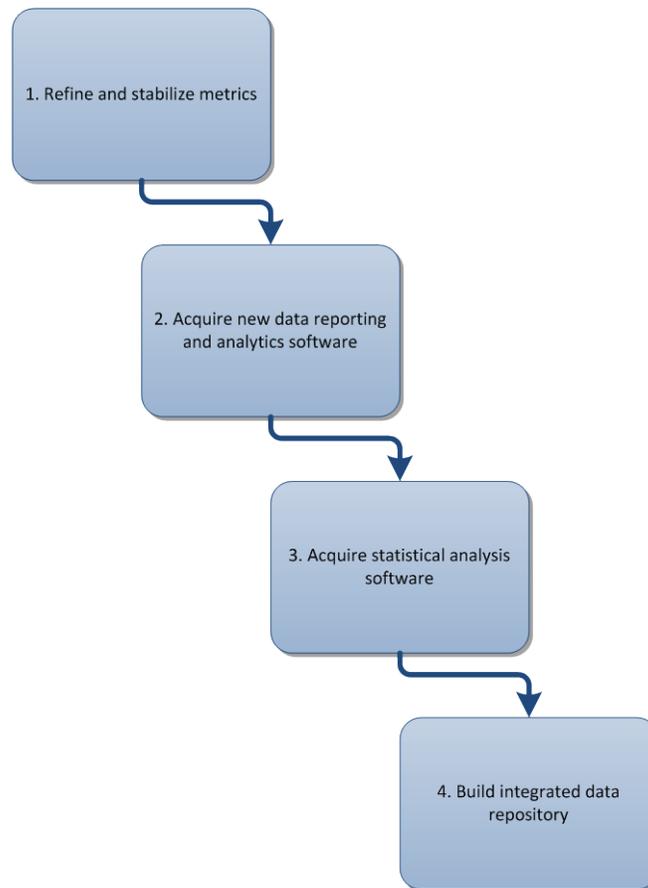


## Implementation Roadmap

Currently the federal government is offering 90 percent federal funding for states to improve interoperability of health and human services systems. As a result, the State has a time-limited opportunity to obtain funds at a highly favorable rate to further develop its data reporting and business analytics capabilities. These funds are available only through the end of 2015.

The following roadmap details how our recommendations should be sequenced into steps for attaining a high-functioning and high-valued reporting and analytics program throughout CDHS. As shown below, we suggest that these steps be executed in the order presented so that CDHS can both start benefitting from the enhancements with the biggest potential return (in terms of program improvement) but also so that the department does not tackle too many improvement ideas at once.

### BI Enhancement Roadmap



Whatever path is taken, time is of the essence. Implementation of improved data reporting and business analytics will facilitate continued improvement in the management of CDHS programs. It will enable services to be targeted more effectively and to be delivered more efficiently. However, the Agency will lose precious momentum if it does not move forward expeditiously to consolidate its work and build the infrastructure for expanded capabilities.

Equally important, it is necessary to move quickly to take advantage of the time-limited 90 percent federal funding that is provided for interoperability projects such as the development of data repositories. This funding source will fade away at the end of 2015. To take full advantage of the funding, the State will need to issue an RFP soon after the beginning of 2014. This would leave barely enough time to select a vendor, sign a contract, and stand up the new capabilities, while waiting beyond that point may leave the State short of the full potential funding it could otherwise receive.

## Interoperability

This study is the fourth component of a grant to explore means for improving data-sharing and interoperability among human services and related programs. Our recommendations will enhance operability in several ways.

- ***Direct analytic access.*** The acquisition and deployment of new tools for data analysis and reporting as well as statistical analysis will enable central office staff (i.e. the Office of Performance and Strategic Outcomes) to perform analyses on multiple programs using extract files from systems such as CBMS and Trails. This will enable them to gain a deeper understanding of the data from such programs and begin to identify linkages that should be explored.
- ***Integrated data repository.*** Once the agency implements an integrated data repository with a suitable governance structure, it will be able to perform cross-program analyses for any CDHS program with data stored in the repository. This will support analytical interoperability across CDHS programs, including Medicaid and CHP+ (Children’s Health Insurance Program) eligibility administered through CBMS. Department staff could then perform analyses of multi-program participation and assess the cumulative impact of its programs for a given client or family. Having the ability to perform analyses easily across CDHS programs (plus Medicaid and CHP+ eligibility) would be a major step forward for analytical interoperability.
- ***Inter-departmental analyses.*** Having an open-platform analytical tool in conjunction with a strong statistical analysis tool will enable CDHS staff to analyze data bases from other agencies. Ultimately, however, the

Department's ability to carry interoperability to that level depends on achieving a satisfactory resolution of the issues of access, confidentiality, and security being addressed in other components of this project.

The Department's rapid progress in the use of metrics combined with the availability of the time-limited 90/10 federal money provides a unique opportunity to maintain the momentum it has gained and use strengthened data reporting and business analytics to improve program outcomes.

# CHAPTER ONE

## Introduction

This report presents an assessment of the potential for improving business intelligence and business analytics for the Colorado Department of Human Services (CDHS), with a particular focus on child welfare and behavioral health programs. We have performed this assessment under the auspices of the Colorado Client Information Sharing System (CCISS) project, which has been funded under a state systems interoperability and integration planning grant from the U.S. Department of Health and Human Services. Colorado is one of seven states to receive such grants.

### CCISS Goals and Objectives

The project has three stated goals:

- Improve service delivery for clients
- Reduce errors and improve program integrity
- Improve administrative efficiency

These goals have guided our analysis of the potential for improved business intelligence and business analytics.

To place this study in context, it is one of four contractual components for the overall CCISS project. These four components are:

- Development and proof of concept testing for standard health and human services data discovery and documentation process
- Assessment and recommendations for enhancing interfaces to support information sharing
- Assessment and recommendations to maintain confidentiality and ensure compliance with privacy requirements in developing an interoperable system

- Assessment and recommendations for improving data analytics and reporting tools to support program leadership requirements

This study is the fourth component in the CCISS project and this report presents the findings from the data analytics/reporting tools study.

The scope of the study was Department-wide; it was intended to conduct a broad review of the potential for improving business intelligence (BI)/business analytics (BA) within CDHS. However, the primary focus of the study is improving the information available to guide the management of the child welfare program, with attention to its relationship to behavioral health.

## Methodology

This study is based on:

- ***Review of reports and relevant documents.*** In the course of the study, the project team collected and analyzed examples of management and analytical reports prepared by the Department, by counties, and other sources. These included most notably:
  - C-Stat reports for each program area from the CDHS-wide performance reporting program initiated in the past two years
  - Colorado Practice Model (CPM) scorecard reports for the child welfare program
  - Child welfare Administrative Review Division (ARD) reports, which are essentially case audits for children receiving child welfare services
  - Management reports for child support enforcement (MMR – Monthly Monitoring Reports)
  - Various reports for other program areas such as SNAP, Colorado Works, and Refugee Assistance
  - Selected reports produced by Trails, the automated system that supports child welfare and youth corrections

- Analytical reports produced by certain counties

The team also reviewed related documents, such as strategic plans and the Colorado Practice Model, which provided guidance on the key performance measures used to assess a program's performance.

- **Interviews.** We conducted extensive interviews of CDHS staff, a total of 22, including management staff in key programs as well as technical staff engaged in data compilation, analysis, and systems support. We also conducted four interviews of external experts as well as four interviews of technical staff in the Governor's Office of Information Technology. To obtain a local service delivery view, we conducted 30 interviews of staff in nine counties.

These interviews were guided by semi-structured questionnaires for each category of staff, which were reviewed by State project staff prior to their use. These included:

- CDHS staff questionnaire intended to capture information about BI/BA within CDHS programs
- County director questionnaire oriented toward management-level assessment of BI/BA across CDHS programs, but with emphasis on child welfare
- County child welfare supervisor questionnaire assessing their awareness of performance metrics and their use of data for managing staff
- County child welfare caseworker questionnaire collecting information on their awareness of performance data and their use of data to guide their work
- External expert questionnaire to gather their insights on how use of BI/BA data by CDHS could be improved

We show these questionnaires in Appendix I and a list of interviewees in Appendix II.

We used the questionnaires as guides, but we used an interactive interviewing methodology in which we pressed for additional information and comments as indicated by the initial answers, and posed follow-up questions when useful. In a few

cases, we interviewed certain specialized experts outside of the categories covered by the questionnaires, in which case we posed open-ended questions.

For the most part, two members of the Veritas HHS team conducted each interview. This provided for a more interesting and richer discussion about the current status of information, process, data, technology, etc. The cooperation and extensive knowledge and expertise of those interviewed were impressive and meaningful. Many of those participating had prepared answers indicating the thoughtful and research oriented approach they took to the interview. Some even provided documentation and other records to better explain and more deeply ensure an understanding of the nature of the work being done in their particular area or field.

Particularly at the county level, interviewees evidenced a deep interest in ensuring that the sharing of the information processes utilized to provide services for children and families in their local communities was fully explained and understood. This was evident in many cases not only by prepared answers but by the dialogue and documents provided.

- **Best practices.** We have integrated our knowledge of best practices for business intelligence and business analytics for comparable programs in other states.

These sources of information have provided the basis for our analysis of potential improvements.

## Organization of Report

The remainder of this report is organized into four additional chapters.

*Chapter Two* presents an assessment of the current state of business intelligence and business analytics in CDHS, especially in the child welfare program. The Department has launched an impressive array of initiatives to improve the quality and dissemination of critical management information. This chapter describes these efforts, starting with C-Stat (the Department's comprehensive management assessment). We also describe the program-specific data reporting and analysis tools that the Divisions use to analyze data and prepare reports. While offering a broad description of such initiatives across the

agency, we give special emphasis to the agency's development of improved business reporting and analytics capabilities within the child welfare program.

*Chapter Three* describes the current status of metrics-based management, use of state management reports, and additional business analysis within the counties. This chapter encompasses all of the CDHS programs, but emphasizes child welfare. The counties generally welcome the increased attention to performance metrics at the State level and the new information that is provided through C-Stat. Many of the counties also participated in the development of the Colorado Practice Model and the design of the CPM scorecard reports. However, our interviews showed that: 1) management data is not used consistently by the counties, and 2) child welfare supervisors and caseworkers are generally not incorporating program metrics into the daily management of casework. This chapter analyzes these issues and provides recommendations for using data more consistently to guide work of the program at all levels. Among other recommendations, we describe the need for cascading metrics – different metrics at each program level -- to align the outcomes desired at the management level with the measurable results obtained at the service delivery level.

Some of the large counties have developed their own sophisticated data reporting and business analytics capabilities. Some are also focused on interoperability issues within their own jurisdictions since they share a vision of holistic services and are highly motivated to generate better information on the entire range of services received by families and individuals. It is apparent from our interviews that the counties share the need for improved business intelligence and business analytics data and tools.

*Chapter Four* offers our recommendations for improved business intelligence/analytics for the agency. We start with continued development of the performance metrics agency-wide and within child welfare. We then address technology issues, including identification and acquisition of an improved analytical tool, then moving to the development of a robust technical infrastructure to support improved reporting and analysis at the programmatic level. Such an infrastructure could also enhance the Department's ability to analyze data from other departments to provide information on services delivered to a given client across agencies.

*Chapter Five* is a conclusion that provides a roadmap for implementing the recommendations in the report. The Department has made major strides in improving its use of metrics to improve performance in programs across the agency but needs to make significant investments in infrastructure to continue building on its recent accomplishments. The time-limited availability of federal 90/10 funding provides a unique opportunity for the agency to continue its impressive progress, but also requires that further development of its technological infrastructure be carried out quickly to take advantage of the funding before it is no longer available. The conclusion also briefly describes the impact of the recommendations for interoperability. Implementing a robust technological infrastructure will support reporting and analytics interoperability for CDHS programs, including eligibility functions for Medicaid and CHP+ (Colorado’s Child Health Insurance Program). Acquiring additional business and statistical analysis tools will assist in analyzing data from other agencies, but only after issues of access, confidentiality, and security are addressed through other components of this project.

## CHAPTER TWO

### Current State of Business Analytics in CDHS Programs

The interviews and analyses that we have performed have provided rich and varied insights into the current state of business analytics and data reporting in CDHS. Overall, it is clear that the agency has been proactive in expanding its capabilities to collect, analyze, and present data for the purpose of improving program management across the Department. The counties have also been active, both in collaboration with the State and, in some cases, acting locally, to improve their use of program data to achieve better program outcomes.

Across CDHS programs, the national trend has been toward increased use of data as an important tool for managing human services programs at the state, local and provider level – in some ways directed and supported by federal initiatives. These efforts have been facilitated by the advances in technology and the reduced cost of storing and analyzing data.

We designed interview guides to provide a review of the data that is currently being collected and analyzed and to determine how it is being used, who it benefits, what benchmarks are in place and how the use of that data helps ensure the success of the Vision, Mission and Goals of the agency. We also attended a weekly C-Stat meeting at the agency. The skill and knowledge displayed at that meeting was evident. Staff clearly conveyed a sincere and meaningful effort to emphasize data and metrics and to do that in a way that brings credit to the individuals conducting the sessions and to government in general.

Ultimately, after reviewing current documents and reports, reviewing the data accumulation, analysis, and dissemination, the goal is to improve the process by which local field staff in the counties obtain and input information so the decisions and recommendations they make lead to better outcomes for the children and families in Colorado. For that to occur, data has to be presented and formatted in a user-friendly way and generated in real time to add value to caseworkers, supervisors, county directors, and the CDHS leadership and management teams.

## Agency Findings

The agency interviews began at the end of May 2013. The questionnaire served as the basis for the interviews but there was extensive free flow dialog during the interview process. (We show copies of all questionnaires in Appendix I.) While in some cases there was great variety in responses, for the most part the responses were within a range and framework which added validity to the answers as a whole. Given the nature of the instructions through the grant application and kickoff meeting, most of our questions addressed the issue of data and metrics in an effort to determine the current status, the gaps that may exist, and to formulate recommendations for advancement of the current status of business intelligence and business analytics.

### C-STAT

C-Stat is the Department's central initiative for using data to improve performance throughout the agency. Beginning in early 2012, the Office of Performance Management has compiled a quarterly C-Stat report on programs for all four operating components of the Department. The report shows performance relative to goals, and performance trends, for those program outcomes deemed to be most significant. Selection of the performance measures is, in itself, a significant step because there is not always agreement on which metrics represent the most important results. Data for the metrics is sometimes readily available, but other times requires establishment of new reporting requirements for county partners or service providers.

C-Stat reporting and program assessment is an ongoing process. Although the reports are produced quarterly, there are weekly meetings to review program results for one of the four operating divisions, so that performance in each division is evaluated each month. The quarterly reports are also posted on the Department's website, which evidences a laudable commitment to transparency in reporting program outcomes.

The C-Stat process currently reports 64 performance measures for 19 operating divisions and programs. Because C-Stat is a relatively new process, it is not surprising that some performance measures are evolving. As the agency learns that some measures represent desired outcomes only imperfectly, and/or that data for some measures is not entirely reliable, it is only natural that some metrics are dropped, modified, or added over time. In

addition, program policies and operational structures change over time, and these changes also affect the choice of proper performance metrics.

There is no doubt that implementation of C-Stat has been a major effort involving every part of CDHS as well as substantial involvement by the counties and some service providers. The recurring C-Stat reviews are in depth and widely considered helpful by those involved with the process. C-Stat represents a giant step forward in driving improved performance through the rigorous application of outcomes data. It has been successful in moving the agency toward commonly agreed metrics for program management and focusing state and county leaders on quantitative outcomes.

There are several limitations of C-Stat, however, that came to light through our interviews. One is that C-Stat reports are tremendously labor-intensive to create. Staff in the Office of Performance Management does not have direct access to the data that are used to create the reports. Rather they rely on slide decks and Excel spreadsheets provided by the Divisions and then must compile the C-Stat reports from this amalgamation of different data sources and formats.

A second is that, in some state/county programs, there is not universal agreement on the metrics selected to measure performance, either because of different views of performance, or because the counties do not view a given metric as reliable. One example is the timeliness of assessment closure used for child welfare, which should indicate whether services are provided promptly and that the agency is not “lingering in a family’s life.” While we found no disagreement on the intent of the measure, many county staff questioned whether the data underlying the metric accurately represent the desired outcome. Some cases need to be held open longer for various technical reasons that do not represent deficient quality, and in many cases data on assessment closure is not entered timely so that the reported outcome is not entirely accurate.

A third is that there are significant reporting lags for data collection relating to a given measure. For some measures, there can be delays of up to 90 days in collecting information needed to measure performance, either because of data entry delays or because of delays in getting data from external providers. This makes the data that are available so stale that it greatly diminishes the value of that metric.

These limitations do not detract from the progress represented by C-Stat and the contribution it is making toward more effective management of the agency. Rather they represent potential areas of improvement that we address in the following chapters.

## OPERATING DIVISIONS: DATA, REPORTS, METRICS, AND ANALYTICS

The project team interviewed key CDHS staff in the operating divisions based on the initial list of names provided by the state project team, then supplemented by other key officials who came to our attention during the project. As noted above, our interviews were guided by our general questionnaire, but we asked additional questions as warranted by the specific situations of the respondents.

The first series of questions addressed the performance metrics, data reports and an assessment of reports currently available. The second series addressed the issue of business analytics and how current metrics, data reports, and current technological tools are used in the regular work being performed.

### Child Welfare

In recent years, the Division of Child Welfare has worked closely with certain counties to develop the Colorado Practice Model (CPM). Along with the CPM are agreed metrics for child welfare program performance and a county-level scorecard report with 21 measures presented in a dashboard format. Cohort 1 counties, about a third of the total, collaborated in the development and participated in the initial rollout. The Cohort 1 counties include a disproportionate share of the large counties, with the result that many of the small counties were included in the second and third cohorts. The Cohort 1 counties tend to agree on the appropriateness of the metrics, but other counties are less supportive --- perhaps in part because they did not participate in their development. Some counties do not like the timeliness metric, or how certain other outcomes are measured.

As of June 2013, the CPM was implemented in 35 counties (plus the Ute tribe); the remaining counties were scheduled to be added on July 1, 2013.

The scorecard report is made available quarterly. It goes automatically to about half the counties that are participating in the CPM, while other counties have to pull the report from the system.

The scorecard report generally overlaps with C-Stat, with the most important outcomes included on that report. Notable exceptions are the outcome measures: 1) Timeliness of assessment closure; and 2) safety assessment forms completed accurately. These appear in C-Stat, but not the Scorecard.

The Scorecard goes beyond the outcome measures developed by Cohort 1 counties in collaboration with the State. It includes another 20 performance measures emanating from a federal Children and Family Services Review (CFSR) and the resulting Performance Improvement Program (PIP). These 20 PIP measures add another level of complexity to the report and impose additional burdens on the counties in using the Scorecard to track their performance.

C-Stat and the Scorecard represent substantial progress for the child welfare program. Prior to these two reports, the child welfare program was not managing to metrics, but now is making rapid progress in that direction. County Commissioners have even agreed on using 2 percent of funds for an incentive-based reimbursement, based on performance on three measures: *absence of repeat maltreatment, timely permanency, and children aging out without permanence.*

C-Stat is beginning to drive policy, such as asking why developmentally disabled kids are lingering in the child welfare system and devising solutions. The CPM and scorecard are being used to drive process. Counties form continuous quality improvement (CQI) teams and, with help from State technical assistance staff, use CQI methods to address low-scoring areas.

Nonetheless, there are issues with the Scorecard that State staff has identified:

- It is very labor-intensive to produce – agency staff lack the analytical tools to make production more efficient
- It does not go out often enough
- The counties do not have access to the data for their own analyses

These issues are being addressed through ROM, as discussed below. However, it is noteworthy that two senior state officials we interviewed stated that ROM is an interim

solution. This raises the question of what the longer term strategy should be to improve data reporting and data analytics for the program.

To some extent, according to State staff, the scorecard suffers from shortcomings of Trails. Because Trails is so complex and cumbersome for front-line staff to use, the caseworkers frequently lag in completing case data on a timely basis. This means that much of the data in Trails is not up-to-date with the consequence that the affected reports produced from Trails are not accurate. One interviewee estimated that only 70 percent of the relevant data has been entered into Trails when the reports are produced.

In addition, the child welfare program lacks access to analytical tools that could help develop better information to manage the program. Crystal Reports is perceived as useful, but limited. Cognos has provided little to no value, according to interviewees, because it has not been staffed or supported. Staff sometimes uses SQL Server to run Trails queries, but it is not user-friendly.

Another important process has been the implementation of the Administrative Review Division (ARD) audit process that regularly analyzes county records, reports and information through a review of a sampling of cases. These reviews provide assessments of quality in managing the services provided to relevant cases. They are viewed by counties as key performance indicators along with outcomes measured on the Scorecard.

One area of improvement already underway for the Child Welfare Division is a project (ROM) to outsource the Practice Model scorecard metrics processing. CDHS will provide a Trails extract to the University of Kansas weekly. The University will process the data, calculate the metrics, then publish the results monthly – instead of quarterly -- in a widely accessible internet based reporting tool. ROM will aggregate and present data from Trails in a user-friendly fashion. It will provide:

- Aggregate public data
- Secure county-level data
- Structured performance reports

A significant benefit is that C-Stat will have real-time data for its child welfare metrics.

This project will eliminate significant manual efforts currently performed by CDHS staff. An additional benefit is the data and reports will be in a format that will allow end-users to manipulate the information according to their needs. One example is that counties will be able to “slice and dice” their information separately from other counties. This will address a strongly felt need by the counties. Note that output of the data will be more timely and universal, but that the quality of the data will still be limited by the timeliness and completeness of inputs.

The State CQI team is trying to determine which core practices determine performance on the 21 outcomes included on the Scorecard. The staff is near completion of a predictive model which will predict which core practices predict program outcomes. Colorado State University has contributed to these efforts.

### **Child Support**

In many ways, child support epitomizes a metrics-driven program. It has a nationally-specified set of five performance measures for judging the effectiveness of the program: 1) proportion of cases with paternity established; 2) proportion of cases with support orders established; 3) proportion of support owed in the current month that is collected; 4) proportion of cases in arrearage with a collection toward arrears; and 5) cost-effectiveness. These outcome measures are set forth in federal statute and they are backed up with cash incentive payments to states based on their performance.

Within Colorado, these measures (along with several others) are widely accepted at both the state and county levels. Counties receive cash incentive payments based on their performance, just as the State does. This establishes a system of accountability down to the county level, and most counties extend awareness of these performance measures down to the caseworker level whether or not they attach tangible rewards to the results.

The child support program produces a Monthly Monitoring Report (MMR) that is exemplary in its comprehensiveness. It includes twenty-four pages of detailed information on an array of performance measures, including the five federally mandated ones. If anything, according to the interviewees, the MMR might benefit from greater selectivity, but there is no doubt that the counties routinely receive the information they need to assess their performance. Child support has also developed a performance dashboard which provides a visual depiction of performance.

While the program has excellent structured performance reports, it has only limited capabilities for ad hoc queries, flexible program analyses, or predictive analytics. It does have some reporting capabilities through Crystal Reports, but lacks more sophisticated data analysis tools.

### **Benefits Programs**

Among other responsibilities, the Office of Economic Security administers the major assistance programs: Colorado Works (TANF), SNAP (formerly Food Stamps), and energy assistance. A major focus of this office has been revamping the Colorado Benefits Management System (CBMS), which is the core eligibility system for SNAP, Colorado Works, Medicaid, and a myriad of other programs. Despite the challenges of making major modifications to CBMS, the office has moved to incorporate key metrics in the management of the programs.

The primary source of data for program management is, of course, CBMS. The most significant outcomes being tracked at this point are the timeliness of processing for applications and redeterminations in SNAP and Colorado Works. One reason for emphasizing these metrics is that the State needs to comply with standards set in a prior lawsuit. In fact, the agency has developed new reporting capabilities such that it can now track the timeliness of applications and redeterminations by the day. It is using this data to move beyond the federal measure for timely application processing to a much more ambitious one: seven days from application to decision. This has been incorporated into C-Stat.

The seven-day goal has been developed in conjunction with some county partners, but there has been pushback from some other counties that have not committed to the new business processes. Others are in the middle between acceptance and resistance. The State is supporting this new goal by doing business process reengineering in the ten largest counties for the next twelve months.

The Office has also created new reports to measure accuracy of eligibility processing to counter undesirably high error rates.

What is missing from the current metrics is data relating to key program outcomes, most notably workforce participation rates for Colorado Works. The Office has developed new

workforce screens in CBMS to obtain workforce participation data and supplements this information with quarterly wage data from the Department of Labor, when available.

At this point, the Office believes that it has good reports for the eligibility programs, but that the data are not yet fully reliable. It is an ongoing challenge for the Department to have tools and staff to support data analytics and program reporting. It would also be desirable to talk across programs so that the agency could analyze the combined impact of its services on families.

### **Behavioral Health**

Behavioral Health leadership, local mental health centers, and the provider community have developed a very clear and structured set of metrics that addresses varied responsibilities including federal funding, the Substance Abuse and Mental Health Services Administration (SAMHSA), and state and provider networks. These metrics include:

- Timeliness of access to outpatient services
- Engagement
- Increasing the number of clients
- Reduction of substance use
- Reduction of mental health symptoms severity
- Maintaining and improving mental health housing.

These partnership efforts have resulted in a vast improvement of data gathering and analysis and have led to performance-based contracting with the providers.

Despite these efforts and improvements, mental health professionals in general lack agreement on the performance metrics. The introduction of C-Stat has helped move the community in the right direction, but full adoption and implementation is stymied by a general distrust in the data. One example of an issue is the timeliness of reporting data received from providers. While due within 30 days of month of closure, information appears incomplete, remaining so in some examples up to 90 days. The agency needs to improve its ability to deliver accurate data in a usable manner outside of the main office, and particularly to the contracted providers.

Tools such as Treatment Management System (TMS) and Web-Based Colorado Auditing Tool (WCAT) are helping to manage the information, but while all providers deliver information to the state, they do not always get that information back. In addition, using the Center for Improving the Value of Healthcare (CIVHC) will assist in improving the quality of behavioral health data management. Business intelligence software and mobile technology would help Behavioral Health provide more timely and reliable data access and give analysts the tools they need to mine the data.

One expressed concern is that there is a greater degree of technical sophistication within the community mental health centers and HMOs than currently exists with the technology, data, and analysis available at the State level. Another concern is hiring up to full staff size, as they are currently at half staffing. A third concern is the lack of integrated data sets. In part this is due to a concern about the confidentiality of mental health records. An example would be not having access to criminal records regarding driving under the influence violations. Yet, the relationship between mental health and substance use versus misconduct evidenced through driving records is obvious. The final concern is not sharing information with providers in a timely manner so that they can make better decisions for the people jointly served.

### **Office of Long Term Care**

The data and system connections between the Regional Centers and Child Welfare are tenuous. The possibility that children served by the Child Welfare or Behavioral Health system may, at some point during their minority or upon reaching the age of 18 become patients of a regional center is very real. Yet, the information system used by the Regional Centers in the Office of Long Term Care is completely home-grown and based on Microsoft Excel. It offers no connectivity or data merging potential with Child Welfare or Behavioral Health. The division is currently moving the system toward Microsoft Access and SQL Server but the progress is minimal.

The adult-only patient population served by the regional centers includes long-term patients needing habilitation, some sex offenders, and individuals needing short-term mental health crisis intervention. The office uses a risk management tool to minimize reoffending and has a low recidivism rate.

Their system, THERA-RAP, tracks three primary measures: reduction in the number of physical interventions, time of admission to time of discharge, and readiness for discharge.

The division uses data to make day-to-day decisions regarding the number of patients leaving, readiness of services, and to determine barriers for transition. The primary goal is to decrease the time individuals spend in the system without sacrificing quality of service. They rate their system very highly.

The Regional Centers would benefit from access to information including history of substance abuse and related services/treatment provided previously, behavioral health records, data from the child welfare system, and information on patients aged 18 who are currently receiving Medicaid services. The Regional Centers rate the ability to access that information very low, preventing adequate and appropriate early assessment, service delivery, and transition when appropriate from the division. While there appear to be legitimate barriers to that exchange of information, the division essentially believes that it is the unwillingness of people to share information that is the primary barrier.

Other barriers to improvement include outdated desktop operating systems, outdated software, and lack of access to advanced analytics software. With an advanced analytics software package they would study how to improve their metrics including time of admission to discharge and reduction in the number of physical interventions. A second study area is how effective the division is with patients eventually discharged from the system. This requires good data captured during admission, the treatment phase, and access to other production data, including mental health centers and the criminal justice system.

### **Youth Corrections**

Children entering the Youth Corrections system have generally touched many other systems including child welfare, community behavioral health, economic security, probation services, and educational services. Thus, the need for information sharing is an important tool for assisting the assessment cycle in the Youth Corrections system.

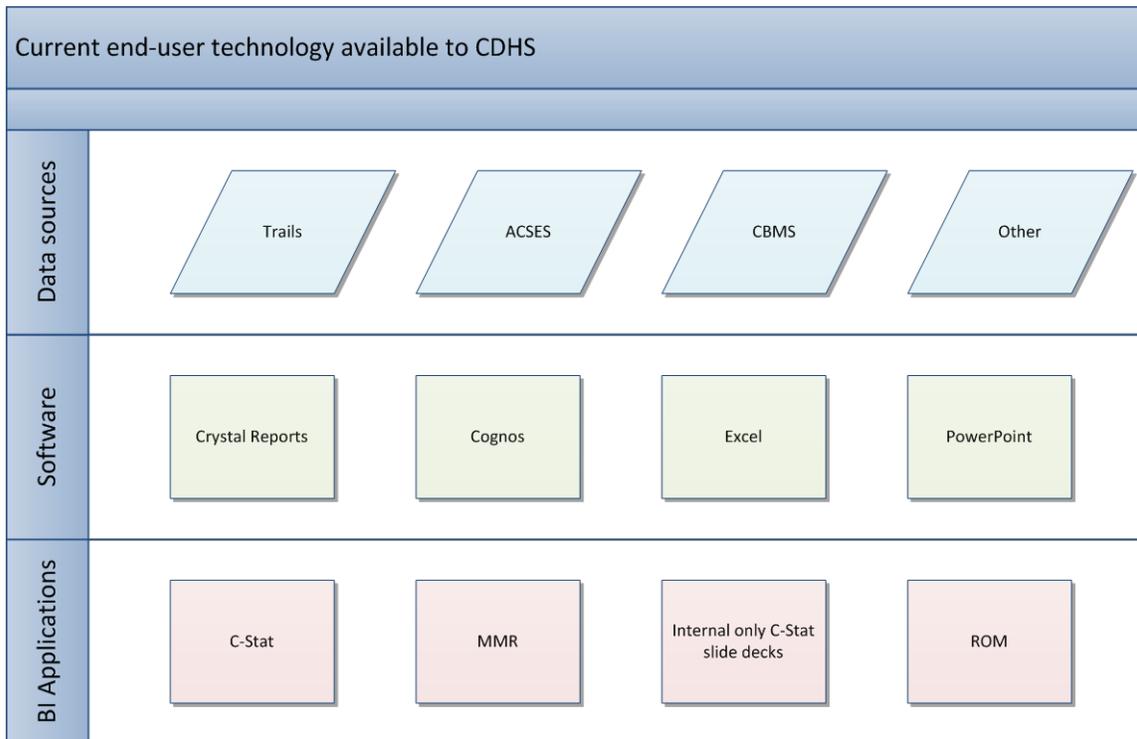
Youth Corrections spends a great deal of time seeking information they need from Trails and other systems. Management indicated a desire to operate the programs with more reliance on performance data and has requested dozens of reports and information from the Trails system. However, Trails was not designed with Youth Corrections' needs in mind, preventing ease-of-use for program and case manager evaluations as well as advanced analytics. Specifically, Trails lacks a way to capture Multidisciplinary Team (MDT) models making record-keeping overly complicated and challenging. Their

workaround is to use a monthly report, the DYC Management Report, by starting with an extract from Trails. Youth Corrections have their own business analysts who work with the tools and data available, but a better CDHS system that accounts for specific Youth Corrections business requirements would be beneficial.

## Technology: Analysis of Current Tools for Data Reporting and Business Analytics

CDHS has a variety of data sources and reporting tools available, but in general these sources and tools are stove-piped, meaning the interaction between the data sources is limited. At the agency level, there are no automated integration points for the data from distinct programs but the Office of Performance and Strategic Outcomes does put significant efforts into compiling information from multiple sources into C-Stat slide decks. Again, this is not integrating actual data but manually compiling information into ready to consume slide decks and presentations.

The following chart displays the current end-user technology available at the CDHS level:



As explained in detail below, these individual boxes are not integrated nor connected except in purely manual BI applications, such as with the C-Stat Slide Decks.

## DATA SOURCES

Program managers and their staff have access to their program's data and reports through the individual systems, but no cross-functional team, most notably Performance Management, has direct access to program data. This includes access to Trails, ACSES, CBMS, and other standalone data sources such as those found in Behavioral Health. Trails and CBMS both have data extracts run against the production environments, opening data access to the programs without impacting the production environments during business hours.

### Trails

Trails is the production application used in Child Welfare and Youth Corrections. Its backend is a transactional database. Overnight, a mirrored extract is run against the database and provided to counties and agency users for program use and analysis.

### ACSES

Child support workers use ACSES to perform case management activities and this production system is the source for the Monthly Management Report, discussed below. ACSES has a limited number of Crystal Reports available but ad hoc and analysis usage is not widespread.

### CBMS

CBMS, like Trails, is a production application used throughout the benefits management programs, including Medicaid eligibility, SNAP, and Colorado Works. Also like Trails, a nightly extract is made available to county and agency users for program use and analysis.

### Other

Other programs, such as Behavioral Health and the Office of Long Term Care, use other programs and systems to manage their cases and programs. In general the data access to these programs is extremely limited outside the individual programs.

## END-USER SOFTWARE

Data and reporting access throughout CDHS at the agency level can be described as limited, manual, and segregated. Offices that would greatly benefit from access to all CDHS program data, such as the Office of Performance and Strategic Outcomes, only have sporadic access and often rely upon the individual divisions to supply information. Users do have two software packages to pull reports, Crystal Reports and Cognos, but in general the implemented ad-hoc functionality of both packages to do analysis and reporting outside of canned reports is severely limited.

Strengths and weaknesses of status quo CDHS end-user software			
Crystal Reports	Cognos	Excel	PowerPoint
<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• High quality report functionality</li> <li>• Low learning curve for current users</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Currently run against transaction data creating latency</li> <li>• Long lead time to move ad hoc to canned</li> <li>• Perceived as inconsistent</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Industry leading tool</li> <li>• Broad access to contractors and programmers who are experts in Cognos</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Difficult to implement</li> <li>• Widely perceived in CDHS as too challenging to use</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Universal access</li> <li>• Short learning curve</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Not a reporting tool by design</li> <li>• Not easily used for enterprise report publishing</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Near universal access</li> <li>• Short learning curve</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Not reporting tool</li> <li>• Not easily dynamic in regards to data updating</li> </ul>

### Crystal Reports

Crystal Reports is a broadly used Business Intelligence report writer application available to CDHS to run reports against Trails and ACSES. This tool has great features and functionality when utilized in a BI environment optimized for reporting and analysis. Neither Trails nor ACSES, as transactional database environments, are optimized for end-user compatibility. Reports using Trails extract data take a significantly long time to run, leaving the end-user frustrated and often ends with the user giving up.

## Cognos

Implemented with the rollout of CBMS, Cognos is an analytics and reporting platform with a significant presence across a broad spectrum of industries. When implemented well, Cognos is considered one of the best analytics platforms among its users<sup>1</sup>. However, Cognos is also considered one of the most difficult software packages to implement among end-users<sup>2</sup>. When asked about their experience using Cognos to run reports against CBMS and other systems, most users expressed frustration to the point that if possible Cognos is completely avoided.

## Excel

Excel has the advantage of near ubiquity among desktop computer users. The learning curve is small when compared to other analytics and reporting tools. As a result, Excel is often the default software used for reporting and analysis when deficiencies exist among other database reporting and analysis tools.

## PowerPoint

PowerPoint is normally not considered a reporting tool but because slide decks are a primary method of information communication within CDHS it is included here. PowerPoint cannot easily query or update data so its main weakness is that the end-user is required to pull data from other sources. PowerPoint does have some functionality to create charts and graphs but the lack of data source connectivity makes this a burden.

## BUSINESS INTELLIGENCE APPLICATIONS

As detailed earlier in this chapter, CDHS has taken great strides in developing and implementing improved data reporting and information consumption. The primary area of this improvement is with C-Stat and the related Slide Decks used internally during the monthly meetings, but as previously mentioned, other programs are leveraging their data and information to their benefit, such as with the Child Support MMR and Behavioral Health's Treatment Management System. The addition of ROM will advance CDHS's efforts to disseminate metrics information more broadly as well.

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<sup>1</sup> <http://www2.microstrategy.com/download/files/whitepapers/open/gartner-magic-quadrant-for-bi-platforms-2012.pdf>

<sup>2</sup> Ibid

## Conclusion

The Department has taken great strides in developing and implementing improved data reporting in a relatively short period of time, most notably with C-Stat and the CPM scorecard. But C-Stat is also driving individual programs to improve their reporting and data analysis capabilities and to use the outcomes data to help improve program management.

The biggest shortcoming is the lack of appropriate technology to support these efforts. Producing C-Stat and Scorecard reports has been tremendously labor intensive. Moreover, central office staff has no capability to analyze data directly from any of the individual program databases. This is not only inefficient, but also precludes the possibility of achieving greater interoperability in data analytics by facilitating cross-program analyses within CDHS. These are issues that we address in more depth in Chapter Four – Recommendations and Chapter Five – Conclusion, which includes a recommended Roadmap for improved BI and BA for human services programs.

# CHAPTER THREE

## Use of Metrics and Business Analytics in the Counties

### Introduction

Since Colorado has a state-supervised/county-administered structure for human services programs, we have devoted a significant part of this study to developing a sound understanding of how the counties use performance metrics and what needs the counties have for improved business reporting and data analytics. In this chapter, we report on the results of interviews and review of relevant documents. These demonstrate that the counties have been generally receptive to the Department's increased emphasis on metrics-based performance management, especially when counties have participated in developing those metrics. However, we also observed that the implementation of metrics remains a work in progress and that the metrics must evolve further, especially in child welfare, to reach their full potential.

The counties' investment in improved operational outcomes has led some of the large counties to augment the business reporting and analytical capabilities provided by the State. Consequently, developing improved data sources and analytical tools would benefit not only the State, but also the counties' capabilities to track client participation across programs and improve the outcomes they obtain for their citizens.

### County Interviews

We conducted the county interviews over a three-week period of time. These interviews focused on child welfare, although there were some questions relating to other programs such as child support and self-sufficiency. The selected county interviews typically included the director, a supervisor and a caseworker. In some of the larger counties, we included a divisional administrator. In most counties, we separately conducted the interviews for different staff levels. In a few others, we interviewed staff in small groups. In a limited number of counties one of the individual categories was not available at the time the interviews were set so these interviews were skipped.

Each respondent was helpful and responsive to the individual questions and interviews. We devoted most of the time in each county to the topic of the performance measures in

the data reports. Some limited time was provided on other topics such as frequency of reviews of data reports, recommended changes, and outside agency information availability. In the large counties, we also collected information on their own business analytics capabilities and plans.

## Use of Metrics

### COMMITMENT TO MANAGEMENT BY DATA

In general, there is very strong buy-in at the county level to the increased reliance on metrics to drive program management. This is especially true in the large (top 10) counties, but also extends to the smaller counties. In fact, in child welfare and extending to other programs, most of the large counties have developed their own capabilities for report writing and data analysis. They want program management to be evidence-based and, in child welfare, they want management to be based on a uniform practice model.

As one director stated: “Every program needs to be data-managed. It is an evolutionary process as research findings are produced to support evidence-based practice. Business analytics are critical for program management and business management.”

Some of the counties (Cohort 1) participated in the development of the Colorado Practice Model (CPM) and the associated scorecard. They generally welcome the advent of C-Stat and the State’s promulgation of the CPM Scorecard. They want more and better data for their own analysis and they would welcome improved data analysis tools.

It was generally stated that CDHS is better at using the data to drive policy, practice, procedures, etc. than is being done at the county level. This may be reflective of a number of issues which may include the fact that there is a greater need for the state level to review data for policy and practice; the state has a better opportunity to review the data in a comparative manner especially when comparing county to county; that few counties have a data analyst allowing them to review the data in an analytic style; and that the state has a greater responsibility given federal involvement through both reviews and funding that may influence policy and practice.

Nonetheless, the buy-in is not yet universal. Especially in the smaller counties and at front-line staff levels, there is some resistance to increased use of metrics based on the notion

that much work in child welfare is not subject to accurate quantitative measurement, that cases are too individualized, and that critical qualitative aspects of their work are not measured. To some extent, the greater resistance in smaller counties may result from their smaller caseloads, which lend themselves to case-by-case review and do not have the critical mass to display consistent patterns of outcomes.

Some of the smaller counties were reported to be resistant to participating in the Colorado Practice Model, but their inclusion is mandated as of July 1, 2013, with the sanction for non-participation being denial of access to funds from the IV-E waiver. Even though the State is providing technical assistance for CPM involvement, many of the small counties have small staffs and limited management resources.

We asked about how accountability for performance, efficiency, timing and costs are factored into the use of the data and reports provided and learned that those have not previously been a focus. There was a statement that through collaborative management at the local level and then the state, a standard set of metrics was developed, resulting in the Scorecard, but that the next step regarding accountability is just now being implemented. CDHS has made steps in that direction through the allocation of two percent of child welfare funding from the state to the local counties focused on three main areas – absence of repeat maltreatment, timely permanency, and children aging out without permanence.

## PERCEPTION OF METRICS

There is not yet full alignment on CDHS metrics, but given how new the C-Stat and CPM Scorecards are, the disagreements are relatively small. The lack of full acceptance is primarily limited to child welfare. There are no reported disagreements concerning child support metrics, which have been mandated for fifteen years. When the State decided to develop a modified child support arrears metric, it collaborated closely with the counties in its formulation. For the benefit programs, State staff reported resistance by some counties to the dramatically shorter standard (7 days) for application processing.

In child welfare, many counties we interviewed expressed frustration with the C-Stat metric for timely completion of assessments (60 days). Comments included: 1) 60 days is not long enough; 2) data entry often lags so that counties are “dinged” on the metric simply because documentation is not complete; and 3) some cases should not be completed within 60 days because more time is required to resolve all the relevant issues.

Some counties also did not like how some metrics were measured. Finally, there was a frequently expressed frustration with perceived instability of metrics: that shifting priorities resulted in frequent changes that interfered with front-line job performance.

Several directors mentioned that the number of metrics was “overwhelming”. Mostly this comment was directed to the CPM scorecard, but one director also included C-Stat in this description. The CPM scorecard has 21 outcome measures, which is a large number for a manager to track, and even more daunting if corrective action is needed on more than a handful. However, it also has performance data on 20 additional measures from a Performance Improvement Plan created in response to a federal Child and Family Services Review (CFSR). This is a daunting list for any manager to analyze systematically, let alone follow up in a methodical way.

Several small counties also mentioned the distortions in reported program outcomes caused by small numbers. If the county fails to take an action on a single case, and there are only two cases in that category, for example, then the reported shortcoming is greatly exaggerated. It is even worse when the reported failure to take action results from a documentation delay rather than an actual failure to take the proper step.

In the interviews, we asked respondents for their perception of the most important metrics that guided performance in the child welfare program. There was a surprising level of variability in the metrics cited by the interviewees. This demonstrates the need for more targeting and clarity on the important measures that will improve practice, provide safety, permanency and well-being, and allow some degree of management supervision for appropriate reports.

## PERCEPTION OF C-STAT AND SCORECARD REPORTS

There is general agreement that C-Stat and CPM Scorecard reports represent significant improvements to the limited information available in the past. Virtually all of the directors reviewed the C-Stat reports and used them to manage their programs. In fact, a few smaller counties said that the C-Stat and CPM scorecard reports were the only reports they needed to manage their programs. However, there was considerable dissatisfaction with the timeliness and reliability of the reports. Some counties reported that they did not receive C-Stat reports consistently, or that they had to pull them from the web-site.

For the CPM Scorecard, many counties reported big gaps in report access and there was confusion about how to obtain the reports. Because many (if not all) of the counties have to “pull” these reports rather than having them issued automatically, they often do not make the time to acquire them. There is a perceived difference in access, with the smaller counties believing that their access is less than the large counties.

Many of the counties mentioned the need for better data on their own counties as well as comparative data for other counties. Several of the large counties with their own analytical resources stated that they would rather get data from CDHS rather than reports because they do their own analysis and run their own reports. There is a strong demand for reports and/or data that can be broken down by unit and worker and for more trend types of reports.

### FRONT-LINE IMPACT

One of the more surprising findings from our county interviews was that in child welfare the use of metrics has only barely penetrated to front-line staff. While there were one or two exceptions, generally the front-line staff reported that they did not generally use performance data to guide their daily work and that they rarely if ever met with their supervisors to review reports on their caseloads. What was especially surprising was the extent to which this was reported even in some of the larger counties which were most committed to data-driven management.

There appear to be several factors responsible for this result.

- Some of the most significant metrics at the management level do not translate well to the activities of front-line staff
- No one has provided systematic training on metrics-based management to supervisors and their staffs
- The small caseloads in child welfare permit individualized attention to cases

It is important to address these issues if the expanded use of data and metrics are to achieve their full potential for program improvement.

As an example of a key metric that does not translate well, avoiding repeat maltreatment is a critical goal for the program, but does not map directly into a result that can be readily measured at the caseworker level. In a small caseload, the number of events is too small to establish an accurate pattern and the caseworker needs guidance on the specific actions he or she should be taking to affect this variable. The program needs to make this translation. Statistical analysis of data can help make this connection and refine the translated outcomes.

Our experience in other programs reinforces the notion that training and technical support for front-line staff are required for metrics to have their desired impact. Supervisors and caseworkers need to understand the meaning of metrics and their linkages to program success. They also need to understand how their actions affect the outcomes reported for the agency and how these actions ultimately affect the evaluation of their agency's performance and perhaps even the availability of funding. Finally, they need to have metrics data presented to them in an easily digested format and the training needs to address how caseworkers should use the data to manage their daily work and how supervisors should use the data to manage staff.

Thus, while the existing child welfare metrics can be a valuable management tool at both the State and county levels, there does appear to be a disconnect in their application to casework activities. This is an important issue for CDHS and the counties to address as their approach to metrics-driven management continues to evolve.

## Need for Data from Other Programs

Staff in every county expressed the critical need to obtain data from other programs to assist in management of child welfare cases. The list is pretty consistent. The staff generally has access to drivers' license and CBMS eligibility data. They would like to have access to the following types of data to help them provide better services:

- Educational records
- Criminal records
- Open warrants
- Mental health records

- Court records
- Medical records
- Psychiatric records
- Probation records
- Housing data
- Drug and alcohol records
- Vital statistics data – especially birth records

The staff recognizes the difficulties inherent in getting mental health records because of the confidentiality restrictions.

Getting improved staff access to data from other programs is being addressed by other elements of this interoperability project.

One issue concerns access to child support locate databases. These can help child welfare caseworkers identify and locate fathers and their relatives. In counties where we interviewed, staff indicated that they must usually access such information through requests to a designated child support staff person rather than having on-line access. In any case, this resource was typically viewed as cumbersome and difficult to access.

## County Capabilities for BI/BA

In the course of this project, we conducted interviews in nine counties, of which seven were in the top 10 counties that have approximately 85 percent of the child welfare caseload. These seven were Arapahoe, Boulder, Denver, El Paso, Jefferson, Larimer, and Weld. All of these counties other than El Paso have developed their own independent capabilities for data extraction and analysis in child welfare and other human services programs. We know from the interviews that Adams County has significant analytical capabilities as well.

Our interviews provide useful insights into the benefits of data reporting and business analytics, significant innovations developed in some counties, the potential value of improved capabilities, and the strong desire by the larger counties for improved

interoperability tools to analyze client participation and impacts across programs. There is also a strong desire by the larger front-range counties for improved data and tools to support their BI and BA efforts. As one director said: “they want the ability to put information into a dashboard and manipulate reports into their own reports and mine the data easily.”

Denver County has taken the nightly Trails extract along with data from other programs and created a county-specific system called WMS—Workflow Management System. The workers use this interface for alerts and ticklers on specific cases while supervisors use it to determine compliance for their workers. The workers find this more user-friendly than directly accessing Trails but it still has some limitations. The most often mentioned complaint is that the data feed for WMS, pulled directly from the overnight Trails extract, is often not in-sync with Trails. We were shown an example of this during one of the Denver interviews when a supervisor showed us a case status directly in Trails that differed from the overnight-fed WMS.

Larimer County uses Crystal reports to get data from the state system and then take it down to the unit and worker level. As of July, they were planning to start a project to develop a dashboard to get specific unit-worker data. They want to do predictive analytics and they are working with CSU to develop their capabilities.

Of the counties we visited, Jefferson County is perhaps doing the most with Trails data to support their operations. The County developed and maintains a .NET graphical user interface, called J-STAT Dashboard, that sits on a SQL Server database populated from the overnight Trails extract. Jefferson County took this approach for a number of stated reasons:

- The Trails interface has hundreds of reports but has no search functionality, thus users have to spend too long clicking and scrolling to find the report they want to execute
- Trails reports take too long to return data
- County-requested canned reports (to OIT) take up to twelve months to go into production
- Trails has no built-in dashboarding functionality, a desired piece for workers and management

- The state maintained Crystal Reports version for Trails is out of date

J-STAT Dashboard runs more quickly than Trails reports, has ad-hoc report functionality, and can be maintained by Jefferson County without state OIT support. Jefferson County took the extra, but critical step, of transforming the Trails transactional data from the extract into a summarized database with faster performance. The county demonstrated the latency issue within Trails by running a report from each; the J-STAT reports were much quicker.

Boulder County is also forward-looking and believes that integrated services are the crux of the next 15 years. They do a significant amount of system development locally but their progress varies by program. Boulder County has embraced the Colorado Practice Model. Like other counties using the CPM, Boulder deploys a continuous quality improvement (CQI) component based on metrics performance as it strives to manage every program on evidence-based information.

Boulder County has its ICM system that supports child welfare. The County started running detailed dashboards four months ago and now they are starting to build interoperability across programs. The county can look at individuals in some human service programs but would eventually like to expand that to all programs, including housing. Boulder shares this information with Douglas, Denver, and Adams County to compare performance and learn from each other.

Of the counties we visited, Jefferson and Boulder Counties come closest to having a complete business intelligence infrastructure. Jefferson County matches case data between Trails and CBMS using SSNs, state IDs, names, and dates of birth. They would like access to data from the state child support enforcement system. Their data warehouse allows analysts to data mine, explore trends, and find causal relationships and predictors of desired outcomes. As previously mentioned, Boulder already looks at program participants across all programs.

One large county manager characterized their work as a “shadow system”, i.e. they had to build a shadow system to get the data the way they wanted it so that they could run the reports that they needed. In many ways, the county systems are attempts to fill a perceived void at the State level, a void that may shrink when the State implements ROM. However, the systems are also investments in building their own capabilities to

understand their caseloads better and to develop interoperable analytic tools that they can use to learn the cumulative impact of their programs on their clients.

## Impact of Trails on County BI/BA Capabilities

In our interviews, we accumulated a great deal of feedback on the benefits and limitations of Trails. Overall, the views of Trails were sharply divided, almost schizophrenic. On the one hand, many county staff expressed appreciation for the data collection and retrieval aspects of Trails: the accessibility of statewide data and the 10-year history that has been collected. On the other hand, virtually all staff commented on the tremendous burden Trails imposes on caseworkers to collect data, the cumbersome user interface, and the very limited reporting capabilities.

The counties perceive Trails as imposing significant limits on their BI and BA capabilities for child welfare. There are both input and output issues. With respect to input, the counties (and also State staff) do not fully trust the reports produced by Trails because often the input data is perceived to be incorrect. In most cases, this is because the caseworker did not input data in a timely way. Estimates of the proportion of their time that caseworkers must spend to document their casework on Trails ranged from 40 to 60 percent (and even higher in a few instances). Case documentation on Trails is so burdensome, that some caseworkers either do not get information entered on a timely basis or do not get it entered at all. As one caseworker explained, often he sits down to document a case, then gets interrupted by an emergency call. After disposing of the emergency, he might or might not finish up the interrupted work on a timely basis before some other demand intervenes.

Several respondents also mentioned that input needs to meet exacting State expectations for how an action is portrayed: “It must be said just right.” If a caseworker uses the wrong words to describe an action, or misses one line, it can throw off the entire evaluation and compromise the accuracy of the resulting reports.

With respect to output, Trails has an abundance of data and is easily accessible; however, it is not tailored for specific use, either for case managers or for managers and executives who crave performance data. Trails is not configured for reporting (reporting was “an afterthought” according to one county director) and there are no ad hoc query tools that

have been provided by the State, except for Cognos which has not been used. Trails does not support dashboarding.

Under the leadership of the Colorado Trails Users Group (CTUG), there are over 600 pre-defined Trails reports that have been created. However, there is no search capability and it is difficult for staff to find reports that they do not use regularly. One interviewee stated that the system “gets data and collects it very well, but in getting it out, they were not very good at it.” In an interesting dichotomy, one interviewee stated that Trails needs more ad hoc reports and yet there are stated to be more than 600 reports available. While those reports may not all be available for child welfare or behavioral health, the extensiveness of the reports in Trails appears to be significant.

In addition, counties perceive that reports on Trails take too long to run, and that, when a new report is requested and approved, that it now takes six months to a year for the report to be created and placed into production. Cognos is widely viewed as lacking in utility, primarily because it is perceived as unsupported.

With respect to Trails capabilities for data analytics, then, the current situation is very much self-serve. The state has made access to production environments such as Trails relatively easy; although due to the nature of a state-supervised, county-administered business model, what counties choose to do with access ranges widely. Larger population counties with deeper pools of resources are using the information in very innovative ways. Smaller population counties typically use what the state has made available, via canned reports, and not much else. The desire for system that aggregates data across production environment is high and would lead to better case management and innovation.

The State is implementing ROM to address many of the shortcomings with respect to data access and reporting. ROM will provide Trails data to the counties in a format that facilitates ad hoc queries, reporting, and analysis. Counties will have the ability to create their own reports and perform analyses on their own data. This will certainly address many of the BI and BA shortcomings of Trails but it is not clear whether represents more than an interim solution.

We collected considerable feedback on the perceived merits and drawbacks of Trails as a case management system. Whether or not Trails should be replaced or substantially

modified is an issue that is beyond the scope of this study. However, in Appendix IV we include a summary of the feedback on Trails as a case management system.

## Large-County/Small-County Divide

It is apparent from our interviews that there is a vast gulf between the capabilities of large and small counties with respect to developing and even running their own reports, as well as performing their own queries and analyses of data. At least six of the large front-range counties have invested considerable resources to meet their own business processing and reporting needs and are doing impressive work, e.g J-Stat for Jeffco, WMS for Denver, APAPA.stat for Arapahoe, ICM for Boulder. However, the smaller counties do not have the bandwidth (resources or funding) to create similar systems and therefore rely entirely on reports and analyses prepared by the State. While the outputs of improved reporting and analytic capabilities would be useful to all counties, the large counties have additional needs for better data and tools.

## Advanced Analytics

While most of the work at the county level is focused on basic reporting and ad hoc queries, there are interesting examples of advanced analytics, a few of which are described below.

- Jeffco is using the common person ID to analyze client participation and outcomes across multiple programs, including child welfare (Trails) and benefits (CBMS) programs
- Boulder is undertaking similar work
- Larimer County is collaborating with Colorado State University in applying predictive analytics to the child welfare program

One county director referenced the child and family risk assessment tool, but stated that they do not use it as a good predictive tool and that it is being reworked through the State and will start being applied.

In the course of the interviews (and some post-interview emails), we asked respondents about the potential utility of advanced analytics, including predictive analytics. Most were

curious about such possibilities but had few suggestions. A few expressed the opinion that it would be difficult to apply predictive analytics at the case level. However, there were interesting suggestions from a number of interviewees about the types of issues for which predictive analytics, risk scoring, and other approaches would help in day-to-day casework and the overall management of the child welfare program. Some of these ideas were:

- Risk assessment
- Scoring system for Red Team process
- Safety planning and safety criteria
- Assessment of whether to place youth out-of-home (keep with parents or place in foster care, residential treatment?)
- Assess whether to keep a child in placement
- Measurement and assessment of family engagement
- Staff assignments (use data to predict which staff characteristics are suited to different casework functions)
- Predict best order of treatment
- Analysis of fatalities
- Analysis of time that a case is open versus the frequency of face-to-face visits

One respondent described the ARCh project – Applied Research in Child Welfare – which is a partnership between ten counties, the State, and CSU. The project has done work on success scoring (how to close a case) and case-reopening.

## Conclusion

The results of our interviews demonstrate that the relationship between the State and counties in a State supervised/county-administered program structure may complicate, but does not preclude, developing and implementing metrics-driven programs. The collaborative efforts of the State and counties have resulted in significant progress being achieved in defining key metrics and using them to measure program progress. The

counties have, with few exceptions, bought into the concept of data-driven human services programs and, indeed, have played a significant role in moving the state in this direction.

There are several other key findings from the interviews:

- While there is substantial agreement on most metrics, the state has not yet attained complete alignment as there is resistance to some measures both in C-Stat and the CPM scorecard.
- There was considerable dissatisfaction with access to and timeliness of C-Stat and CPM scorecard reports, some of which may be alleviated with ROM.
- Within child support, use of metrics has achieved only a low level of penetration with front-line staff. This suggests a need to translate some management-level metrics to more appropriate measures for casework staff. It also indicates a need to provide training to both supervisory and casework level staff in the meaning and appropriate use of metrics in guiding their work.
- There is a strong desire for data from other programs, especially education, law enforcement, and mental health.
- The large front-range counties have substantial independent capabilities for data reporting and business analytics. They have a strong desire for better access to data and more effective tools to support analysis.
- The smaller counties generally lack the resources for their own data analysis capabilities and are reliant on the state for whatever reports and data analysis they receive.
- The counties perceive Trails as lacking in support for reporting and analytics, although they are hopeful that ROM will mitigate some of the system's shortcomings. They also have some mistrust of the reports due to input issues that arise because of Trails' cumbersome worker interface.
- There is strong interest in advanced analytics, including predictive analytics, and some counties are involved in efforts to apply these

advanced tools. Colorado State University is collaborating with some of these efforts.

As the State pursues further interoperability in data access and business analytics, it is important to recognize that counties are acutely interested in these issues. Especially the larger counties are interested not just in data-sharing, but also developing sophisticated tools to assess the cumulative impact of their programs on their clients. This interest is consistent with the holistic service model that counties espouse under which they are pursuing a more integrated approach to service delivery. It is their hope that better coordination of services will be more cost-effective for the taxpayers, but will also bring about better outcomes for their program participants.

# CHAPTER FOUR

## Recommendations for Improving Data Reporting and Business Analytics

### Introduction

Through its major initiatives in the past two years, CDHS has clearly demonstrated that it recognizes the value of rigorous data reporting in its programs. By establishing quantifiable outcomes, setting goals, measuring progress toward those goals, and laying out performance improvement plans when efforts fall short, the Department is driving improved performance across the agency.

Consistent with the Department's efforts, the child welfare agency has worked with selected counties to develop performance scorecards in conjunction with a Colorado Practice Model. While this effort has not quite attained uniform statewide application and would benefit from further development, our interviews demonstrate that it has had the positive effect of focusing many of the counties on performance metrics for the child welfare program.

In this chapter, we present our recommendations for improving data reporting and business analytics in CDHS programs. These encompass the following areas:

- ***Consolidate implementation of metrics.*** The foundation for metrics-driven programs is having agreed outcome measures that accurately capture the most important results. Implementation of metrics is an evolving process and it must engage all levels of the program delivery structure, from State managers down through county managers and county front-line staff who actually deliver the services.
- ***Identify and acquire business reporting and analytics tool.*** CDHS previously acquired Cognos as its primary analytical tool, but it has not been effectively used for a variety of reasons. It has supplemented Cognos with Crystal Reports, Excel, and other means of extracting and compiling program data. Deploying a technologically current and open-platform analysis tool could substantially reduce the excessive manual effort within the Department to support C-Stat. It would also facilitate expanded data

reporting and business analytics by the divisions as well as by the counties. Particularly important are ad hoc reporting and the ability to develop performance dashboards down to the worker level.

- ***Develop robust technology infrastructure.*** We concur with the recommendation by Deloitte to implement fully the Enterprise Service Bus (ESB). The ESB could then facilitate development of an integrated data repository to house analytical data across departmental programs and facilitate cross-program analyses with other departments.
- ***Acquire a statistical analysis tool.*** This will be used for more sophisticated analyses of program operations and ultimately to support capabilities for predictive analytics and other advanced business analytics methods.
- ***Implement advanced business analytics methods.*** Using Department staff augmented by contracted resources, the Department should develop capabilities to use its new infrastructure for improved program management and service delivery.
- ***Integrate county capabilities.*** Given the dynamics of a state-supervised/county-administered human services system, we discuss the potential for improved integration of county capabilities into business analytics planning.

These steps will provide analytical interoperability across the full range of CDHS programs. They will also facilitate cross-program analyses involving other departments once issues of access, confidentiality, and security are worked out. These issues are being addressed in other components of this project.

## Consolidate Implementation of Metrics

Colorado has demonstrated its commitment to a metrics-driven child welfare program through the C-Stat process and the practice model scorecard. As discussed in Chapters Two and Three, these initiatives have focused the program and its practitioners on measurable outcomes. Gaps at this point include:

- Perceived lack of consistency in the measures enunciated by CDHS,
- Incomplete agreement by county leaders on the metrics;
- Lack of prioritization on a limited number of key performance measures;
- Lack of consistent dissemination of performance data to counties; and
- Lack of translation from high-level metrics to measures that are meaningful at the casework level, along with an absence of focused training for front-line staff.

To a large extent, these gaps seem to arise because the Colorado initiatives are still relatively new and maturing. However, the last issue, support for use of metrics by front-line staff, is a widespread shortcoming in implementing program metrics.

### ALIGNED MEASURES AND CONSISTENT REPORTS

The starting point for a metrics-driven program is a set of performance outcomes which are consistent with federal measures and for which there is common agreement among state and county program leaders. Across the agency, Colorado has made substantial progress toward this goal and it is reasonable to expect that State and county leaders will continue to move closer to agreement in the near future as they continue to refine the performance measures.

For child welfare, the State and counties could work to ensure that C-Stat and the scorecard are in complete agreement. It would also be helpful to prioritize no more than ten performance measures that are front and center in C-Stat and county reports. The reports could provide data on other measures, but these would be supplemental to the core metrics. The three performance measures that are being used as the basis for allocation of incentive funding could be a starting point: absence of repeat maltreatment, timely permanency, and children aging out without permanence.

CDHS could then issue performance reports each month with the agreed upon measures. Again, Colorado is making progress toward this goal. Currently the scorecard reports go out automatically only to those counties that are participating in the practice model, while other counties have to “pull” them – which often does not happen. In addition, the reports only go out quarterly because of the major manual effort that is required to create them. With implementation of ROM, the state should be able to issue the reports monthly and

distribute them to all counties. In addition, the counties will be able to pull performance data at any time. This will help focus county directors, even in small counties, on the outcomes most important for the program.

Leadership at the county level should be able to look at comparative data for similar size counties and trend data as well as the state data on these selected measurements. When leadership at the county level finds abnormalities within their data, they should review the data and metric measures of supervisors to determine the reasons for those trends.

### **CASCADING PERFORMANCE MEASURES: DIFFERENT METRICS FOR OPERATIONAL STAFF**

Another gap occurs for a different reason that is important to address: what is important for an executive is often not on the radar of a front line worker. Put another way, a goal that is critical to management may not be effectively measurable at the line level. A good example of this issue is absence of repeat maltreatment. This is one of the highest priority goals for child welfare managers. It is also an important outcome for caseworkers, but there is no meaningful way of directly measuring progress toward its achievement because its incidence is too low to be accurately measured in individual caseloads. Instead, it is necessary to specify instrumental (intermediate) activities that will lead to the desired outcome at the agency level. Examples might include a measure of initial family engagement, and monthly meetings with families, and other measures that will contribute to absence of repeat maltreatment.

We found it striking in our interviews that, even in the counties with the highest commitment to metrics-driven outcomes, the caseworkers and supervisors rarely used the agency performance measures to guide their work. Exceptions were time-based measures, such as interviewing child placements monthly, or completing initial assessments within two months. This does not mean that supervisors and caseworkers were not committed to broader objectives such as absence of repeat maltreatment. Rather, these objectives simply did not have operational meaning to them.

After the initial leadership level measures are chosen, the next level down must decide how their realm of influence can contribute to achieving goals for the measures immediately above. In some cases this will be an identical measure. For example, the State may have the federal measure monthly caseworker visits with an associated goal. Counties

may have the same measure but a different goal. As long as both measures share an exact definition, the performance program has maintained a cascaded measure approach.

In other cases, the measures at the next level down will not exactly mirror the measures from above. This is appropriate so long as the measures chosen support, or drive, the outcomes desired by the superior measures. For example, a county supervisor may have a measure to meet regularly with her team. This type of measure would not show up at the state department level nor would it be on a caseworker's set of measures. But regularly meeting, giving time to stress the importance of adhering to the Practice Model, addressing group and individual performance, and providing a forum for discussing other issues, ensures that caseworkers are focusing on the proper methods to achieve good outcomes.

Another example, this time from child support enforcement, may be useful. A core metric for child support is the proportion of cases with support orders (federal goal is 80 percent). However, this may not be meaningful for the child support caseworker if caseloads are too high, or the starting point is too low for an 80 percent attainment to be realistic. A more meaningful goal for that caseworker might be to establish a minimum number of orders per month (e.g. 20 new orders established), so that if every worker meets that performance standard, the agency will make progress toward the programmatic goal.

In summary, caseworkers at the county level should have their own specific measurements and reports that are supported by dashboards, ticklers, and reminders. Examples of measures appropriate for caseworkers include:

- Case manager monthly visits
- Frequency of team meetings
- Timeliness of team meetings
- Identification and location of noncustodial parents
- Timeliness of assessments
- Reports on court hearings and specifically timely reports to the court

In child welfare, appropriate performance metrics for casework staff start with a defined practice model that specifies the actions needed for cases to be properly worked in a way that leads to achievement of the overall goals. The reason to create a Practice Model is to ensure uniformity and consistency of service to children and families once they come to the attention of government. It sets the stage and opportunity for consistent training and the opportunity for uniform measurement of success once that model is created, trained and fully implemented. The Practice Model should reflect the agency's performance metrics for child welfare, but it should also guide the appropriate outcome measures for caseworkers.

It is also critical to ensure that the Practice Model is measured for improvement. Therefore, it is important for CDHS leadership, in partnership with a multitude of other individuals and agencies, to develop metrics and measurements that accurately determine whether or not the Practice Model is improving services and providing better outcomes. Every performance measure established should be analyzed to determine its impact on the determination that the practice model is and has been effective in proving the outcomes it intends to impact.

### FRONT-LINE STAFF TRAINING

For a program to be driven by appropriate metrics, these outcomes must not only be appropriately translated to front-line staff, but they must also be trained on:

- The meaning of management level metrics
- The relationship between line staff performance metrics and critical program outcomes
- How to track and evaluate progress
- The relationship between outcomes achieved on relevant metrics and overall job performance

The Department, in conjunction with the counties, should consider how best to formulate and deliver such training in order to optimize the impact of metrics it has developed at the management level.

The Department and counties will reinforce the impact of such training if it is tied to accountability for job performance. One Supervisor we interviewed expressed concern over the lack of accountability for line caseworkers in her jurisdiction. Just as the State and counties have agreed to introduce accountability for measurable results into the child welfare program by establishing financial incentives, it would be desirable for accountability to carry through to the line staff level.

One way of reinforcing front-line accountability is to develop worker-level performance dashboard reports. By presenting outcomes in simple visual form, such reports can have beneficial impacts on performance. We discuss these tools further below.

## Identify and Acquire Business Reporting and Analysis Tool

A strong business analytics program will enable enterprise reliance on good information. Structured reports that satisfy the needs of many constituents, from executives to caseworkers, along with ad hoc query and reporting functionality are critical. These reports must be easy to attain, contain accurate information, and become integrated within the daily business processes throughout the department at the state and county levels. They would enable managers and analysts both at CDHS and the counties to extract information easily and present the information in visually appealing formats that are intuitive and easy to grasp.

The Department has made available one such tool in the past: Cognos. However, our interviews indicated that the potential value of Cognos was not realized because the effort was not made to configure it so that it could be readily used in agency programs and that technical support was generally lacking. This failure to adopt highlights a critical step for any new technology rollout: gaining end-user acceptance from the beginning.

### BENEFITS OF A NEW TOOL

A well-fitted and well implemented business reporting and analytics tool can be a boon for information insight, process improvement, performance management, and strategic alignment. When the right tool is in place and configured appropriately, the right people asking the right questions have the means to do their jobs in efficient ways not possible when getting a question answered requires multiple meetings, several staff members' efforts, and often results in questionable or unreliable results.

A true, but perhaps cliché, characterization of business intelligence is that it delivers the right information to the right people at the right time. Any organization that relies on multiple handoffs, manual processes, and sporadic access to source data is suffering under the weight of inefficient BI processes. The right tool should have several desirable traits:

- ***Agnostic data source connectivity.*** Most tools on the market today allow a variety of data inputs, whether it is a SQL Server data table, a spreadsheet, or even internet activity, such as number of web page hits. Tools that require a significant amount of setup and constant IT maintenance will quickly fall out of favor or never gain full adoption.
- ***Short learning curve.*** Finding the right BI reporting and analysis tool can be a challenge because emphasis on one aspect can often create troublesome burdens in other areas. The right tool will have a balance of these tradeoffs but will be strong in the areas of critical need. Any new tool will need a short learning curve so that end-users can start creating BI applications immediately, whether it is replacing a manual report process (C-Stat) or fulfilling a backlog of report requests (Crystal Server canned report requests that take up to twelve months to fulfill).
- ***Agnostic report publishing options.*** The right tool will allow users to push (or in some cases even pull) out reports and findings in any number of desirable methods, including report repositories (e.g., on SharePoint), Excel, PDF, or even PowerPoint. Most tools available today have functionality that allows power users to share results without licensing all potential users under a costly licensing plan.

## REQUIREMENTS

The right new reporting and analytics tool will have the characteristics described above, but should also be flexible software as CDHS continues to evolve its BI programs. CDHS should consider today's requirements but also tomorrow's growth when choosing the right tool. A few of the requirement considerations include:

- ***Enterprise vs. desktop licensing.*** Most BI platform companies offer a variety of licensing options. CDHS needs to evaluate who can start

leveraging a new tool but also what the evolving program may require in the near future. Can a desktop licensed tool meet all of the needs today and tomorrow? Can use of the tool be extended to county human service agencies? Does the tool of choice allow a change to enterprise licensing as needs evolve?

- ***Integration with current and future technology.*** The right tool for CDHS will empower users today to start creating new and replacement reports while also opening paths to deeper analytics immediately. To do this, the tool must integrate with the environment today. But, as CDHS evolves (e.g., future data repositories, Big Data) the tool must work well with these technologies too or else CDHS will be going through another cycle of finding the right tools to meet the needs within a few short years, not a desired outcome.
- ***Strong reporting functionality.*** CDHS needs to get good information in and back out in the form of performance metrics discussed in other sections of this report. A good tool will have the functionality to meet these needs. One of the first projects CDHS should undertake when a new tool is in place is to replace the current C-Stat data gathering and slide deck generation process (almost entirely manual today) with an automated process. Connect the new tool to the data source used by divisions to create C-Stat reports (e.g., Trails) and then build each report using a leadership-prioritized queue. As each new report is generated, decommission the status-quo manual process.
- ***Strong analytics functionality.*** The current needs of CDHS for analytics include empowering analysts to research program and individual performance and report results easily to management and leaders. The right tool will have a menu of analytics functionality including
  - Easy to create charts and graphs for visual analysis
  - Trending capability to explore current and forecasted future trends
  - Basis statistical analysis such as correlations and other descriptive statistics (mean, median, variance)

## EXAMPLES OF TOOLS

Choosing the right tool is not a quick or easy task. Along with the considerations mentioned above, CDHS should evaluate its needs using its formal acquisition process prior to making a decision. Because HCPF has had long experience using analytical tools and is going through a major procurement process which includes collecting input from vendors, it may be able to provide useful input in this process.

Once the requirements are generated, making the choice of tool will mostly follow finding the software that meets the most critical needs the best while also mitigating any of the tool's weaknesses in relation to the CDHS requirement. CDHS is fortunate that the availability of good software is large so a tool that optimizes the right mix of requirements is possible. The list of all potential reporting and analysis tools is too lengthy to include here, but the candidates may include

- Microsoft stack
- Tableau
- MicroStrategy
- SAS

This is a partial list of potential reporting and analytic tool replacement options for CDHS pulled from Gartner's Magic Quadrant report published annually. Evaluation criteria include categories that would be especially valuable to CDHS during a product acquisition effort, including:

- Integration – BI infrastructure, Metadata management, Development tools, and Collaboration
- Information delivery – Reporting, Dashboards, Ad hoc query, Microsoft Office integration, Search-based BI, Mobile BI
- Analysis – OLAP, Interactive visualization, Predictive modeling and data mining, Scorecards<sup>3</sup>

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<sup>3</sup> <http://www2.microstrategy.com/download/files/whitepapers/open/gartner-magic-quadrant-for-bi-platforms-2012.pdf>

The sample of software candidates above should be expanded upon by CDHS to include other companies, but each of the options referenced above score well on the Gartner “ability to execute” axis, something that should be critical to CDHS.

## Provide Improved Reporting and Basic Analytical Capabilities

Once CDHS acquires an analytical tool, a logical step is the development of management and caseworker performance dashboards in conjunction with the counties. Appropriate metrics can be incorporated into dashboards giving agencies and work units ratings of red, yellow, or green goal based on performance relative to set goals.

Although controversial in some quarters, we recommend that these dashboards get extended down to the caseworker level, bearing in mind that having the right metrics is essential if this is done. Staff of Veritas HHS have developed and implemented management and caseworker dashboards for child support enforcement offices with positive results. The red/yellow/green graphic gives an instantly recognizable indicator of performance status. No manager and no caseworker likes having their performance shown as red and the dashboards become powerful motivators for staff to improve their results. An example of such a dashboard is shown below, in Figure 4 – 1.

Figure 4-1  
Child Support Caseworker Dashboard

**Establishment Case Flow and Productivity**  
Worker ID xxxxxx

	Caseload	Cases Opened	Cases Closed	Case Reviews	NCP Locates by Address	NCP Locates by Employer	Referrals to Legal for Establishment	New Orders Established	Paternities Established
Latest month's goal		27	14	32	12	12	12	51	32
Oct-12	1,803	24	13	31	14	14	14	50	31
Sep-12	1,785	25	13	25	15	15	15	51	25
Aug-12	1,800	24	14	23	22	22	22	50	23
Jul-12	1,795	23	13	24	23	23	23	45	24
Jun-12	1,820	24	12	26	21	21	21	34	26
May-12	1,788	24	11	35	23	23	23	60	35
Apr-12	1,792	28	15	34	24	24	24	50	34
Mar-12	1,795	34	13	36	22	22	22	35	36
Feb-12	1,817	35	12	45	23	23	23	33	45
Jan-12	1,800	25	15	56	21	21	21	45	56
Dec-11	1,801	27	13	34	23	23	23	56	34
Nov-11	1,800	31	15	34	24	24	24	54	34
Oct-11	1,781	32	17	33	23	23	23	44	33

For child welfare, the CPM scorecard is an excellent example of a management dashboard. If the number of priority metrics were limited, it would most likely have even more impact than it already does. In addition, additional work may be required before this scorecard could be directly applied to measure casework performance as development of intermediate metrics would be necessary to capture casework outcomes that lead to the desired results at the agency level.

Improved reporting can be supplemented by the ability to apply basic analytical tools to program management. The most common tool is an ad hoc query capability – the ability for program managers and analysts at all levels to identify patterns within a caseload. An ad hoc query capability can provide answers to many types of questions, including: Why did this value change? Which worker has the best performance for this metric? What are that worker’s caseload characteristics?

Examples include the proportion of child welfare cases opened within the past six months that have resulted in group home placement, or the proportion of child support cases opened in the past year that have had child support orders established. A good query capability with an accessible database is a powerful management tool that can, in the right circumstances, be extended all the way down to the supervisor level.

## Develop Robust Technology Infrastructure

It will be difficult for the Department to advance its business reporting and analytics capabilities significantly without developing a much more robust infrastructure of technology and training professional staff who can use it. The limitations of the current technologies mean that the analytical staff who do work at the agency or within the counties struggle with the constraints of taking extracted data from existing legacy systems and creating reports using limited tools. The heavy manual effort involved in creating C-Stat reports and CPM scorecards is symptomatic of the shortcomings of the current environment. The difficulty of analyzing data across CDHS programs and across external programs is another symptom of a deficient infrastructure. The vigorous efforts of counties to create their own data analytics capabilities are indicative of perceived shortfalls at the State level.

Management of the agency programs would benefit greatly from the following types of technologies which are designed to support data reporting and business analytics, and

which complement each other. Not to be overlooked given the nature of the grant funding this report is that the following technologies also enable interoperability reporting and analysis. A robust program will likely include the following infrastructure components.

### ENTERPRISE SERVICE BUS

A premise of the interoperability grant is looking across programs' platforms and leveraging data. Per the recommendation from Deloitte under a different component of this project, CDHS should expand its usage of an ESB. Doing so will open the access points to multiple production environments and their source data.

### ETL TOOL

A primary benefit of implementing an ETL (Extract, Transform, and Load) tool is that CDHS can standardize metrics definitions across users. Bringing production data into an integrated data repository, discussed next, is a great step but without some amount of transformation the data will still be misused. An ETL tool, along with business effort to standardize definitions, will ensure that end-users share common dimensional definitions.

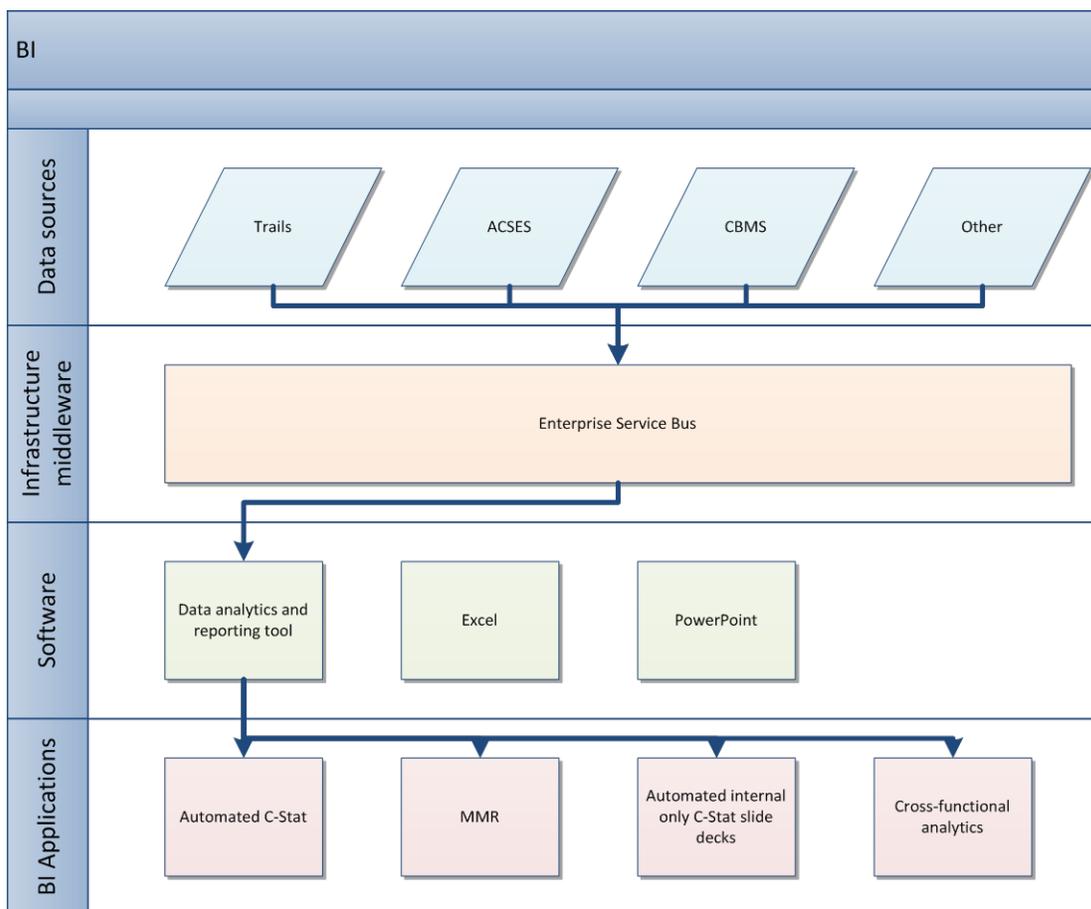
Perhaps the best way to explain the benefit of an ETL is by way of example. The status quo for opening access to Trails data is for CDHS to provide an overnight extract to counties and the department. Because Trails is a transactional database, the mirrored extract is also a transactional database. However, end-users typically do not consume transactional data. Rather, some amount of data summarization is most beneficial. Not only does this process standardize the metrics definitions, it also greatly improves the report generation speed. Jefferson County demonstrated running the same Crystal Report from the Trails extract as well as their summarized database fed from the same extract. The report against the straight extract took several minutes to execute while the summarized data source returned within seconds.

A second example of the need to transform the data involves definitions. If every data analyst creates his or her own definitions, then getting an answer greatly depends on the analyst being asked. Ask two different analysts the same question and you will often get two answers. This apparent discrepancy creates distrust and lack of adoption. As mentioned in the opening paragraph of this section, some business effort is required to implement this technology but the upfront effort is more than offset during the use of standardized information. Section 5.3 of Deloitte's report details the steps and processes

required to implement a controlled, and standardized, data environment that an ETL tool or process would help establish.

Implementing the steps detailed above would result in an infrastructure with the components shown in Figure 4-2.

Figure 4-2  
Enhanced BI Infrastructure



## INTEGRATED DATA REPOSITORY

An integrated data repository provides a number of benefits.

- **Discrete reporting database.** An integrated data repository establishes a database of program data (or uses new tools to simulate such a database) which is separate from a production database. Since running queries and/or reports can be a significant drag on system response time in a production environment, creation of a separate database (or simulated database) allows managers and analysts to run queries and reports without slowing down operations.
- **Optimized for data analysis.** Such data repositories are optimized for data analysis and have complementary tools that provide access to a range of analytical and presentation capabilities.
- **Interoperability.** A Department-wide data repository would facilitate cross-program analysis of services. If cases can be linked by the common client identifier, or some other identifier such as social security number (SSN), a data repository would permit analysts to develop client-centered views of services provided under multiple programs, including Medicaid and CHP+, since eligibility for those programs is managed through CBMS. Given the large overlap between CDHS programs and Medicaid, for example, a logical next step might be to perform cross-agency analyses by linking data in the repository for each department (subject to HIPAA requirements on the Medicaid side). This would support a richer set of analyses than developing stand-alone, specialized extracts from the production systems (e.g. MMIS for Medicaid and Trails for child welfare) so that, for example, each department could assess the levels of health care services provided to different groups of child welfare clients.

The potential for greater interoperability through increased data sharing between agencies is being addressed through other components of this project that are exploring the security and confidentiality aspects of increased data sharing. If greater data sharing potential is realized, CDHS would benefit from having the analytical tools and capabilities to take advantage of the newly available data sources, as well as using such expanded data for operational needs.

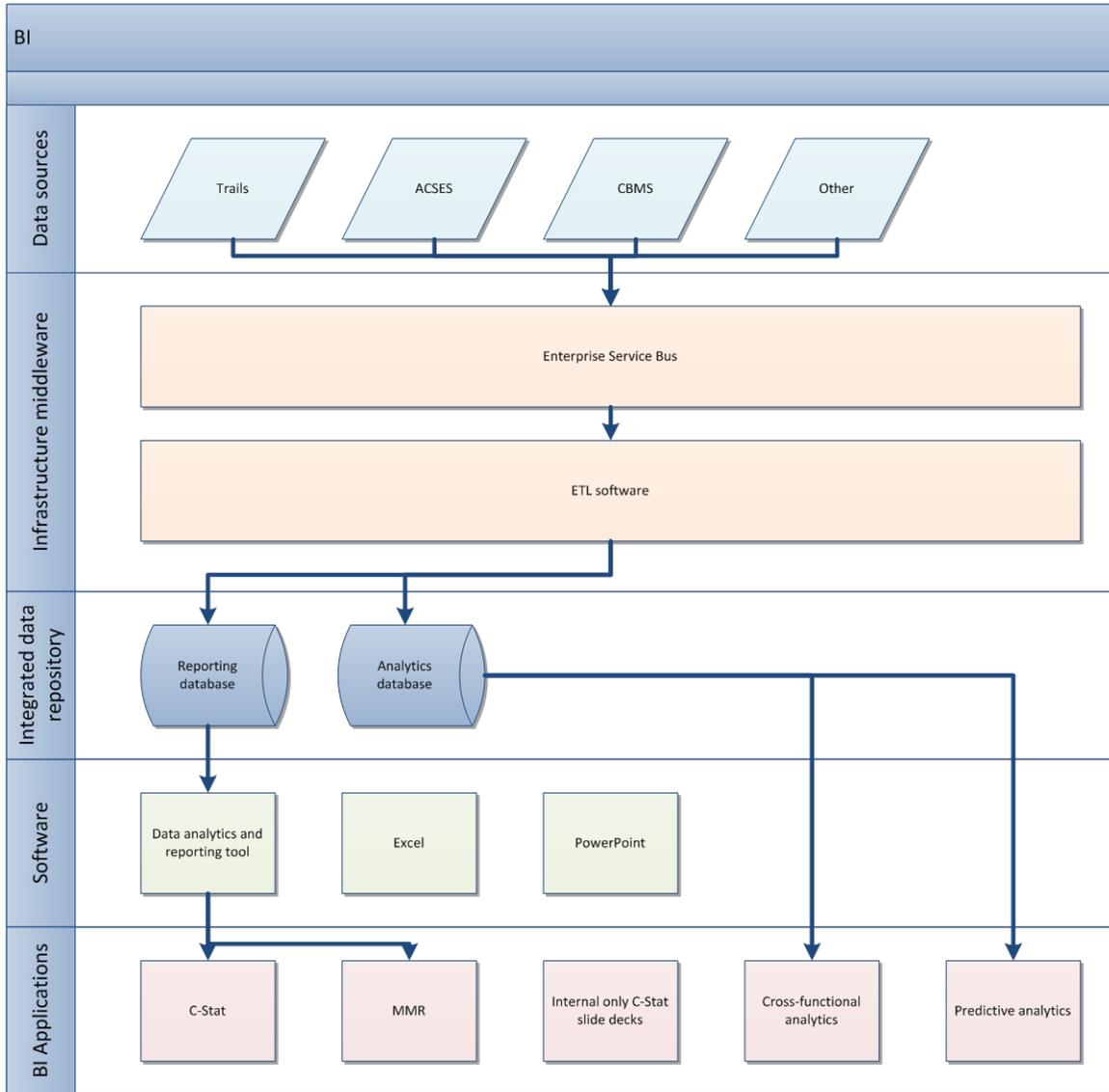
## STATISTICAL ANALYSIS TOOLS

Some business reporting and analytics software packages sell themselves as the complete package for all business reporting and analysis needs. The main problem with this approach is that packages that try to do a bit of everything end up not doing the statistical analytics very well. We recommend that the decision process to acquire a new business reporting and analytics software package, described above, be separated from the process to acquire a statistical analysis software package. While the reporting and analytics platform will be broadly used, if only in respect for ad hoc queries and consumption of reports, statistical analysis software will only be used by a select few staff with the skills to leverage this type of tool.

The types of packages available are more limited when compared to reporting and analytics packages, but several options are still available. Some of the more well-known and industry tested options include SAS, SPSS, and R, with SAS and SPSS being the most widely used. Each has a variety of package options and both have sales staff dedicated to helping customers choose the right options.

The addition of an integrated data repository along with a statistical package would create a more mature BI infrastructure, as shown in Figure 4-3.

Figure 4-3  
Matured BI Infrastructure



### Benefits of a Statistical Package

Reporting and analytics packages like Cognos, Tableau, or the other software referenced above are intended to provide canned and ad hoc query/reporting capabilities while also enabling some amount of data mining and other exploratory analysis. Typically these analyses functions are limited to descriptive statistics, limited comparative analysis, and in some cases very limited forecasting tools. Alternatively, statistical analysis software is

bundled with far greater statistical capabilities, ranging from descriptive statistics up to predictive analytics.

The primary benefit from having this type of software is that as the capabilities and adoption of business intelligence grows at CDHS, the types of questions asked will become increasingly sophisticated, requiring software that can handle this complexity. Having a well-functioning business reporting and analytics program enables CDHS to assess performance at all levels throughout the department but it does not enable it to answer questions like:

- What is the probability that this child with unmarried parents in the Child Support program will result in a kinship placement for a child removed from the mother's home if paternity has been established through the child support program?
- What is the likelihood that this particular mix of treatments will lead to the most optimal outcome for this child in Behavioral Health?
- Which provider in Child Welfare will best handle a child with this particular set of parameter values (e.g., age, gender, past history in other programs)?

These example questions get at predictive analytics, a maturation of desired analyses mentioned frequently during our interviews.

It is important to note that predictive analytics do not equate exactly to forecasting. The typical forecasting functionality bundled with most reporting and analytics packages require a time dimension (e.g., months) and an outcome dimension (e.g., cost per service). The software can then utilize a number of algorithms – usually linear or non-linear regression – to calculate future trends in the outcome dimension over future time periods. Some packages can even predict forecasted trend lines using other explanatory variables. But the basis of this is still forecasting a trend over time.

Predictive analytics can involve a time dimension, but the essence of predictive modeling is not to continue a trend line into the future but rather to answer questions like those posed above. The types of algorithms required to answer these types of questions are more complex and include:

- Decision trees
- Logistic, probit, and linear regression
- Cluster analysis
- Survival analysis

### Requirements

A good statistical analysis package will have the best combination (for CDHS) of the following qualities:

- ***Integrates well within current environment.*** As an example, if the majority of extracts and data sources are in SQL Server, picking a package with native connectivity to SQL Server should be a high priority.
- ***Shortest learning curve.*** CDHS needs to evaluate the small group of analysts who will be the primary users of the statistics software. Do they have any background with a particular package? If so, choosing a package that meets the other requirements but also has been utilized by staff will shorten the learning curve.
- ***Broad set of algorithms.*** Upon initiation of a predictive modeling project, the best algorithm (decision tree, logistic regression) for the research question will be unknown. Often the analyst will need to try several approaches to determine the best model for predicting outcomes with the highest accuracy. Thus, a package with a broad set of algorithms available is quite useful.
- ***Desktop and enterprise licensing options.*** Initially, the requirement for starting an advanced analytics program, including predictive analytics, should be limited to a small set of desktop users. In this case, client-based licensing will normally work best. But as the predictive analytics program grows, CDHS may want to integrate advanced analytics into other infrastructure and business processes, essentially making the advanced analytics software available as a service. This typically requires an enterprise licensing approach and deployment on a server, either physical or cloud-based. Most leading statistical packages offer both desktop and enterprise licensing but the costs for both should be understood prior to software selection.

## Outsourcing

While CDHS already has staff with strong analytical skill sets, both at the overarching division level and within individual programs who could utilize advanced analytics software, CDHS could also consider outsourcing some or all of the research questions, as it has done in the past with the ARCh projects. Many private sector entities, as well as research universities, have staff with the expertise to work with customers in performing the analytic work.

## Implement Advanced Business Analytics Methods

In recent years, there has been growing awareness of the value of applying advanced data analytics to the administration of human services programs. Use of these techniques has been made more feasible by the development of better technologies and the dramatically reduced cost of data storage and manipulation.

Advanced data analytics have the potential for significant benefits:

- Improved outcomes by identifying groups of cases for which given interventions are most effective
- Increased efficiency by targeting resources more appropriately
- Enhanced customer service by tailoring program responses to individual case characteristics
- Better staff morale by assigning responsibilities based on assessments of worker capabilities

These benefits can be achieved through more flexible analyses of data, use of sophisticated analytical techniques to evaluate the results of case actions, and development of predictive models to forecast the impact of different actions on case outcomes. Some examples of advanced data analytics include:

- **General data mining.** Data mining is an approach to study vast amounts of data, searching for trends and correlations and then seeking business process explanations that illuminate the findings.

- **Cycle time analysis.** This is the assessment of how long individual business processes take. It can help evaluate staff efficiency.
- **Correlation, ANOVA, regression analysis.** Each of these methods can be used to study data trends that can be leveraged for continuous improvement efforts.
- **Predictive analytics.** Analyses of past patterns can be used to score cases with certain characteristics and predict the likely impact of certain interventions.

The child protection system has, for many years, looked at the issues of assessments and methods for determining specific evidence-based processes which will provide direction for specific actions and steps within the child welfare system. Several examples of these include safety assessments to help in the determination of remaining in home or removal from home; psychological assessments to determine treatment needs; and drug and alcohol assessments to determine the need for services regarding drug and alcohol use or abuse. Use of predictive analytics can help address these types of questions.

Many categories and flavors of predictive analytics exist. For the purpose of this report, we will focus on two examples: research driven predictive analytics and predictive modeling. The key difference between these two methods of study is how the findings are implemented. In a research driven study, business processes may be adapted to the findings but the goal of the study isn't necessarily to drive business process change but to inform existing processes.

An example of this first method is the ARCh study titled *Predictors of Family Preservation Outcomes and Child Welfare Success*. This study showed the relationship between child and case characteristics and desired outcomes, as modeled by the study's authors. This study determined that specific characteristics, such as substance abuse, significantly decrease the likelihood of a successful outcome over a similar case without a substance abuse history. This information helps caseworkers understand some of the challenges as they evaluate how to handle cases and can help county and state departments understand the depth of their challenges with their caseloads when these characteristics are known.

The second predictive analytics approach, predictive modeling, would tackle this problem from a "how do we make daily decisions regarding a case when this information is known"

perspective. For example, within the Youth Corrections division, each child is given a set of assessments that help determine what programs the child will undertake. A predictive modeling project would profile children against their known outcomes using historical data, and then apply that information to new cases to maximize their outcomes. Using an historical set of data that contains both known outcomes (this child was a recidivist, this child obtained a GED, etc.) and known case characteristics (this child undertook treatment in this order, this child had a substance abuse history, etc.), certain profiles can be understood. When a new child enters the system, his or her history will be compared to known profiles. Because we know the outcomes for these profiles, a treatment plan or approach that maximizes this child's potential for a beneficial outcome can be pursued. Another way of describing predictive modeling is that it is used operationally.

If the state and counties pursue a merged data repository, containing multiple systems, then the power of predictive analytics is even greater. A child new to Youth Corrections may have a long history within the child welfare and benefits systems. Analysts can study these profiles across programs to determine if this information is helpful.

Within child welfare, case managers are given a bevy of providers for their cases. Predictive modeling could help determine which provider might provide the best outcome based on known profiles. This is not to imply that one provider is better than another in general, just that some providers may do better with certain cases than others. This information could even be used to select the best case manager for a child entering the system.

Predictive analytics and modeling is tied to a metrics driven program because projects must focus on driving outcomes critical to the organization. These cues are taken from the performance metrics system. For example, a focus on absence of abuse while in care can lead to a specific set of predictive analytic questions:

- Historically, what types of cases have experienced this abuse?
- Are there certain demographic characteristics more prevalent in abuse while in care cases?
- What separates similarly profiled cases where one case experienced abuse while another did not?
- What are CDHS and the counties doing to proactively prevent abuse while in care?

- Do some methods of abuse prevention seem to work better? Why?

In child welfare, there is need for assistance in determining such things as whether or not a caseworker has better outcomes of addressing children who have been neglected as opposed to children who have been abused; children who have been sexually abused as opposed to those who have been physically abused; counselors or therapists who may serve a teenager population with more success than a preteen population; an order of service which may indicate that a particular service order is more successful with a particular type of case than another; and what service array may be helpful in preventing reoccurrence of abuse neglect post-closure. Targeted applications of predictive analytics can help guide caseworkers with these daily determinations.

In these situations, the guidance is provided through the development of predictive models that estimate probabilities of success based on analysis of past actions for large groups of cases. The results obtained from these models can then be used to guide future actions such as safety assessments or treatment regimens. Scoring the likelihood of success can be one way of applying the results of a predictive model to a case situation. An important aspect of predictive models is that they can be self-updating. They can be continually refined based on the results of successive applications to new groups of cases. This makes them even more effective as they “learn” from new agency experience.

Some states, such as Pennsylvania, have used predictive models to assess alternative approaches to new child support cases. Based on an array of variables, the model assigns each new case a likely compliance score, and this score guides the caseworker in the level of monitoring and types of enforcement action used for the case.

Also in child support, states such as Missouri have implemented caseload stratification models to gain efficiencies in case administration and improved enforcement results. Under this approach, Missouri analyzes child support cases based on their individual characteristics and assigns cases to different types of caseloads depending on whether they are likely to cooperate with the agency, whether they will need close monitoring and aggressive enforcement, whether they will have little activity due to an unlocated obligor or incarceration, or whether they will need intensive community services (such as employment preparation and referral) before they are capable of paying.

This analysis determines the type of caseworker that will be assigned to the case (e.g. customer service oriented for complying cases, or collections mentality for the difficult-to-enforce) and the caseloads that they can carry. A worker with a cooperative caseload may carry 2,000 cases or more, while one with an intensive enforcement caseload may carry 400 or fewer. This results in more efficient deployment of staff because some workers can carry higher caseloads; more effective enforcement because cases with ability to pay but lacking in inclination are given more intensive monitoring; and better morale because workers are given responsibilities most compatible with their personalities.

Predictive models can be used in child support to provide guidance to caseworkers on the most effective enforcement action. While many enforcement actions are determined by a state’s automated system, predictive analytics can be useful for assessing whether “soft” enforcement measures can be useful, such as reminder or warning letters, in which circumstances such measures are most effective, and the best timing for using them. In 2007, Policy Studies Inc. developed such a predictive model for use in the El Paso County child support office, which it had contractual responsibility to administer. In the first six months alone, deployment of the model increased collections by six percent in the cohort for which it was used, and one percent across the total caseload.

Application of advanced data analytics can be expected to yield significant benefits to the agency, to program participants, and to taxpayers. While some progress can be made using existing databases and tools, as well as resources of external partners such as University of Kansas (ROM) and Colorado State University, development of advanced business analytics will be limited until the department acquires and implements the more robust infrastructure described above.

## Integrate County Capabilities

The dynamics of state-county relationships in a state-supervised/county-administered system pose numerous challenges to program management. Yet state-county alignment and effective coordination are critical to meeting public expectations for human services programs. In conducting this study, we identified opportunities where better integration of state and county capabilities for data reporting and business analytics would result in more efficient use of resources and better program outcomes.

A necessary condition for a metrics-driven program is achieving agreement by the state and counties on the specific measures to be used for judging performance. As discussed in the previous chapter, child support enforcement is an unusual example of a public program where there is little or no debate about the key metrics. These were hashed out through federal-state deliberations and memorialized in federal statute. Since these metrics determine the distribution to the states of a large pool of federal incentives, and since county-administered states almost always pass through all or most of the incentives to the counties, jurisdictions suffer financially if they do not take these metrics seriously.

Starting with the advantage of an agreed set of national metrics, then, there is no material disagreement between the state and counties about the highest priority performance measures. The Monthly Monitoring Report provides a wealth of additional performance data which is valuable to the counties in managing their programs, but no one would question which of the measures should receive the highest priority when judging the performance of a program. When the state program decided to develop an additional metric recently, a revised monthly collection on arrears indicator that was added to C-Stat, it did so in collaboration with the counties, according to our interview with State officials.

For child welfare, development of C-Stat metrics and the CPM scorecard proceeded on separate tracks, at least to some degree. While there is considerable overlap, it is important that there be alignment between the two. Some of the county interviewees indicated that there is still some disagreement between the State and counties on the metrics to be included in the scorecard. Moreover, when we asked about prioritizing the metrics because there are over twenty measures on the scorecard, one key respondent indicated that there was a lack of agreement on selecting a smaller group that should receive most emphasis.

In the major self-sufficiency programs (SNAP and Colorado Works), there has been some reported disagreement over the greatly expedited performance goal of one-week processing time for applications. However, this may be an area where the State is appropriately leading the counties to a higher benchmark of public service. At some point, counties will need to come into agreement if this metric is to be taken seriously at the operational level statewide.

In our visits to some of the larger counties, we were struck by the level of innovation in data management and analysis. The counties are hungry for more knowledge about their

caseloads and they are pursuing cross-program data analysis in their own jurisdictions, subject to data availability constraints. The counties are especially committed to a holistic service model that demands better information on the entire suite of services delivered to an individual and/or household.

Jefferson County is leading the way in a three-county consortium to develop better child welfare data analytics using data from Trails. As noted in Chapter 3, it has developed a data extract, certain tailored reports, and ad hoc query facility. It would welcome having access to child support data so that it could perform cross-program analysis. In many ways, these capabilities may equal or exceed those that the State will be gaining from ROM.

In our federal system, the states serve as “laboratories of democracy” and are the sources for many of the innovations ultimately adopted at the national level. In a state-supervised/county administered system, the counties play a similar role, especially the large counties with their greater resource pools. It would be to the advantage of the State if it could identify and evaluate county capabilities in business analytics, then adopt some of the processes and disseminate them statewide. This may require some creative contracting or inter-agency agreements, but if the State could leverage innovative developmental work by the counties, it could save resources at the State level and progress more quickly in gaining adoption of more advanced analytical tools statewide.

## Case Example: HCPF Acquisition of Advanced Business Analytics Capabilities

There are several ways to achieve the goals of CDHS, but it is worth pointing to the example of a current undertaking by the Department of Health Care Policy and Financing (HCPF), a sister agency. HCPF recently released a draft Request for Proposals (RFP) for business intelligence and data management services (BIDM).<sup>4</sup> This draft RFP has requested proposals for the following types of tools (we show a partial list):

- Enterprise data model
- 

<sup>4</sup> Released 5/24/2013 and available on Colorado BIDS website.

- Data warehouse
- Extract, Transform, and Load (ETL) tools
- Business intelligence and analytics tools
- Statistical analysis tools
- Online analytical processing (OLAP)/modeling and other predictive analytics tools
- Geospatial analytics capabilities
- Data mining
- Integration of external data (e.g. capture information from external programs, publicly available data, non-public databases)
- User-defined query and reporting tools

In addition to this array of technologies, the draft RFP also requests proposals for expert staff services to assist the agency in building its analytical capabilities.

The HCPF draft could serve as a starting point for acquisition of similar capabilities by CDHS, although CDHS would do well with a considerably more limited tool set than is being requested by HCPF.

There are many products in the market-place that would be responsive to the requirements specified in the draft RFP. We are not attached to any particular hardware or software approach. Technology should be chosen based on the needs of the agency and its partners, as well as the usual cost considerations.

In our experience, it is not necessary to foresee all of the uses to which this type of infrastructure may be put. Rather, once the infrastructure is in place, analysts at the Department and program levels will find ways to use the information to better understand and manage their programs. The larger counties with more sophisticated visions for data-driven program management and holistic service strategies will also tap into the power of these technologies to find new and creative ways to deliver services to their citizens. In a real way, if the Department builds it, they will come.

Without such infrastructure, the Department can continue to make progress with data reporting and make limited progress with business analytics, but it will get further faster with the type of infrastructure recommended here. Data reporting will be much more efficient than the current labored efforts, better presentation at the management and casework levels will focus attention on needed outcomes, and introduction of more advanced business analytics will result in smarter decision-making at all levels of the programs.

## Conclusion

With C-Stat, the practice model scorecard, and other initiatives, CDHS has made great progress in using metrics to elicit sustained improvements in program performance. With that achieved, and with the federal emphasis on interoperability and expanded use of business analytics, the timing is right to institutionalize the advances in data reporting and provide the foundation for the use of advanced business analytics, including predictive modeling, to achieve further operational efficiencies and improved outcomes.

The most fundamental need is acquisition and deployment of a capable analytical tool. This should be followed by development of a robust infrastructure to better support data reporting, to facilitate cross-program analyses (interoperability), and to provide the database for advanced business analytics. Acquisition of a statistical analysis tool is another important step. Development of a plan to consolidate and extend data reporting, and move forward with business analytics, would provide clear guidance to CDHS staff while enabling the Department to gain better alignment with counties in expanding their capabilities.

Although both the State and the counties have made many efforts to coordinate their approaches to data reporting, there is room to foster even better integration. More importantly, the State could benefit from innovations being developed in some of the larger counties, and could improve their programs by finding ways to adopt them and promulgate them for statewide use.

# CHAPTER FIVE

## Recommended Roadmap and Interoperability

The Colorado Department of Human Services has made impressive strides in implementing improved data reporting and business analytics during the past two years. A number of counties have also developed their own innovative approaches to data analysis in support of their increased reliance on program metrics to support improved management, and to develop more coordinated, holistic services for their citizens.

CDHS can build on this momentum by improving its infrastructure for data analysis and business analytics, taking progressive steps to develop these capabilities further, and continuing to improve coordination with the counties.

### Time-Limited Availability of 90 Percent Federal Funding

Currently the federal government is offering 90 percent federal funding for states to improve interoperability of health and human services systems. Developing an integrated data repository and acquiring tools for better data reporting and business analytics are the types of expenditures that qualify for 90 percent funding. (Note that program-specific customizations of these tools must generally be accomplished with normal program match rates.) These funds are available only through the end of 2015.

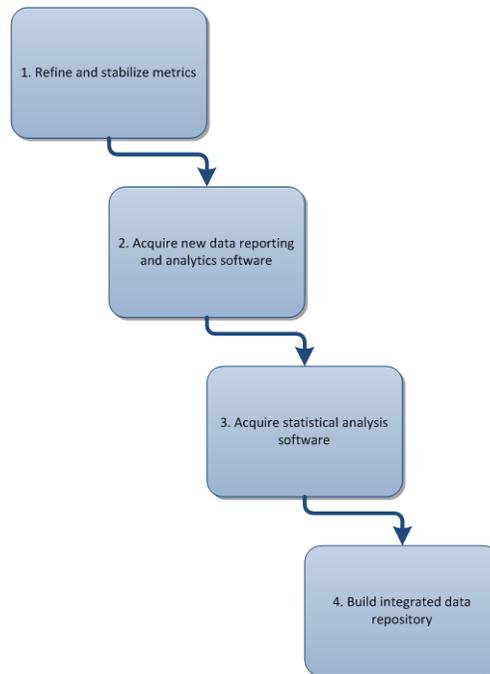
As a result, the State has a time-limited opportunity to obtain funds at a highly favorable rate to further develop its data reporting and business analytics capabilities. Using these funds to move forward will enable CDHS to build on the momentum it has established and significantly enhance its use of these powerful tools to improve program efficiency and deliver better services to the citizens.

### Recommended Roadmap

The following roadmap details our recommendations for the sequence and steps for attaining a high-functioning and high-valued reporting and analytics program throughout CDHS. As shown in Figure 5-1, we suggest that these steps be executed in the order presented so that CDHS can both start benefitting from the enhancements with the biggest

potential return (in terms of program improvement) but also so that the department does not tackle too many improvement ideas at once.

Figure 5-1  
BI Enhancement Roadmap



Each step should be carefully executed but also carefully monitored. For example, the current process for C-Stat and Slide Deck creation should be measured. How many staff members are required and for how long? Upon implementation of BI enhancements, CDHS should re-measure the process to ensure that desired outcomes are being achieved. This ensures that CDHS is getting its value out of the enhancement but it also fits well with the concept of continuous improvement.

### REFINE AND STABILIZE METRICS

Experience of other states strongly indicates that using metrics to drive performance can significantly improve the outcomes of a child welfare program. CDHS has made rapid progress in this direction especially during the past two years and it is starting to witness

the fruits of its efforts. Continued maturation of its initiatives could continue to strengthen management of the program. These include:

- Consolidating agreement between the State and county on needed outcomes and aligning the reporting in C-Stat and the CPM Scorecard
- Prioritizing no more than ten of these outcomes as most critical for the child welfare program
- Establishing cascading metrics under which casework level performance measures may be different from those of the agency, but which contribute to the agency-level outcomes

A positive externality of moving the department toward a stabilized metrics environment is that other continuous improvement ideas will bubble to the top of management and leadership's list of initiatives. As programs-counties-workers metrics become stable, accurate comparisons between operating units become feasible. Questions about who is high-performing versus low-performing will be answered without creating controversy or doubt about the validity of the comparisons. Quickly, management and leadership will start asking why? Can we replicate good performance in other units (workers/ teams/ counties)?

## ACQUIRE NEW DATA REPORTING AND ANALYTICS SOFTWARE

To build on the impressive momentum achieved by the Department with C-Stat and the CPM scorecard, we recommend a strategy to move forward with progressively more sophisticated data reporting and business analytics capabilities. Under this strategy, the Department would take advantage of the time-limited 90/10 federal interoperability funding to acquire infrastructure for these capabilities. It would complement infrastructure acquisition with consolidation of its efforts to develop and track key metrics for agency programs.

As detailed in Chapter 4 of this report, better-fitting reporting and analytics software for CDHS would provide numerous benefits, both in terms of reduction in manual efforts but also with improved capability to implement the data-driven program desired throughout CDHS and the counties. Additionally, the new software would not immediately have to be an enterprise-wide implementation. Plenty of the reporting and analytics packages available can be implemented through desktop licensing. CDHS could provide licenses to

several analysts across multiple divisions, including staff in the Office of Performance and Strategic Outcomes. CDHS should charge this office with replicating the current C-Stat and Slide Deck process using the new software package.

This approach would allow a phased adoption of the new software without requiring a department-wide change. Users with access to the new reporting and analytics software would tackle a department-prioritized list of projects, ideally starting with replacing the manual C-Stat and Slide Deck production, then continuing with other reporting needs.

Alternatively, CDHS may opt for an enterprise-wide approach with the new software should the product of choice and licensing structure make more sense than a narrower implementation. This depends greatly on the specific requirements CDHS develops during the evaluation/acquisition phase and the individual software pricing options.

In addition to empowering analysts across multiple divisions and even within the counties to have access to a powerful new tool to tackle reporting (in support of the Refine and Stabilize Metrics recommendation above), these analysts would also be unleashed to conduct data mining and other business analytics projects that would aid the department's goals and strategies. As mentioned in the first step of this roadmap, ideas for new projects in support of continuous improvement efforts will start to come from all directions.

## ACQUIRE STATISTICAL ANALYSIS SOFTWARE

As described in Chapter 4 of this report, a statistical analysis software package is both desired throughout various levels of CDHS and the counties but is also a requirement to take the programs into new areas of maturation.

Once the software is acquired and a queued list of projects developed, the department should prioritize projects that fit the scope and definition of the interoperability funding so that the license fees associated with the acquisition are subject to the 90/10 matching.

## BUILD INTEGRATED DATA REPOSITORY

At minimum, CDHS needs to acquire the infrastructure to store data from multiple production environments in a mirrored environment so that analysts can access all available source data easily without impacting the production environments themselves.

Ideally, CDHS will take the extra step of integrating these multiple data sources in a system under a data governance structure described by Deloitte in its report provided under another component of this project (Section 5.3). Doing so will ensure that proper data quality and definitional standards are utilized throughout the department, leading to consistent reporting and ad hoc analyses because everyone will be reading from the same script.

To achieve these minimum standards, we recommend that CDHS work with OIT to acquire the infrastructure described above to support advanced data reporting and business analytics. With technologies evolving rapidly, it is important to obtain more information on the most effective and economical approach to meeting the Department's needs. While these needs might have been met a few years ago with a data warehouse, ETL (extract, transform, load) tool, business analytics package, and statistical analysis capabilities, it is possible that newer technologies can provide the integrated data repository without the cost and maintenance requirements of a data warehouse.

Integration is a key component of the roadmap, not just for interoperability funding advantages, but also because data source integration will enable cross-program reporting and analysis not possible today.

One option CDHS can pursue is to outsource the repository and related maintenance to a hosted-services vendor, possibly even utilizing the many cloud-based vendors to reduce costs further. There are also procurement advantages to this approach. The State can specify CDHS requirements, then let vendors propose their most effective and economical approaches without artificial constraints of a pre-ordained solution.

To move forward with acquisition of these capabilities, the State will need to develop an RFP with the specifications of needed services. It may be desirable to precede issuance of an RFP with a Request for Information (RFI). This will enable vendors to describe solutions that might not otherwise be known to State staff, and will enable the State to issue a more informed RFP. We recommend that any decisions regarding the approach chosen should involve county representatives, to include case managers, as well as State staff.

Whatever path is taken, time is of the essence. Implementation of improved data reporting and business analytics will facilitate continued improvement in the management of CDHS

programs. It will enable services to be targeted more effectively and to be delivered more efficiently. However, the Agency will lose precious momentum if it does not move forward expeditiously to consolidate its work and build the infrastructure for expanded capabilities.

Equally important, it is necessary to move quickly to take advantage of the time-limited 90 percent federal funding that is provided for interoperability projects such as the development of data repositories. This funding source will fade away at the end of 2015. To take full advantage of the funding, the State will need to issue an RFP soon after the beginning of 2014. This would leave barely enough time to select a vendor, sign a contract, and stand up the new capabilities, while waiting beyond that point may leave the State short of the full potential funding it could otherwise receive.

## Interoperability

This is the fourth component of a grant to explore means for improving data-sharing and interoperability among human services and related programs. Our recommendations will enhance operability in several ways.

- ***Direct analytic access.*** The acquisition and deployment of new tools for data analysis and reporting as well as statistical analysis will enable central office staff (i.e. the Office of Performance and Strategic Outcomes) to perform analyses on multiple programs using extract files from systems such as CBMS and Trails. This will enable them to gain a deeper understanding of the data from such programs and begin to identify linkages that should be explored.
- ***Integrated data repository.*** Once the agency implements an integrated data repository with a suitable governance structure, it will be able to perform cross-program analyses for any CDHS program with data stored in the repository. This will support analytical interoperability across CDHS programs, including Medicaid and CHP+ (Children's Health Insurance Program) eligibility administered through CBMS. Department staff could then perform analyses of multi-program participation and assess the cumulative impact of its programs for a given client or family. Having the ability to perform analyses easily across CDHS programs (plus Medicaid and

CHP+ eligibility) would be a major step forward for analytical interoperability.

- ***Inter-departmental analyses.*** Having an open-platform analytical tool in conjunction with a strong statistical analysis tool will enable CDHS staff to analyze data bases from other agencies. Ultimately, however, the Department's ability to carry interoperability to that level depends on achieving a satisfactory resolution of the issues of access, confidentiality, and security being addressed in other components of this project.

The Department's rapid progress in the use of metrics combined with the availability of the time-limited 90/10 federal money provides a unique opportunity to maintain the momentum it has gained and use strengthened data reporting and business analytics to improve program outcomes.

# APPENDIX I

## List of Questionnaires

## CDHS QUESTIONNAIRE

Name: Title:  
Phone: Email:  
Interviewers: Date:

### **Business Intelligence**

1. *Performance metrics.* What are the most significant performance metrics that drive your program? We are aware of the C-Stat metrics – are there others? What is the source of the metrics: i.e. federal, CDHS, or program?
2. *Use of performance metrics.* Is there agreement on performance metrics at all levels of the program (i.e. federal, State, county)? Are managers, key personnel and program partners held accountable for cost, schedule/timing, efficiency and performance results – do they use data to determine that- how are these benchmarked?
3. *Use of data.* How is data used to drive policy, practice, procedures, training, and case-worker discretion? How often do you use data and BI to review the effectiveness and progress of : 1- CDHS; 2- your division/program; 3- individuals; and 4- specific metrics?
4. *Data and reports.* What are the sources of the data and reports you use to assess program operations? Where is it kept and reported? Are reports made available to all levels of State and county management? Do you have sample reports you can provide us? Are you aware of any counties having operational reports that should be applied statewide?
5. *Assessment of reports.* Describe or state the current status of Business Intelligence reports in CDHS or your area of responsibility- on a scale of 1 to 10 with 10 being the best, how would you rank BI? What aspects of BI do you think should be improved?
6. *Assessment of data gathering.* Describe or state the current status of data or information gathering in CDHS or your area of responsibility- on a scale of 1 to 10 with 10 being the best, how would you rank the current data or information gathering? What aspects of data gathering do you think should be improved? Are there key data elements missing that are needed to analyze program performance or improve operations?
7. *External agencies.* Does the Department regularly collect timely and credible performance information, including information from key partners, and use it to manage programs and improve performance? If so, how does this occur? Are there types of data / information needed from other agencies that would provide a more informed view of efficiency / effectiveness of programs, program evaluation and research reporting?
8. *Global data needs.* How are you determining global data needs? Do you know how to access the data is that you need to help answer the questions being posed by leadership? Legislators? Public? Clients/Customers?
9. *Changes in performance metrics.* When presented with ‘new’ performance measures (through a grant or request) how does your agency address the issue?

### **Business Analytics**

10. *General.* Are you using data to help improve performance at the program or individual case level? For example, are you using data to group case assignments by case classification, to determine what specific action should be taken on a case, to determine type of treatment or agency assistance, and/to determine workloads for staff? Please provide specific examples.
11. *Predictive Analytics.* Do you think that having a predictive analytics tool could help provide better outcomes for the agency? If so, how?
12. *Best Practices.* What processes or actions could advise the field on best practices, approaches, strategies or programs in order to achieve CDHS goals and objectives?

### **General Questions**

13. *Tools.* What technology tools, if any, are currently used in the field to provide data input, access to vital information and other decision making data? What tools would be important to introduce to the field? To the central office?
14. *Staff resources.* What staff resources are allocated to business reporting and business analytics functions? If more staff resources are needed, what practical benefits would be derived from their addition?
15. *Wrap-up.* Are there any other thoughts/suggestions you might have about how the agency or your program might improve its approaches to business intelligence and/or business analytics?

## **Questions for County Human Services Directors**

1. For child welfare, what do you believe are the most important performance measures that should guide administration of the child welfare program? What are the sources for these measures: federal requirements or request, state requirements or request, or local County requirements? Are there performance standards promulgated by the State that you believe do not accurately assess program performance?
2. What do you believe are the most important performance measures for other programs that you administer, specifically Colorado Works, food and nutrition programs, Medicaid eligibility, and child support enforcement?
3. For child welfare, do you regularly receive data and reports from the state office showing the work that is done in your County? For instance, do you receive reports on caseloads of caseworkers, assessments by caseworkers, visits to children and families, repeat maltreatment, timely adoptions, etc.?
4. Do you regularly review those reports with your supervisors and do you compare those reports among your supervisors, or with other counties of a similar size? Do you find the reports and data you receive useful in determining how to allocate human resources and other assignments within your County? If so, describe how you make adjustments, if you do based on that data.
5. How frequently do you review the data and reports that you have available to you – in other words, do you review data and reports only when you receive them, or do you refer to them throughout the period of time between receiving those data and reports?
6. Do you make recommendations directly to the state, or through another source such as the county directors' organization, for improvement of the data measurements, alternatives to the data measurements, or elimination of those that are not useful to you at the local County?
7. Assuming that you do receive state data measurements and metric reports, are there other reports that you have available to you through your local County system that help you manage your local County? If so, can you describe some of those additional data reports and even provide a copy.
8. On a scale of 1 to 10, with 10 being the best, how would you rate the reports that you receive from the state in helping the caseworkers and supervisors in your County best serve children and families? What additional data, reports or metrics would cause your rating to improve?
9. Would it be useful to have predictive statistical tools to assist with key decisions involving child welfare, such as removal, return to the home, or treatment plans?

10. What outside agency information would be helpful to your case managers, supervisors and to you in order to better serve children and families in your County? For instance, immediate access to drivers' license, criminal history, education records, mental health records, etc.?
  
11. On a scale of 1 to 10, with 10 being the best, how would you rate the case work management system in use in your County? What additional improvements would cause that to increase?

## Questions for County Child Welfare Supervisors

1. What are the performance measures that are used to judge the performance of your unit in providing child welfare services? Do you think that any of these measures are not helpful, or provide inaccurate indications of service quality? Are there other performance measures you think should be used to measure the work of your unit?
2. Do you regularly receive data reports and metrics showing the work that is done in your County and or unit? For instance, do you receive reports on caseloads of caseworkers, assessments by case workers, visits to children and families, repeat maltreatment, timely adoptions, etc.?
3. Do you regularly review those reports with your caseworkers and do you compare those reports with other units that may exist in the county and/or with other counties? Do you find these reports useful in managing and supporting case managers and determining the work that is being done in the county?
4. Do you regularly review these reports with the county director? Do you receive guidance and or support on how to improve performance or address any issues that you or others determined need to be addressed? Does your review include a comparison of other counties of a same or similar size?
5. Do you have comparison data to show whether or not a caseworker you supervise, your unit, and/or the county are improving, stabilized, or falling back?
6. Having reviewed the data, metrics and reports with a caseworker, what actions do you take to reward or hold accountable those individuals who are not meeting or who have exceeded the standards set out in those reports?
7. Have you been in discussions where reports, data and metrics received have been discussed and then offered suggestions for improvement? The might address such issues as changes to better address the services to children and families, or modifications to more accurately reflect the work being done at the local County level?
8. Do you regularly receive notification by a reminder, tickler, benchmark or otherwise when a caseworker on a particular case has not been meeting the standards set out by policy and practice? If so, what have you done with those notifications?
9. Are there any tools that provide statistical guidance to you or your staff with respect to major decisions involving a case? These might include, for example, removal from a home, treatments while out of a home, interventions in lieu of removal, or placement back into a home. Would such tools be useful in helping provide guidance for complex decisions?
10. Do you have an opinion on what technology tools would be helpful for caseworkers in making good decisions regarding children and families? For instance, tablets, voice-activated dictation, air cards, a really good interactive case management system, etc.?

## Questions for Caseworkers

1. What are the activities or events that you do on a regular basis that are used to judge your work? For instance, timely assessments, visits to children and families, repeat maltreatment, timely adoptions etc.?
2. Are there different measures that you think would more accurately demonstrate the work that you do?
3. What data measurements do you currently use when you access Trails in order to perform your job? For example, last child or family visit, length of time since case opening, date of next hearing.
4. What agency information do you find helpful as you go about your daily tasks so that you can do a better job assessing, evaluating, making recommendations, and implementing services for children and families? For instance, driver's license, criminal history, mental health records, etc.?
5. How frequently do you review data and information (work statistics) with your supervisor and how do you incorporate those sessions into your daily work.
6. What technology tools would you find helpful in making better decisions regarding children and families? For instance, tablet, voice-activated dictation, air cards, a really good interactive case management system, etc.?
7. On an average day or week, what is the percentage of time that you spend on the case management system – Trails – in order to do your work in the office and or in the field? Do you feel that is a part of this, you could do better work for children and families if he spent more or less time on the computer? Finally, what percentage of time you think would be a good number for you to spend on the computer.
8. What measurements would you find helpful if you were to receive notification by a reminder, tickler, benchmark or otherwise so that you could do all of the things you needed to do timely and with sufficient notice? For instance, seven-day notice that a visit of a child or family is not occurred timely, seven-day notice that an assessment needs to be closed out, a five-day notice that a court report is due, etc.?

# APPENDIX II

## List of Interviews

CDHS		
Interviewee	Position	Date
Troy Evatt	Manager, Data and Evaluation Division of Behavioral Health	May 30, 2013
Paulette St. James	Director, Division of Child Support Enforcement	May 30, 2013
Craig Goellner	CSE Systems Director, Division of Child Support Enforcement	May 30, 2013
Larry Desbien	Section Chief, Policy and Evaluation, Division of Child Support Enforcement	May 30, 2013
Leslie McGrew	Evaluation, Supervisor Division of Child Support Enforcement	May 30, 2013
Jon Sushinsky	Manager, Research, Evaluation, Data Section, OCYF	May 30, 2013
Julie Krow	Director, Office of Children, Youth, and Families	May 31, 2013
Judy Rodriguez	Associate Director, Programs, Child Welfare Division	June 12, 2013
Herb Wilson	Business Technology Resource Manager, Office of Administrative Solutions	June 13, 2013
Jay Morein	Director, Office of Performance and Strategic Outcomes	June 13, 2013
Leo Jaramillo	Deputy Director, Office of Behavioral Health	May 31, 2013
Les Cowager	Financial Section Manager, OCYF	May 31, 2013
Ki'i Powell	Director, Performance Management Division, Office of Performance and Strategic Outcomes	June 19, 2013
Al Estrada	Trails Manager, Division of Youth Corrections	June 17, 2013
Dan Casey	Section Manager, CPA Monitoring, OCYF	May 30, 2013
Deborah Nelson	Division Associate Director, Operations, OCYF	May 31, 2013
Dr. Richard Ratliff	Division Director, Regional Centers	June 7, 2013
Paul Stein	Director, Division of Refugee Services	June 7, 2013
Jack Chen	Director, Division of Food and Nutrition	June 7, 2013
Dr. David Menefee	Associate Director, Quality and Performance Improvement, Division of Child Welfare	June 21, 2013
Julie Kerksick	Director, Office of Economic Security	June 27, 2013
Todd Jorgensen	Deputy Director, Office of Economic Security	June 27, 2013

<b>Governor's Office of Information Technology (OIT)</b>		
Galina Kivokuk	Senior Manager for Health Care Services, OIT	May 30, 2013
Sherri Hammons	Chief Technology Officer, OIT	June 26, 2013
Dianna Anderson	Chief Data Officer, OIT	July 25, 2013
Dr. Chris Wells	Director, Healthcare Information Technology Architecture	July 25, 2013
<b>External</b>		
Chris Underwood	Department of Health Care Policy and Financing	July 19, 2013
Dr. John Fluke	Researcher, University of Colorado	June 20, 2013
Honorable Ann Gail Meinster	Judge, Jefferson County	June 18, 2013
Honorable Karen Ashby	Judge, Denver County	June 17, 2013
<b>Counties</b>		
<i>Larimer</i>		
Ginney Riley	Director, Larimer County Department of Human Services	June 14, 2013
Laura Walker	Deputy Director	June 14, 2013
Cathy Weaver	Supervisor, Accountability Unit	June 14, 2013
Thad Paul	Deputy Division Manager	June 14, 2013
Andrea _____	Caseworker	June 14, 2013
<i>Arapahoe</i>		
Cheryl Ternes	Director, Arapahoe County Department of Human Services	June 14, 2013
Angela _____	Division Manager for Children Youth and Family Services	June 14, 2013
Greg Miller	Trails and Data Manager	June 14, 2013
<i>Weld*</i>		
Judy Griego	Director, Weld County Department of Social Services	June 13, 2013
Heather Walker	Manager	June 13, 2013
<b>*In addition to these interviews, Weld County provided written responses from two supervisors and four caseworkers whose names were not provided to us.</b>		

<b><i>El Paso</i></b>		
Richard Bengtsson	Director, El Paso Department of Human Services	June 12, 2013
Caseworker, name unknown		June 12, 2013
Gregory Baldwin	Caseworker	June 12, 2013
<b><i>Montrose</i></b>		
Peg Mewes	Director, Montrose County Department of Human Services	June 10, 2013
Linnea Edwards	Lead Child Welfare Caseworker	June 10, 2013
<b><i>Chaffee</i></b>		
Phil Maes	Director, Chaffee County Department of Social Services	June 11, 2013
Monica Haskell	Supervisor, Youth, Family, and Adult Services	June 11, 2013
Paul Witty	Social Caseworker	June 11, 2013
<b><i>Boulder</i></b>		
Frank Alexander	Director, Boulder County Department of Housing and Human Services	June 18, 2013
Terry Ryan Thomas	Intake Manager	June 18, 2013
Jenny Zuetell	Caseworker	June 18, 2013
Jason McCroy	Business Operations Director	June 18, 2013
Kit Thompson	Family and Children's Services	June 18, 2013
<b><i>Jefferson</i></b>		
Lynn Johnson	Director, Jefferson County Department of Human Services	June 18, 2013
Graig Crawford	Programmer/Analyst IV, Finance and Data Management Unit, Children Youth and Families Division	June 18, 2013
Sharon Ashcraft	Supervisor, Finance and Data Management Unit	June 18, 2013
Jessica _____	Supervisor, Child Welfare	June 18, 2013
Chelsea _____	Case Manager, Child Welfare	June 18, 2013
<b><i>Denver</i></b>		
Kelly Garcia Brauch	Supervisor	
Twanna French	Caseworker	