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Evaluation of the Michigan Disease Surveillance System:
A Subjectivist Approach to Assessing an EDSS and Its Environmental Context

By
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Degree to be awarded: M.P.H.
Executive MPH

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Abstract

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Background:
Since 2004, the State of Michigan's Communicable Disease Division (CD Division) at the Michigan Department of Health and Human Services has used a custom-built, web-based surveillance tool as its electronic disease surveillance system (EDSS). This EDSS accepts both manual entry of cases and electronic laboratory reports (ELRs), supports case investigation, and is the basis for subsequent reporting to the State's partners (e.g., to CDC). In that time, a comprehensive assessment of the system has not been completed. In order to assist the CD Division in assessing the remainder of the MDSS lifecycle, its environmental context, and whether it can remain viable into the future, a comprehensive analysis of system requirements, a comparative assessment of existing (a.k.a., "off of the shelf") systems, an informatics capacity assessment, and a funding assessment were conducted.

Methods:
Using a subjectivist approach through a responsive/illuminative framework, system user feedback was solicited and analyzed to progressively elucidate specific system requirements, successes, and functionality gaps. Applying a standardized EDSS comparison tool (the vendor analysis), MDSS was then compared against other comprehensive 'off-the-shelf' EDSSs. In order to support the optimal identification and ongoing use of the most appropriate EDSS, an additional standardized assessment tool was then utilized to assess the CD Division's capacity to engage in informatics activities around supporting EDSSs for communicable disease surveillance. A high-level funding analysis was conducted to describe the funding environment in which MDSS is currently maintained and developed.

Results:

The responsive/illuminative approach found that, overall 82.7% of users would give MDSS and adequate or mostly adequate rating. Results showed that an EDSS solution should be identified by the CD Division that addresses specific attributes, including: Accuracy, Completeness, Consistency, Data Quality, Error Reduction, and System Reliability and Functionality. The standardized EDSS comparison tool was shown to provide an effective methodology and format to identify and articulate system needs and to critically compare systems. But, while this tool showed that there is reason to believe that an alternative system might be warranted for consideration, significant limitations in the tool's dated representation of evaluated systems and the introduction of rater bias through the addition of the MDSS assessment resulted in only general findings. The informatics capacity assessment showed that the CD Division has a strong foundation of informatics practices and principles, is in the range of a 'managed' level of maturity, and is well poised to further develop its growth. The funding review illustrated that there are significant environmental constraints on the CD Division's ability to select and/or develop an EDSS for communicable disease surveillance, including: lack of state sponsorship, system enhancements restricted to funding opportunity requirements, and lack of an effective funding communication and advocacy strategy.

Conclusions:

While this evaluation did not determine whether any 'off-the-shelf' EDSS should replace MDSS or whether MDSS should be further enhanced to address system gaps identified in this analysis, several recommendations were identified to assist the CD Division in determining which attributes matter most in promoting confidence in any EDSS solution for communicable disease surveillance in Michigan. Specific recommendations were made that, regardless of the EDSS solution, would target: reducing variability in data input, supporting sophisticated data analytics, improving system response time, reducing incidents of missing case data, enhancing system alerts, development of a case follow-up module, and improving communication and transparency in system support. The vendor analysis showed that other 'off-the-shelf' EDSSs show potential as possible EDSS solutions and should be further investigated by the CD Division as viable options. The informatics capacity assessment led to the development of a specific, five-year plan with a three-year interim benchmark. This five-year plan would result in moving the CD Division from a 'managed' state to a 'defined' state of informatics practice. And, the funding review provided for three recommendations: that the CD Division should develop a funding management model to organize and direct its funding activities; that the CD Division should develop a managed EDSS development communication strategy; and, that the CD Division should work to identify more diversified funding sources including efforts to obtain state sponsorship of communicable disease surveillance activities. The recommendations resulting from this evaluation were also compared to the recently publish Public Health Commission (PHC) report to Governor Snyder and found to be in compliance with the recommended PHC approach and efforts to modernize Public Health towards Public Health 3.0.

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-Matt

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Appendices

Chapter 1 - MDSS Evaluation Literature Review

1.1: What is an Electronic Disease Surveillance System - (a) General Description

In an oft-cited description of the most essential element of public health activities, surveillance, both the synthesis and the application of knowledge obtained through the rigorous practice that is used to drive mission-critical activities is evident. Surveillance is the “ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health.” [1] In that vein, surveillance can be seen as a set of activities (and the systems that support these activities) that are critical for the “development and enhancement” of effective programs to prevent and control the transmission of disease.[2] It also becomes apparent that, without surveillance, effective prevention and control measures simply are not possible.[3]

To achieve effective surveillance in the United States, each state and territory maintains a list of conditions that are mandated to be reported within that particular jurisdiction by health professionals and laboratories. These “Reportable Disease” lists also specify the timeframes in which these reports are to be made.[3] These reports are the basis of what drives each public health entity’s ability to accomplish two overarching objectives in its operation: “(1) to track disease incidence and identify outbreaks; and (2) to allow public health officials to make informed decisions and implement appropriate control measures to prevent the spread of disease.”[3] CDC notes that these objectives are achieved through the use of this information in a variety of standard, core public health activities, including: guiding quick decision-making practices in cases where urgent public health action is important; measuring burden of disease (“including changes in related factors, the identification of populations at high risk, and the identification of new or emerging health concerns”); monitoring and identifying changes in trends in the burden of any given disease/condition (e.g., outbreak detection); guiding intervention

program planning, implementation, and evaluation; the evaluation of public policy and practice; the evaluation and allocation of limited public health resources; describing the natural history of disease; and providing “a basis for epidemiological research.”[1]

While each state and territory does set its own public health policy and laws (including maintaining its own list of reportable conditions, as noted hereinabove), the national strategy for surveillance of communicable diseases is predicated on voluntary adherence to the National Notifiable Diseases Surveillance System by state and territorial jurisdictions.[4] This system both defines the list of conditions and laboratory results that are nationally notifiable to the Centers for Disease Control and Prevention (CDC) as well as condition-specific case definitions used in the course of regular public health surveillance activities.[4] The specific case definitions that are used in the course of notification are developed in partnership between CDC and the Council of State and Territorial Epidemiologists (CSTE; “an organization of member states and territories representing public health epidemiologists”[5]). The complex nature of federalism in Public Health in the United States requires strong partnerships between federal agencies and the state and territorial jurisdictions that oversee their own specific public health reporting requirements, policies, and protocols.[6,7] These case definitions are collaboratively developed with CSTE position statements in order to facilitate adoption of “uniform criteria” across these reporting jurisdictions. Additionally, this national system also provides for a mechanism (message structure and transport systems [i.e., the National Electronic Disease Surveillance System {NEDSS} and the Public Health Information Network Messaging System {PHIN MS}]) to report these conditions and findings to CDC.[8]

In order to facilitate the dissemination of data-driven knowledge, pertinent data must be collected by public health stakeholders (community physicians, hospitals, laboratories, schools, etc.), analyzed by appropriate parties, and provided on a timely basis to those who can intervene with the appropriate response to prevent, mitigate, or remediate the public health concern (e.g., local health jurisdictions and state health departments).[9] The specific sequence

of steps involved in an investigation will vary by condition and available resources within a given jurisdiction, prior to providing notification to CDC. Additionally, states and territories often use these data for purposes other than just reporting notifiable conditions to CDC (e.g., developing program-specific, community-level interventions and outreach programs).[9] While CDC recommends that jurisdictions notify CDC of cases as soon as they receive a report, some states wait until they receive laboratory confirmation to provide such notification to CDC. This can add delay and affect timeliness of data at a national level.[9]

Use of electronic disease surveillance systems (EDSSs) can both expedite reporting within a jurisdiction and, following prescribed messaging protocols, facilitate provision of updated case information on a regular basis (e.g., confirmation of case identification where previous notification was sent to CDC under a suspected or probable case status).[2] This aids in improving surveillance timeliness for the response that the jurisdictional actors may then carry out with their local partners and in ensuring accuracy in the updated notifications sent to CDC through the National Notifiable Disease Surveillance System (NNDSS). Use of an EDSS facilitates basic surveillance activities and supports strategies for meeting ongoing agency objectives. They improve data timeliness and "facilitate access to epidemiological data allowing [for] more rapid analysis and response."[2]. Additionally, while supporting both NNDSS and non-NNDSS public health activities (e.g., local health department projects, community outreach), they facilitate the "establishment of disease baselines," identification of disease trends over time, "assessment of responses to public health measures[,] and generation of hypotheses" thanks to the availability of longitudinal data.[2]

Other data quality measures can also be improved through use of standardized reporting mechanisms like electronic lab reporting (ELR), facilitated through use of EDSSs.[2] Compared to a manually-intensive, paper-based counterpart system, ELR has been shown to improve both completeness and timeliness of reporting in disease surveillance.[2]

These EDSS systems can vary in the types of data sources - from manual data entry to electronic exchange of data (e.g., lab reports, case reports), complex surveys, etc. - and in scope - from systems that are narrow in scope (e.g., HealthSIS - which focuses solely on the routing of reportable condition information to public health entities; and, EpiAnywhere - which facilitates basic data entry and case surveillance for users with limited technology infrastructure[10]) to systems that receive data in multiple formats which are then provisioned for multiple purposes.[1] Because of this variation, there are a number of public health informatics concerns that must be considered, both in an EDSS's initial development and in ongoing review. These include, but are not limited to: hardware; software; user interface; data format and coding; data quality assurance measures; confidentiality; and system security.[1]

1.1: What is an Electronic Disease Surveillance System - (b) Critical Functions

As a general rule, full scale EDSSs must facilitate all reporting activities from the time that the occurrence of a health event is identified, through core public health activities (at the state and local levels [e.g., investigations and trend monitoring]), to notification of the findings to appropriate public health stakeholders (e.g., CDC, media), and in the assessment of public health interventions (for continuous process improvement, and in support of (or response to) funding requests, and/or as a legislated requirement of the agency), etc.; see steps 1 through 7 in Figure 1, below.

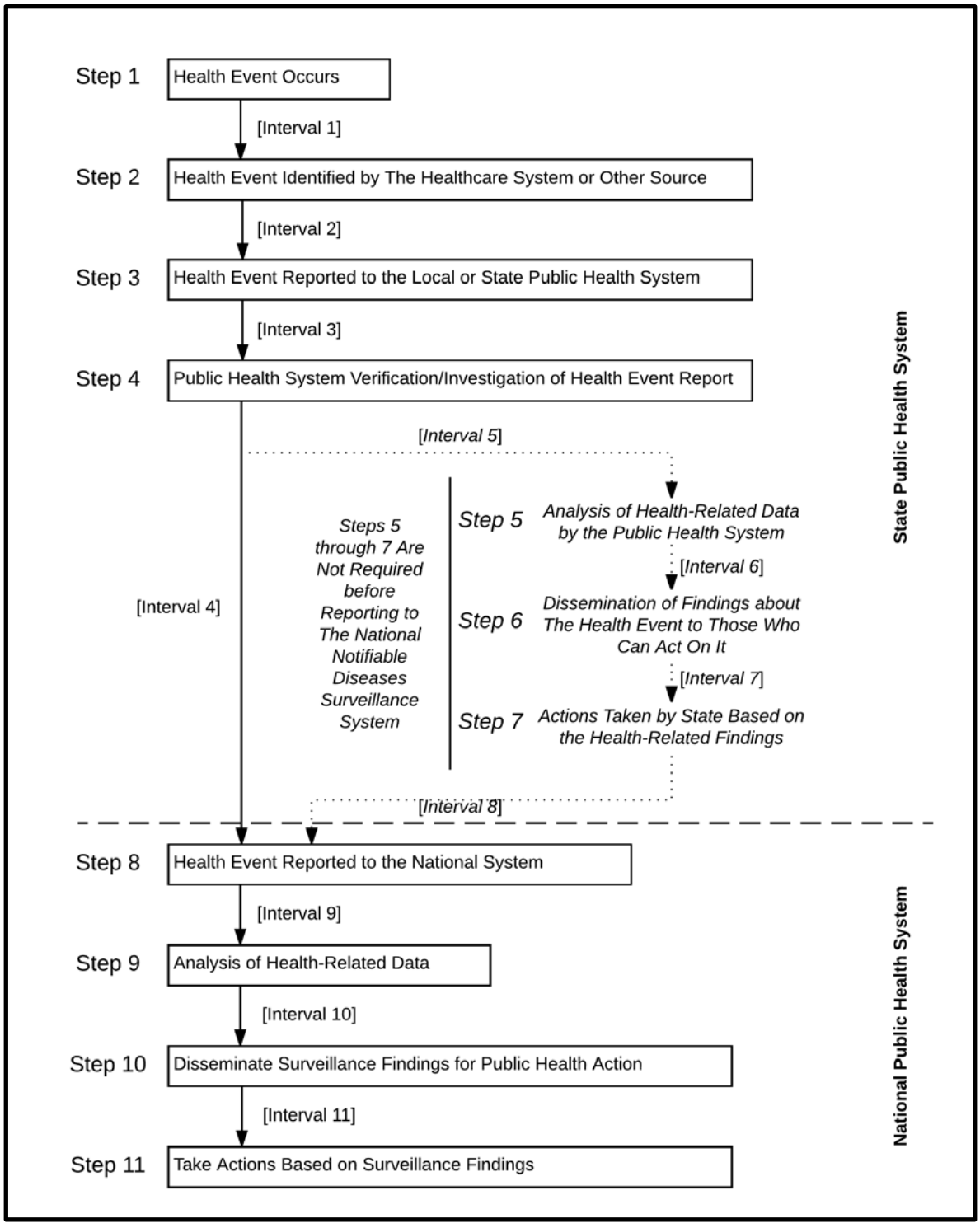

Figure 1.1: "Sequence of Actions Needed to Gather and Use Health-Related Information for Public Health Purposes" (*adapted from Figure 1, in: Jajosky RA, Groseclose SL. Evaluation of reporting timeliness of public health surveillance systems for infectious diseases. BMC Public Health. 2004*)

The reporting process can include several steps, including: detection of a case; identification of a reportable status; extraction of relevant data points (e.g., patient information, physician information, laboratory tests and findings, etc.); and, transmission of a lab or case report.[3] The transmission of an initial report to Public Health (e.g., ELR or eICR) is the first point of EDSS interaction in the surveillance process. In most states' existing EDSSs, it is the state health department (SHD) that receives the incoming case report and then routes the information to the appropriate local health jurisdiction (LHJ). While the LHJ then conducts the case investigation (and any necessary interventions), it is generally the SHD that conducts analysis and reporting to relevant stakeholders.[3]

In addition to case detection and case reporting, EDSSs should support and enhance other core public health functions, including: facilitation and assessment of effective interventions, estimation of disease and/or injury impact, describing the natural history of a given disease or condition, determining the incidence, prevalence, and distribution of a condition; "generating hypotheses and stimulating research;" program planning; assessment and evaluation of implemented public health measures; and, outbreak detection and management.[4] An EDSS, like any surveillance system, should emphasize the system attributes that are of greatest value to its stakeholders and business processes, with the understanding that emphasis and efforts to improve some system attributes (e.g., sensitivity or positive predictive value) "might detract from other attributes (e.g., simplicity or timeliness)."[1]

EDSS can generally be categorized into one of three classification types: comprehensive, specialized, and niche.[10] Comprehensive systems are those that support *all* of the core public health activities in which the public health agency engages for communicable disease surveillance. Specialized systems are those that target a specific subset of these core public health functions (e.g., NEDSS Base System [NBS] - provides case management functionality but not contact intervention or outbreak management[10]). The number of, and types of, functions included in specialized systems will vary relative to the objectives that the

system is expected to meet; but, any specialized system (by definition) does not address at least one of the core public health functions. Niche systems, by contrast, are those that are tailored to meet a highly specific public health need, focusing on one or few aspects of an EDSS, like transmission of laboratory data or providing basic surveillance tools in low-resource areas.[10] Some systems can also be considered niche in that they focus on a specific condition or set of conditions (e.g., CDC's eHARS and Arbonet).

Some EDSSs, under the umbrella of syndromic surveillance, take advantage of data that, while not necessarily diagnostic in nature, *might* otherwise be indicative of an emerging outbreak.[4] These data include "patient[s'] chief complaints in emergency departments, clinical impressions on ambulance log sheets, prescriptions filled, retail drug and product purchases, school or work absenteeism, and constellations of medical signs and symptoms in persons seen in various clinical settings."[4] While syndromic surveillance arose primarily out of an acknowledgment of a need for terrorism preparedness, it has also been successfully used in resource-poor environments where laboratory confirmation of a disease or condition (e.g., sexually-transmitted diseases) is not necessarily feasible.[4]

EDSSs have demonstrated a capacity to significantly address data quality (both completeness and consistency) and timeliness issues that are often associated with input constraints.[11] Especially in terms of conditions that are highly communicable and/or with high mortality rates, interoperable EDSSs help to facilitate detection and to inform intervention and response.

1.3: EDSS Evaluations - (a) Necessity

EDSSs, like all systems, must be monitored and revisited on a regular basis to ensure that issues of public health concern are being addressed both efficiently and effectively.[1] The overarching goal of these evaluations should focus on identifying to what degree the EDSS is supporting the organization's objectives[12] and to assess where and how interoperability can be employed to improve process and outcomes.[13] Subsequent to these periodic evaluations, recommendations should made with a target focus in the areas of quality, efficiency, and usefulness.[1]

1.3: EDSS Evaluations - (b) Core Requirements

CDC's guidance on EDSS evaluations is largely considered the gold standard from which all other recommendations are derived.[12] There are several attributes that this guidance recommends be assessed as part of any EDSS evaluation. They include: "simplicity; flexibility; data quality; acceptability; sensitivity; predictive value; representativeness; timeliness; and stability."[1,12] The assessment of these attributes should follow rigorous and methodical review, using the following criteria: importance of the attribute; objectives of the system and how/whether the attribute meaningfully contributes to meeting those objectives; the costs to support the meaningful use of the attribute; the quality of the attribute. [1] For example, efforts to improve sensitivity within a system (e.g., for health-related events or precision in patient matching for potential record merging) might encumber the simplicity of the system or the timeliness of the data availability.[1] While there is no consensus amongst professionals regarding how structured or unstructured the format of such evaluations should be, there are five overarching aspects to these aforementioned criteria for attribute review. Comprehensively, they address whether the system is meeting necessary metrics of: "system quality; information quality; use (ease of and efficiency); user satisfaction;" and health impacts achieved.[12] Further still, such "value-based" assessment can be framed as an attempt to address even higher-level concepts, such as: "merit (i.e., quality), worth (i.e., cost-effectiveness), and significance (i.e., importance)."[14] Lastly, a comprehensive evaluation must address the less ethereal aspects of any system, such as: hardware; software; user interface design; data format and coding; quality checks within the system; and "adherence to confidentiality and security standards."[1]

While CDC's Framework for Program Evaluation in Public Health is geared primarily toward traditional public health programs (Hepatitis surveillance, community-level HIV interventions, etc.), the generalized nature of its recommendations fits within, and is appropriate to consider for, the scope of an EDSS evaluation. This is especially true when we consider that EDSS evaluation is programmatic, in its own right, in how it is structured to support the more

traditional “programs” that we generally think to be the purview of Public Health communicable disease response. In this framework, CDC recommends starting with six overarching questions. From there, the evaluation should proceed, viewed through the lens of four groups of standards, by way of six interdependent steps.[14] These overarching questions are:

1. “What will be evaluated? (That is, what is the program and in what context does it exist?);
2. What aspects of the program will be considered when judging program performance?
3. What standards (i.e., type or level of performance) must be reached for the program to be considered successful?
4. What evidence will be used to indicate how the program has performed?
5. What conclusions regarding program performance are justified by comparing the available evidence to the selected standards?
6. How will the lessons learned from the inquiry be used to improve public health effectiveness?”

The four groups of standards that guide these six steps are echoed in Adewunmi’s aforementioned metrics (“system quality; information quality; use; user satisfaction;” and impact on individuals). These include: “Utility; Feasibility; Propriety; and Accuracy.” CDC recommends initiating the process by engaging stakeholders, then proceeding to describing the program. This description should include seven aspects: “Need; Expected Effects [e.g., Outcomes]; Activities; Resources; Stage of Development; Context (Environmental Influences); and, Logic Model.”[14] From there, one can move to a focus on the evaluation design, the gathering of credible evidence, and developing justified conclusions. The last of the six steps is to ensure use and dissemination of lessons learned.[14]

Similar to CDC's recommendations that begin with overarching questions, standards, and steps, the European Union's European Centre for Disease Prevention and Control (ECDC) suggests that, while many evaluation recommendations focus largely on assessment of system attributes, there are additional questions that also warrant consideration, such as:

1. "What are the components of a surveillance system and how do they interact?
2. What triggers the evaluation of a surveillance system?
3. Which evaluation methods are appropriate?
4. Which components should be evaluated?
5. What do the results of the evaluation tell us?
6. What are the possible interventions?"[15]

These six questions echo the recommended six questions that CDC recommends posing, at a high level, prior to initiating system evaluation. This supports the critical necessity for beginning evaluation with these core questions.

As mentioned above (section 1.1:(b)), an EDSS, like any surveillance system, should make use of those system attributes that are of most value to it. That said, an EDSS evaluation should make its best effort to comprehensively review all customary, generally accepted attributes required of any system that is attempting to conduct surveillance. These include traditional, surveillance-oriented attributes: completeness; validity; sensitivity; specificity; positive predictive value; negative predictive value; timeliness; usefulness; and representativeness.[1,15,16] CDC, ECDC, and WHO all agree that, in addition to the above core surveillance attributes, EDSS evaluation also requires review of system simplicity, flexibility, acceptability, stability, reliability, and adequacy.[1,15,16]

1.3: EDSS Evaluations - (c) Existing Frameworks

In 2005, the Public Health Informatics Institute (PHII) and the Association of Public Health Laboratories (APHL) jointly published a high-level, nine-dimension evaluation framework for public health information systems. PHII and APHL also demonstrated the proof-of-concept of this framework on a Newborn Screening Laboratory Information System which had been recently integrated into a Child Health Information System in Rhode Island.[13] This framework is predicated on assessment of how technical and programmatic inputs affect information quality, system quality, and service quality (each of these is defined and evaluated by a core set of attributes). The assessment of these three quality measures then informs system impact on both the use of the system as well as the user experience within the system (again, defined and assessed by a set of aspects and attributes). Subsequently, the impact of use and user satisfaction on economic, organizational, and individual impact is assessed. This then, lastly, informs the evaluation on the system's impact on health and health services (see Logic Model in Figure 2, below).[13]

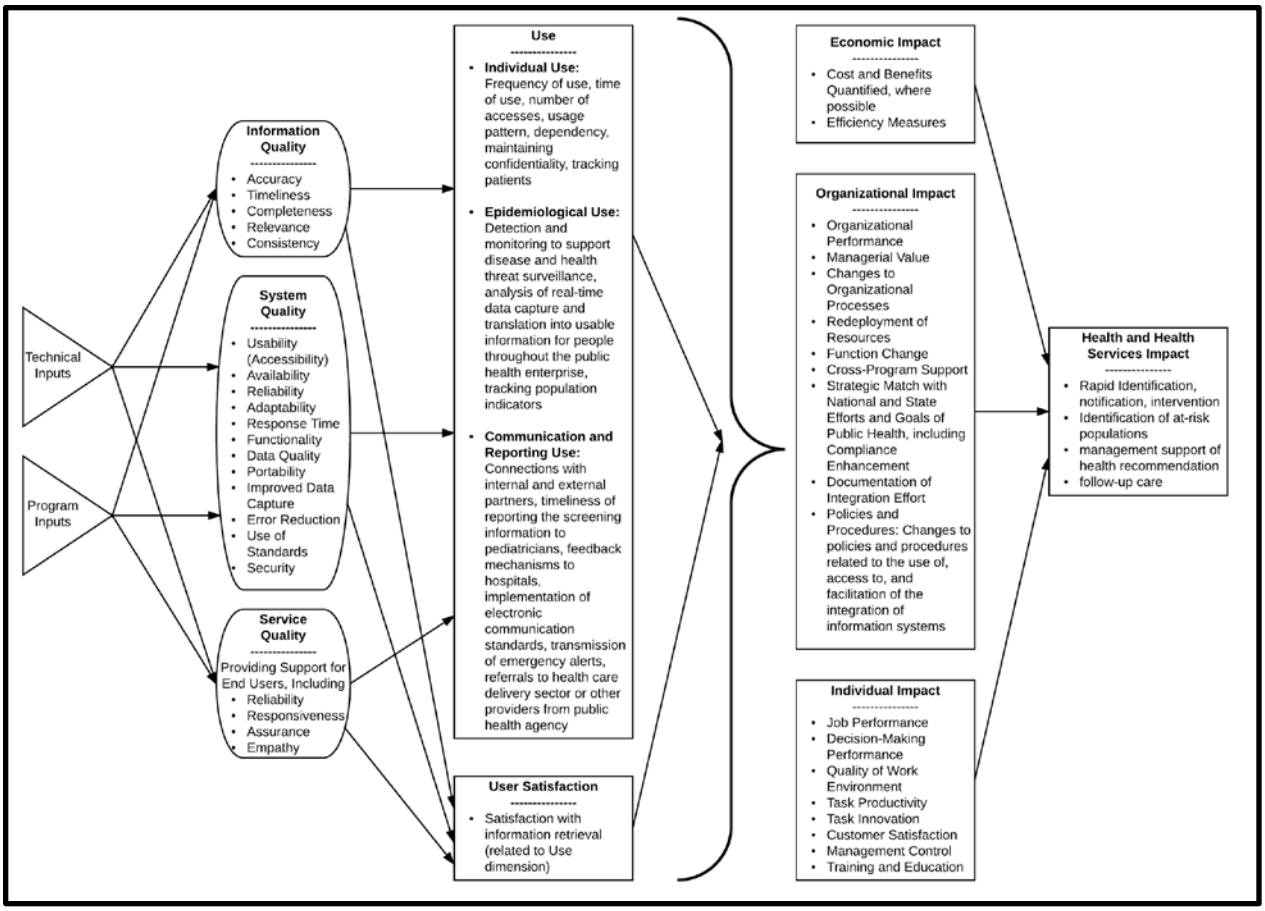

Figure 1.2: "Logic Model for the nine-dimension evaluation framework to assess public health information systems" (adapted from Figure 1, in: Public Health Informatics Institute, Association of Public Health Laboratories. Towards Measuring Value: An Evaluation Framework for Public Health Information Systems. Decatur, GA: Public Health Informatics Institute; 2005)

Review of this evaluation framework showed that it worked well in two critical ways. Firstly, it successfully identified areas within the agency's systems and processes where value was accrued. It highlighted both how an organization can be impacted by systems integration and how integration has to be changed by (adapted to meet) an organization's needs. Secondly, it highlighted areas within the agency that hadn't kept pace with technology changes. The PHII and APHL report noted that this is a key takeaway as many public health organizations, especially large ones, experience this lack of progress uniformity due to varied and complex processes and structures. In such organizations change can be slow.[13]

In line with this framework, the World Health Organization (WHO) recommends, first, elucidating precise definitions of indicators.[16] These indicators can be classified into various typologies that blend with the logical framework approach and support PHII's and APHL's approach (discussed above). Input Indicators represent resources that are needed to implement a given system (personnel, funding, hardware, software, standards, etc.); Process Indicators are used to "monitor and track" public health surveillance activities (training, guideline and protocol development, supervision, etc.); Output Indicators track the immediate results of activities (reports, surveillance data, etc.); Outcome Indicators measure both system quality and the degree to which surveillance objectives were met; and Impact Indicators measure the degree to which the overall objectives of the system are being achieved.[16]

Through a separately framed organizational structure, Drs. Handler, Issel, and Turnock offer a comparable approach in *A Conceptual Framework to Measure Performance of the Public Health System*. Albeit less granular in detail, compared to WHO's description of indicator assessment, this framework allows for public health system assessment in a global sense, about an agency, or with regard to a particular system within an agency. Viewed within the larger Macro context, the framework begins with the public health Mission and Purpose, and its operationalization of goals through "performance of the core functions of assessment, policy development, and assurance" to address this mission and purpose.[17]

Once this mission is described, the evaluation proceeds through an assessment of interdependent components that are viewed both individually and relative to their interrelated impact on each other. For example, Structural Capacity (which includes the same aspects described under Input Indicators, above) informs Processes (core public health services); Processes inform Outcomes; and Outcomes inform both Structural Capacity and Processes. Lastly, this is all assessed within the scope of the outlined mission and purpose (see the Conceptual Framework in Figure 3, below).[17]

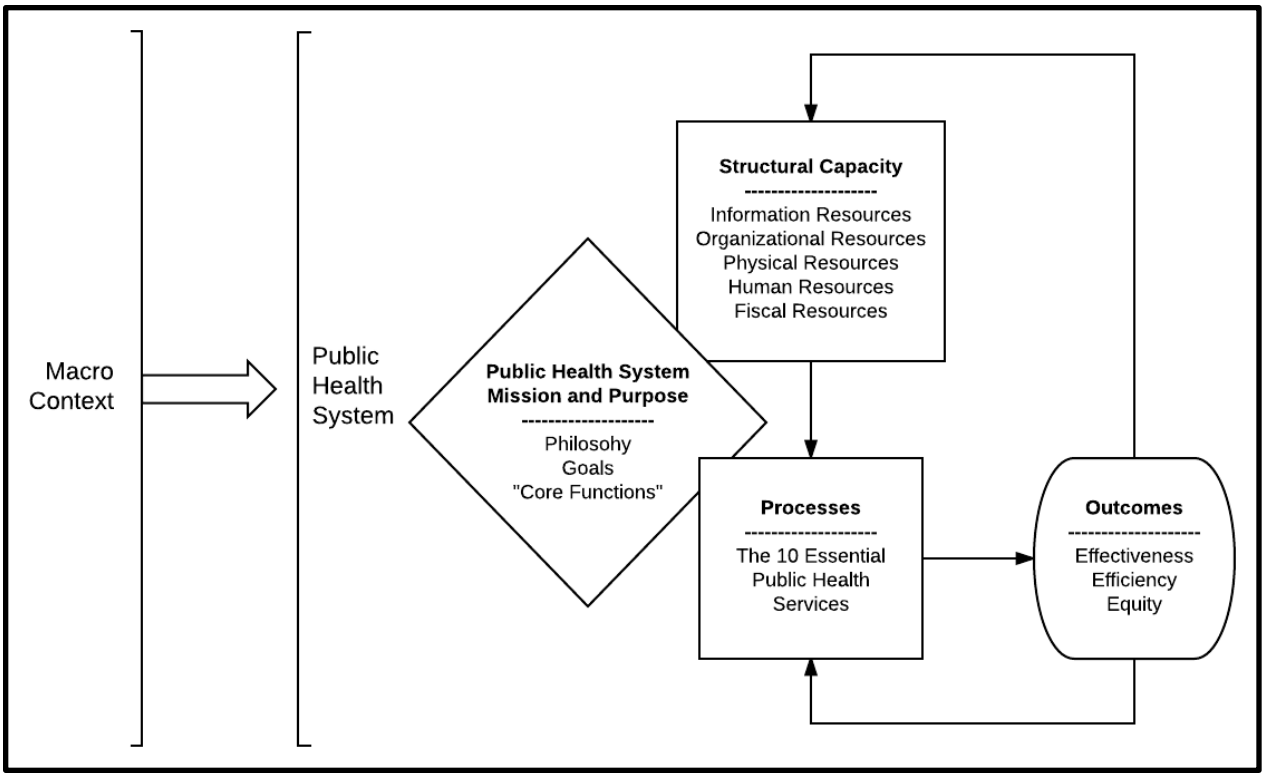

Figure 1.3: "A Conceptual Framework of the Public Health System as a basis for measuring system performance" (adapted from Figure 1, in: Handler A, Issel M, Turnock B. A conceptual framework to measure performance of the public health system. Am J Public Health. 2001;91: 1235–1239.)

By far, however, the most exhaustive evaluation model completed, to date, is the 2013 EDSS Vendor Analysis conducted by PHII. While this review represented a point-in-time analysis, the information contained therein concerns existing, proprietary (a.k.a., "off-the-shelf") EDSSs.[10] While this analysis does date from 2013, it does represent an evaluation of critical components of existing software. And, perhaps most critically, this PHII review also offers a detailed roadmap for public health agencies who wish to complete their own evaluations.

This self-conducted analysis follows an overarching, four step process:[10]

1. Requirements prioritization: Following the *Requirements Comparability Matrix*, provided in this PHII tool, public health agencies should rank system requirements and attributes that are the most important to the agency. This should be a collaborative effort, with stakeholders and users of the system. The overarching categories of the requirements identified in this framework are: "Support for Reportable Conditions Surveillance Core Functions; General System Requirements; Technical Design; Data Exchange and Integration; Data Analysis, Visualization, and Reporting."
2. System Classification: Is the system a comprehensive, specialized, or niche system?
3. Information Gathering: Following the tool-specific processes, identify the critical functions of an EDSS that align with the agency mission and business needs.
4. System Comparison: A comparison between the self-conducted analysis and the completed *Requirements Comparability Matrix*, identifying whether an off-of-the-shelf system would better meet the agency's needs. However, it can also be framed to identify whether an agency's existing EDSS is meeting its current needs, what unrecognized gaps may exist, and what functional opportunities could be capitalized on (if any).

1.4: Necessity of Public Health Informatics

While the explicit and obvious function of EDSSs (and other technologies that support the public health mission) is to improve both the timeliness and quality of information through electronic exchange of data (client-installed and/or web-based software), the less obvious, more implicit challenge with these systems can be found the expanded opportunities that they present. More and more, Public Health is feeling the pressures of increased technological innovation such that, at its core, "its operational model" must change from that of "an 'information consumer' to that of an 'information broker.'" [18] The data that these systems process are arriving at ever-increasing numbers from an increasing variety of data sources, and often need to be communicated to additional, downstream partners through standardized means (message structures; use of ontologies and taxonomies; vocabularies; transport systems; etc.). Additionally, between policy incentives that seek to continue moving Public Health in a direction of increased use of electronic platforms and Public Health facing increasing operational demands without the corresponding financial investment to respond to those demands, many in leadership roles are looking for novel approaches to meet these demands with improved efficiency and operational performance, while positioning their agencies for continued success.[18] Public Health Informatics, as a professional domain, is seen as a significant part of the response to these opportunities.[18]

As a relatively new field, Public Health Informatics includes several operating definitions, including: "the systematic application of information, analytics, computer science, and technology to support the day-to-day work of public health, including surveillance, quality improvement, research, reporting, and health promotion;"[19] it is "an action-oriented science and innovation-driven practice;"[20] and Fond, Volmert, and Kendall-Taylor describe it as involving "the collection, organization, manipulation, processing, communication, interpretation, and visualization of information—all in the service of public health and population health goals."[21] Fond, et al., go further to include an additional set of duties that Public Health

Informatics should undertake, including: creating and managing the technology and tools that support its main goal; determining what data should be collected, how much, and how; determining how to “package” these data for dynamic exchange across varied stakeholders and partners; identifying the most efficient and appropriate means to communicate processed data and information; understanding the people who use data and information, and how and why it is important to them; and, “[to] see the ‘big picture’ and [to] ‘connect the dots’ across all of the other fields related to public health.”[21]

A recent study has found that, while Local Health Departments (LHDs) use a mixed variety of information systems (including: electronic health records [EHRs], Health Information Exchanges [HIEs], Registries, EDSSs, ELR, and syndromic surveillance systems), out of the 505 LHDs surveyed, only 144 (21.8%) had at least one information specialist (defined separately from the role of a traditional I.T. professional).[19] There are several apparent factors shared as a common thread amongst the agencies that have successfully elicited higher levels of information system implementation; in addition to capital to support the investment, geography, and governance status, the engagement of information system professionals played a demonstrable role. [19] As Shah, et al. noted, this is because “[Public] Health Informatics plays a critical role in the daily operation of LHDs and in activities such as mapping, disease surveillance, strategic planning, quality assurance, community resource assessment, vital statistics, environmental health, immunization tracking, and laboratory reporting in addition to strategically making sense of, and guiding, changes in their environment.”[19]

It is important to recognize here, that, unlike some industries where they may be varying degrees of cross-over in types of activities in which organizations may engage, “the majority of the activities [in which Public Health engages] are the sole purview of the public health system.”[19] While epidemiology, as a core domain of public health, is generally concerned with data analysis, Informatics is concerned with the data collection and sharing that both enables this analysis and disseminates its findings, which leads to improved decision making.[21] Public

Health Informatics works to both understand that different organizations and professionals needs access to different types, amounts, and scope of data, at different times; but, it also strives to navigate these distinctions and respond to these “varied practices, needs, and goals.”[21]

There are, however, notable challenges that persist. First and foremost, the informatics workforce is difficult to distinguish and characterize. This is due to a number of factors, not least of which is that public health informatics professionals are often misused or misplaced with public health departments; far too often, the old stereotype of public health informaticians being I.T. professionals persists and critical distinctions between these domains are not acknowledged.[21] Additionally, while it is on one hand difficult to find individuals with the full scope of the requisite training needed within the profession, on the other hand the skillsets of the field are often lost in oversimplification of what is otherwise a complex domain. And, unlike epidemiology that produces discrete results, those that precipitate from public health informatics activities are often far less tangible (e.g., organizational or process improvements).[21]

If the varied public health system and structures throughout the country are to align in an efficient and coordinated fashion, there must be an increased uptake of a qualified public health informatics workforce that can create and manage the various information systems, like EDSSs, that benefit public health stakeholders. Truly, “good information leads to good decisions, which lead to better interventions and better health outcomes.”[21] Public Health Informatics is the key to this information brokering.

1.5: MDSS

The Michigan Disease Surveillance system (MDSS) - a web-based interface developed to national standards to facilitate rapid notification of reportable conditions to LHJs[22] - is a custom-built EDSS that has been in use for communicable disease surveillance at the Michigan Department of Health and Human Services (MDHHS) since June 13, 2004. Currently in version 4.5.1, MDSS undergoes two to three minor version upgrades per year, with occasional patches, and infrequent major upgrades, every few years.[23] While the user interface (UI) in the current version remains very similar to the original program, the software and functionality of the system has been substantially expanded since its inception.

Originally developed by Scientific Technologies Corporation (STC) for the State Health Department (that is now MDHHS), MDSS is currently maintained by Altarum Institute, headquartered in Ann Arbor, Michigan. The business owner of MDSS is the Surveillance and Infectious Disease Epidemiology (SIDE) Section in the Communicable Disease Division at MDHHS.[23]

MDSS is a mature system. It is the foundation for all communicable disease surveillance within the State of Michigan and is fully integrated as a component of all MDHHS communicable disease surveillance activities. It has the capacity to receive HL7 compliant ELRs using LOINC and SNOMED coded results;[24] can accept manual case entry for all reportable communicable diseases; and is the system from which all NNDSS notifications are provisioned for CDC.[23] In the most recent, completed calendar year of activity, MDSS received 214,742 referrals and 150,011 individual case reports.[25] This accounted for nearly 2.5 million transactions in the system, in 2016.[25]

As is the case with most states' EDSSs, MDSS receives ELR and case entry at the state level. Through inherent geo-coding, MDSS then adjudicates the case information to determine the LHJ to which the case should be directed for case investigation and/or intervention. State-level epidemiologists and other surveillance staff also access MDSS for traditional epidemiological analysis of cases and conditions.[23]

Additionally, MDSS is funded solely through a patchwork of federally-supported grants. While the federated nature of Public Health in Michigan is legislatively mandated to support both local autonomy and local authority in public health activities, the ongoing operations and development of MDSS do not receive any LHJ or state dollars.[23] Being that MDSS is the electronic system that underpins all communicable disease surveillance throughout the state, this presents some very unique challenges in aligning the system with both local need and the objectives dictated by the federal funding mechanisms that support the system on an ongoing basis.

1.6: MDSS Evaluation

While there have been past efforts to evaluate various components of MDSS (generally condition specific and therefore narrow in intended scope), there has never been a comprehensive evaluation of MDSS to ensure that MDSS continues to meet the ongoing, programmatic needs of its stakeholders.[23] Further, over the past couple of years, there has been an increase in anecdotal reports of system performance issues, unintended system outages, and various data concerns that impact data trustworthiness (e.g., inexplicable data errors). While inroads have been made to address these issues, a comprehensive evaluation would provide both a baseline for representation of stakeholder need and system performance assessment, as well as a basis for MDSS business owners to begin determining the remaining lifecycle of the system (enhancement or replacement).[23]

The intent of this thesis is to conduct a comprehensive evaluation of MDSS, following the framework recommendations discussed herein, in order to determine whether it is adequately meeting stakeholder needs, how it compares to other available “off-the-shelf” systems, and what recommendations for MDSS can be made to positively impact the future of MDHHS communicable disease surveillance activities. This prospective view includes a discussion of Public Health 3.0 activities and how/whether MDSS is positioned to adapt to the future information requirements of Public Health. A high level cost description and analysis will address the funding mechanisms that support MDSS and the limitations of this funding. An assessment of the current state of informatics within the Communicable Disease Division will be made, as the future success of electronically-based surveillance activities will be largely dependent on adequate informatics structures for operational support. And, a cross-comparison with other “off-the-shelf” systems will provide for a system assessment vis-à-vis comparable EDSSs available for use on the general market.

Chapter 2 - MDSS Evaluation Methodology

2.1: Evaluation Methodology Basis and Justification

The primary goal of this evaluation is to determine whether the current functionality of the Michigan Disease Surveillance System (MDSS) adequately meets public health surveillance strategy requirements for the public health community in Michigan. The specific study aims of this evaluation seek to address this fundamental question across stakeholders of the system (end users and system funding objectives/requirements) and relative to other available [a.k.a., "off-the-shelf"]) systems. Additionally, a cost assessment and baseline informatics capacity measures (that can be used for ongoing system assessment over time) have been established, herein. These components of the evaluation culminate in final system recommendations.

The evaluation process is subjectivist in design, resting primarily on a Responsive/Illuminative approach[26]. As Friedman and Wyatt note, such evaluation designs are particularly useful in Informatics when documenting a need for a system and/or when identifying its "niche within a given work environment."[26]

The study type is a Needs Assessment.[26] While this type of assessment typically occurs prior to resource or application design, it is appropriate here as it can be used to inform future decisions about future application designs or modifications to replace or enhance MDSS.

A Responsive/Illuminative approach is predicated on methods borrowed largely from ethnography (it is naturalistic; i.e., it is not constrained to experiments and tests).[26,27] While objectivist evaluation designs tend to focus on quantitative analysis of quality measures, as a subjectivist design, the Responsive/Illuminative approach focuses more on the qualitative aspects of a system through "observations, interviews, and reviews of documents."[26,27] Such an approach is appropriate in this evaluation as it is designed to capture that which is important to end users and other stakeholders. Capturing such value is not necessarily always discernible in quantitative analysis which tends to focus on effects identified through experimentation in lieu

of identifying processes through empirical study.[27]

The “Responsive” aspect of this approach is argued by Maxwell to be concerned primarily with providing a “transactional and participatory orientation” in effort to discern the “meaning and value of a program [to its users].”[27] Therefore, when undertaking a responsive approach, evaluators typically begin by observing use of the program in a naturalistic manner and talking with users/stakeholders. This, in turn, establishes key issues of concerns and outlines/highlights salient attributes of the system (both “good and bad, successful and unsuccessful”) as identified and elucidated by the individual experiences of the evaluation participants.[27] In reporting in a Responsive approach, the goal is to both identify the key components of the system/program and to highlight the various perceptions of the value and worth of those components.[27]

The “Illuminative” aspects of this approach are concerned more with the development of the system over time, how and why “it has been shaped by its context,” and the various demands that have been placed on it to which the system’s custodians have had to respond over the course of its lifecycle.[27] “[...] Effects are seen as embedded in the context of the program.”[27] Like its empirical complement, the Responsive approach, the Illuminative approach focuses more on processes than outcomes. A successful illuminative evaluation will succinctly represent the program’s key “operational features, highlight its critical and problematic features, encompass its common and atypical experiences, expose its framework or interconnection of components, reveal the similarities and differences of various viewpoints and opinions, and untangle any puzzling dilemmas or confused thinking about it.”[27] As Maxwell noted, the Illuminative approach starts at a higher level of observation and analysis, drills down progressively into more granular aspects of a system, and then ultimately concerns itself with explanation of causation. Maxwell refers to Parlett’s and Dearden’s three-staged development of the Illuminative approach: *observation* (to “program orientation and setting”); *progressive focusing* (where “emergent issues are identified and explored progressively”); and

explanation (of the “reasons for effects and opinions [...]”).[27,28] Friedman and Wyatt frame a similar argument, albeit in a different light. For Friedman and Wyatt, Maxwell’s initial *observation* phase begins as initial immersion and data collection.[26] From there, Friedman and Wyatt describe an iterative loop (akin to Maxwell’s *progressive focusing*) included in which Friedman and Wyatt embed “member checking:” in other words, referring back to the participants for validation of whether the evaluator’s findings are reasonable.[26] Lastly, both the Friedman/Wyatt text and Maxwell describe a final output in which causal explanation is prepared and reported.[26,27]

These two methods are often used in tandem as their distinction is not always clearly identifiable. Some have even gone as far as framing the Illuminative model in terms of a particular subset of the Responsive model.[27] Indeed, though, they should be seen as complementary, a Responsive evaluation is “populistic” in both its reliance and deference to users. The Illuminative approach, by contrast, is more “expository.”[27] As Maxwell observed, the empirical nature of such a framework (or, “qualitative and discursive,” as framed in Maxwell’s terms) is such that the evaluator must continually validate the accuracy of the observations (a.k.a., “member checking,” per Friedman and Wyatt).[26,27] Maxwell’s description of these methodologies is further corroborated by Friedman and Wyatt, who describes subjectivist design’s as “‘thick’” or insightful description - the intent of which is to lead to a more profound understanding of the system. Such designs lead to persuasive argument, rather than simple demonstration.[26] Maxwell’s description of the Natural History of Subjectivist Study can be seen in figure 2.1, below.

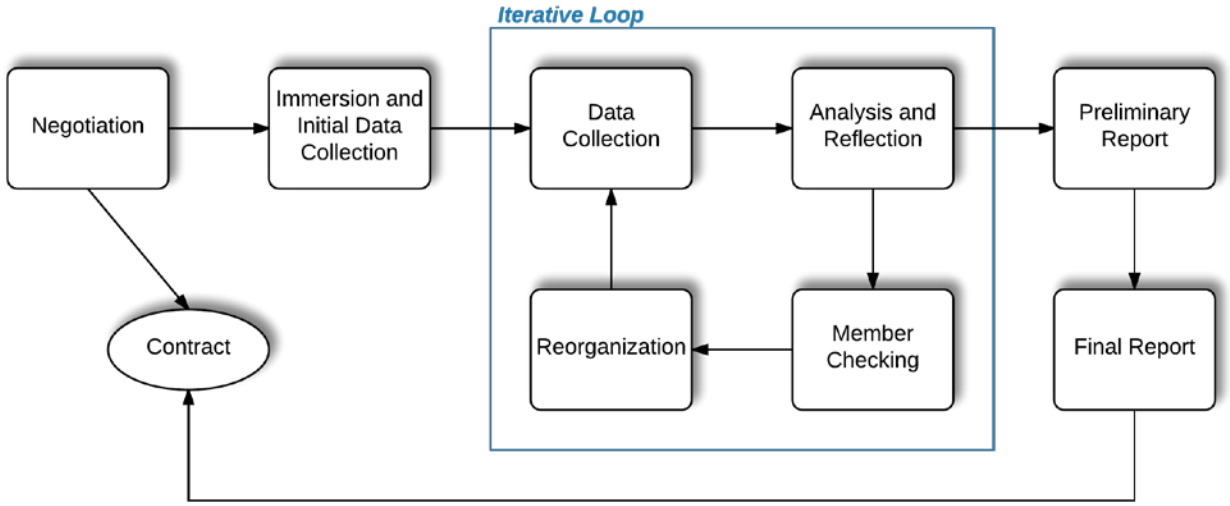

Figure 2.1: "Natural history of a subjectivist Study"
(adapted from Figure 9.1, in: Friedman CP, Wyatt JC. Evaluation Methods in Biomedical Informatics. 2nd Edition. New York, New York: Springer Science+Business Media, Inc. 2010)

In terms of the study type, a Needs Assessment is being used to identify information problems encountered by system users. As noted above, this type of study customarily occurs prior to system design. It is used here, however, as a quasi-design validation type, which may be used to inform system owners of future development needs. Additionally, the Needs Assessment study type allows for comparative analysis of other systems, and blends well with the empirical nature of the subjectivist approach. Table 2.1, below, highlights study type distinctions.

Study type	Aspect studied	Broad study question	Audience/stakeholders primarily interested in results
1. Needs assessment	Need for the resource	What is the problem?	Resource developers, funders of the resource
2. Design validation	Design and development process	Is the development method in accord with accepted practices?	Funders of the resource; professional and governmental certification agencies
3. Structure validation	Resource static structure	Is the resource appropriately designed to function as intended?	Professional indemnity insurers, resource developers; professional and governmental certification agencies
4. Usability test	Resource dynamic usability and function	Can intended users navigate the resource so it carries out intended functions?	Resource developers, users
5. Laboratory function study	Resource dynamic usability and function	Does the resource have the potential to be beneficial?	Resource developers, funders, users, academic community
6. Field function study	Resource dynamic usability and function	Does the resource have the potential to be beneficial in the real world?	Resource developers, , funders users
7. Lab user effect study	Resource effect and impact	Is the resource likely to change user behavior?	Resource developers and funders, users
8. Field user effect study	Resource effect and impact	Does the resource change actual user behavior in ways that are positive?	Resource users and their clients, resource purchasers and funders
9. Problem impact study	Resource effect and impact	Does the resource have a positive impact on the original problem?	The universe of stakeholders

Table 2.1: “Classification of generic study types by broad study questions and the stakeholders most concerned” (copied directly from Table 3.1, in: Friedman CP, Wyatt JC. Evaluation Methods in Biomedical Informatics. 2nd Edition. New York, New York: Springer Science+Business Media, Inc. 2010)

Additionally, the Needs Assessment study type is the most amenable to the evaluation frameworks discussed in Chapter One, herein, in terms of study attributes, as it is the only study type concerned with sampling real system users and distilling analysis of process, user skills, knowledge, decisions and/or actions, cost, organization, and outcomes. Table 2.2, below, summarizes the distinctions between study type attributes and factors, and highlights the appropriateness of the Needs Assessment study type.

While, according to this table, a Needs Assessment is typically conducted when there is not a pre-existing resource or it is expected that the pre-existing resource will be replaced, it is appropriate here as this evaluation provides a baseline assessment of the minimum set of qualities required of any EDSS in use by MDHHS for communicable disease surveillance. This evaluation is agnostic to any preconception as to whether MDSS *should* be replaced. Rather, this evaluation is charged with setting the baseline metrics for what constitutes as successful EDSS at MDHHS, as well as highlighting gaps and opportunities for system improvement, and preparing for the EDSS lifecycle, regardless of the EDSS in use. By definition, this could result in continuation of the current track (if deemed adequate), enhancement of the existing system, or replacement of MDSS, altogether. As such, a Needs Assessment is amenable to fulfilling this charge.

Study type	Study setting	Version of the resource	Sampled users	Sampled tasks	What is observed
1. Needs assessment	Field	None, or pre-existing resource to be replaced	Anticipated resource users	Actual tasks	User skills, knowledge, decisions, or actions; care processes, costs, team function or organization; patient outcomes
2. Design validation	Development lab	None	None	None	Quality of design method or team
3. Structure validation	Lab	Prototype or released version	None	None	Quality of resource structure, components, architecture
4. Usability test	Lab	Prototype or released version	Proxy, real users	Simulated, abstracted	Speed of use, user comments, completion of sample tasks
5. Laboratory function study	Lab	Prototype or released version	Proxy, real users	Simulated, abstracted	Speed and quality of data collected or displayed; accuracy of advice given, etc.
6. Field function study	Field	Prototype or released version	Proxy, real users	Real	Speed and quality of data collected or displayed; accuracy of advice given, etc.
7. Lab user effect study	Lab	Prototype or released version	Real users	Abstracted, real	Impact on user knowledge, simulated/pretend decisions or actions
8. Field user effect study	Field	Released version	Real users	Real	Extent and nature of resource use. Impact on user knowledge, real decisions, real actions
9. Problem impact study	Field	Released version	Real users	Real	Care processes, costs, team function, cost effectiveness

Table 2.2: “Factors distinguishing the nine generic study types”
(copied directly from Table 3.2, in: Friedman CP, Wyatt JC. Evaluation Methods in Biomedical Informatics. 2nd Edition. New York, New York: Springer Science+Business Media, Inc. 2010)

2.2: Evaluation Framework - (a) Overarching Design

Following the PHII framework, “Towards Measuring Value,” discussed in Chapter One, Section 1.3:(c), and using the iterative, progressive granularity approach described in Chapter Two, section 2.1, the overarching design of the framework follows technical and programmatic inputs into the existing surveillance model assesses their impact on defined attributes that represent Information Quality, System Quality, and Service Quality. These attributes are outlined in Chapter One, Section 1.3:(c) and can be found in Figure 1.2, “Logic Model for the nine-dimension evaluation framework to assess public health information systems.”

This nine-dimension framework, as outlined in “Towards Measuring Value,” is appropriate within the context of this evaluation, as it fits the subjectivist approach, described hereinabove, and meets several, generally-accepted requirements of EDSS evaluation as outlined in sections 1.3:(b) - (c).

For example, as was noted in Chapter One, Section 1.3:(b), CDC guidance on EDSS evaluation recommends prioritization and review of meaningful core surveillance attributes. [1,12] The attributes should be evaluated on how/whether they contribute to meeting system objectives, quality, importance, and cost. Comprehensively, these attributes are evaluated within the larger context of how they impact “system quality; information quality; use; user satisfaction;” and impact on individuals.[12] In addition to these conceptual aspects of system evaluation, consideration to the technical design (hardware, software, interface, etc.) is be paid.

In this nine-dimension framework, these core evaluation requirements are met: both the conceptual and technical aspects of system evaluation requirements are met through assessment of technical and programmatic inputs in how they impact various quality measures which are defined by various system attributes (including the core surveillance attributes described in Chapter One); the resulting impact on these quality measures has subsequent impact on both use (Individual, Epidemiological, and Communication/Reporting/Dissemination) and user satisfaction - this is the larger context in which CDC recommends viewing attributes;

from there, impact is evaluated (on individuals, as prescribed above; but also in terms of economic and organizational impact); and, finally, how this ultimately impacts health services and population health.

2.2: Evaluation Framework - (b) Iterative Observations and User Feedback

Following Friedman/Wyatt and Maxwell's guidance for Responsive/Illuminative evaluation, this framework follows a staged, multi-phase approach. Evaluation begins through initial observations and data collection with a sample user-base of teams in high-utilization program groups. In this study, The Hepatitis C and Sexually-Transmitted Diseases (STD) units were shadowed as they represent the two programs that surveil conditions with the highest burden of disease, of all the units who subscribe to MDSS for disease surveillance. Two units were selected for shadowing in this phase, following the representative sample population identified in the Representative Focus Group Composition outlined in table 2.3, below. Initial observations were conducted with the MDHHS-based unit teams (not LHDs or ELR generators). These initial observations were used to distill core program processes and system requirements (as dictated by both funding objectives and unit needs). Additionally, funding requirements and metrics from other core program areas were compared and contrasted as part of this initial, high-level requirements derivation; the other core program funding mechanisms that were evaluated were the Assessment, Assurance, Policy Development, and Prevention Strategies (AAPPS) grant – which supports STD surveillance; the Public Health Emergency Preparedness Cooperative (PHEP) - which provides funding for emergency preparedness and regional epidemiologists; and, Tuberculosis grant funding - which supports the Tuberculosis unit.

A second-level iteration of observations was then achieved through focus group discussion. This discussion group was used as a member-checking technique for the information gathered through the first set of observations and to glean new information to be considered. A roughly representative sample of system users was invited to participate in these discussions. It was expected that the discussion group would be limited to 20 persons so as to maintain a manageable group size where valuable discussion could be facilitated. Using MDSS user data from July, 2016, the active MDSS user base was roughly 1550 individuals. In order to maintain a representative focus group of 20 individuals, a focus group of 6 healthcare provider

staff, 3 laboratory staff, 9 LHJ users, and 2 MDHSS-Bureau of Epidemiology (BOE) users was targeted. The 9 LHJ users was separated into two groups: 2 regional epidemiologists and 7 LHJ staff; and, the 2 MDHHS-BOE staff were solicited from the Hepatitis and STD units. Table 2.3, below, outlines the representative sample that was targeted. The emphasis of observation for this target focus was on use of MDSS, user satisfaction, and how these affect the three subsequent impact areas (economic, organizational, and individual) and population health and health services.

MDSS User Type	Count of Active Users	Proportion of User Base	Calculated Focus Group Member Count	Final Focus Group Member Count	Additional Notes
Healthcare Provider/Staff (including Hospitals)	423	27.45%	5.49	6	
Laboratory	233	15.12%	3.02	3	
Local Public Health Jurisdiction Users (LHJ)	653	42.38%	8.48	9	(2 Regional Epidemiologists[1] and 7 LHJ reps)
MDHHS-Bureau of Epidemiology (BOE)	154	9.99%	2.00	2	(Hepatitis and STD units)
(blank)	78	5.06%	1.01	N/A	
Grand Total	**1541**	**100.00%**	**20.00**	**20**	

Table 2.3: "Representative Focus Group Composition"

The specific observations recorded over the course of these first two phases were clearly documented and made available as part of the evaluation output (see Appendix B: Responsive/Illuminative Analysis – Focus Group Discussion Summaries). Individual names and experiences were redacted so as to solicit the most accurate feedback possible and to protect individuals from any unauthorized disclosure of their opinions, feedback, or user perspective.

[1] Regional Epidemiologists are MDHHS-employed personnel who serve an intermediary, "on-the-ground" role between central office staff and local health departments. While they are technically MDHHS-BOE users of MDSS, they have the unique capacity to also represent the LHJ user experience, especially for those LHJs who may not have representation at these focus group discussions. As such, they are classified here as LHJ users of MDSS. At step three (the individual MDSS user survey), these Regional Epidemiologists will be classified within the MDHHS-BOE user role.

A third and final step in user feedback was solicited through a general survey of existing MDSS users. This survey was used both as validation of observations obtained in the two steps described above, and to solicit additional qualitative feedback. A 10% survey response rate was targeted. These three phases of the approach are discussed in the final evaluation and recommendations, and serve as the primary driver behind the system functionality prioritization in the EDSS cross-system analysis, discussed below in section 2.2:(c).

2.2: Evaluation Framework - (c) Cross-System Comparative Analysis

While the intent of this evaluation is to distill functionality of EDSSs that is critical for communicable disease surveillance at MDHHS, and while this evaluation is agnostic as to which system would best serve in that capacity, a critical component of the evaluation is to provide a baseline qualitative assessment that assists the Communicable Disease Division (CD Division) leadership in determining whether MDSS should continue to be the EDSS of choice. The standardized approach outlined in the Requirements Comparability Matrix (EDSS Vendor Analysis Appendix A) of PHII's *Electronic Disease Surveillance System (EDSS) Vendor Analysis: An Overview of the Selected EDSS Landscape for Public Health Agencies* (2013) was used to compare MDSS to Comprehensive EDSSs documented in this vendor analysis.[29] The observations obtained in the "Iterative Observations and User Feedback" steps (Section 2.2:(b), above) were used to satisfy the Information Gathering Process (EDSS Vendor Analysis Appendix D).[29] Through the Interview Guide (EDSS Vendor Analysis Appendix E) in this guidance, any outstanding questions or gaps identified in the analysis of system requirements were satisfied through interviews and feedback from vendors included in the analysis.[29]

2.2: Evaluation Framework - (d) Funding Analysis

Additionally, a funding analysis of MDSS was conducted in order to adequately reflect the economic environment in which it has been developed and is currently found. The factors of this economic ecology may be found to be system strengthening or limiting factors, depending on the economic attribute in question. Providing an analysis of these factors would be critical in determining the future of MDSS and whether it is best suited for enhancement or eventual replacement. This cost analysis follows a high-level approach. It looks at funding mechanisms, dedication of dollars, and identifies funding gaps. As noted above, in section 1.5, the unique challenges of the environment in which MDSS finds itself - a legislated paradigm where neither the legislature nor those with local public health authority directly contribute to the operations and development of the system upon which communicable disease surveillance is predicated - are such that the nuances of system funding must be evaluated in order to determine the specifics of existing financing limitations and possible opportunities on which the Communicable Disease Division could capitalize. Return on Investment (ROI), which could be seen here as the burden of disease mitigated across the course of the MDSS lifecycle, will not be reviewed in detail, as it is outside the scope of this project.

2.2: Evaluation Framework - (e) Informatics Capacity Self-Assessment

In order to address the informatics challenges identified in Chapter One, Section 1.4, PHII's *Building an Informatics-Savvy Health Department: A Self-Assessment Tool* was used to provide an assessment of informatics capacity in the Communicable Disease Division of MDHHS.[18,30,31] This assessment resulted in both a baseline view of the Communicable Disease Division's informatics capacity and was used to facilitate specific recommendations on how to enhance how the Division capitalizes on the domain of Public Health Informatics.

2.2: Evaluation Framework - (f) Prospective Public Health Capacity Readiness

As we look toward the future of communicable disease surveillance and the role that it has to play in population health practices, it is important to identify not only whether MDSS is meeting current needs and objectives, but whether it is positioned to adapt to future programmatic, technological, and interoperability needs. Additional development considerations are discussed, how these development projects fit within Public Health 3.0 targets, and to provide specific recommendations about how to ensure that EDSS utilization continues to remain on the forefront of innovative public health practice, in Michigan.

Chapter 3 – MDSS Evaluation Results

3.1: Responsive/Illuminative MDSS Analysis – (a) Initial High-Level Requirements Gathering Results

The responsive/illuminative approach used in the MDSS evaluation is predicated on two overarching assumptions: 1.) that the approach will be carried out in a cyclical fashion (the natural history of subjectivist study) - where each iterative loop through the approach dives deeper into the findings derived at the previous loop. This serves to validate or reject the findings from the previous cycle (a.k.a., member checking) while gaining more granular insight into the key findings of the analysis; and, 2.) that the qualitative experience of users throughout a system serves a critical role in identifying whether a system is, or has the potential to be, successfully implemented and utilized. While a quantitative approach is often recommended in EDSS analysis[4,15,32], and is an approach that certainly adds value to assessment, quantitative analysis often lacks the ethnographic component that is key in determining whether system users are invested in a system, or are even willing to engage with it - for example, quantitative system analysis can provide an excellent picture of data timeliness or how complete the data quality is; but, it cannot tell you whether users like the system and are committed to its uptake.

The first iterative loop in this MDSS responsive/illuminative approach consisted of an initial requirements gathering phase where the STD and Viral Hepatitis Surveillance and Prevention units were shadowed, as they represent the units that surveil diseases with the highest incidence. Additionally, the requirements of three separate funding mechanisms were reviewed. This provided an initial perspective into system requirements from program management staff (those who both monitor LHJ user activity in MDSS and ensure that activities in MDSS are meeting funding source requirements) and it allowed for distillation of both the cross-cutting requirements shared by funding mechanisms and the unique aspects of each funding source.

The shadowing summary and funding source review details can be found in ‘Appendix A - Responsive/Illuminative Analysis – High-Level Requirements Discussions and Funding Review’.

Program/Unit management shadowing was conducted between late September 2016 and early December 2016. Four program-area unit staff were shadowed (two from STD Surveillance and two from Viral Hepatitis Surveillance and Prevention). In each circumstance, key program/unit processes were documented and user experience was used to provide insight into how MDSS facilitates or inhibits accomplishing routine program tasks.

Both units’ interaction with MDSS was shown to reflect two key - albeit counterintuitive - aspects of disease surveillance that are presumptively shared by all surveillance units: 1.) The specific processes by which surveillance is conducted varies widely across units; and, 2.) All units must find ways in which these varied surveillance processes can be conducted through the available, singular EDSS. The factors that account for these variations across disease surveillance units are widely documented and can include: morbidity and mortality of the disease; whether the disease is pathogen or syndrome specific; the resources needed to conduct the surveillance; whether the data are used to monitor or to develop measures for control and prevention; etc.[33] Additionally, as review of the funding metrics for three funding sources shows, third-party requirements can heavily influence the manner and methodology of surveillance activities: targeting specific, funding source objectives; community partners involved in surveillance and/or intervention; cross-program coordination; follow-up; etc. This, in turn, requires that the EDSS in use be rigid enough to be both complete and consistent over time and flexible enough to meet the unique needs of each program/unit area.

For example, while both shadowed units surveil diseases with some of the highest disease burden of all reportable conditions in the State of Michigan (syphilis, gonorrhea, chlamydia, and chronic hepatitides B and C), the manner in which surveillance is conducted between these two teams is remarkably different.

In STD surveillance, while there are both the program/unit team members at the State-level and the LHJ team members at the local level (as there are in Hepatitis surveillance), there is also an additional level of staff that, functionally, sits in between these two groups - the Disease Intervention Specialist (DIS) staff. These personnel act locally but are functionally part of the State-level surveillance structure. The presence of these team members is a reflection of the degree and scope of activities that go into STD surveillance, treatment, and case follow-up. Additionally, the presence of these staff places additional functional requirements on the EDSS used for surveillance - namely, while MDSS was not designed specifically to accommodate such DIS staff, it must be able both to accommodate units that do not employ DIS staff and handle case assignment to DIS staff and case approvals for STD surveillance.

The STD surveillance program/unit area at the Communicable Disease (CD) Division is extensively involved in each step of the surveillance process; it is either directly or indirectly involved in each of the following steps, from the time that a potential case is initiated in MDSS to when that case is closed: initiation -> case prioritization -> case management assignment -> case investigation with cross-program checks -> individual and partner services -> intervention -> treatment follow-up -> case review and analysis.

Additionally, metrics are closely followed at each one of these steps for progress measures. These metrics are used to report both downstream (quarterly reports to DIS supervisors and LHJ administrators) and upstream (to funding source).

Hepatitis surveillance at the program/unit level is substantively different. While the STD Surveillance unit plays a direct role in individual case investigation and management, the unit that surveils acute (non-perinatal) and chronic hepatitides B and C takes much more of a supervisory position than it is directly involved with investigation of individual cases - which is an LHJ-reserved activity. For viral hepatitis surveillance, the program unit at the MDHHS is more heavily involved with the ongoing triage of lab and case report form (CRF) data quality, ensuring appropriate case classification (acute vs chronic), ensuring appropriate deduplicated

patients/merged cases, and (more recently since the advent of Hepatitis C treatment options) identifying cases where infection has cleared.

In reporting, too, this unit differs substantially from the STD Surveillance unit. While this unit does report both downstream and upstream, the downstream reporting seems to happen in a more passive sense - the reporting isn't conducted based on specific, individualized metrics for each LHJ, but rather occurs mostly as an extensive annual report that is publicly available and represents Statewide findings (some individualized LHJ figures do exist in this report).[34] For both units, however, many commonalities in their respective experiences with MDSS seemed to persist. For example, both units spend a significant amount of time conducting both data validation (ensuring correct data) and data cleaning in MDSS. The STD Unit engages in weekly activities to export recent case information, clean the data, conduct analysis (primarily in SAS), and deduplicate patients who have co-infection(s) across other surveillance systems (e.g., HIV co-infection identified via eHARS record review). The Viral Hepatitis Surveillance and Prevention unit, likewise, pursues ongoing activities to ensure that all laboratory result data is reflected in the CRF (a function of the CRF diagnostic tests section not communicating with the laboratory results tab within MDSS); to verify that data is being entered as needed for appropriate case classification; to verify that unique, individual cases are being created or merged appropriately; to utilize data exports for cross-reference with other public health systems (like the Michigan Care Improvement Registry [MCIR] for vaccine record checks for hepatitis B cases).

The STD unit is directly involved with both the case assignment and case closure of all syphilis cases (assignment and closure of both chlamydia and gonorrhea case assignment are handled by the LHJs, as the case counts are too high to be handled manually by the STD Unit in the CD Division) - the STD unit individually assigns all incoming syphilis cases, and reviews each case and partner interview records as they are closed to ensure that all necessary data have been appropriately entered by DIS and LHJ staff. These case assignments currently

require manual intervention, as MDSS is not capable of prioritizing syphilis cases based on titer, pregnancy status, or lack of recent case(s) within the past 6 months (i.e., which would represent a new syphilis infection). Similarly, the Viral Hepatitis Surveillance and Prevention unit individually reviews each incoming record to ensure that the person was appropriately deduplicated and that any case merges were correctly executed.

It should also be noted here that, since the time that this shadowing was conducted, several functional improvements have been added to MDSS which have changed some of the workflows described in the shadowing notes (Appendix A). For example, new/incoming Hepatitis C labs now auto-merge into existing Chronic Hepatitis C cases, when the patient is auto-matched by the system and the corresponding Hepatitis C case is both confirmed and closed; this was implemented to help reduce the need to ensure deduplication of these closed/confirmed Hepatitis C cases. It does not, however, remove the need for monitoring deduplication and merging, as many hepatitis cases are not confirmed/closed Hepatitis C cases and it will not auto-merge Hepatitis C labs for patients who are not auto-matched. It is expected that these types of incremental improvements will continue to be implemented and expanded in MDSS.

This also highlights one of the key beneficial features of MDSS - its flexibility. As long as adequate funding is available to support improvements in, or extensibility of, MDSS, then these improvements/extensions are generally fairly easy to procure. These enhancements are often unit/program-specific (like the auto-merging of Hepatitis C labs), but can then often be extended to other programs/condition surveillance at later dates, more cost-effectively, once the concept has been proven. The same is not necessarily true of proprietary surveillance systems that, much like EHRs, tend to commit to system enhancements when a demonstrable need is expressed by the overall client base. They do not necessarily exhibit the same degree of flexibility for system enhancements.

Just as each of these program areas places both general and unique requirements on MDSS, so too do the financing mechanisms that support the program areas who use MDSS. For this initial review, three funding mechanisms were addressed: the Public Health Emergency Preparedness (PHEP) Cooperative Agreement funding; Assessment, Assurance, Policy Development, and Prevention Strategies (AAPPS) funding for STD surveillance; and Tuberculosis Surveillance funding.

Each of these funding mechanisms placed a shared emphasis on continuous system and information improvement - that the status quo of any system, while quite possibly representing a strong system, can always be improved. The PHEP metrics refer to the "surveillance and disease reporting infrastructure [continuing] to be enhanced through system upgrades, the addition of users[,] and by new electronic data streams." While AAPPS seems to make more specific requirements for system improvements, these requests have the larger aim of sustaining continuous development of system and information quality: improvements to case-based data collection (gender of sex partners, pregnancy status, treatments, etc.); improved proportion of cases with geo-coded addresses; more automated matching of co-infection cases across disparate systems; etc. For Tuberculosis surveillance funding, all of the activities in Strategy 2 ("Surveillance of TB Cases and Case Reporting") are explicitly outlined to support the priority 1 task of "timely assessment and reporting of all confirmed TB cases and identifying surveillance infrastructure gaps and system needs."

Of course, each funding source also contains specific requirements that are unique to the funding agreement. PHEP, for example, makes several detailed requirements for MDSS, including: requiring that MDSS remain flexible to the dynamics of NNDSS (e.g., implementation of MMGs for NMI); promoting registry linkages (EDRS, MCIR, MPI, etc.); and, supporting the ongoing onboarding of ELR senders into MDSS. Likewise, PHEP also makes specific requirements that implicitly affect MDSS, including: requiring ongoing use of the Weekly

Surveillance Report (WSR) which is published through an MDSS function; and, MDSS training and troubleshooting being conducted by regional epidemiologists.

While some of the MDSS enhancements required by AAPPS were noted, above, others (like PHEP) also make implicit requirements of MDSS, including: the dissemination of MDSS-housed information for reporting purposes; monitoring of screening and treatment guidelines; improving timeliness between case initiation and closure of investigation; maintaining a website with complete, annual data; cross-program coordination and co-infection identification; use of alerts; and, identification and targeting of priority areas based on review of data trends.
And, while the Tuberculosis surveillance funding has the larger aim of infrastructure support and improvement, the individual objectives are specific to Tuberculosis surveillance: linkage of genotyped results to case surveillance data within specified timeframe; RVCT follow up reports 1 and 2; surveillance liaisons with a variety of community partners; and, ongoing feedback summarizing Tuberculosis surveillance data.

With respect to the three quality metrics in the Public Health Informatics Institute (PHII) Nine-Dimension Evaluation Framework, this initial requirements gathering has demonstrated a particular emphasis on both MDSS's information and system quality. Of particular note are the attributes of Accuracy, Timeliness, Completeness, and Consistency (in 'Information Quality'); and, Reliability, Adaptability, Functionality, Data Quality, and Error Reduction (in 'System Quality'). This initial review shows that high variability in inputs can significantly and adversely affect Accuracy, Completeness, Consistency, Data Quality, and Error Reduction. This impact, in turn, erodes confidence in the system and the information. As a result, program activities have a heavy focus on continual validation of data within the system in order to preserve effective epidemiological use and reporting/communication with community partners. Additionally, it became clear during the course of this shadowing that there is a significant amount of data analysis and inter-program coordination that occurs outside of the MDSS application, itself. It should be acknowledged that MDSS is not always the only limiting factor (e.g., eHARS does not

interoperate with other systems, so co-morbidity identification with eHARS-housed data will never be possible within a single system, regardless of the EDSS employed by the CD Division). But, even when these other systems do offer some degree interoperability, MDSS does not currently have the capability to communicate with these systems. MDSS's design and architecture are artifacts of an era when surveillance systems were primarily repositories of information. This initial requirements review shows, however, that there is need from both a programmatic and a funding source perspective that promotes more information brokering. It should be noted here, that there are currently projects that are underway to begin facilitating limited data exchange with other MDHHS-owned applications (EDRS and possibly MCIR). But, even though these initial forays into MDSS interoperability will be critical steps at further systems integration in the future, these projects are very limited in scope and are not likely to demonstrate significant impact on the reduction of workflow burdens associated with data cleaning, validation, and analytics, as illustrated in this initial assessment.

Lastly, in terms of data analysis, MDSS does not currently offer any ad-hoc data query tool; only canned reports and data exports can be generated for subsequent analysis by outside, third-party systems (Excel, SAS, Link Plus, etc.). As was made clear by unit-level managers and staff throughout this initial review, there is a demonstrable need for an ability to run ad-hoc data queries that aggregate and present data in a format that conforms to user need. For example, while STD funding requires analysis of treatment and adherence to treatment guidelines for syphilis, there is no effect means of aggregating and exporting historical treatment information that would easily facilitate this analysis.

3.1: Responsive/Illuminative MDSS Analysis – (b) Focus Group Discussions Results

In March of 2017, a series of three focus group discussions were convened to further build on the results elucidated during the initial phase of this responsive/illuminative evaluation. This second level of analysis follows the iterative loop of the responsive/illuminative framework. These discussions occurred once-a-week, for three weeks, for one hour each. Discussion group participants were solicited on a first-come, first-serve basis, relative to their MDSS User Role, through an online survey platform. The target group composition was based on the figures outlined in Table 2.3: “Representative Focus Group Composition.” Participants were asked whether they wished to participate in focus group discussions on MDSS and whether they would be able to attend all three scheduled discussions. While attendance at all three sessions was not mandatory, participants who indicated that they could attend all three were prioritized for an invitation.

Of the 30 responses, one was a duplicate entry, one was for a person who completed the survey even though he/she did not want to participate in the survey, four responses could not commit attending all of the discussions, and six were later removed - either through their own volition or due to adequate representation from respondents for that particular user group. None of the responses were for commercial or hospital laboratory-based MDSS users. While at first glance this may appear that laboratory-based users were then under-represented in this sample, laboratories typically do not have a lot of engagement with MDSS. Laboratories interaction with MDSS rests with initial case reporting, and this usually occurs in an automated way such that laboratory-based users do not need to directly access MDSS. As such, lack of involvement of laboratory-based users in the focus group discussions likely did not detract from the value of the information obtained. Overall, while the final focus group composition did not match the desired composition as initially described, there were an adequate number of representatives from each of the remaining user groups to effectively carry out these focus group discussions.

MDSS User Type	Desired Final Focus Group Member Count (from Table 2.3)	Actual Final Focus Group Member Count
Healthcare Provider/Staff (including Hospitals)	6	4
Laboratory	3	0
Local Public Health Jurisdiction Users (LHJ)	9 (2 Regional Epidemiologists and 7 LHJ users)	8 (3 Regional Epidemiologists and 5 LHJ users)
MDHHS-Bureau of Epidemiology (BOE)	2	5
Grand Total	**20**	**17**

Table 3.1: “Actual Representative Focus Group Composition”

In the first of the three focus group discussions, information quality attributes and system quality attributes were the primary focus. Several examples were outlined by participants as to when MDSS is effective and ineffective at ensuring the level of attribute quality desired by users. For example, users discussed how accuracy and completeness are often compromised (creation of cases based on negative results, missing complete provider contact information, etc.), but also how the introduction and high uptake of ELR reporting has significantly and positively impacted timeliness of information in the system - allowing for quicker intervention by LHJ staff.

Users noted that the system is easily accessible, as a web-based platform, and the ease with which modifications and enhancements can be introduced to the system has been a substantial benefit of MDSS. Additionally, it was noted that many of the instability issues that were frequent in late 2015 have largely ceased - although many users did express concern over the fairly regular systemic latency that tends to appear by the afternoon, under normal use.

While the overall functionality of the system was largely lauded, several opportunities for system improvement were also noted, including: system alerts based on specified field completion within a case report form (CRF); more and better field integration across the platform to reduce duplication of entry in several areas; a need to improve data presentation and extraction beyond canned reports and unfriendly exports; and, statewide access across LHJ users for complete patient and case information was frequently communicated.

Users also expressed a desire to see more data quality assurance measures, more use of decision support software to enhance the processing and provisioning of laboratory results (e.g., exclusion of negative results), more standardized data entry protocols (e.g., required fields, drop-down menus for manual laboratory result reporting), and standardization of user guidance on the system (user manual, versioning communication, system best practices, etc.).

During the second focus group discussion, service quality measures were covered, along with how all of the quality area attributes impact individual use, epidemiological use, communication/reporting, and user satisfaction. It was noted that, depending on the issue being reported and its solution, it can often take quite a while for issues to be rectified. The system user who noted this was especially concerned about the issue closure process and ensuring timely response.

Additionally, after users were asked to rank which attributes they felt were the most important, there was some degree of consensus that reliability, accuracy, functionality, and usability were essential. Some users also placed timeliness and data quality in this category. Use of standards were seen as important. And everything else was regarded as being positive, but not necessarily critical. It was generally agreed that the overarching areas of information quality and system quality are both important and impact each other - high information quality is irrelevant if the system isn't usable; and high system quality is irrelevant if the information is lacking.

In terms of how the realization of these attributes have downstream impact on use and user satisfaction, it was generally recognized to facilitate the various surveillance activities that users were looking to accomplish - through data quality review, investigation, investigation monitoring and management, handling of duplicate information, and data analysis. But, it was also noted that each of these aspects could continue to benefit from additional enhancements. For example, error checking is largely a manual process and, while deduplication methods have been improved over MDSS's lifecycle, the inclusion of alias and/or maiden name could help to improve it further. Including better data analytics directly in MDSS could also reduce the need to export and clean all data for all epidemiological analysis.

It was also made clear that context matters. For example, while the local public health nurses tended to express concern over the entry of laboratory results and the need to identify more standardized methods for manual entry, they were largely happy with the information available through the canned reports. These reports seem to provide them with the information that they need, on a regular basis. By contrast, MDHHS users expressed significant frustration over the inability to extract clean data in user friendly formats from the system; for them, the canned reports seem to add little value in terms of their day-to-day activities.

During the third and final focus group discussion, system impact and health service outcomes were the primary subject of discussion. It was noted that MDSS has equipped state-level users with more and better data that can be manipulated, aggregated, and analyzed, especially for notification to CDC. It can be said to have also positively impacted individual workflows at the local health department level through the reduction of follow-up calls needed for each individual case - although this is critically tied to the quality of the data that is initially received, which can often be lacking. It was also noted that, while there have definitely been positive workflow impacts (e.g., timeliness of case reporting has greatly improved over the years), there have also been other impacts that offset these achievements (e.g., the rapid increase of ELR submitters has resulted in significantly greater effort needed to resolve

deduplication queues). It has proven itself to be efficient at capturing and storing information, but has not demonstrated capacity to require information to the degree that it would significantly reduce LHJ follow-up activities. And, it has not been shown to be an effective broker of information for other systems. One user commented, during discussion of upcoming projects to connect EDRS and MCIR with MDSS, that system administrators need to be conscientious in how interoperability is promoted - these connections with other State of Michigan systems should not be just a matter of how MDSS can use data from these other systems, but also in terms of how MDSS can feed information to these other systems that might be of use to them. Overall, the limitations that MDSS has in its ability to demonstrate positive organization and individual impact and has more to do with the front-end quality control measures that the system exhibits over the incoming data.

In terms of MDSS impact on health services and outcomes, users seemed to largely agree that MDSS isn't being used as a mechanism to facilitate public health interventions. MDSS is seen as a repository of surveillance data, not as a comprehensive public health engagement tool that would otherwise be expected to facilitate interventions and post-intervention follow-up. Additionally, as one user noted, LHJs maintain strong working relationships with the healthcare providers in their jurisdictions. This cannot readily be captured in MDSS but is critical in tracking and acting on disease trends. It was generally agreed that interventions and follow-up was the purview of local health departments and shouldn't be prescribed within a centralized system.

Summaries of all three discussions can be found in 'Appendix B - Responsive/Illuminative Analysis – Focus Group Discussion Summaries'.

3.1: Responsive/Illuminative MDSS Analysis – (c) MDSS User Survey Results

The third and final step in this responsive/illuminative framework was to conduct a survey assessment of the entire, active user base of MDSS. This user survey was modeled after the Nine Dimension framework, first addressing attributes of quality measures (information, system, and service), followed by use and user satisfaction, and, lastly, impact and outcomes. A survey was constructed in April, 2017, following completion of the focus group surveys. This survey was constructed on the Google platform, using the Forms application. The survey was released on April 21, 2016, with a two-week completion timeframe. Three e-mail notifications were sent during this time period to solicit user participation. Additionally, a verbal reminder was presented at the statewide Communicable Disease conference on May 4th.

In 2016, there were 1304 unique user logins. At the time that this survey was conducted, the user base was composed of the following:

MDSS User Type	**User Base Population Distribution**
Healthcare Provider/Staff (including Hospitals)	28.64%
Laboratory	16.33%
Local Public Health Jurisdiction Users (LHJ)	44.63%
MDHHS-Bureau of Epidemiology (BOE)	10.40%

Table 3.2: “User Survey Population”

Using the unique 2016 logins as the base population (N), and seeking a 10% minimum response rate for this survey, the desired sample population was 131 (n = N * .10). At completion, a total of 140 responses were received, distributed across all user groups, in the following manner:

MDSS User Type	Respondent Population Distribution
Healthcare Provider/Staff (including Hospitals)	17.9% (25)
Laboratory	2.9% (4)
Local Public Health Jurisdiction Users (LHJ)	64.3% (90)
MDHHS-Bureau of Epidemiology (BOE)	15% (21)

Table 3.3: “Respondent Population”

Just as was noted for the focus group survey results in section 3.1.2, the low response rate of the laboratory user group may not be an under-representation of that particular user type so much as it might be an indication that laboratory users do not engage with MDSS in the same manner as LHJ users, BOE users, or Healthcare Provider/Staff users - either in breadth or scope. Laboratory users utilize MDSS for the entry of laboratory results (manually and/or via ELR); whereas all other users engage with MDSS as a tool to surveil communicable disease cases (LHJ activities), to report on statewide incidence and prevalence (BOE activities), or to confirm that hospitals and providers have reported all cases of patients with suspected reportable conditions (Healthcare Provider/Staff activities).

Adjusting the respondent population distribution by accounting for this minimal scope of use by laboratory users, the distribution changes to:

MDSS User Type	Adjusted Respondent Population Distribution
Healthcare Provider/Staff (including Hospitals)	34.23%
Local Public Health Jurisdiction Users (LHJ)	53.34%
MDHHS-Bureau of Epidemiology (BOE)	12.43%

Table 3.4: “Adjusted Respondent Population”

While MDHHS-BOE users were fairly evenly represented in the respondent population (n = 12.43%; N = 10.4%), Healthcare Provider/Staff users were underrepresented by about half (n = 17.9%; N = 34.23%), and, LHJ users were slightly overrepresented in the respondent population by about 11% compared to the active user base. While there is no means by which MDSS user access can be weighted in terms of average number of individual logins in any given year (this data is not captured by the system), or by amount of time spent actively using MDSS, the majority of work completed in MDSS is done by and for local health departments who are charged with case surveillance and disease intervention within their respective jurisdictions. Thus, ⅔ of survey responses coming from LHJ users does not necessarily over-represent this user group’s interaction with MDSS. Unfortunately, adequate data is simply not captured by the system in order to measure this frequency and scope of activity. Likewise, as Healthcare Provider/Staff Users typically use MDSS for two purposes: 1.) to manually enter cases; or, 2.) verify MDSS receipt of ELR transmitted data, a 17.9% response rate from this user group does not necessarily underrepresent this group’s interaction with MDSS, when the full scope of MDSS capabilities and use is considered. Again though, without user login frequency data, this is impossible to weigh. While these response rates and over/under-representation should be treated with concern, they should not be summarily disregarded.

The first nine questions of the user survey were directed towards soliciting feedback on user perception of the quality attributes described in the Nine Dimension framework (under Information, System, and Service quality areas). Each quality area was divided into three separate parts: 1.) a rating of the user's belief as to how significant or requisite the particular attribute should considered within *any* EDSS - (a.k.a., the subjective "necessity factor" - how important the user believes the attribute to be); 2.) a rating of the user's perception as to how well the same attribute is specifically represented within MDSS - in order to measure the gap between the subjective belief of the attribute's necessity and its perceived presence in MDSS; and, 3.) descriptions of why the user believes there may be a gap, if any, in highly necessary attributes if that same attribute was then, subsequently, less-than-highly rated vis-à-vis its representation in MDSS. The rating scale used was: 3 = High; 2 = Moderate; 1 = Low; 0 = Absent.

For information quality attributes, the five attributes in question received a median necessity rating of high in 73.38% of the responses (range: 67.15% - 89.93%). Four out of the five attributes in question saw a heavy loss in this gap assessment between the frequency at which they were rated as highly necessary (part #1) and the frequency at which they were less-than-highly rated in MDSS (part #2): Accuracy = -38.5%; Timeliness = -32.6%; Completeness = -35.52%; and, Consistency = -35.17%. Only the attribute Relevance saw a significantly smaller loss (-15.33%); but, it should be noted, that Relevance also had the fewest number of initial high necessity ratings (meaning, it was not perceived to be as important as the other attributes).

In most of these shifts, however, there was a roughly equivalent increase in the moderate rating. So, while users tended to think that these attributes were 32% to 38% less-than-optimal in MDSS, they were still mostly rated as moderate. Overall, the vast majority of users rated these attributes at either moderate or high (range: 97.12% to 99.28%; median: 98.53%). A shift from a high rating to a rating below moderate was nominal (range: -12.12% to .01%; median = -3.6%). Completeness was the only one of the five attributes that saw a loss in

the shift between the necessity factor to the MDSS representation that fell below the IQR that describes this shift (IQR: -8.2% to -1.09%). This shift for completion was -12.12%, which suggests that users find Completeness of information in MDSS to be the quality attribute in need of the most attention.

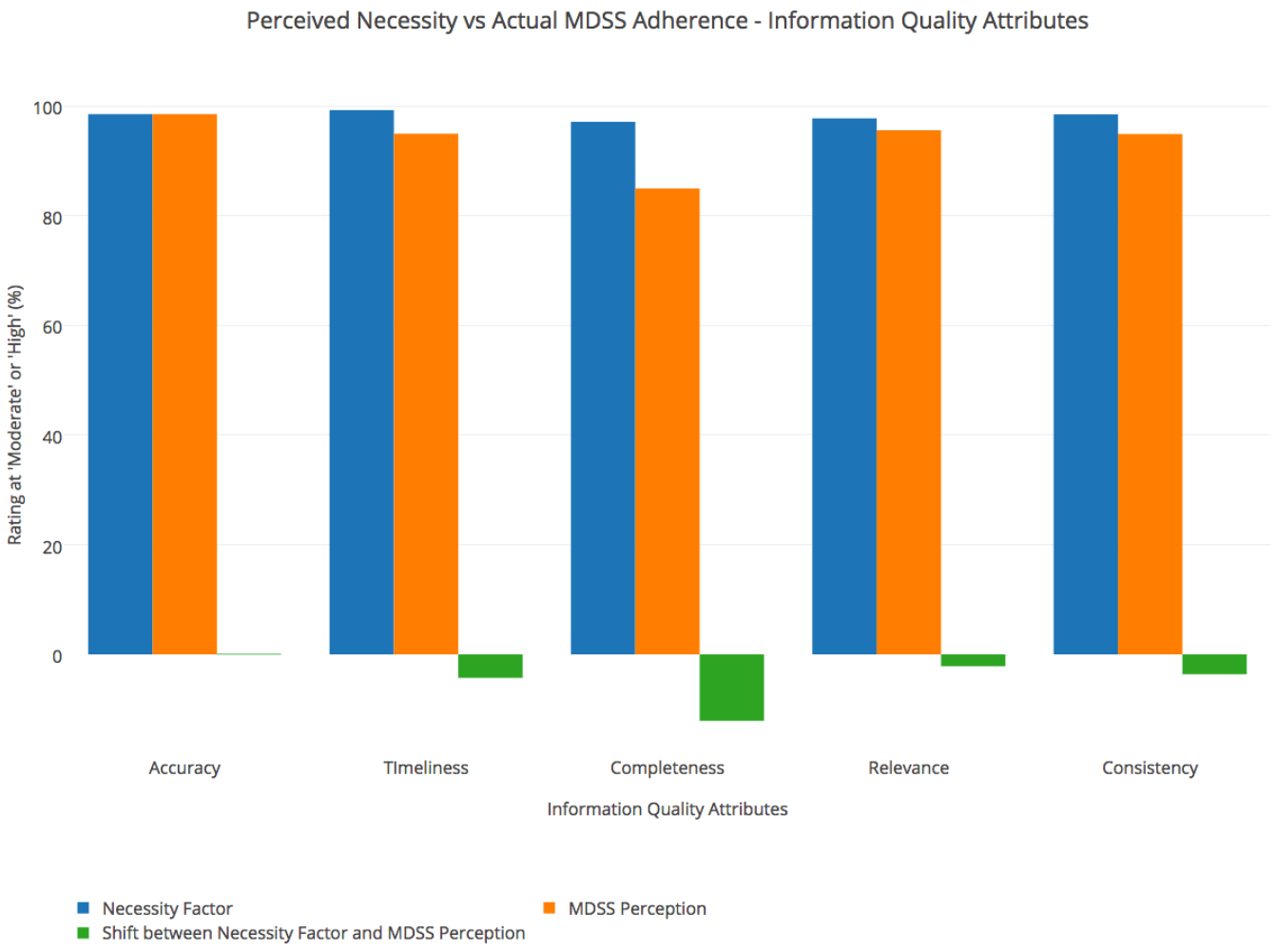

Figure 3.1: “Information Quality Attributes”

The short-answer responses at step #3 for information quality attributes seem to corroborate this shift. Two responses from two different LHJ Users are representative of common feedback:

> "The way MDSS is set up doesn't force reporting of mandatory information such as doctor name and phone number, specimen source, patient address etc, all of which are mandatory reporting requirements and should be easily reported. This happens not only with ELR's but also with manual reporting[;]"

and,

> "I believe MDSS is quite timely within the limitations of laboratory testing and reporting. There are occasional delays with reporting that are unnecessary, but they are not the norm. For use with informatics, it is help (*sic*) for fields to all be filled, and to be filled accurately and consistently. I find this to be sporadic and believe that there could be more state leadership on expectations for forms fields, though I understand that local resources are a limitation."

As was the case for information quality attributes, system quality attributes also saw most of the rating shift between high and moderate ratings - if an attribute was rated as high for the necessity factor, any consequential change in the MDSS-specific rating likely shifted to moderate. Likewise, when high and moderate ratings are jointly considered in the MDSS-specific assessment (step #2), the vast majority of responses fell in either of these two ratings (range: 89.47% to 98.56%; median: 97.49%). The median shift from high to any rating below moderate was nominal (median -3.69%); however, three attributes did see a shift that fell below the IQR for this type of shift (IQR: -10.68 to -1.87): Adaptability (-11.24%); Response Time (-12.23%); and, Error Reduction (-12.56%).

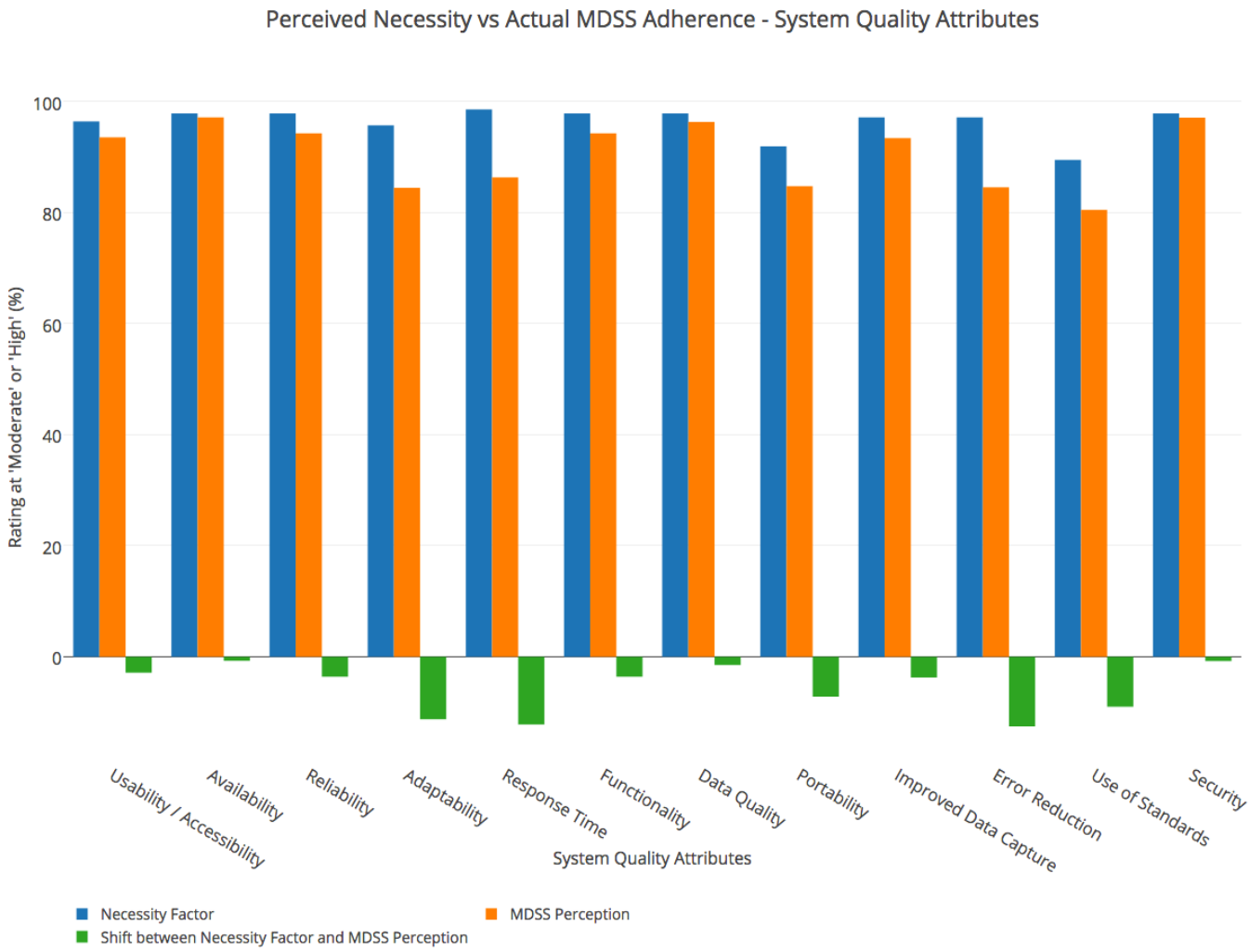

Figure 3.2: “System Quality Attributes”

The feedback provided at step #3 for system quality attributes, again, corroborated this focus on a user-perceived need to improve Adaptability, Response Time, and Error Reduction. The following short-answer responses capture many of the issues described in the user feedback:

> “Some days it take (*sic*) longer between clicks, and the system goes down. This is very frustrating when trying to follow up on cases. I'm not sure how adaptable the system is, and the data is only as good as the person entering it or the Computer system uploading it[;]”

> “MDSS IS TOO SLOW. It takes too long to get forms to come up, too long of lag time, it does not pull out the info I would like to pull out, it is complicated to know how to answer questions for specific diseases (specifically lab results), there are TOO MANY NOT A CASE (*sic*) that are imported from hospitals/lab systems. It is NOT and (*sic*) EFFICIENT use of staff time[;]”

and,

> “All the attributes that I rated as high, I did so because I believe that MDSS does that attribute very well. For the others: Reliability - it is not unusual to have to wait a while for it to pull something up[;] Adaptability - The system seems to be very adaptable to updates, but the overall process to make the changes can take a long time once something is discovered or requested to change.[;] Data Quality - as mentioned above, people are inconsistent with data entry[;] Error Reduction - the instructions and tips should help users reduce errors, but the "human" element is up to supervisors to improve the quality in their offices.”

Similar to the other quality area metrics, any shift away from service quality attributes rated as highly necessary typically saw similar corresponding increase in a moderate rating for MDSS measures. When addressing MDSS-specific rates that were either high or moderate, there was a very high frequency of responses that fell into either of these two ratings (range: 94.96% to 98.57%; median: 98.21%). In measuring the frequency of shift in ratings between high for the necessity factor scoring (step #1) and less-than-moderate for the MDSS scoring (step #2), the median frequency was -6.46% (range: -9.71% to -3.85%). Only one attribute, Assurance, fell below the IQR (-9.18% to -4.22%), suggesting that, of the four attributes used to measure service, users need more assurance from the MDSS support team that their issue(s) will be addressed.

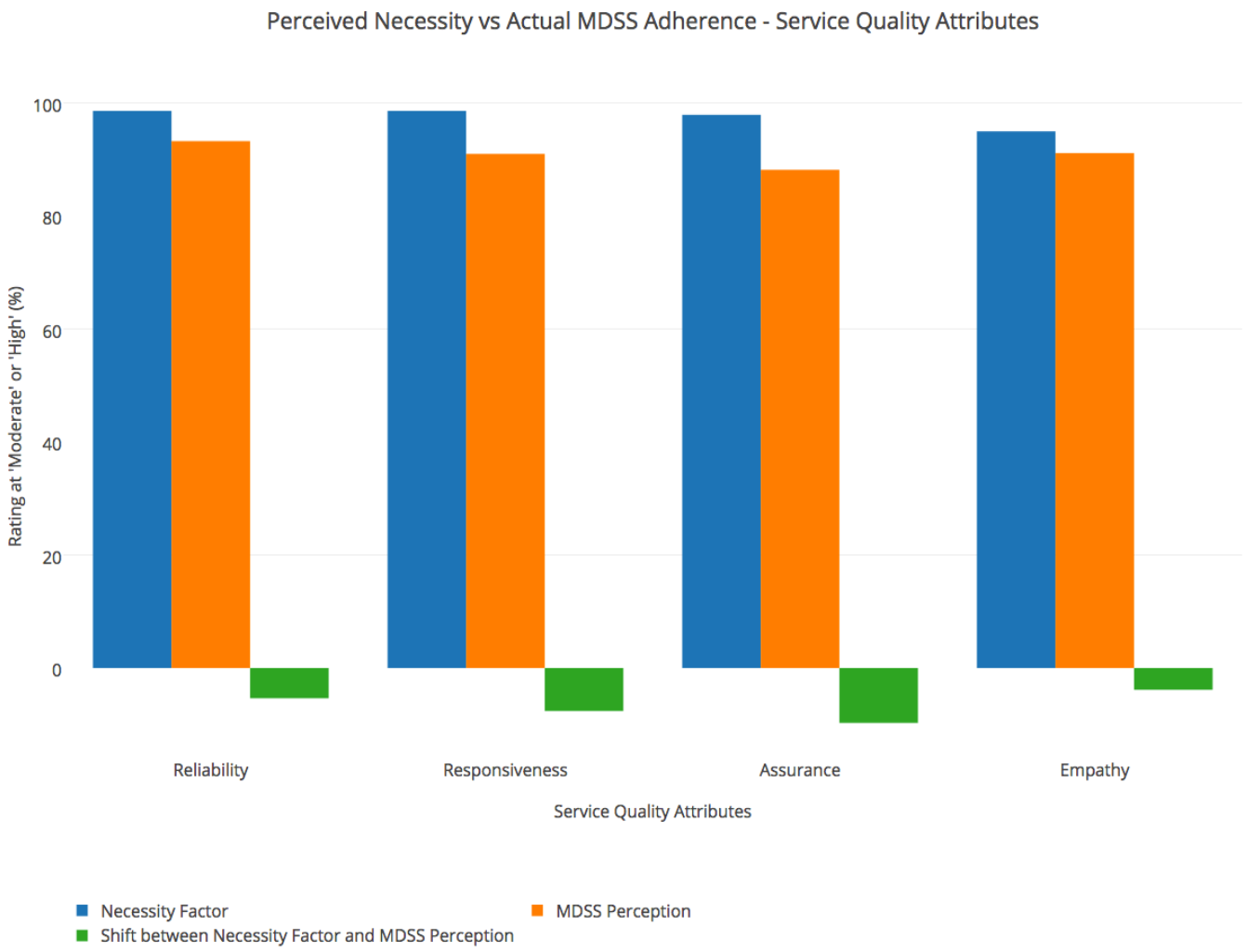

Figure 3.3: “Service Quality Attributes”

While the responses at step #3 for services quality attributes reflected that the support team is generally responsive (user feedback was especially positive when discussing the support received from Regional Epidemiologists), these responses also underscored concerns expressed with respect to Assurance:

> “I feel like the support team listens to me and empathizes with me but may be limited due to funds or other reasons as to why my suggested fixes aren't completed[;]”
>
> “I think customer service is extremely important, especially when it comes to "technology". I think the team does a good job to respond in a timely fashion. However, I often lack assurances that issues will be resolved. How issues are prioritized for "fixing" is often a mystery[;]”
>
> “Assurance - just because you report something doesn't mean the fix will be fast[;]”
>
> and,
>
> “Reliability and responsiveness of the system support team are critically important to users. If users run into problems and report them, they want to have their problem resolved as quickly as possible. Our Informatics group needs to grow - I think we would benefit from splitting off development from operations and having more people in each.”

Users were then asked to decide where, amongst these three quality areas, they would allocate limited resources for targeted development. Information quality and system quality were both heavily prioritized by users (50.39% and 41.73%, respectively). Only 7.87% recommended focusing first on improving service quality. Following their selection of the quality area to prioritize, users were asked to provide specific recommendations on how to improve within these quality areas. These recommendations were then grouped relative to various types of improvements that were recommended. User responses did not necessarily classify their recommendation by type; however, these types of user recommendations were elucidated relative to the comprehensive set of comments. This allows for more objective measure of non-discrete feedback.

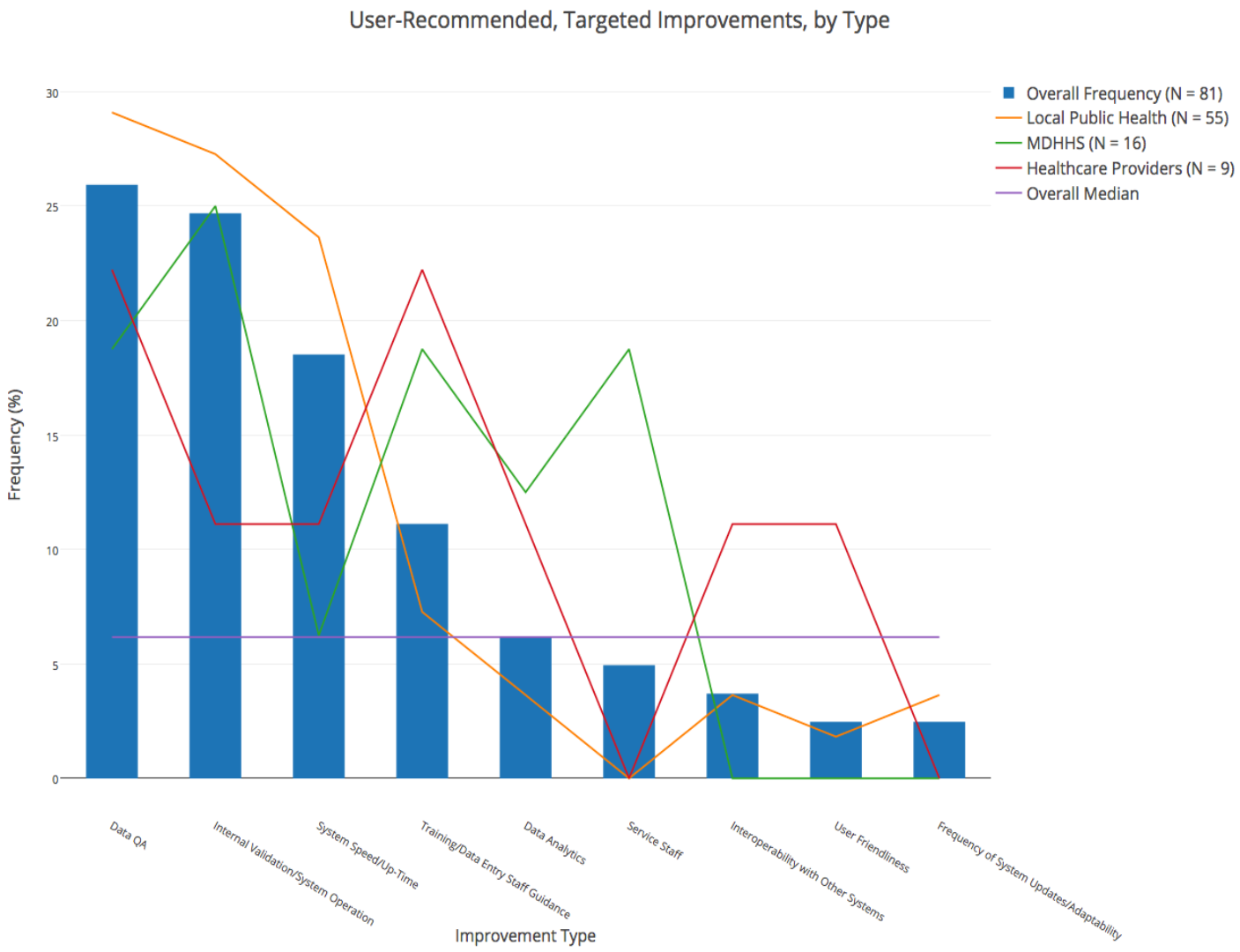

Figure 3.4: "User-Recommended Targeted Improvements"

Of these nine 'Improvement Type' groups, four were above the median frequency of 6.17%, overall: Data Quality Assurance (QA) (25.93%), Internal Validation/System Operations (24.69%), System Speed/Up-Time (18.52%), and Training/Data Entry Staff Guidance (11.11%). Two of these were above the IQR (range: 3.09% to 21.61%), Data QA and Internal Validation/System Operations. This is suggestive of a perceived need to both increase use of decision support logic and quality assurance measures (which could be automated, manual, training-related, or policy-based).

The focus of recommended changes are varied by user type, which was indicative of the various ways in which different sets of users engage with MDSS. HCP Users recommended a higher focus on Data QA and Training/Improvements for Data Entry Staff; and, a moderate focus on Internal Validation/System Operation, System Speed/Up-Time, Interoperability with other Systems, and User Friendliness. MDHHS Users (Regional Epidemiologists, BEPH Users, and BoL Users) rated internal validation/system operation with a high level of recommended focus; Data QA, Training/Data Entry Staff Guidance, and Interoperability with Other Systems were all recommended at a moderate-high level of focus, and Data Analytics were recommended at a moderate level of focus. LHJ Users recommendations largely followed the same trend line mirroring the overall results. This is likely largely due to the fact that LHJ User recommendations accounted for 67.9% of all the recommendations included in response to this question – it had the single largest influence over the final, overall results. LHJ Users highly prioritized Data QA and Internal Validation/System Operation; high-moderate frequency in System Speed/Up-Time; and moderate frequency in Training/Data Entry Staff Guidance. One user's response seemed to succinctly summarize what was implicitly expressed by other users:

> "The overall workability and utility of the surveillance system seems paramount - can it help accomplish the goals of surveillance[?] A difficulty in achieving this lies in the overall purpose(s) of the system. At times MDSS seems to be playing multiple roles: a disease reporting system for epidemiologic/surveillance purposes, and a case management system for personal preventive health/public health nursing purposes. Maybe there can (and should) be several purposes at one time, but some thought needs to be put into how each of those roles is best accomplished and what the specific objectives are."

Laboratory users were not featured in these user-specific results, as there were too few respondents to confidently derive meaningful results.

Targeting Use and User Satisfaction, and based on a scale between 1 and 5 (where 1 = inadequate and 5 = adequate), users were then asked to rate MDSS's ability to support task completion without the use of supporting software, systems, or other resources.

Only 58.02% of ratings indicated that MDSS's ability to support task completion were either adequate (5) or mostly adequate (4). Another 26.72% of respondents rated Task Completion at moderate (3). And, 15.27% were below moderate, as mostly inadequate (2) or inadequate (1) - 9.16% and 6.11%, respectively. HCP and LHJ User responses mostly or closely followed the overall trend. MDHHS Users, however, reflected a split between those who found task completion to be mostly adequate and those who found it to be mostly inadequate. MDHHS Users reflected a significantly lower satisfaction score than LHJ or HCP Users. The average scores, per user group were: HCP Users = 3.96/5 (79.17%); LHJ Users = 3.75/5 (74.94%); and, MDHHS Users = 3.05/5 (60.95%). As was with the targeted improvement recommendations, laboratory user-specific figures were not included in these figures, due to the low response rate from this user group.

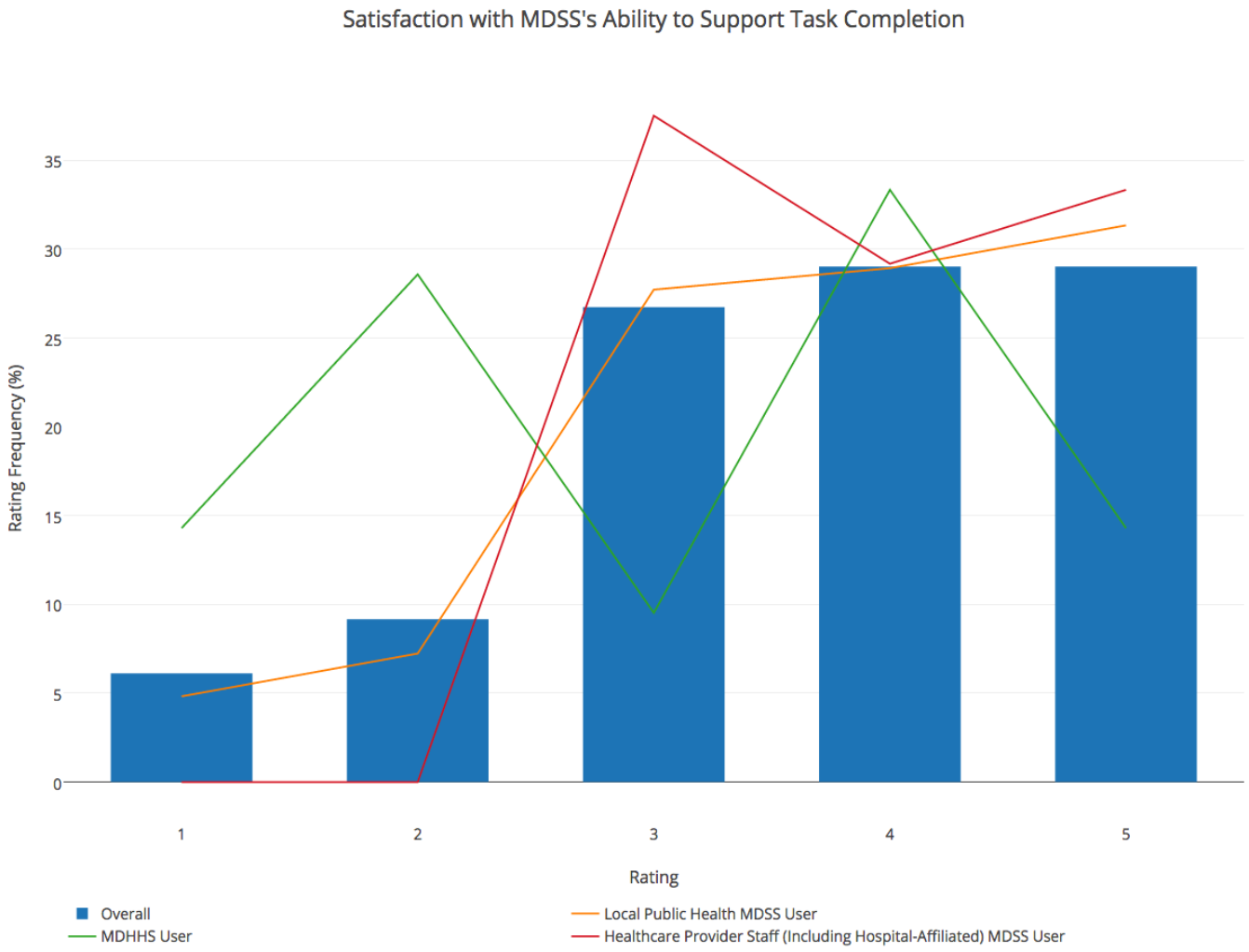

Figure 3.5: “Satisfaction with Task Completion”

Of the reported third party systems used, most were predictable – Excel, Word, SAS, R, and Epi Info. Of additional note, though, 69.23% of the respondents who mentioned using EHRs as a third-party resource were from local health jurisdictions. This is an important consideration as, conceivably, other MDSS users also use EHRs on a regular basis (e.g., healthcare providers and ICPs at hospitals). The distinction is that local public health office staff (especially nurses) are recording information both in their EHRs and in MDSS for CD reporting - as opposed to other EHR users where those who provide direct care likely enter data into the EHR but rarely report cases in MDSS; and, the ICP who reports cases in MDSS but doesn’t

necessarily enter the healthcare data in the EHR. For LHJs, the staff who are entering this information are engaging in duplicate data entry – this supports a need for interoperability between LHJ EHRs and MDSS, which has been regularly communicated to MDSS leadership and is expressed elsewhere in these survey responses from LHJ users.

34.29% of respondents reported that they use MDSS for epidemiological analysis. 76.19% of these users were MDHHS Users (Regional Epidemiologists, BEPH, or BoL Users). Of all users who reported using MDSS for epidemiological analysis, 79.17% reported adequate detection and monitoring functionality. Of those who reported that this functionality is not adequate, issues centered on lack of automated detection tools; that users must call data through exports (which are cumbersome and not user friendly); and statewide access restrictions for LHJ Users (limits scope of view of patient and case data, and interpretation).

Another 79.17% reported adequate real time or near-real time data capture and translation into useable formats. Of those who reported that this functionality is not adequate, issues focused on lack of user friendliness in exports and data inconsistencies that affect trustworthiness.

While only 58.33% reported adequate ability to track population indicators, most of those who reported that this functionality was not adequate then subsequently stated that they were either unclear as to what this question was soliciting or could not identify an example of how MDSS would track population indicators. This suggests (and is supported by focus group discussions) that users aren't looking to MDSS for this type of functionality and would not necessarily take advantage of it, were it to be made available.

61.43% of users indicated that they use the reporting and alert functions in MDSS. Of these users, 89.54% report that MDSS adequately supports timely communication of information to facilitate public health interventions. Reliability of the alerts was frequently the concern that was expressed, if any.

81.4% reported satisfaction with canned reports and exports meeting their ongoing work needs. Of those who reported that canned reports and exports are not adequate, issues were centered on user friendliness of exports (extraction of multiple records, the number of variables, poorly formatted lab results, etc.). Still others commented that they are not flexible and always require third-party software programs in order to conduct analytics on the data.

Targeting individual use and user satisfaction, 80.58% of respondents reported adequate (5) or mostly adequate (4) ratings of MDSS; 13.67% rated MDSS at a moderate level (3); and 5.76% of users gave MDSS a mostly inadequate (2) or inadequate (1) score. HCP, LHJ, and MDHHS User group trends all closely or mostly followed this same overall trend. The average scores, per user group were: HCP Users = 4.16/5 (83.2%); LHJ Users = 4.15/5 (82.9%); MDHHS Users = 4.14/5 (82.9%); Overall = 4.14/5 (82.7%). As was with previous sections of this survey, Laboratory User-specific data are not elucidated separately from the overall responses due to the low number of responses.

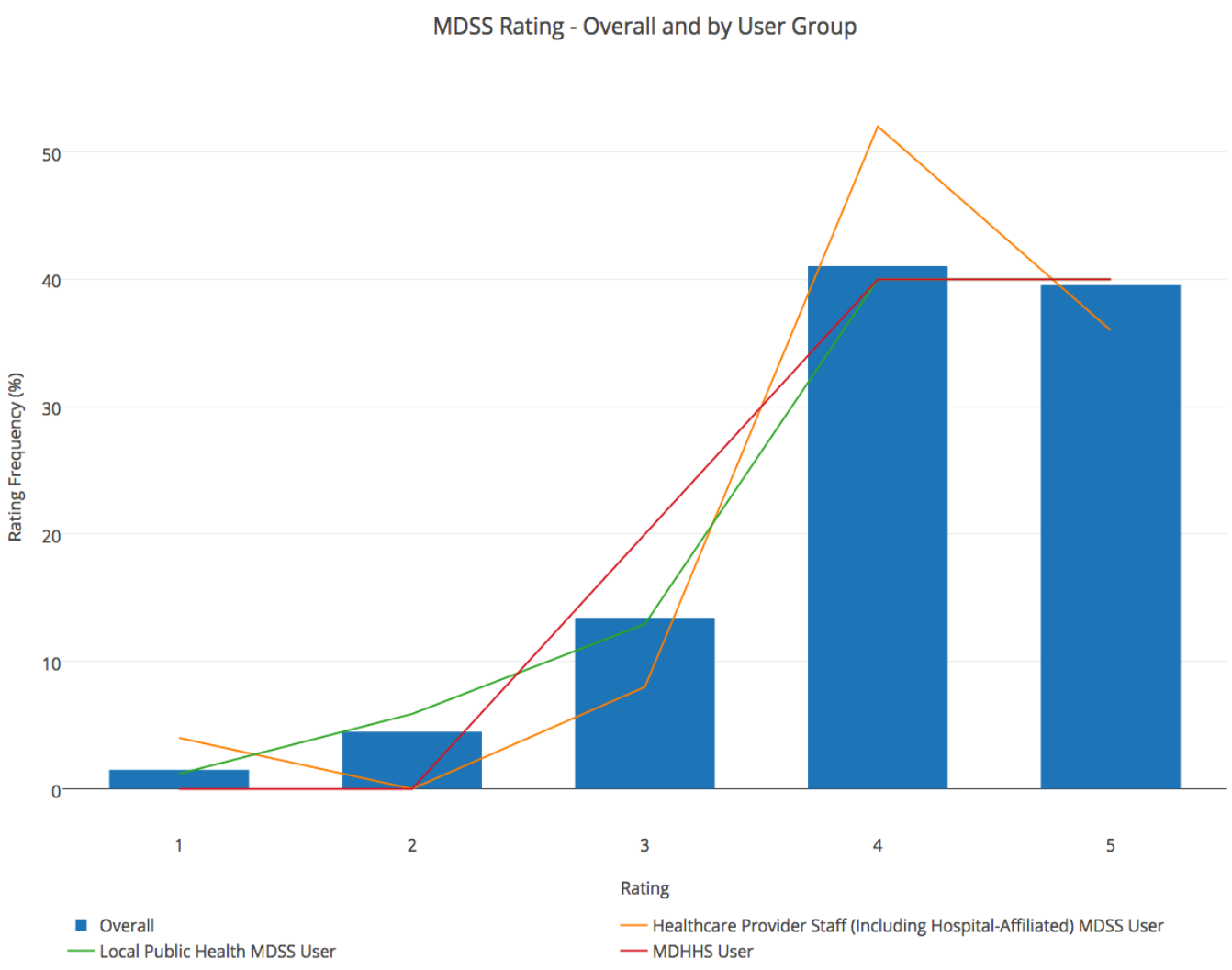

Figure 3.6: “Overall MDSS Rating”

Users were then asked to rate MDSS on value added to the organization of which they were a part. 92.14% of respondents stated that MDSS brings value to management; 5.71% rated it as not bringing value; and, 2.14% did not answer. Generally, feedback was positive, noting that MDSS helps management to monitor workflows, and keeps team members apprised of the team’s activities and workloads. Respondents noted that MDSS has both changed their organization’s policy and procedure and has been incorporated into it in a variety of ways. There was large consensus that MDSS has become the standard for case investigation documentation

(replacing paper records), the official standard of timeliness of response activities, and is important for local health department accreditation.

In terms of individual workflows, 81.43% stated that MDSS has added value; 16.43% stated that it has not added value; and 2.14% chose not to respond. Of those who did give MDSS a favorable rating for adding value to individual workflows, it was noted that it takes less time to complete investigations (presumably compared to a non-electronic disease surveillance system - although this was not explicitly stated); that it is “organized, specific, has the general details [needed], and is easy to use;” and is easier to use than completing forms by hand. However, frustrations were also expressed regarding the occasional loss of data, frequent lack of provider and referral source information, and too much time being spent in deduplication and in cleaning and exporting of data.

In terms of training on MDSS, only about two-thirds of users stated that training was moderately adequate (5) or mostly adequate (4) (32.56% and 31.78%, respectively). There was a clear gap, as well, in these responses, based on user type. MDHHS users gave MDSS training an average rating of 4.5 (90%). But, LHJ and HCP Users only rated MDSS training at an average of 3.63 (72.68%) and 3.83 (76.67%), respectively. Suggestions focused on developing easily accessible and consistent training materials - web-based trainings; annual refreshers; and, a more user-friendly manual and tip sheets.

In a comprehensive look at these impacts (across organizational, individual, and health services and outcomes), two were rated as not having a positive impact at rates above the median for “No” - both Identification of At-Risk Populations and Facilitation of Follow-up (which was beyond the third quartile); and, two additional impacts were at the median - Value Added to individual workflows/tasks and Facilitates Management of Interventions and Recommendations. User feedback noted that, while MDSS is good at identifying the numerator (a.k.a, a case), the denominator (the at-risk population) is unknown. And, it is difficult to link cases. Several users noted that, while MDSS is strong at data collection and storage, it does not, in and of itself,

identify at-risk populations or targeted interventions. While there was consensus that MDSS does not facilitate intervention or follow-up, there was not consensus as to whether MDSS *should* facilitate these functions. Some were adamant that it is purely a surveillance system and, thus, should be used only to identify cases. In turn, LHJ staff and/or healthcare providers would effect an intervention strategy and follow up as necessary. A few felt that this capability does exist in some capacity but is just under-utilized. And still others advocated for more intervention and follow-up capabilities in the system. In any case, it is clear that MDSS is not generally being used for these functions (regardless of the degree to which it can facilitate them), even though these measures are often required for grant reporting metrics.

Impact - Does MDSS Facilitate the Following?						
		Yes		No		Blank
Organizational						
	Value Added to Management	129	92.14%	8	5.71%	3
Individual						
	Value Added to individual workflows/tasks	114	81.43%	23	16.43%	3
Health Services and Outcomes						
	Rapid Identification, Notification, and Intervention	125	89.29%	12	8.57%	3
	Identification of At-Risk Populations	107	76.43%	29	20.71%	4
	Facilitates Management of Interventions and Recommendations	113	80.71%	23	16.43%	4
	Facilitation of Follow-Up	102	72.86%	32	22.86%	6
	Median Count	113.5	81.07%	23	16.43%	
	Count IQR	107 to 125	76.43% to 89.29%	12 to 29	8.57% to 20.71%	

Table 3.5: “Impact and Outcomes”

3.2: PHII EDSS Vendor Comparison – Results

While the responsive/illuminative approach is designed to help build an understanding of how users derive value from MDSS, as well as where such value gaps may exist, this approach is limited to gaining insight only into MDSS. It must be acknowledged that other, 'off-the-shelf' proprietary systems exist and could also potentially serve as an adequate EDSS solution for the CD Division. In addition to gaining insight into the application benefits and deficiencies identified in MDSS, it is critical also gain an understanding of whether one of these other proprietary systems would offer similar benefits and/or perpetuate the same issues and concerns highlighted in the responsive/illuminative approach; or whether one of these other systems show potential to rectify such issues.

In 2013, the Public Health Informatics Institute (PHII) published the "Electronic Disease Surveillance System (EDSS) Vendor Analysis: An Overview of the Selected EDSS Landscape for Public Health Agencies." Recognizing the significant variation in capabilities and types of EDSSs that were available on the market, PHII designed this evaluation framework to assist public health agencies in defining guided cross-comparison practices that could objectively evaluate selected EDSSs.[29]

The evaluation rubric first groups EDSSs by scope: Comprehensive EDSSs; Specialized EDSSs; and, Niche EDSSs. This categorization was dependent on the number of functionalities within the core set of EDSS Requirements Categories that a given EDSS was designed to meet. Comprehensive EDSSs, by definition, support all of the core functionalities within these categories; Specialized EDSSs provide for a targeted set of functionalities; and Niche EDSSs address a limited subset of functionalities (one or two). This classification scheme recognizes that not every public health entity necessarily needs a full-scale, full-scope (comprehensive) EDSS. For example, even within the CD Division at MDHHS, certain units have developed and deployed additional applications that provide targeted technical solutions to the unique needs expressed by that unit. The HIV Surveillance unit, for example, utilizes the HIV Laboratory

Management System (LMS) to handle the processing and provisioning of HIV ELRs, prior to importing of data into CDC's eHARS database (the Enhanced HIV/AIDS Reporting System). This is in response to the particular nature of eHARS, which is a uni-directional surveillance system (users can input, but not extract, data) and is document/laboratory result-centric; as opposed to MDSS which is patient-centric. As the HIV LMS is singularly designed to address these few gaps in MDSS and eHARS functionality and specific HIV surveillance workflow processes, following the PHII Vendor Analysis, it would be classified as a niche EDSS.

The PHII Vendor Analysis begins by describing five EDSS Requirement Categories. Three of these categories are then further described by subsets of core functionalities that make up the particular requirement category: 1.) Support for Reportable Conditions Surveillance Core Functions: Condition Reporting, Event Identification and Validation, Case Investigation, Contact Tracing, Case/Contact Specific Intervention, Event/Outbreak Management, Public Health Alerts; 2.) General System Requirements: System Support, Functionality, System Administration, Data Capture; 3.) Technical Design: Technical Design and Architecture, Development/Programming Languages, Platforms, Security/Privacy, User Interface; 4.) Data Exchange and Integration; and, 5.) Data Analysis, Visualization, and Reporting.

These categories and core functionality subsets were then transposed to the Requirements Comparability Matrix, the primary tool used in this section of the MDSS analysis, to represent Requirements Comparability Matrix sections and subsections, respectively. It should also be noted that, while the EDSS Requirement Categories describes Development/Programming Languages and Platforms as core functionalities within the Technical Design category, these two items were not called out in the Requirements Comparability Matrix as specific core functionality areas. Aside from the limited set of questions concerning platform support and programming language that are embedded in the Technical Design and Architecture core area (questions 1.3.1 through 1.3.7), the Vendor Analysis text does not provide an explanation as to why these two items were detailed as core requirements

within in the EDSS Requirement Categories, but not explicitly identified in the Requirements Comparability Matrix as their own core areas.

The Vendor analysis is intended to assist public health agencies in several ways: 1.) to describe the EDSS landscape, at the point in time of the creation of this Vendor Analysis, through a description of both systems and their scope; 2.) to assist public health agencies in elucidating an understanding of their surveillance I.T. needs; 3.) to provide for a refined, out-of-the-box methodology to compare and contrast various vendors through defined templates and processes; and, 4.) to assist in determining which EDSS may best serve a public health agency's needs. It is recommended that this analysis follow a series of sequential steps: 1.) Prioritize system requirements - order those that are most important to the overarching system in which the EDSS must function. This was achieved through the responsive/illuminative analysis; 2.) Classify the system (hereunder); 3.) Gather Information; and, 4.) Compare Systems.[29]

MDSS is the only communicable disease surveillance tool in use in the State of Michigan that has both vertical integration across all levels of the communicable disease surveillance system (hospitals/healthcare providers, laboratories, local public health departments, and State-based surveillance teams) and horizontal integration across disease surveillance groups and scopes of use. It is expected, with limited exception, to directly fulfill or indirectly facilitate all requirements of a comprehensive surveillance system. For this analysis, MDSS meets the requirements of a comprehensive EDSS as described in the Vendor Analysis.

All attribute questions and statements for the Requirements Comparability Matrix were outlined according to the sections and subsections identified in the PHII's vendor analysis. Using the same rating system that PHII applied to the three comprehensive surveillance systems outlined in the vendor analysis, MDSS was rated in an identical fashion, where each attribute received a response indicating whether MDSS fully meets, partially meets, or does not meet the parameters of the attribute as described by the question or statement. In addition, the scores for three comprehensive surveillance systems outlined the PHII vendor analysis were also itemized, verbatim.

The analysis included 319 questions divided across sixteen core function areas. The number of questions in each question area ranged from 1 to 61 questions (median: 17.5). The sixteen core function areas included: Condition Identification and Reporting; Event Identification and Validation; Case Investigation; Contact Tracing; Case/Contact Specific Intervention; Event/Outbreak Management; Public Health Alerts; System Support; Functionality; System Administration; Data Capture; Technical Design and Architecture; Security/Privacy; User Interface; Data Exchange and Integration; and, Data Analysis, Visualization and Reporting.

To quantify the results, each response where a system fully met the attribute, as described in the question or statement, was given the literal value score of '2'; each response where the system in question partially met the attribute, as described, was given the literal value score of '1'; and whenever a system did not meet the attribute, as described, the literal value score of '0' was assigned. Each area then received a core area percentage score, based on the percentage of adherence to an overall perfect score - for example, if every question statement received a corresponding response of '2', as described within that core area, the system would receive a score of 100% for that particular core area. These percentages were then averaged for an overall, aggregate percentage score. A completed copy of the comparability matrix can be found in Appendix C: PHII EDSS Vendor Comparison – Comparability Matrix Results.

The results in table 3.6: “Vendor Analysis – MDSS Results,” below, are listed relative to the scores attributed to MDSS’s core function areas. The results are listed by the areas with the lowest attributed score to the areas with the highest attributed scores, in a sequential, ordinal manner. The comparability matrix scores for three other comprehensive EDSSs are also included, side-by-side, for comparison.

Core Area	**Maven**	**Trisano**	**WorldCare**	**MDSS**
Case/Contact Specific Intervention	100.00%	96.67%	93.33%	28.33%
Public Health Alerts	80.00%	60.00%	80.00%	40.00%
Contact Tracing	100.00%	94.12%	100.00%	41.18%
Event/Outbreak Management	100.00%	89.34%	86.89%	45.90%
Data Analysis, Visualization and Reporting	96.55%	96.55%	96.55%	58.62%
Functionality	100.00%	93.75%	96.88%	65.63%
User Interface	100.00%	94.12%	100.00%	73.53%
Case Investigation	100.00%	90.32%	100.00%	74.19%
Event Identification and Validation	100.00%	100.00%	100.00%	75.00%
Data Capture	100.00%	100.00%	100.00%	80.56%
Data Exchange and Integration	96.30%	77.78%	96.30%	83.33%
Security / Privacy	95.65%	95.65%	97.83%	97.83%
Condition Identification and Reporting	100.00%	80.00%	100.00%	100.00%
System Support	100.00%	100.00%	100.00%	100.00%
System Administration	100.00%	100.00%	100.00%	100.00%
Technical Design and Architecture	100.00%	100.00%	100.00%	100.00%
Overall, Aggregate Percentage Score	**98.03%**	**91.77%**	**96.74%**	**72.76%**

Table 3.6: “Vendor Analysis – MDSS Results”

MDSS received an overall, weighted percentage score of 72.76%. Core areas received percentage scores ranging from 100% to 28.33% (median: 74.60%). By comparison, Maven received an overall score of 98.03% (median: 100%); Trisano's overall score was 91.77% (median: 94.88%); and, WorldCare's overall score was 96.74% (median: 100%). For MDSS, the areas of Event Identification and Validation, Data Capture, Data Exchange and Integration, Security/Privacy, Condition Identification and Reporting, System Support, System Administration, and Technical Design and Architecture all scored above the median (the last four of these all scored 100%). Data Analysis, Visualization and Reporting, Functionality, User Interface, and Case Investigation all scored below the median, but within the second quartile. And Case/Contact Specific Intervention, Public Health Alerts, Contact Tracing, and Event/Outbreak Management all scored below the 25th percentile.

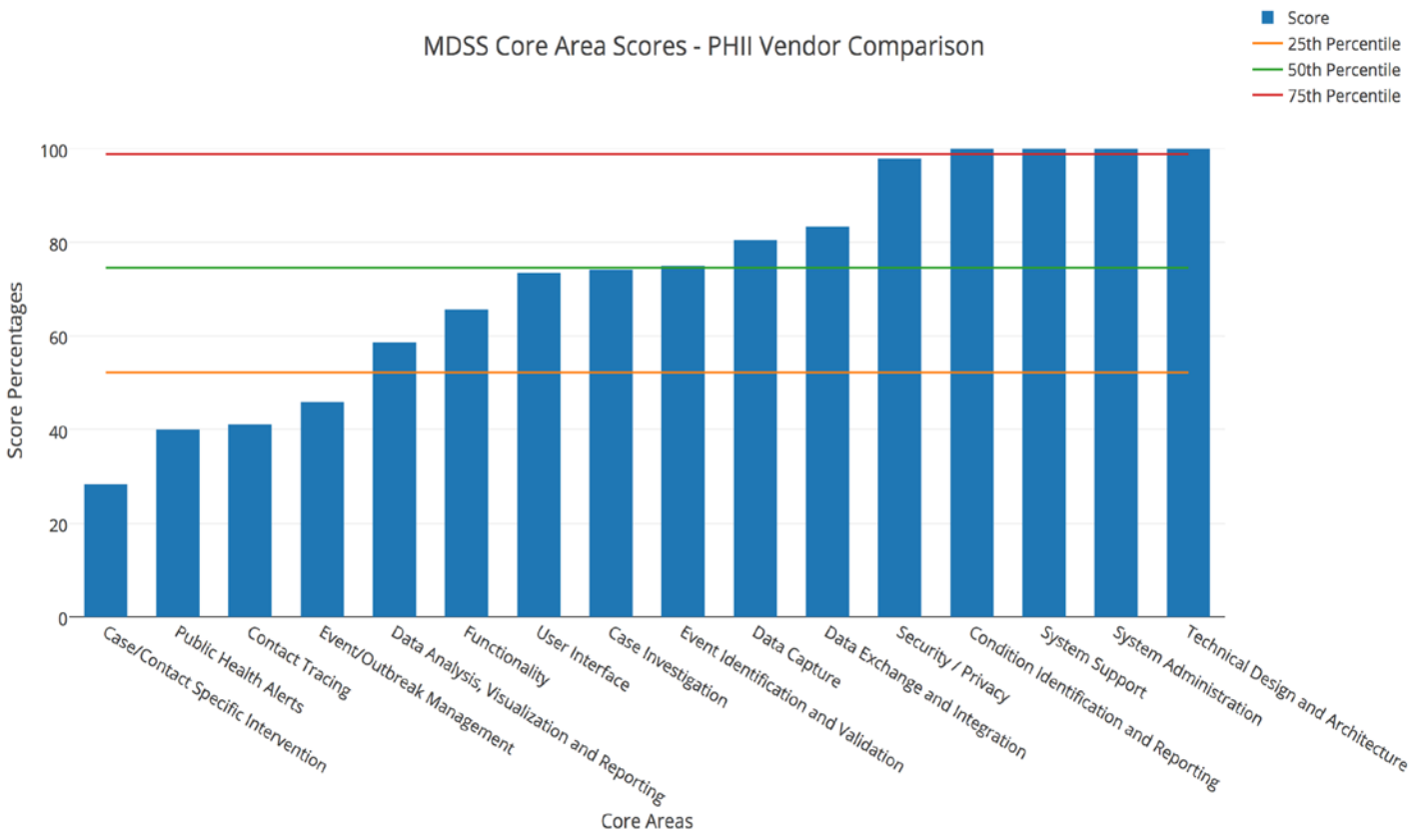

Figure 3.7: "MDSS Core Area Scores"

However, it must be acknowledged that case/contact specific interventions and event/outbreak management are two activities that are not currently conducted in MDSS (outbreak management will be deployed in late summer/fall of 2017). While aspects of these core function areas can be found in existing areas of MDSS, the functionality of MDSS at the time of this analysis was not explicitly designed to fulfill these core functionality areas.

3.3: Building an Informatics Savvy Health Department: A Self-Assessment - Results

The PHII Informatics Capacity Self-Assessment is a point-in-time exploration of an entity's developed informatics capacity that can be then used as a gap analysis in two potential ways. First, this analysis can illustrate what gaps exist, if any, between the presupposed state of informatics capacity and its actual state. Secondly, following the identification of any gaps, this analysis can be used to plan for future informatics capacity development and refinement. The assessment is comprised of 28 targeted questions that are grouped into three subject sections: Vision, Strategy, and Governance; Skilled Workforce; and, Effectively Used and Well-Designed Systems. These three sections can provide insight as to where an entity shows informatics strengths and weaknesses, and where it may wish to allocate resources for informatics development. This assessment should be used as both a retrospective assessment of what has been achieved, to date, and to assist with future informatics planning.

For this assessment, the entity (or agency) in question is the CD Division at MDHHS. Focusing on the CD Division for this assessment allows for subsequent recommendations that may be more easily enacted. Were this assessment conducted at a higher level (Bureau, Administration, or Department), not only would it there be far more variation in the responses (that would, therefore, not necessarily reflect the environment in which MDSS decisions are enacted), but the results of assessing informatics capacity at administrative levels above the CD Division may have unintended implications on systems that are not the subject of this overarching evaluation. As the business owners of MDSS, the electronic disease surveillance system in question for this project, it is the CD Division that exhibits the closest degree of authority over the informatics team that is charged with developing and maintaining MDSS. Therefore, constraining this informatics capacity assessment to the CD Division is the only appropriate level of assessment.

It should be noted, however, that if another entity's policy or procedure (e.g. MDHHS policy or inter-departmental procedures) holds authority over the CD Division, then that policy or procedure (along with the respective entity) is discussed, herein, as the controlling authority. This should not be construed to mean that such an entity is therefore implicitly included in this assessment; only the conditions of its relevant policy or procedure are considered, and only to the degree that they make specific requirements of the CD Division. For example, the Department of Technology, Management, and Budget (DTMB) policies on information security dictate both the administrative and technical security procedures that are used to ensure secure exchange of information in and across MDHHS applications. While the CD Division has no control over these policies and procedures, it is bound by them.

The completed assessment can be found in 'Appendix D - Building an Informatics Savvy Health Department: A Self-Assessment'.

This informatics capacity assessment for the CD Division received an overall raw average score of 2.107 (reference range: 0 – 5). It is critical to note here, as was addressed in the assessment's introduction, low scores are not uncommon for this self-assessment, even amongst successful agencies that have a history of focus on informatics. As the introduction to this self-assessment tool describes, "[t]his reflects the organizational challenges that are inevitable with formally establishing new ways of working and then rigorously evaluating that work."[30]

Just shy of 90% of the assessment questions were rated at 1, 2, or 3 - meaning that roughly 90% of the activities and attributes assessed are in a state somewhere between initial/ad-hoc development and being well-defined, but without ongoing assessment. Over one-third of the 28 questions received a score of 3 ('Defined') where the activity or attribute in question would be considered developed and in use with consistent application, but where ongoing evaluation is absent. Roughly another one-third received a score of 1 ('Initial'), meaning that the CD Division has demonstrated initial and/or ad-hoc efforts to engage in the activity or achieve the attribute in question. And just over 21% received a score of 2 ('Managed'), where there are organizational efforts to manage the activity or attribute, but in the absence of complete institutionalization or systematic documentation. The remainder of the activities and attributes were rated either at 0 ('Absent) or 4 ('Measured'), where there is consistent application and progress measure. None of the activities or attributes were rated at 5 ('Optimized') which would require consistent and full institutionalization of the activity or attribute, regular measure of progress, and utilization of the progress measure to inform subsequent actions and decisions relative to that attribute.

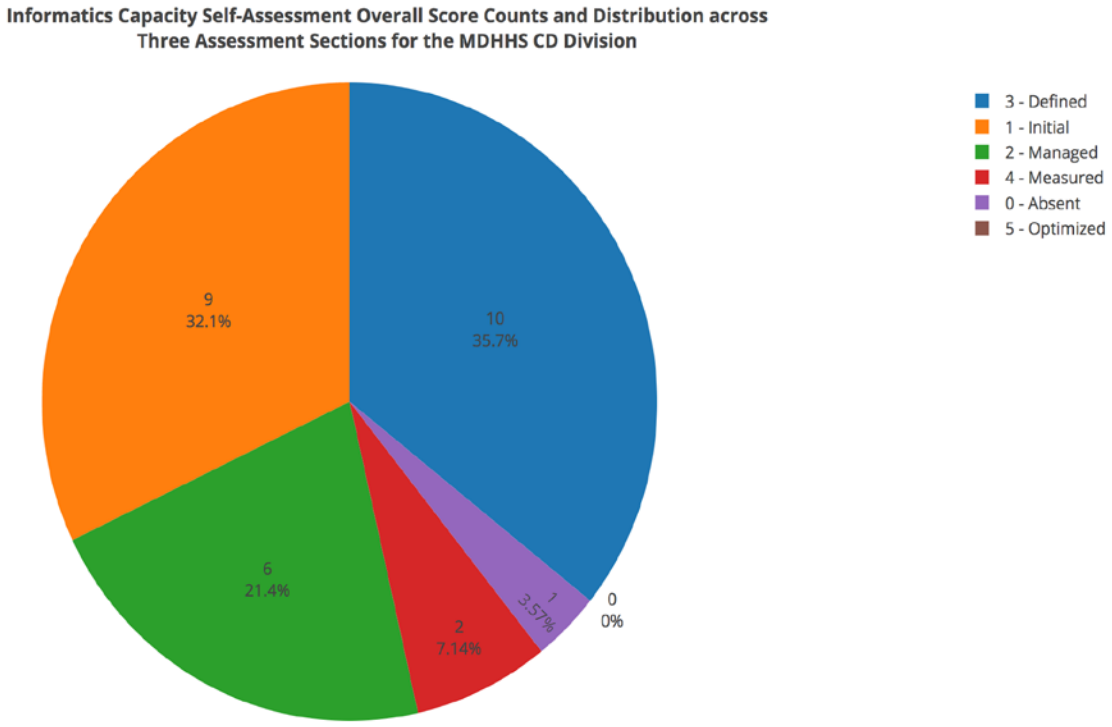

Figure 3.6: “Informatics Capacity Self-Assessment Score Distribution”

Within the three individual sections, the following average scores were attributed within the same reference range as the overall raw average score: Vision, Strategy, and Governance = 1.82; Skilled Workforce = 2.5; and, Effectively Used and Well-Designed Systems = 2.18. The frequency distribution of scores within each section reflects that Vision, Strategy, and Governance lags somewhat behind the implementation of a Skilled Workforce and Efficiently Used and Well-Designed Systems.

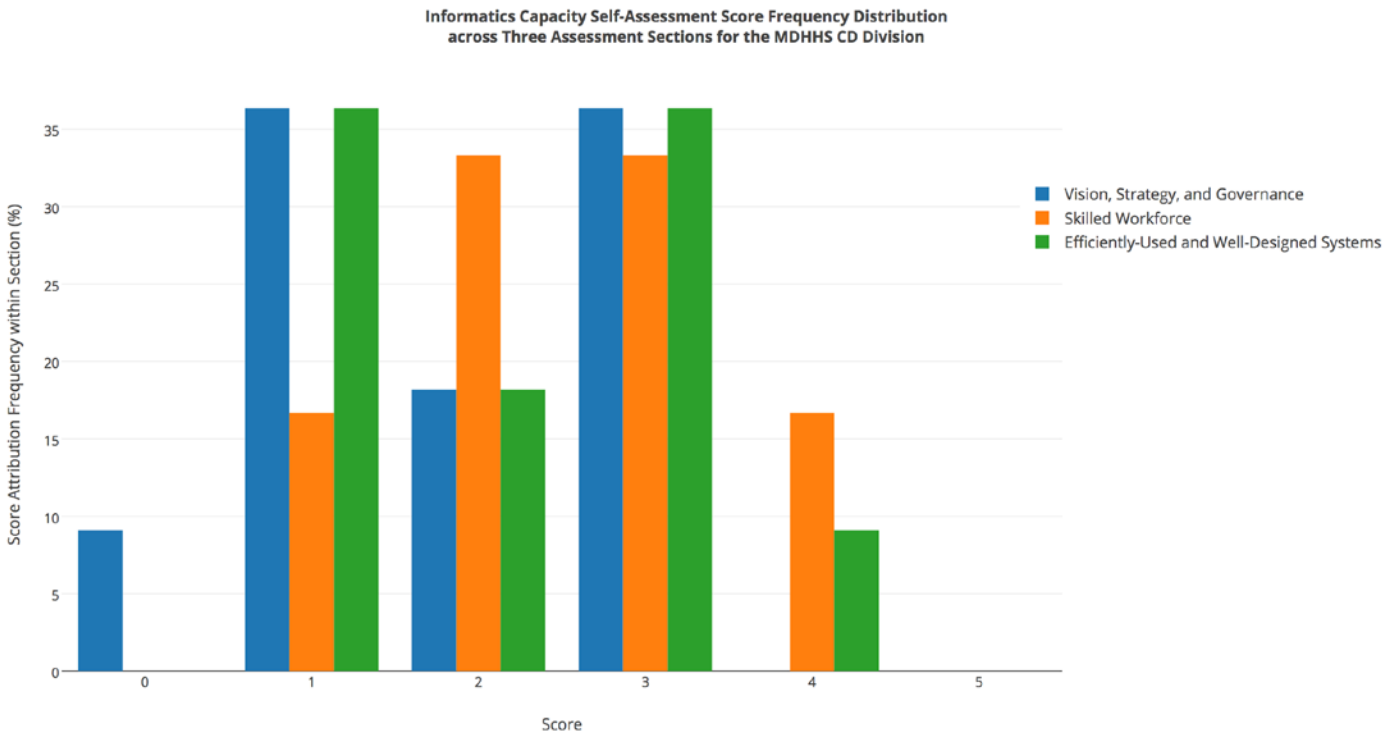

Figure 3.7: “Informatics Capacity Self-Assessment Score Frequency Distribution”

The only question that received a score of 0 (‘Absent’) concerned whether the CD Division has conducted an assessment to inventory its information assets and needs. The score of 1 (‘Initial’) was attributed to nine questions. The commonality shared amongst these questions was that they all concerned both the acts of assessing and documenting various indicators of strong informatics capacity (informatics strategy, assessment of data exchange, informatics job classifications, project management procedures [within the CD Division], information systems, systems usability, and data management). Six questions received a rating of 2 (‘Managed’). The commonality shared across these questions amounts to access to informaticians, information, and/or information systems. These include an informatics focal point within the CD Division, IT strategy to support informatics goals, an informatics workforce, program level staff having access to information systems and tools, standardized software development processes, and ability to send/receive data between programmatic information

systems. Ten questions received a rating of 3 (‘Defined’). These included a systematic approach to soliciting funding, collaboration with community partners for information system development, broad range of informatics job classifications, ability to securely send/receive data, integration of shared services, among others. Two questions were rated at a level of 4 (‘Measured’). These included having experienced, academically trained informaticians and the capability to process data sent from external partners.

3.4: Funding Assessment – Results

MDSS is mainly financed through two federally-supported grant programs, both of which result from the Patient Protection and Affordable Care Act of 2010 (ACA). The Epi-Lab Capacity (ELC) grant is funded through the Prevention and Public Health Fund (PPHF), which was authorized under section 4002 of the ACA.[35] PPHF dollars, statutorily, must be used "'to provide for expanded and sustained national investment in prevention and public health programs to improve health and help restrain the rate of growth in private and public health care costs.[35]'" Additional maintenance dollars have been made available for health information technology development under ACA-authorized Medicaid expansion, through the Advanced Planning Document (APD) process.[36] These two mechanisms are the primary means by which MDSS is supported, both in terms of its maintenance and ongoing enhancement and in terms of providing for most of the of the EDSS support team at the CD Division.[23] Additionally, subsequent to the 2014/2015 Ebola, limited Public Health Emergency Preparedness dollars were made available to support an outbreak management system (OMS) in MDSS. [23] This OMS will go live in the fall of 2017.

Wherever these funding mechanisms are not able to support enhancement, some condition-specific funding can be allocated, within the constraints of the program area's flexibility of use of such dollars. For example, while most HIV surveillance is conducted through ELRs that are processed and provisioned into another system (the HIV LMS), MDSS must be able to accept cases of manually entered HIV case reports, from healthcare providers who manually report all reportable conditions into MDSS. The HIV Surveillance unit is in the process of enhancing its case report form, redesigning the HIV data export, and facilitating manual entry of laboratory results within HIV cases; the specific requirements of HIV reporting require that these system components function differently than they do for surveillance of other reportable conditions. The total cost of these enhancements is estimated at $60,000 and is being covered by STD/HIV Prevention dollars, not through ELC or APD dollars.

While this type of program-specific enhancement funding is not uncommon, the overwhelming majority of development is funded under ELC and APD dollars. MDSS undergoes approximately 3 minor upgrades every year, with occasional major system upgrades every few years. The next minor upgrade (version 4.6) is planned for late summer, 2017. The next major system upgrade (5.0) is planned for early winter, 2017/2018.

Personnel-dedicated dollars from ELC have largely been funded at or near the requested amounts, in recent years - in 2014/2015 budget, 4 FTEs were requested, 3.18 were funded (79.5% of the requested amount);[37] in 2015/2016 budget, 4 FTEs were requested, 3.2 were funded (80% of the requested amount);[38] in 2016/2017 budget there was a funding format change and 88.86% of contractual and non-contractual personnel dollars were funded;[39] But, the ELC dollars dedicated to system enhancements and maintenance seems to vary significantly, and largely without clear explanation. During the 2014/2015 funding cycle, 26.5% of dollars requested for enhancement projects were allocated (totally $170,000) - this included $140,000 dedicated to increasing ELR submitters to MDSS and $30,000 for 'Out of State' reports. All other projects, including those that would enhance system functionality that would modernize system middleware or help to achieve the projects that were funded, were not funded.[37] During the 2015/2016 funding cycle, 34.4% of enhancement projects were funded ($265,000) - this included $90,000 dedicated to increasing ELR submitters to MDSS, $75,000 for upgrading system middleware (only 25% of the original requested amount [$299,000.00]), among other limited system upgrades. Curiously, while MDSS was also part of the NNDSS Modernization Initiative (NMI), during this time, supporting system upgrades were not funded (e.g., the NEDSS Messaging User Interface upgrades).[38] During the 2016/2017 funding cycle, however, only 7.47% of the requested, contractual project development was funded; these dollars were solely dedicated to increasing the number of ELR submitters into MDSS.[39]

Like ELC dollars, Medicaid APD dollars have been planned out and requested both to support personnel needs and to target specific maintenance and development. For the FY 2017 and 2018 planning cycle, these sub-projects include ELR expansion (including: eCR and OMS messaging components, HL7 CDA QA tool, and initiation of MPI integration), CDA testing with local public health (including: implementation guide development, rhapsody-based message ingestion, MDSS-based data ingestion), case reporting to CDC (including: implementation guide development, creation of outbound message, testing), and two additional sub-projects that are in planning stages[40]. The FY 2018 and 2019 planning cycles largely mirror the same subprojects[41]. Unfortunately, due to circumstances beyond the CD Division's control, while the requests for both planning cycles have been finalized, there is no confirmation as to whether Medicaid APD dollars will be allocated for either the 2017/2018 or the 2018/2019 planning cycles; and, if so, to what extent. Medicaid APD dollars, like ELC dollars, are not a given, consistent source of funds.[23]

Chapter 4 – Discussion and Recommendations

4.1: Discussion - Overview

As noted in Chapter 1.6, the primary intent of this evaluation was to assess what qualitative gaps may exist MDSS's functionality, vis-à-vis users' perceived needs and feedback, and to provide for recommendations that can help CD Division leadership in EDSS system lifecycle planning. While this evaluation did involve some quantitative analysis of user feedback, these results were predicated on subjective user perspective. This evaluation was implicitly qualitative and, thus, deviated by design from more traditional models of system evaluation, which tend to focus on measuring discrete system attributes. While this evaluation in no way intends to undermine the value that such traditional analyses can provide to developers and managers of EDSSs, this analysis is an attempt to acknowledge and address a critical gap of such quantitative analyses in that, while such analyses can and do provide important and necessary information, they fundamentally cannot address whether users are satisfied with a system and, as a result, whether these users are committed to maximizing its use and value.

While this approach did take advantage of a standardized, subjectivist design, following a progressive responsive/illuminative approach using the previously validated Nine-Dimension Framework, it was unique in that it is the first known evaluation to apply the Nine Dimension Framework to an EDSS used for communicable disease surveillance. Additionally, while this approach focuses primarily on a qualitative analysis of MDSS, itself, the incorporation of an informatics capacity analysis, vendor analysis, and funding assessment provide for description and analysis of the environment in which MDSS is constrained. This environment is viewed at three levels, the micro-level being the office of the CD Division which is charged with its oversight (Informatics Capacity Assessment), the macro-level being the community of available EDSSs that are similarly designed to facilitate disease comprehensive disease surveillance (Vendor Analysis), and the financial perspective that illustrates historic use of limited resources

while discussing high-level opportunities for realignment of these limited resources (Funding Assessment). The inclusion of this environmental analysis is intended to help guide rational, achievable planning and decisions about how to address the future of the MDSS and the needs identified through the responsive/illuminative approach. It acknowledges that MDSS does not exist in a vacuum and that, while user perception and feedback are the paramount concerns of this evaluation, there are considerations beyond user perception that dictate and/or limit the system's development and functionality.

4.2: Responsive/Illuminative Approach – (a) Discussion

The responsive/illuminative approach takes advantage of progressive analysis that becomes more granular at each step, in order to member check the preceding steps, such that information gathered at the final step can be presumed accurate. This type of progressive validation is critical in subjectivist designs, as such a model does not implicitly include the same validation rigor generally encountered in objectivist evaluation. The member checking of the previous steps ensures that subsequent steps are following a valid and representative trajectory.

The first step of this analysis, the high-level requirements derivation, highlighted two key factors: 1.) High variability in data input has resulted in a significant amount of workflow processes focused on ensuring accuracy, completeness, consistency, data quality, and error reduction. These efforts are conducted, largely, in an effort to maintain confidence in the system and the resulting data output; and, 2.) There is a significant amount of analysis and program coordination that happens externally to MDSS - analysis and coordination that is conducted ad-hoc and through systematized use of third-party systems (e.g., SAS, Excel, Link Plus, etc.).

Additionally, through analysis of funding requirements, it became clear that each program area within the CD Division is extensively working to meet the requirements of their funding source agreements through use of a system that is primarily designed as a repository of surveillance data. The extraction and transformation of data into useful information to meet these requirements is an extensive process that ultimately reflects how MDSS has not been adapted from a more traditional silo of data to a broker of communicable disease information. While it could be argued, with only limited effectiveness, that MDSS is currently engaged in some degree of brokering through NEDSS and NETSS transmissions to CDC, a distinction should be drawn between these data transmissions and the type of information brokering needs identified at this first level of analysis. Primarily, brokering of information critically differs from brokering of data in that the transformation of data to information involves the application of

analysis in order to derive meaning and, subsequently, to facilitate the synthesis of knowledge. This type of direct brokering is lacking in MDSS in terms of inter-program information (e.g., between the STD Surveillance unit and the Viral Hepatitis Surveillance or between the Viral Hepatitis Surveillance unit and the Vaccine-Preventable Disease Surveillance unit), reporting to funding sources (all reporting is accomplished through significant, ad-hoc analysis of MDSS-housed data), and in reporting to community partners (currently, all publishing of publicly available information is conducted through manually-intensive analysis and reports). To effect such brokering, MDSS would ostensibly require the addition of several types of functionality:

1.) The inclusion of data analytics within the system, itself; or, in the very least, more user-friendly ability to meaningfully extract data from the system in a manner that convenes to ad-hoc user parameters prior to the execution of third-party analytics, as was illustrated by the STD Surveillance unit's need for exported data that reflected course of treatment, and titer by age, or the Viral Hepatitis Surveillance unit's growing need to reflect negative Hepatitis C test results followed by positive Hepatitis C test results - indication of acute infection - and Positive Hepatitis C test results followed by negatived Hepatitis C test results - indication of cleared infection;

2.) The addition of automated, disease-specific monitoring, operating in the background of the system, that will notify specified users when specific events occur or when sets of conditions have been satisfied. It should be noted here that this type of functionality need has previously been identified and discussed by system administrators under the guise of disease aberration detection. It is currently in the very early stages of development with no current estimated date of implementation and funding has not yet been allocated; and,

3.) The ability to publish, in some fashion, disease-specific information directly from MDSS. This could be achieved through the addition and use of APIs for persistence of up-to-date public-facing information, or through manually-executed publishing to publicly available information portals, in combination with enhanced analytics.

The focus group discussions, the subsequent step in this iterative process, sought to convey the two key factors identified at the first level of this approach and derive further system assessment through discussions with system users across all user levels of MDSS - as opposed to the first step which focused only on State-level system users.

While general satisfaction with the system was expressed, there were some critical issues that were identified that significantly impact users' trust in the system and their ability to accomplish desired tasks. At this level, concerns about accuracy, completeness, consistency, data quality, and error reduction were substantiated, and system reliability and functionality were added as key attribute considerations. There was less consensus by the group, on the whole, as to which of these attributes were paramount, but there was general agreement that information quality and system quality must co-exist - one cannot supplant the other, and they are complimentary.

That said, the lack of consensus regarding attribute ranking illustrated a key distinction from the first step of this analysis: increasing the scope of user activities captured by the analysis highlights how system users at different levels utilize and value the system differently. A local health department user's efforts to enter and save laboratory data or case information is largely impacted by whether the laboratory data entry screens provide adequate prompts for the user to know how to correctly represent the test result information, the lack of standardization across some case field forms (i.e., open-ended textual data), and minimal required fields in case report forms all augment frustration and decrease user confidence that the system will consistently contain the data needed to accomplish desired workflow tasks. While State-level users have focused workflows on maintaining and cleaning usable data on the downstream end

in an effort to encourage flexibility of data entry on the front end - so as to incent data entry flexibility with the goal of minimizing loss or lack of input of key, needed data - other, upstream users are concerned that this system 'openness' ultimately presents an undesirable, potentially counterproductive risk - that the openness allows for too much variability and, thus, reduces consistency and completeness.

These examples should serve as key lessons for system managers who may be fearful that placing too many constraints on data entry requirements could dissuade case entry or the communication of critical case information. In fact, these focus group discussions highlighted a significant gap across these system user levels: while State-level users are engaged in various data management practices to maintain a repository of usable communicable disease data, upstream users of the system (namely public health nurses and other LHJ case investigators) are expressing concerns with the lack of consistency in incoming ELR-initiated cases and lack of constraints that would guide them in data entry and manual case creation. For example, in addition to concerns about variability in incoming ELR data, if a public health nurse receives a faxed copy of a laboratory result that is not otherwise already represented in MDSS, he/she will enter this information into the case record, largely, through a series of drop-down menus that represent different tests and result options. These drop-down menus are only limitedly dynamic and, as a result, contain wide-ranging options that span a number of conditions and test types. If the public health nurse is unsure of which option best represents the test(s) and result value(s) that were faxed (as he/she is not a laboratorian), he/she may simply select 'other' and manually represent the test(s) and result(s), verbatim, to minimize incorrect interpretation. This has led to increased variability through a de-standardization of user practices for results reporting where 'other' is frequently over-selected (meaning, the test and/or result may actually have a corresponding drop-down menu option) in lieu of selecting the best discrete option that otherwise truly represents the test and/or result. Similar concerns were expressed over the lack of minimally required fields in case report forms that lead to too much variation across case

representation within any given condition and negatively impacts both consistency of data and its completeness.

This over-selection of 'other' and lack of data consistency and completeness, then, has downstream impact where subsequent users cannot meaningfully extract data from the system with reasonable assuredness that true and complete information is being extracted. And, those who input these data on the upstream end are often unaware of these downstream impacts, as they are functionally separated from these subsequent activities. As an example, if the State-level Perinatal Hepatitis B Surveillance team wants to extract the number of lab tests over the course of the past year that represent a positive Hepatitis B Surface Antigen test (HBsAg) - a test and result that, following the CSTE case definition, would reflect acute infection - they would have to also include *all* 'other' tests that were manually entered into MDSS for that same time period and identify additional ways through which they could filter this non-discrete data to exclude non-HBsAg tests/results. This risks both the incidental inclusion of non-HBsAg tests/results and the exclusion of true HBsAG tests/results. And, as pregnancy status is not a required field in the case report form, it is difficult to ascertain whether all positive HBsAg test results for women of childbearing age might be indicative of a perinatal infection.

Additionally, while the first level of analysis illustrated a need for enhanced data analytics and/or improved data exports, during the focus group discussions, local health jurisdiction and hospital-based users (namely, ICPs) seemed to largely agree that the available canned reports within MDSS adequately met their needs on a regular basis. This distinction also serves to underscore the differing objectives of user workflows at different levels of the communicable disease surveillance system - while quick and regular access to canned reports helps to manage the day-to-day workflows of ICPs and LHJ professionals, State-level users' querying of data is less reliant on routine parameters and output. The system must support both, not one in place of the other.

Lastly, focus group discussions made it clear that MDSS is not used to directly facilitate or monitor public health interventions. While the data collected certainly contributes to the decisions made by local health jurisdictions in whether and how they may intervene, the intervention is not captured or managed by the system, directly. This is largely a function of Michigan's federated, decentralized public health structure that defers control of public health activities to the local health jurisdictions. As such, there is not any single intervention or approach that is systematized in such a way that MDSS could or should be the mechanism by which it is carried out. Certainly, best practices are employed. And, it is even possible that there may be consistent agreement across jurisdictions as to how any given intervention should be implemented. But, the nature of public health in Michigan is such that these calls are made by LHJs, sometimes on a case-by-case basis, and are not within the purview of a statewide EDSS. LHJs made it clear that this autonomy is critical and their ongoing working relationships with their local healthcare providers are, in large part, what facilitate effective interventions.

By design, the third step of the responsive/illuminative approach, the end user survey, provided the most comprehensive and detailed feedback. At this step, a detailed survey was sent to all registered and active users of MDSS. This spanned all user types.

Like the focus group discussions, there were concerns expressed about several system and information quality attributes, including: completeness of information represented in MDSS; and, the system's adaptability, response time, and capacity to facilitate error reduction. While virtually all of the information quality and system quality attributes saw a shift in user responses between how important users thought the specific attribute to be and how well it is represented in MDSS, most of these shifts occurred between being rated as highly important and at least moderately represented in MDSS. Only Completeness, Adaptability, Response Time, and Error Reduction saw shifts that resulted in positive MDSS rankings within the lowest quartiles.

These, in large part, speak to the same issues that were addressed in the focus group discussions. User feedback indicated that users wish to see more uniform standardization and quality assurance (QA) practices to improve on these attributes.

In addition to those attributes that were identified as key areas in both the focus group discussions and in these user feedback surveys, users submitting feedback surveys also rated Response Time as an area in need of adjustment. While this was not a key attribute highlighted by the focus group discussions, it was mentioned several times during the focus group component of this evaluation - specifically, while focus group members noted that the critical system failures experienced in mid-to-late 2015 have largely ceased, there remains a frequent issue where MDSS response times can lag, often for extended periods of time, significantly impacting system use and user workflows. The user feedback surveys found this to be a primary concern in need of remediation, along with the other information and system quality attributes highlighted in this evaluation.

Service Quality Attributes saw a similar connection, as well, in that, while the focus group members did specifically highlight the need for improved service from the MDSS support team (indeed, Service Quality attributes were not seen to be as significant as Information Quality or System Quality attributes), it was noted that issue resolution can be inconsistent, at best. While focus group members largely felt that the service team was accessible and helpful, they noted that issues that could not be immediately rectified by the MDHHS support team often lagged for extended periods of time, or never got resolved, altogether. The user feedback surveys were significantly more critical in this regard, noting that, while the support team can be empathetic, assurances that issues will be resolved (as demonstrated through consistent and timely problem resolution) is lacking. Users illustrated that the service/support component of MDSS seems to happen ‘behind-the-curtain’ – where few, with limited access, understand the process by which system issues are addressed. Users stated that, “[prioritization] for ‘fixing’ is often a mystery” and “just because you report something doesn’t mean it will be fixed fast.” Still

others provided specific recommendations like growing and splitting the informatics team such that development and ongoing operations would become the purviews of separate entities.

All in all, users were also fairly evenly split in where they thought prioritization should be placed for system improvement, with 50.39% of users electing a focus on improving Information Quality Attributes and 41.73% electing a focus on System Quality Attributes. This mirrors the focus group discussions where either one of these quality attribute groups was not clearly identified as more important than the other. Perhaps here, though, it was less evident as to whether these two quality attribute groups were seen as complementary.

While identified user types (LHJ Users, MDHHS USers, and Health Provider/ICP Users) seemed to all agree that they would focus efforts on improving data QA, there was less uniform agreement on where else emphasis should be placed (see Figure 3.4: "User-Recommended Targeted Improvements"). End users of MDSS data (MDHHS and LHJ Users) seemed to place greater emphasis on the system's ability to validate, process, and provision data on an automated basis. LHJ users, who also spend a significant amount of time conducting data input during case investigations, also indicated a need to improve system speed/up time. Training/Data Entry Staff Guidance was curiously split between both MDHHS and Healthcare Provider/ICP Users who responded at twice the frequency of LHJ Users in recommending a focus on this area. As noted earlier, during the focus group surveys, both MDHHS and Healthcare Provider/ICP Users felt that there were too few controls over the data entry process, allowing for too much variability. Healthcare Provider/ICP Users felt that there was inadequate and non-standardized guidance and training and that they, as a result, often felt ill-equipped to knowledgeably interact with MDSS, especially when newly introduced to the system. Additionally, many of these Healthcare Provider/ICP Users do not interact with MDSS on a regular basis, so the opportunity for consistent interaction with the application to supplant rigorous training and guidance does not exist for many of these users. LHJ Users, particularly those who hand entry of case data, on the other hand, often interact with the system. Over time,

the ease of interaction with which they engage with the system becomes acquired and they, as result, were perhaps less likely to rate training/data entry staff guidance as a critical area to address. MDHHS Users, however, feel the impact of this variability when trying to extract and interact with data; as a result, they voiced similar concerns as those who expressed a lack of consistent training and guidance materials.

Perhaps one of the more illuminating figures was the low level of satisfaction expressed by users in terms of MDSS's ability to support task completion on its own. On a rating of scale of 1 (low) to 5 (high), only 84.74% of users rated MDSS's ability to support task completion as at least moderate (3 or higher). Only 58.02% - slightly over half of all users - rate MDSS's ability to support task completion as mostly or entirely adequate (4 or 5, respectively). This speaks to the direct functionality of MDSS and its ability to support decision-support logics and enhanced data analytics. Surprisingly, MDHHS users were the group with the single lowest overall satisfaction in this area - 60.95% satisfaction rating. Supporting the findings of both the initial requirements derivation phase and the focus group discussion phase, respondents to the feedback survey noted that Excel, Word, SAS, R, and Epi Info were some of the most heavily used supportive software to accomplish tasks not otherwise directly achievable in MDSS. That said, over two-thirds of LHJ users placed a particular emphasis on the work they conduct in independent EHR systems. Several times in this feedback survey, users commented on the importance of connecting MDSS with healthcare provider EHR systems. MDHHS currently has two pilot projects underway to connect with EHR systems through electronic case reporting (eCR) and one or both of these projects could prove of use to users who find that there is excessive duplicate entry of EHR-housed information. Neither of these pilots, however, is currently considering interoperability where MDSS would communicate back to EHR systems (or other systems) for true information brokering. It should also be noted that, while many other 'off-the-shelf' EDSS developers are, too, working to develop the ability to connect their systems with EHRs through eCR, it has not been demonstrated by any vendor that any known EDSS is

actively engaging in brokering information back to EHR systems. This degree of information brokering interoperability is consistently lacking throughout the market of available EDSSs.

The areas of epidemiological analysis and reporting/alerts were further elucidated through a subset of users who were identified, and whose responses were isolated, based on whether they self-reported use of MDSS for these epidemiological functions. Even in these areas, concerns surrounding the lack of internalized analytics and cumbersome, user un-friendly exports were raised as the primary issues. Otherwise, only the reliability of the alerts were raised as an ongoing issue. Users indicated a lack of confidence that alerts would trigger when the specific alert conditions were met, expressed a frustration with an inability to set disease trend thresholds that would result in investigation alerts (akin to the disease aberration detection mentioned herein, earlier), and communicated a desire to see specific form-based alerts that, much like the disease aberration detection, would notify a specified user when a specific condition was met during an investigation (e.g., when a female between the ages of 10 and 60, as part of a Hepatitis B investigation, is identified as being pregnant).

MDSS does appear to largely bring value to management practices. Of the areas that were separately identified and discussed in this survey, value added to management received the highest overall score. This was supported in the focus group discussions where, those with management roles within their respective agencies, commented that the existing canned reports and search functionalities allow them to easily track, monitor, and manage workflows. This was reiterated by the STD Surveillance unit, stating that the ability to manage DIS staff queues and case reviews has proven very beneficial.

As briefly noted earlier, there were frequent comments provided throughout this survey focused on a need to improve consistency and availability of training and system guidance. This was further supported in targeted questioning, where less than two-thirds of users (64.34%) stated that training was either adequate or mostly adequate. Additionally, there was a dramatic gap between MDHHS users' perception of training (90% average rating) and the average

ratings of LHJ and HCP users, 72.68% and 76.67%, respectively. This difference between MDHHS user perception and the perception of other groups underscores the criticality of ensuring outreach to all user types during ongoing management of any system. As executive decisions about MDSS are largely made by system administrators at the State level, driven largely by funding and policy constraints at the State level, impact on non-represented user groups risks not being adequately considered. As MDSS development and management decisions have increasingly focused on system functionality improvements and program-driven requirements, the very important area of system training and guidance has either been overlooked at worst, or underappreciated, at best. LHJs' and HCPs' physical and administrative separation from the State complex is such that consistent access to, and application of, rigorous system guidance and training materials is the best front-line defense to promoting consistent use of the system. Without these, and without a rigorous, system-management-led emphasis on the importance of consistent and available training materials, the system can become encumbered by high degree of variable practices, workarounds, data entry processes, data completeness, case closure policies and practices, and so on. This is no hurdle that data QA practices could surmount, on their own. Indeed, perhaps the simplest, least technically difficult measure that could be implemented to improve consistency in application use and to reduce the burden of QA is to support a coordinated, system-wide strategy to training and guidance of users across all levels of the system.

In gauging the system's impact on both the Public Health system and on facilitating meaningful health services outcomes, MDSS was well-rated in terms of its ability to rapidly identify needs, notify the appropriate individuals/teams, and initiate intervention. Likewise, as noted above, MDSS is not designed to systematize, manage, or track the actual intervention (on either an individual or outbreak level); this was not identified by users as a lacking functionality as it was largely viewed, at all levels of this evaluation, as a process that is incumbent on each LHJ to develop and manage, within its scope of practice. The scores from this user feedback

survey seem to corroborate this, as the feedback indicated that MDSS's ability to facilitate the management of interventions and recommendations had neither a positive nor negative impact on health services and outcomes.

However, MDSS's ability both to identify at-risk populations and to facilitate follow-up (post-intervention) were in or at the threshold of the lowest quartile of the impact scores (IQR 76.43% - 89.29%): Identification of At-Risk Populations = 76.43%; Facilitation of Follow-Up = 72.86% (see: Table 3.5: "Impact and Outcomes"). This points to MDSS's historic development as a repository of surveillance data that can be used for epidemiological analysis. These scores reflect that, as funding sources and policy continue to demand more and more in the way of holistic population health management practice and documenting/tracking specific aspects of case closure and follow-up - activities that are more traditionally under the scope of case management - MDSS has not been fully adapted to meet these requirements. As a result, users are left to develop alternative workarounds that often end up with this type of data being commented in a open text note fields or in copies of PDF files uploaded into a patient record. These types of practices do not support the discrete representation of data and, as a result, negatively impact both the ability to easily extract such information and user confidence in the system.

Overall, MDSS received a satisfaction ratings of adequate or mostly adequate from 80.58% of users. The trends in satisfaction ratings across individual user groups highly correlated to one another, suggesting that each user group subset is largely in agreement with other user group subsets (see: Figure 3.6: "Overall MDSS Rating"). This would be an indication that, even though these different user groups use MDSS in varying scopes across a variety workflows, each user group seems somewhat satisfied with MDSS, with significant concerns noted.

4.2: Responsive/Illuminative Approach – (b) Recommendations

As noted hereinabove and in chapter one, the intent of this evaluation is to provide for a baseline analysis of MDSS that will inform EDSS planning within the CD Division. Conceivably, should the CD Division decide to implement an EDSS planning strategy predicated on this evaluation, there are two potential approaches that the CD Division could employ that would address the findings, herein: 1.) The CD Division could opt for a planned deprecation MDSS through replacement with another system that meets the requirements identified in this assessment; or, 2.) The CD Division could target its limited resources to effecting enhancements within MDSS, as recommended in these evaluation findings, that would increase the system longevity and provide for the adaptive functionality that meets the dynamic needs of contemporary public health practice. While this responsive/illuminative evaluation is concerned with offering suggestions for system targets (either through enhancement or replacement) that could meaningfully improve user perception and increase confidence in whatever system is used, it is agnostic as to which of these two overarching options would represent the best choice for the CD Division.

There are several discrete recommendations that result from the three step responsive/illuminative analysis. These recommendations can be grouped by tasks and/or aims to meet objectives that target an overarching goal. For the sake of this evaluation, within the guise of the Nine Dimension Framework, there are three overarching goals that this evaluation has highlighted: 1.) Identify solutions that incent and support meaningful brokering of information; 2.) Develop rigorous and systematic mechanisms that sustain system functionality and fully address issues to a resolved status; and, 3.) Employ a system service strategy that promotes transparency and communication in customer support.

In order to meet the goal to identify solutions that incent and support meaningful brokering of information, two independent, but equally important objectives are recommended. These objectives include specific aims and actions/tasks to be completed: 1.) Reduce variability of Data Inputs; and, 2.) Support sophisticated data analytics.

To meet this first objective (to reduce variability of data inputs), ten aims are recommended. While most of these aims operate independently of one another, the effectiveness of some is dependent on one or more preceding aims (dependencies are called out, as applicable). Thus, while most of these aims can be selected à la carte, the capacity of each aim to exhibit individual effectiveness is bolstered when all are targeted, comprehensively. They represent a mix of both technical and administrative solutions:

Goal #1: Identify solutions that incent and support meaningful brokering of information	
Objective #1: Reduce variability of Data Input	
Aim:	Action / Task(s):
#1 - Update Communicable Disease Reporting Rules	Complete a gap analysis of current communicable disease reporting rules; develop and enact a legal framework that provides for augmented disease reporting rules and standardization of ELR and eCR as preferred reporting mechanisms (attrition of manual reporting except under specified circumstances [e.g., individual practitioners who rarely report]).
#2 - Identify Technical Solutions for Improved Validation, Processing, and Provisioning in Automated Data Exchanges.	Currently, some extraneous data is known to erroneously generate non-reportable case data (e.g., processing of negative results within panel tests or reporting of most individual influenza cases); this creates an unnecessary burden for deduplication and investigation teams. The EDSS in use should be able to handle complicated, disease-specific validation, processing, and provisioning. This will be especially critical in implementation of eCR, which provides for richer, more complicated data.
#3 - Strengthen ELR Onboarding Procedures to Limit Message Variability	Onboarding procedures should establish a rigorous testing and validation protocol with established measures that will be communicated to message senders during onboarding initiation. These measures should mirror the strengthened communicable disease rules, updated in aim #1, above.

#4 - Use of Decision Support Logics	Decision support logic can be utilized to solicit targeted data entry on a case-by-case basis to make efficient use of data entry staffs' time; can be used to adjudicate and prioritize cases based on condition and other available data, including: titer, sex, age, etc.; and, can support monitoring of changes in individual case activity (e.g., evaluating Hepatitis C ELRs to establish acute cases or cleared infection).
#5 - Development of Software and Administrative Processes that Facilitate Ongoing QA Activities	Presently, all QA activities are manually intensive and do not allow for comprehensive review of any sender's data completeness for any given timeframe. This has limited the Division's capacity to continually report ongoing message quality issues back to message senders. The CD Division should implement systems and ongoing processes that facilitate this type of ongoing reporting, require message quality improvement plans, and track reporting completeness over time. Ideally, this would consist of two parts: ● The CD Division would set self-imposed expectations for ongoing QA activities (QA targets, review goals and objectives, internal response plans); and, ● The ongoing auditing, reporting, and enforcement of message quality with senders (both the reporting of metrics to senders and the solicitation of message quality improvement plans/activities).
#6 - Strengthen Data Consistency and Completion through Increased Use of Required Fields	The EDSS solution should better capitalize on requiring completion of program-specified variables for case completion. While system managers have historically shied away from such requirements out of concern that this could result in unreported cases, this concern does not acknowledge the burden that message senders have to notify MDHHS of reportable conditions - as long as this remains true, MDHHS exhibits much flexibility in deciding what may constitute a complete case referral (this coincides with goal #1, objective #1, aim #1, hereinabove). And, the findings of this evaluation show that an unintended negative consequences has actually resulted from this position - users report too much variability and inconsistency in data inputs. This aim is particularly powerful when implemented following the strengthening of disease reporting requirements in aim #1, strengthening ELR onboarding procedures in aim #3, and with the development of software and administrative processes to facilitate ongoing QA activities in aim #5 (all in goal #1, objective #1).

#7 - Optimized Manual Laboratory Result Reporting Data Entry Screens	Manual laboratory result reporting currently uses only minimally dynamic data entry screens. These data entry screens should be reformatted to guide the user through options based on their previous selection. Additionally, the most generalizable test and result names and codes should be used for manual entry so as to minimize risk of overwhelming the user with an abundance of options. Result entry should, likewise, be dynamic - qualitative test selection should only present qualitative result options, quantitative test selection should only present numeric and percent values, etc. It is also recommended to add help/assistance links that can provide clarification for the user on the functionality that they are attempting to use.
#8 - Limit Access to 'Other' options	While no system can ever have absolute certainty that all presented options will fully meet user needs 100% of the time, access to 'other' options should not be easily permitted; it certainly should not be the primary default value used by system users. This is true for manual laboratory result entry, many case report form values, and much of the patient/demographic information. There are several potential ways in which access to 'other' options could be limited. For example, for the manual laboratory result reporting, some options include: embedding the 'other' option at the end of dynamic lists - thus requiring users to scroll past possibly valid options before selecting 'other'; only allow 'other' entry by support administrators and system administrators - this would require that users call their regional epidemiologist or system administrators for assistance which should incentivize selecting another appropriate option, first. This would facilitate discussion/review of the lab report and whether the test/result option is truly missing, and will limit 'other' use to times when no other option is truly available; require user input of additional result code information from the available lab report with 'other' selections (e.g., LOINC codes, local codes, etc. from lab report) - these codes could then be validated by the system to validate and amend test/result names based on code catalogs; and/or, require a PDF of the lab report be attached for 'other' tests which would then require second-level manual review where code(s)/name(s) could be updated (e.g., by regional epi or other MDHHS staff). Other (non-MDSS) EDSS solutions may include additional controls that should be evaluated in the decision-making process.
#9 - Training and Guidance	Develop standardized training and guidance materials, including data entry. This should include a standardized training regimen that would be consistently replicated by various system trainers across all regions of the state.

#10 - Strengthen Patient Deduplication	The MDHHS Master Patient Index (MPI) shows potential to reduce replication of functionality across multiple MDHHS systems. For example, the MPI is alleged to offer deduplication functionality. While its accuracy and precision remain to be demonstrated, it is possible that placing this functionality externally to the EDSS in use could result in a reduced deduplication burden for system users. This type of system alignment will become more and more critical as the EDSS in use connects to more MDHHS applications and systems over time (MCIR, EDRS, etc.) and as eCR comes online; or, If MDSS is remains the EDSS of choice, in addition to capitalizing on the MPI, it is recommended that the CD Division implement the recommendations from Dr. Weinberg's 2017 analysis on improving the MDSS automatic patient deduplication.[42] These include system treatment of the patient's middle initial as an independent variable, allowing for small differences (≤2) in names when all other critical variables match, and the creation of an 'alias' variable, among others.

Table 4.1 - Recommendations: Goal 1, Objective 1

The second objective within this first goal is focused on developing more sophisticated data analytics capabilities. At present, data analytics, as well as the communication of information that results from data analysis, exist outside of MDSS and are heavily dependent on users' specific knowledge of, and experience with, third-party software (e.g., SAS, R, Excel, etc.). While the State of Michigan has only recently begun moving in the direction of more systems integration across state platforms (recent purchase of Power BI), there exist several avenues by which such functionality could be incorporated into the EDSS solution.

Goal #1: Identify solutions that incent and support meaningful brokering of information	
Objective #2: Support Sophisticated Data Analytics	
Aim:	Action / Task(s):
#1 - User Querying of Databases through GUI Interface that Permits Dynamic Interaction with Export Parameters	User-generated exports should allow for user-dictated dependencies (e.g., instead of patient-centric exports, a user may want to generate lab result-centric exports). The EDSS should support connection with analytics software, decoupled from the system (e.g., through APIs).

#2 - Saved Export Parameters	The EDSS should facilitate saved export parameters that permit the user to export data in a user-standardized format on a routine basis.
#3 - Facilitate Direct Publication of Information	Facilitate the publication of both internal and public-facing information. This could include near-real-time interactive communicable disease information (e.g., through use of Power BI software), weekly disease summary reports, and/or communicable disease dashboards.
#4 - Implement Disease Aberration Detection	The EDSS solution should be able to track ongoing disease activity and determine whether an aberration in trends exists. This type of detection could also be utilized to enhance the message sender QA activities described in Goal #1, Objective #1, Aim #5, above, by tracking ongoing sender activity and identifying when individual message trends deviate from expected transmission rates.

Table 4.2 - Recommendations: Goal 1, Objective 2

Whereas goal #1 focuses on improving information quality and brokering, goal #2 decidedly focuses on improving overall system functionality. This goal includes four objectives, corresponding aims, and several actions/tasks to undertake.

Goal #2: Improve overall system functionality		
Objective:	Aim:	Action / Task(s):
#1 - Improve Response Time / Up Time	User feedback decidedly pointed to continued frustrations regarding frequent system latency, interrupted sessions, and system failures. The EDSS solution should continually work to mitigate, identify, and resolve underlying root causes of such issues in a regimented, systematic manner.	Develop protocol for both proactive prevention of and systematic response to such system issues. Document nature of system issues, efforts to remediate and prevent future occurrences, track indicators that can point administrative and/or technical concerns that may contribute to ongoing system issues.

#2 - Reduce Incidents of Missing Case Data	User feedback identified that instances of lost case data - whether at submission, when returning to a case, or loss of attachments, seem to be experienced across all user levels. This is, perhaps, one of the single most important causes in reduced confidence in MDSS. A primary aim of any EDSS solution should be to consistently maintain reputable and complete repositories of surveillance data.	Coordinate with MiLogin (the Statewide Single Sign On) to implement a session timer within the EDSS interface. Develop protocol for investigating and remediating instances of lost data. Develop additional case data backup tools that will facilitate the retrieval of lost case data. For example, the EDSS solution could include an auto-saving feature (in the style of Google docs and other web-based tools) that will allow users to access and retrieve previous versions of the case data they've entered.
#3 - Enhance System Alerts	Current alerts only allow for a limited set of triggers and notifications. The EDSS solution should allow for various alerts that can be implemented across several levels of the system.	Allow for alerts to be distributed to users based a variety of conditions: region, user type, role, individual assignment, etc. Allow for both automated and manual alert triggers. Automated triggers should also allow for several types of parameters based on data throughout the EDSS (e.g., trigger an alert to one or more people when a female between the ages of 10 and 60 is pregnant and has an open Hepatitis B investigation). Develop automated triggers tied to Goal #1, Objective #2, Aim #4, "Disease Aberration Detection" Allow for alerts to be used as a management tool to support timely case investigation and completion.

#4 - Develop a Case Follow-Up Module	While system users made it clear that an EDSS that could facilitate case interventions was not desired, there are instances where funding sources have required tracking of post-intervention indicators (e.g., whether appropriate treatment was provided, post-treatment lab results, referrals to ongoing care, evidence of cleared infection, etc.).	The EDSS solution should include a module that facilitates the collection of this information, on a condition-by-condition basis, that provides for collection of discrete information and is dynamic enough to meet changing requirements of funding sources over time.

Table 4.3 - Recommendations: Goal 2

Lastly, the third goal, falling within the category of System Service and Support, has only one objective, aim, and task. This is in an effort to improve the effectiveness of the EDSS service team.

Goal #3: Improve Transparency and Communication of System Service		
Objective:	Aim:	Action / Task(s):
#1 - Implement Means to Better Track and Close User-Identified System Issues	While user feedback indicated satisfaction with the availability and empathy shown by the MDSS support team, there was some indication that issue resolution can be inconsistent and follow-up communication can lag. A solution to register, track, and facilitate communication of issue resolution/closure will help to reduce this perception and provide the support team with the tools necessary to effectively manage such issue resolution.	The CD Division should invest in issue ticket software. While this software should, at a minimum, register issues and user(s), track assignment, and facilitate resolution/closure, a strong ticket system will also facilitate the identification of issue indicators that can point to more systemic problems to be addressed. Ideally, this ticket system would also provide resolution notifications and ongoing communications to the user(s) who initiate tickets.

Table 4.4 - Recommendations: Goal 3

4.3: PHII EDSS Vendor Comparison - Discussion and High Level Recommendations

As a complementary analysis to the responsive/illuminative evaluation, and in an effort to provide context as to how MDSS compares to other available, 'off-the-shelf' EDSSs, MDSS was assessed using the 2013, Public Health Informatics Institute's EDSS Vendor Comparison tool. The results of the MDSS component of this assessment largely support and validate the results of the responsive/illuminative evaluation - alert functionality, data analysis / visualization, and overall system functionality were highlighted as areas of particular concern in both of these assessments. Likewise, condition identification and reporting, security / privacy, and system administration were some of the positive features of MDSS that were largely lauded by both assessments.

This contributes to meeting the second objective of this tool: To assist public health agencies in elucidating an understanding of their surveillance I.T. needs. The results show where prioritization should occur in order to preserve the existing system or, should replacement of MDSS become the selected solution, how the CD Division should evaluate and prioritize critical functionalities of alternative EDSS options.

Likewise, it can be said that two out of the remaining three objectives of this tool were largely achieved in this analysis, as well. The first objective - to describe the EDSS landscape, at the point in time of the creation of this Vendor Analysis, through a description of both systems and their scope - is definitely achieved. The text narrative provides a very strong overview of each system and the assessment tool provides for very granular representation and description of key areas and core functionalities. Additionally, the third objective - to provide for a refined, out-of-the-box methodology to compare and contrast various vendors through defined templates and processes - is also well conceptualized and achieved. As demonstrated in this assessment, this rigorous comparison framework is both detailed and well-organized. It has the capacity to guide users well beyond the extent to which this tool was implemented for purposes of this

assessment, including development of RFPs, agreements, and ultimate selection of an objectively evaluated EDSS.

However, the fourth objective of this tool - to assist in determining which EDSS may best serve a public health agency's needs - was found to be limited in several ways. Firstly, there is reduced confidence in the comparability matrix in that, while the text narrative listed Development/Programming Languages and Platforms as two core functionality areas, they were not included as core areas in the comparability matrix. While seven questions concerning these types of functions were included within the Technical Design and Architecture core area, it is not clear as to how the final scoring may have differed had the comparability matrix matched the core areas as described in the text narrative.

Secondly, there were inconsistencies noted in the uniqueness of some questions. For example, the ability to associate a contact with an index case is evaluated no fewer than three times (questions 1.1.74, 1.1.103, and 1.1.165). While these attribute questions are listed within separate core areas, it is not clear whether this assessment was evaluating the same individual attribute under the context of three separate core areas, or whether the attribute is expected to be represented as a recurring function that should be distinguished in three separate circumstances across the core areas.

This, too, highlights the third, and perhaps most critical, limitation noted - that the addition of MDSS to this comparability matrix cannot account for differences in how the evaluators gauged the respective systems that they assessed. As in the example above, the MDSS evaluator is not clear as to how the original comparability matrix evaluators assessed contact linkages with index cases in their initial assessment; thus, it is impossible to know whether MDSS was assessed on the same grounds, with the same rigor. This difference in evaluators introduces the risk of rater bias due to probable differences in controls used to limit subjective perception of each system; while the attributes, as described, are detailed and

concise, this does not remove individual interpretation as to what constitutes full, partial, or absent attribute compliance.

Lastly, and this was later noted in discussion with developers of the Atlas Worldcare system[43], this assessment dates from 2013. With the exception of MDSS, the assessment of the technologies listed in this analysis are several versions out of date. As such, even though this assessment provides a strong approach, and one that has resulted in high-level recommendations, it cannot be said that this assessment is adequate in its current state. Without an updated version of this vendor comparison tool, this assessment only provides for a very general, out-of-date description of the compared systems and should not be the basis by which a decision to maintain or replace MDSS is solely based.

That said, even with these significant limitations in mind, the final scores for each system in this assessment do show that other 'off-the-shelf' systems could potentially offer the functionality desired by MDSS system users - both those that MDSS does well and those that were rated as less-than-adequate in the responsive/illuminative evaluation. In the areas that mattered to MDSS users in the responsive/illuminative framework, the three comparative systems consistently outscored MDSS, especially Maven and Worldcare (see: Table 3.6: "Vendor Analysis - MDSS Results"). Again, while these scores cannot account for potential differences in rater bias, these results should illustrate for the CD Division that no one functionality makes or breaks a system and that, as a result, consideration of MDSS replacement is warranted. Unfortunately, this tool is not able to provide concrete recommendations as to which of these systems should be selected by the CD Division for ongoing use. As such, additional comparative analysis of the contemporary versions of Maven and Worldcare is recommended. While there are several potential ways in which this could be conducted, comparison through a detailed request for proposal (RFP) approach is recommended, as it would facilitate objective comparison of responses, will allow for cost

estimates, and may result in additional EDSS solution options that are otherwise not known to this evaluation.

4.4: Building and Informatics Savvy Health Department: A Self-Assessment - Discussion and Recommendations

While the assessment of MDSS is necessarily focused on the use and usability of the application, itself, it cannot be ignored that the decisions that impact the system occur within a greater environmental context. The system is led and managed by professionals in the CD Division. For this reason, it was critical to assess the capacity of this division to engage in, and improve, its informatics capacity.

Using the Public Health Informatics Institute's tool "Building and Informatics Savvy Health Department: A Self-Assessment," the CD Division was found to have an overall average score of 2.107 out of a possible 5. As was noted in the assessments introduction, low scores are not uncommon amongst agencies that are conducting this assessment. To this it should be added that this is especially true for agencies that are implementing this assessment for the first time, as is the case for the CD Division. With that said, 2.107 is a notable score. This places the CD Division's informatics capacity within the range of 'managed' - meaning, that organized informatics efforts have begun and/or are being implemented, but not systematically documented or institutionalized. And, while individual prompt/question responses ranged from 0 to 4 (all out of a possible 5), the scores for the three sections within which these responses were situated were all within or very near this 'managed' range as well.

These responses and scores show that the CD Division, while not having yet attained a mature level of informatics capacity, is making significant efforts to move in that direction. Additionally, there are concrete recommendations that can be distilled from this assessment that should help the CD Division move forward in these efforts. In turn, it is reasonable to estimate that progressive informatics capacity building will yield positive impacts on the environment in which the employed EDSS solution is situated.

To this end, it is recommended that the CD Division implement an ongoing informatics capacity improvement strategy that is both predicated on these findings and sets to measure improvements relative to this analysis. As part of this improvement strategy, it's recommended that the CD Division develop a five-year maturity model with interim three-year benchmark milestones. The goal should be to further develop the informatics capacity of the CD Division to a "Defined" state, as evidenced by an overall average score increase of this assessment by 1.071 points in five years' time - no small charge as that amounts to slightly more than a 50% increase in the overall baseline score. While there is certainly flexibility in the design of the improvement strategy and the targeted objectives, a proposed model is outlined, below. This proposed model is achievable and is designed to capitalize on the CD Division's existing strengths.

Within the first three years, the CD Division should set the following objectives to be met:

1. Move the assessed attribute with a rating of 0 (Absent) to a rating of 1 (Initial);
2. Move five (5) assessed attributes with a rating of 1 to a rating of 2 (Managed);
3. Move three (3) assessed attributes with a rating of 2 to a rating of 3 (Defined);
4. Move five (5) assessed attributes with a rating of 3 to a rating of 4 (Measured); and,
5. Move two (2) assessed attributes with a rating of 4 to a rating of 5 (Optimized).

This would amount to an overall score increase of more than .57 points within the first three years. These specific improvements that should be made to meet these objectives are to improve the following attributes (the itemization of this list corresponds directly to the objectives, above):

1. Initiate the following:
    a. Complete an assessment of the CD Division's information assets and needs (while this overarching evaluation could contribute to this effort, it would likely be inadequate as it only encompasses one system).

2. Develop the following attributes to a “Managed” state:
    a. Formalize and implement a documented Informatics Strategy;
    b. Develop a governance process to implement the Informatics Strategy;
    c. Work with Human Resources to develop informatics-specific job classifications, position descriptions, and pay scales;
    d. Adopt project management standards to be implemented by the CD Division informatics team; and,
    e. Conduct an assessment of information systems usability and effectiveness based on program and staff needs.
3. Develop the following attributes to a “Defined” state (both managed and showing consistent application):
    a. Define the CD Division informatics focal point;
    b. Define a workforce strategy for the CD Division Informatics team; and,
    c. Define and adopt a rigorous and standardized software development process;
        - This is predicated on item #2.d., adoption of project management standards, first achieving a managed state.
4. Develop and implement systematized measures for the following:
    a. Success and reach of funding activities (ongoing funding gap assessment);
    b. Success in partner collaboration (both internal and external);
    c. Impact of informatics training across CD Division;
    d. Informatics knowledge and skillsets needed to effectively engage with CD Division information systems; and,
    e. System maintenance (lifecycle planning).

5. Optimize the following through development of a feedforward loop targeting continual improvement:
    a. Use assessment of informatics team to identify informatics personnel needs; and,
    b. Assess success of electronic messaging (both internal and external) to identify areas of potential improvement.

Then, following a successful three year cycle, prior to the end of year five, the CD Division should set the following objectives:

1. Move four (4) assessed attributes with a rating of 1 to a rating of 2 (Managed);
2. Move three (3) assessed attributes with a rating of 2 to a rating of 3 (Defined);
3. Move five (5) assessed attributes with a rating of 3 to a rating of 4 (Measured); and,
4. Move two (2) assessed attributes with a rating of 4 to a rating of 5 (Optimized).

This would amount to an overall score increase of and addition .5 points over the baseline score within the last two years. This improves the overall average score to 3.179, placing the CD Division into an overall "Defined" status, an indication of developed and consistent application of systematic informatics efforts. These specific objective targets should be further defined to state that the following attribute improvements will be met (as was with the three year milestones, the itemization of the following list corresponds directly to the objectives, above):

1. Develop the following attributes to a "Managed" state:
    a. Assess how to improve internal data exchange;
    b. Assess how to improve external data exchange;
    c. Conduct an inventory of CD Division information systems and their services; and,
    d. Adopt data management procedures and QA practices.

2. Develop the following attributes to a “Defined” state (both managed and showing consistent application):
    a. Consistently apply strategy to manage relationship with IT services;
    b. Regularly apply systematized program-level feedback into system development strategy; and,
    c. Engage in consistent and regular automated internal message exchange.
3. Develop and implement systematized measures for the following:
    a. Evaluate data sharing agreements and agreement processes;
    b. Evaluate policies and procedures that ensure privacy and confidentiality;
    c. Evaluate potential for increased adoption of national standards;
    d. Evaluate division capabilities to engage in automated exchange of data with clinical partners; and,
    e. Evaluate adoption of intra-agency technologies (e.g., ESB, MPI, etc.).
4. Optimize the following through development of a feedforward loop targeting continual improvement:
    a. Use Assessed measures of success and reach of funding activities to inform additional funding opportunities;
        - this is predicated on item #4.a, success and reach of funding activities, first achieving a measured state; and,
    b. Use assessed measures of impact of CD Division-wide Informatics training activities to implement additional trainings that meet identified informatics knowledge gaps and skill needs;
        - this is predicated on item #4.c, impact of informatics training across CD Division, first achieving a measured state.

4.5: Funding Assessment – Discussion and Recommendations

Under the current funding model for MDSS, it should be noted that the CD Division has done a good job in balancing the restrictions of each funding source, capitalizing on the strengths of each funding source's requirements, but ensuring that the development is complementary, where possible. That said, the development process appears largely to be dependent on the funding opportunity announcements (FOAs), which may not represent system development that favors user needs. Indeed, the user surveys from the third step of the responsive/illuminative seem to corroborate this. Several users commented that it is unclear how development is prioritized for MDSS.

Additionally, as was noted in section 1.5, even though Michigan is a state where Public Health operates under a decentralized framework, MDSS does not receive any support either from legislative appropriations or from the local health jurisdictions that use it for their daily surveillance activities. And, with the exception of statewide ELC meetings (two to three times per year) and the annual Communicable Disease conference, there is no coordinated environment in which the CD Division seeks feedback from system end users, across all user levels, on forthcoming versions. And, when this feedback is solicited, it is relative to whether already-planned and anticipated enhancements will be adequate - not relative to the selection of which enhancements will be planned. This presents what can amount to a conflict between what the federal funders solicit in FOAs and the functionality enhancements that system users would prefer to see developed.

There are three overarching recommendations that result from these findings:

1.) The CD Division should develop a funding management model that will operate and be evaluated in specific timeframes. This model should be part of, or at least complement, the five-year maturity models recommended in section 4.4. For example, while ELC dollars are funded in one-year increments as part of a larger five-year cycle, the CD Division could employ a corresponding five-year funding management model where high-level goals, objectives, and metrics are set. This model should, in large part, be used to guide the responses to ongoing FOAs during that timeframe. And, this funding model can be used to anticipate lifecycle planning.

    This model should be used to communicate a coordinated strategy that can guide cross-program discussions on system enhancement. This will allow for various program areas to anticipate changes to the EDSS solution, identify what functionality they wish to see, and to individually fund additional enhancements or to coordinate across programs to jointly fund activities that meet the needs of more than one program area. This should help to maximize development opportunities;

2.) The CD Division should develop a managed communication strategy relative to the EDSS development process. While it may not be critical for all levels of system end users to be represented as part of the decision-making process regarding system development, communication of these development prioritization decisions to the user levels should be clear, consistent, regular, and detailed. It is suggested that a committee of system advisors, across all levels, be convened on at least a semi-regular basis as part of this communication strategy. This does not mean this committee must have decision-making power

over EDSS development, but it should at least serve as a critical intermediary in the communication strategy; and,

3.) The CD Division should develop a funding strategy that is more diversified across funding sources. As noted in Section 3.4, the current funding could be described as unpredictable, at best. While current funding sources do seem to regularly fund personnel and specific activities, like increasing the number of ELR submitters, they often fail to fund other development activities that would complement the very same outcomes that they promote in their FOAs (and in other agency activity like NMI or eCR development). This also raises concerns about future funding outlays as their preferred activities reach a saturation point in Michigan - how much longer can ELC fund increases in the number ELR submitters as we approach the onboarding of nearly 100% of hospitals in Michigan? The approval process of current funders appears to be abstract and potentially subjective; this places significant risk on the CD Division and the activities that they undertake.

The CD Division should work to identify potential funding opportunities on two fronts: 1.) It should work with MDHHS and Population Health Administration leaders to advocate for State funds that support Public Health activities. As the department is a functional entity of the governor's administration, and as the governor regularly itemizes funding allocations that are of administrative importance, it would not be absurd for the department to advocate for the importance of public health funding in ongoing budget discussions; and, 2.) The CD Division should develop a plan to regularly identify and respond to additional FOAs that extend beyond the traditional funding sources already in use.

4.6: Additional Considerations

In September of 2016, the governor of the State of Michigan, Rick Snyder, established a commission charged with the focus of evaluating Michigan's current Public Health services delivery infrastructure and to provide recommendations for system improvements. While the commission was unable to select a singular model to recommend, three possible options were presented in a final report to the governor.[44] Critical to any one of these options is the development of a public health services vision that represents the qualities of Public Health 3.0.

Public Health 3.0 is an initiative to define the next steps needed to fully modernize public health services. It acknowledges the historical development of Public Health over the last two centuries while promoting "cross-sector collaboration and environmental, policy, and systems-level actions that directly affect the social determinants of health."[45] Key findings from the regional meetings that informed the 2016 white paper on Public Health 3.0 include:[46]

1.) Building Strong Leadership and Workforce - policy-oriented, diverse workforce that can build cross-sector coalitions and leverage innovative approaches.
    a.) "Building a strong public health workforce pipeline" - one that builds meaningful relationships with academic institutions and retains a talented workforce;
    b.) "Leading for collective impact" - developing new cross-sectional relationships and no longer operating within silos of practice; and,
    c.) Innovative Practices - Look to outside industries for ideas in how to develop novel ideas and practices (e.g., the 'incubator system' in the technology sector).

2.) Establish Strategic Partnerships - this includes identifying what constitutes a meaningful partner (attributes), strategies for engaging future partners, and identifying partners who are critical:
    a.) Identifying mission-critical entities for funding and strategic planning activities - identifying entities with shared interest and those who have political and social capital;
    b.) “Cultivating new and existing relationships” - the idea that authentic relationships built on shared interest tend to yield the most value; and,
    c.) “Identifying collective goals and defining value” - this should be established across a range a diverse partners with unique experiences and insight.
3.) Identifying “flexible and sustainable funding” - too often in Public Health, funding is categorical or condition-oriented. Public Health 3.0 looks to better coordinate funding models, rethinking the “funding silos”, and identify innovative funding approaches:
    a.) “Leverage shared goals” - this includes not only minimizing duplication of effort through coordinated activities, but includes capitalizing on soft resources like access and influence;
    b.) “Breaking the funding silos” - recognizes that organization of work through disease-specific silos limits agency capacity to build readiness and to address social determinants of health. It encourages flexible dollars, pooling of funding and improved funder engagement;
    c.) “Exploring alternative financing models” - includes increased use of joint public-private partnerships, blended funding models, and leveraging Medicaid and Medicare funding to fund demonstration projects.

4.) “Timely and locally relevant data, metrics, and analytics” - this includes the timely access to, analysis of, and application of data to (near) real-time public health decisions.
    a.) “Gaps and Access Challenges” - addressing lag in publication of national data for local action, better representation of more local data (county, sub-county), and increased access to raw, de-identified data;
    b.) “Exploring new types of data” - Capitalizing on non-traditional sources of public health data;
    c.) “Supporting data sharing and analysis” - cross-sector coordination in data analysis is critical to achieving a person-centric or community-centric view and effecting meaningful impact on social determinants of health.
5.) “Foundational Infrastructure”
    a.) “Creating a mission-based, collaborative infrastructure” - emphasizes the critical nature of developing and communicating agency vision and the plan to achieve the vision. This emphasizes collaboration, equity, and commitment to addressing social determinants of health - works with communities as collaborative partners;
    b.) Development of culturally competent departments with an understanding of equity - of particular note, direct and ongoing engagement with the community was highlighted as the best training; and,
    c.) “Articulating [...] the public health brand” - helps departments to make Public Health 3.0 adaptable to their unique community needs; helps to provide for continuity over time as leadership changes may occur; implementing meaningful metrics, timelines, and deliverables.

As already noted herein, like a majority of states, Michigan operates under a federated, decentralized framework, where the State public health agency (MDHHS) and local health departments (LHDs) have parallel authorities. The delegation of such authorities to LHDs means that LHDs retain the power and responsibility to manage their own affairs and meet the "health and well-being [needs] of their residents."[44]

As a result of the public health commission's report to the governor, there are several recommendations that align with Public Health 3.0 and convene to the particular requirements of Michigan's decentralized public health governance. These included continued and expanded collaboration across all levels of government (between local public health agencies and State agencies, across State agencies, and between State and Federal agencies); investment in Michigan's Public Health infrastructure (including many Public Health 3.0 recommendations); and changes to both State and local public health agency accreditation.

The findings of this EDSS evaluation are in line with the public health commission's report to the governor and with Public Health 3.0. While this evaluation is, of course, much more narrow in scope (only considering an EDSS within the CD Division), the recommendations that result from this evaluation should fit within the context of any action taken, or decision made, by administrators as a result of this commission report and/or efforts to implement Public Health 3.0 strategies.

4.7: Limitations

While the overall approach of this evaluation validated that a subjectivist approach could be implemented to distill meaningful analysis of an EDSS, several limitations were noted. First and foremost, while the intent was to base meaningful findings on user perception and feedback, it must be acknowledged that quantitative analysis of system functions will be critical to determining whether MDSS should ultimately be enhanced or replaced with another system. In many ways, it could be argued that the brunt of some of the hardest work has been completed in this evaluation, as qualitative review of user-generated feedback requires a significant degree of organization, time, and commitment that may not be necessary when distilling a set of system-generated reports to analyze data quality, completeness, positive predictive value, or sensitivity. But, a quantitative analysis of these attributes will also be critical in classifying MDSS and any potential alternative EDSS solution.

Additionally, for the responsive/illuminative evaluation, it is recommended that any entity seeking to replicate a similar approach to this study begin with a well-defined, rigid classification of group member composition. For example, MDHHS regional epidemiologists are registered in MDSS as State-level users; but, they also provide a considerable amount of support to local health jurisdictions and, as such, can often advocate for their LHD partners. During this assessment, their role became slightly confounded - on one hand, during the focus group discussions, they were often asked to reflect and comment on how the system impacts local health department workflows and were classified as such; but, during the individual user survey, their actual role and responses reflected State-level users. Additionally, the original estimates for focus group composition were predicated on a simple analysis of user types within MDSS. As noted in the results, this did not (and could not) account for distinctions in how, when, and how often various user types access MDSS. As a result, the initial estimates likely over-estimated the need for laboratory-level users who interact with MDSS in fewer and more limited circumstances than other user types, especially LHJ users. A planned accounting for this

missing frequency information could have been accommodated with a more refined focus group member solicitation process. It was not adequately accommodated in this evaluation and, as a result, *may* have negatively impacted the representative nature of this assessment.

As for the vendor analysis, several limitations have already been noted, particularly in response to its fourth objective - assisting public health agencies in determining with EDSS may best serve its needs. For agencies who may wish to employ a similar comparative assessment, much of the vendor analysis is still recommended, but with one significant exception. It is recommended that the initial steps (around system classification, requirements derivation, and determination of where value is achieved) be employed as part of a comparative assessment, as all are critical steps and found to be strongly represented in this tool. However, unless this tool is regularly updated as a living document to always reflect the most up-to-date versions of each system, it is recommended that agencies supplant the comparability matrix with their own investigation with each vendor, predicated on the operational and value-driven requirements that are distilled in the initial steps. Certainly, agencies may wish to mimic the structure of the comparability matrix in their analysis. But, while there is value in the format, its current state is out of date and not necessarily representative of any given agency's system needs or vendor's system.

In terms of the funding analysis, two critical limitations were noted. The first was in the difficulty in obtaining historical MDSS funding information. As MDHHS is a significantly large organization that also relies on other departments and agencies (like the Department of Technology, Management, and Budget) to manage its activities, there is no single repository of system funding information. While it was possible to coordinate with MDSS leadership to obtain current and some recent past funding information for the purposes of this evaluation, this does not substitute a full analysis of the historic information that could otherwise inform a complete cost analysis and address return on investment. Additionally, part of the intent of this evaluation was to determine whether another 'off-the-shelf' system could meet the CD Division's and end

users' needs. While this evaluation was able to illuminate user need relative to interaction with MDSS and to establish that, with additional investigation, there exist other systems that could potentially serve communicable disease surveillance in Michigan, it is impossible at this point to recommend whether the CD Division *should* transition to another system as a complete cost assessment is lacking for these possible alternatives. As part of this evaluation's investigation, outreach was conducted with both Conduent (owners of Maven) and Atlas (owners of Worldcare). Through discussion with these software owners, it was demonstrated that, in order to provide any kind of reasonable cost estimate, a substantial amount of additional, coordinated communications need to occur first. It is likely that any future request for proposal (RFP) to identify a future EDSS (either MDSS or a replacement) might be the best opportunity to articulate system needs in such a way that an adequate cost comparison could be conducted and a system recommendation provided. And, certainly, this evaluation could help to inform that RFP process. But, this evaluation cannot make any such recommendations, on its own.

The Informatics Capacity Assessment has, perhaps, the fewest design issues compared to the other components of this framework. It is a well-architected, guided assessment that can result in very meaningful recommendations. That said, while the score for each attribute is distilled through guided questions, the assessment responses could have benefited from better, more in-depth supporting documentation, including: specific policy citations and references, specific situational examples where information is otherwise generalized, and nuanced interpretation of past actions, policy, and procedure. This would have required the time and commitment of a team of individuals - something that was simply not tenable for this evaluation. But employing such a time and resource-intensive approach would have led to a more refined assessment and perhaps the identification of additional gaps and needs.

Chapter 5 – Executive Summary

5.1 - Executive Summary

Since 2004, the State of Michigan's Division of Communicable Diseases has used a custom-built, web-based surveillance tool as its electronic disease surveillance system (EDSS) as the basis of communicable disease surveillance activities. This EDSS accepts both manual entry of cases and electronic laboratory reports (ELRs), supports case investigation and ongoing management, and is the basis for subsequent reporting to the State's partners (e.g., to CDC via NEDSS and NETSS exports). In that time, a comprehensive assessment of the system had not been completed. In order to assist the CD Division in assessing the remainder of the MDSS lifecycle and whether it can remain viable into the future, a comprehensive analysis of system requirements, a comparative assessment of existing (a.k.a., "off of the shelf") systems, an informatics capacity assessment, and a funding assessment were conducted.

Using a subjectivist approach through a responsive/illuminative framework, system user feedback was solicited and analyzed to progressively elucidate specific system requirements, successes, and functionality gaps. Applying a standardized EDSS comparison tool (the Public Health Informatics Institute's vendor analysis), MDSS was then compared against other comprehensive 'off-the-shelf' EDSSs. In order to support the optimal identification and ongoing use of the most appropriate EDSS, an additional standardized assessment tool was then utilized to assess the CD Division's capacity to engage in informatics activities around supporting EDSSs for communicable disease surveillance. A high-level funding analysis was conducted to describe the funding environment in which MDSS is currently maintained and developed.

This responsive/illuminative approach found that, overall 82.7% of users would give MDSS and adequate or mostly adequate rating. Results showed that an EDSS solution should be identified by the CD Division that addresses specific attributes, including: Accuracy, Completeness, Consistency, Data Quality, Error Reduction, and System Reliability and Functionality. The standardized EDSS comparison tool was shown to provide an effective methodology and format to identify and articulate system needs and to critically compare systems. But, while this tool showed that there is reason to believe that an alternative system might be warranted for consideration, significant limitations in the tool's dated representation of evaluated systems and the introduction of rater bias through the addition of the MDSS assessment resulted in only general findings. The informatics capacity assessment showed that the CD Division has a strong foundation of informatics practices and principles, is in the range of a 'managed' level of maturity, and is well poised to further develop its growth. The funding review illustrated that there are significant environmental constraints on the CD Division's ability to select and/or develop an EDSS for communicable disease surveillance, including: lack of state sponsorship, system enhancements restricted to funding opportunity requirements, and lack of an effective funding communication and advocacy strategy.

While this evaluation was not able to determine whether any 'off-the-shelf' EDSS should replace MDSS or whether MDSS should be further enhanced to address system gaps identified in this analysis, several recommendations were identified to assist the CD Division in determining which attributes matter most in promoting confidence in any EDSS solution for communicable disease surveillance in Michigan. Specific recommendations were made that, regardless of the EDSS solution, would target: reducing variability in data input, supporting sophisticated data analytics, improving system response time, reducing incidents of missing case data, enhancing system alerts, development of a case follow-up module, and improving communication and transparency in system support. The vendor analysis showed that other 'off-the-shelf' EDSSs show potential as possible EDSS solutions and should be further investigated

by the CD Division as viable options. The informatics capacity assessment led to the development of a specific, five-year plan with a three-year interim benchmark. This five-year plan would result in moving the CD Division from a ‘managed’ state of informatics practice to a ‘defined’ state of practice. And, the funding review provided for three recommendations: that the CD Division should develop a funding management model to organize and direct its funding activities; that the CD Division should develop a managed EDSS development communication strategy; and, that the CD Division should work to identify more diversified funding sources including efforts to obtain state sponsorship of communicable disease surveillance activities. The recommendations resulting from this evaluation were also compared to the recently publish Public Health Commission (PHC) report to Governor Snyder and found to be in compliance with the recommended PHC approach and efforts to modernize Public Health towards Public Health 3.0.

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MDSS Evaluation: Appendix A – Responsive/Illuminative Analysis – High-Level Requirements Discussions and Funding Review

Requirements Derivation – Program/Unit Shadowing

9/28/2016 - 2:30 PM to 3:30 PM - MDSS Discussion with STD Unit Manager

- Funding and its objectives drive what's done in the system
    - AAPPS funding for STD
        - STD measures have changed from process-oriented (case completion percentages, etc.) to impact-oriented
            - [2]Process-oriented measures still exist in DIS world
        - Current measures require improved data quality to improve ability to compare information over time to effect strategy implementation of programs to reduce burden of disease in X,Y,Z populations…
    - Some examples of objectives:
        - Ability to select multiple treatments in case report form (CRF) to reflect recommended treatment options - Ceftriaxone + Azithromycin)
            - Currently, only one treatment can be entered into CRF in MDSS - represents limitation on longitudinal surveillance in event-based system.
        - Sending out communications (e-mails) to effectively notify staff of process changes (e.g., in MDSS)
        - Providing reports to LHDs, re: data quality
            - E.g., Chlamydia and Gonorrhea - account for changes in process
            - This can be iterative loop - go to MDSS, go to export, pick timeframe, condition, go back, select disease specific search/export, add treatment, etc.[3]
            - Data cleaning and deduping within MDSS are needed on an ongoing basis - manually intensive.
                - One barrier is getting complete data from the system both quickly and efficiently
                - STD Unit Manager also keeps his own stored data sets the provide longitudinal view without drawing down new reports from MDSS that would otherwise need additional cleaning

[2] See objectives in AAPPS Funding Review

[3] This requires ongoing data cleaning (e.g., deduping) and ad hoc data cleaning (e.g., when holes are noticed during report generation)

Discussion

- Some items like partner interview records are not exportable.
- Uses Link+ for matching (e.g., annual STD cases with HIV positive cases during annual reporting processes)
- For case closures, processes about 10~ primary (active) and secondary (early or late) cases/week and about 30~ latent cases/week
- STD team works to process and provision reports both downstream (e.g., to LHDs for data quality reporting) and upstream to CDC (i.e., notifications, annual reconciliation, grant reporting) - see 2016 objectives & mid-year progress report
    - This means that MDSS, as a mid-level tool, has to be flexible enough to both accommodate changes in funding dynamics and track/provide feedback on the ground-level metrics that will support that funding.
- They are currently (and have been) working with LHDs for them to see value in connecting EHRs

Case Closure example (Syphilis ONLY)

- Case comes in as ‘Latent - Unknown Duration’ (antiquated term that, for MDSS, represents a new case with an otherwise unknown stage)
- Randomly assigned to someone at LHJ
    - Probably wrong person as syphilis should be directed to DIS staff
    - STD Unit Staff must QA new assignments and determine whether assignment was appropriately matched (see 10/5/16 discussion with STD Unit Staff, below)
- DIS staff conducts investigation
    - Includes partner identification and stage identification
    - This can take time (in example case, case was created on 6/17 [report date] but not pushed to STD Unit until week of 9/25))
- Investigation Report gets assigned to DIS supervisor who reviews and, if complete, changes investigation status to “complete” which re-assigns the case to STD Unit Manager
- Unit Manager’s default MDSS search is set to pull a queue based on cases pushed to him from DIS supervisors
- STD Unit Manager will QA again and either send back to DIS supervisor (if additional work is needed) or process case and push to CDC if complete
    - To complete, STD Unit Manager opens a Notepad window and copies information out of interview record and case tabs or that is otherwise implicit in MDSS (notes; info he knows he is going to need for CRF that has not been auto-inputted into CRF)
    - Confirms completeness of a variety of fields in CRF, changes ‘Onset Date’ to ‘Collection Date’ (Specimen) in order to manipulate MDSS output.
    - Changes to Completed (which pushes case to CDC)

Investigation re-assignment (only for Syphilis - CT/GC go directly through locals, due to volume)

- STD Unit Staff's re-assignment of new/incoming cases into to DIS staff
    - Incoming cases arrive classified as latent syphilis of unknown duration
    - MDSS auto-assigns case holder based on geocode/jurisdiction
    - Needs to be assigned to appropriate LHJ DIS staff for investigation
    - Only happens for syphilis. Gonorrhea and Chlamydia go through LHDs for reassignment. There are just too many for one statewide access person to handle.
        - Limitation of system role types and function assignment - predefined, limited, static user roles (vs dynamic matrix of user role functions)
- If a middle initial is present in incoming case info, remove middle initial, resend through dedup.
- With syphilis ELRs, create new case if no recent syphilis case within last 6 months.
    - Or, if patient is female, it is a new case if she is or might be pregnant
- If merging investigation forms, ensure that appropriate form is being superseded so that already completed investigation information is not lost
- Manual - Complete 900 record search in eHARS
    - DOB and Last Name Initial
    - Enter in notes that 900 search resulted in no records found *or* indicate eHARS record number and 900 search finding.
- Go to lab tab and look at titer (>= 16 is a high priority case)
    - Condition-specific prioritization needs
- Add Spec collection date as onset date
- Change status to suspect
- Reassign to DIS in appropriate area (drop-down menu with name and jurisdiction)
    - Moves to DIS staff's queue

Case Closure (also see 9/28 discussion with STD Unit Manager)

- Occurs after DIS has completed the investigation report, set the case to confirmed and active, and pushed case back to STD Unit Staff's queue
    - STD Unit Staff checks investigation report to ensure that all needed areas are complete (Closure, treatment info, whether treatment was correct).
        - If not, pushes back to DIS queue with note in record with instruction as to what is lacking
        - Will also e-mail DIS staff to let them know.
        - Once they re-complete the case, they will push back to STD Unit Staff's queue and sometimes call and/or e-mail
- Prior to case closure, verify geo-coded address (2017 AAPPS Work Plan: Michigan - FOA Required Activity 3: Geocode case-based surveillance data to target interventions to providers serving a high volume of patients with STDs and to populations in geographic areas with high numbers of reported infections).
- Make sure that the correct referral source is reflected

LHD reports

- Pulls MDSS report, merges with disease specific report for treatment info - both specific to defined timeframe (i.e., since last report to present)
- Runs SAS to vet report parameters
- Concatenates info into master tracking spreadsheet
- Manually runs graph on LHD for defined timeframe (e.g., 1st calendar six months)

DMC File Transfer (Hepatitis and STD)

- DMC files uploaded daily
- Date/Time stamp indicates which file is being uploaded
    - 12:15 or 12:20 are Hep files; 10:25 or 10:35 are STD files
- Review and archive old files (identified by file date in filename)
- Converts files to .txt file
- Deletes commas, parentheses
- Convert to HL7
    - Open converter, select file and file type, convert
- See doc: Preparing DMC Files for Upload to MDSS
    - Research for commas and parentheses
    - Make standardized replacements ('OBR||' with 'OBR|1|', '0000-0' with 'U', and '^^^POS' with ^POSITIVE^SNM^POS') and Save
    - E-mail to MDSS Coordinator
        - With recent inclusion of genotype messages in DMC uploads, MDSS Coordinator also makes additional modifications/replacements

HIV/STD Match (weekly process)

- Time- and multiple systems/programs-intensive
- Start by updating/appending master Gonorrhea and Syphilis files
    - Disease-to-date from MDSS
    - Can be done either through disease-specific search where export variables can be selected and defined (BUT each stage *must* be selected in the export setup) or through a general export (where, for example, all syphilis cases could be captured but the final report would need to modified, where unneeded variables are removed) for cases marked as Active, Completed, Completed Follow-Up, Reviewed, and New.
    - After export, add columns with new M/F sex designation, DOB separated by yyyy, mm, and dd.
    - Append master file with recent extract
- Export HIV cases from eHARS
    - Update the HIV Person Data with SAS extract from eHARS
    - Run SAS to refine report to individuals diagnosed in 2016 and export to CSV
- Launch Link Plus
    - Set configuration style
    - Select matching variables (match on F_Name, L_Name, M_Name (*if*), and DOB)
    - Run
    - Compare potential matches - look for errors
    - Evaluate whether any potential matches are more than 3 months old. If not, only export cases from past 3 months.
    - Open in Excel, and visually dedup from Master match file
        - This isolates new cases

- Pull isolated cases into master match file
- Add additional CDC-required variables
- Look for Entry into Care within 60 days and interview within 30 - determine gaps and contact DIS as necessary
- Follow up with previous dispositions and see if there are any updates.

<u>STD Wishlist</u>

- Having a checkbox for priority cases that flags case for DIS when moving case into their queue
- Adjudicating titer and age
- Auto-reading and flagging titer when >16
- Being able to select and export missing data (isolating nulls within specific variables - e.g., all syphilis cases missing ‘ethnicity’; gui search? E.g., geography/LHD)
- Auto-reassignment within MDSS to DIS specialists
    - How does this complicate the 900 search and matching process?
- Validating completion of required fields prior to closure

Traditional Measures that aren't otherwise in grant objectives and, thus, need to be addressed separately from ongoing work. 3 to 6 items used as intradepartmental metrics.

Q: What proportion of new syphilis patients are interviewed within 14 days of specimen collection?

- Cases to consider aren't immediately clear, as several factors impact determination of proportion.
    - E.g., Signficant time delay - It can't take several weeks for interview and partner report to get entered into MDSS. This doesn't mean that the 14 day timeframe wasn't met even if it takes far longer than 14 days (from specimen collection) to get entered into the system.

- Open Person Record
    - Manually compare interview date and specimen collection date (changed since supplemental STD export function was added)
    - Go to Field Record and look at Disposition and Disposition Date
        - Initiation Date minus disposition date = supervisor metric
        - For both patients and partners

Export Interview records and Disease export (w/ patient name info). Together, the interview record summary and disease export show patient's disposition, disposition date, and partner disposition.

Lab Transfers - done monthly, for the calendar month two months retro (i.e., on 10/12, we looked at the month of August). This process ensure that the lab data entered into the patient lab tab also carries over into the case CRF, into the appropriate condition-specific lab area.

- Disease-specific search
- Example was Hep B Chronic (8/1 - 8/31) confirmed/completed cases
- Pull out referral date & all Hep B labs (or other condition-specific labs [e.g., all Hep C labs if doing Hep C lab transfers])
- Filter out (hide/remove) all labs with results (from CRF lab area) - left only with cases w/o results
- Pull Investigation ID in MDSS
- 'Edit' case
- Manually copy/paste lab data from lab tab area (static view at bottom of CRF) to dynamic lab area within CRF
- Many labs are not auto-populating within CRF lab area
    - Merge Issue?
    - Manual user issue? (e.g., is manual lab entry staff selecting 'other' and typing in lab info

Acute/Chronic case review - done monthly. This process ensures that cases are listed/completed under the appropriate acute vs. chronic typology, relative to available clinical/lab info and the respective case definitions.

- Run disease-specific search (Hep C in this example; 15 to 25 acute cases, per month that need changed to chronic)
- Year-to-date search for confirmed/completed and probable/completed cases
    - Export: Referral, county, patient symptomatic (Y/N), patient jaundiced (Y/N)
    - Check all condition-related labs, ALT (for Hep C), and negative HCV w/in 12 months
    - Sort/filter/color by case definition info
    - Report to regionals those case which need to be reclassified. Regionals report so LHD users who execute changes.
    - Give about 1 week to update
    - If not updated by then, Hepatitis Surveillance Unit Staff updates case info, herself
    - Adds note about reclassification
        - Add screenshot of epidemiological information from CRF
        - Go into new CRF and add epi info from old CRF
        - Make note, re: old CRF epi info that does not have fields in new CRF

Manual Lab Entry

- When lab is received, find patient by searching with * at end of patient name
- Add lab - Hepatitis Surveillance Unit Staff enters negatives

Hep C Dedup with Link Plus

- Maintains a running Hepatitis match file

Hep B Cross Reference

- Will cross reference Hep B cases without vaccine info in case record with MCIR record to see if vaccine history on file.

"Re-un-de-duplification"

- Does a lot of data cleaning and deduplication
    - From experience, this staff knows to redup every case

- Hep B & C - graph showing
    - % of cases requiring manual intervention to correct deduplication errors
    - Manual errors, mostly

- To run dedup check
    - Run Disease Specific Search (e.g., Hep c)
    - Run 1 month at a time
    - Look at Probable / Confirmed / Completed
    - Select demographic parameters (on export, down through 'race')
    - Run Export
    - Link Plus to match F_Name, L_Name, and DOB
    - Match file runs against cases dating back to 2004
    - Export match results to Excel file
    - Review visually and flag for potential matches
    - Go to MDSS
    - Find patient/case
    - Change to completed-review
    - Redup
    - Occasionally, MDSS won't find the potential match that was identified in the Link Plus match
    - 85% of ppl in MDSS with new labs have existing cases (hep C).
    - Hepatitis Surveillance Unit Staff enters many of these new labs, daily (10 to 30)
    - New case closure rules sometimes cause errors when moving from 'completed-review' back to 'completed'.
        - (Fix in 4.5)

<u>Recommendations</u>

- Add condition to queue list
    - This will help to make searching for co-infections easier
- Searching for negative results
- Granting admin role so that Hepatitis Surveillance Unit Staff can enter new laboratory information into MDSS
- Finding a way to mark that people are no longer actively infected

Public Health Emergency Preparedness (PHEP) Cooperative Agreement funding

PHEP - General Observations

1. To sustain current capacity/capability
    - Sustaining current growth/development seems to fit within this statement; not just sustaining status quo; “Surveillance and disease reporting infrastructure will continue to be enhanced through system upgrades, the addition of users and by new electronic data streams.”
2. “MDHHS and LHDs will continue to utilize the MDSS to fulfill public health surveillance activity requirements. MDHHS central and regionally-based staff will work with stakeholders to collect and maintain the health data that supports routine surveillance.”
3. Refers to sustaining MDSS in reference both to meeting statutory requirements for communicable disease reporting, investigation, and intervention at the State and local levels; and, to the processes that are currently used to meet these obligations.
4. Sets a minimum, non-content-related, versioning requirement (i.e., ‘at least once in 2016’)

PHEP-Specific Requirements

- Local level use of MDSS for vulnerable population analysis
- Use of WSR
- PHEP-required CRF variables and subsequent analysis of completeness/data quality measures.
- Requires MDSS to remain a dynamic, flexible instrument that can respond to changes in NNDSS requirements (e.g., MMG updates).
- OMS functionality prioritization
- Interstate (‘out-of-state’) transmissions are prioritized
- Pursuit of DUAs for increased data sharing and access within MDSS
- Linkage with registries and other MDHHS systems (e.g. EDRS, MCIR, MPI, etc.) is prioritized
- Onboarding of laboratories for MU
- Training – to be facilitated by regional epidemiologists, face-to-face, throughout the State
- Regional Epidemiologists provide for MDSS troubleshooting from local partners, referring up to system administrators as needed.
- Up-time requirements – 24/7 with backup for unforeseen long-term outage.

1. Improve the quality of case-based data collection to include routinely obtaining information on gender of sex partners, pregnancy status, HIV status, treatment given, patient address and provider information.
   - Provide LHDs with guidance in completing these key variables, and routine updates on their completeness.
   - Implement laboratory disease reporting requirements to include pregnancy status when available.
   - Provide LHDs with semi- annual statistics on their completion of correct GC treatment info in MDSS.
   - Provide Detroit STD staff with listing of GC cases that are missing correct treatment data, for follow up with patients and providers.

2. Geocode case-based surveillance data to target interventions to providers serving a high volume of patients with STDs and to populations in geographic areas with high numbers of reported infections.
   - Calculate geo-coded patient addresses to identify the areas of the state where there is significant morbidity as well as high racial disparities in diagnosis and overlay pre-paid sites
   - Provide LHD and school- districts geo-coded maps highlighting areas of high morbidity, laid over with areas of high racial disparities, to inform program planning and targeting of resources to key populations.
   - Map residence of male STD cases diagnosed in Detroit using geo-coordinates at the block group level.
   - Provide maps of male STD cases in Detroit to select CBO's and PMDs based in nearby communities.

3. Conduct automated matching of STD and HIV cases for identification of syndemics and for targeting partner services for co-infected individuals to identify new HIV infections and other HIV infected individuals who are not in care.
   - Compare each new syphilis investigation against HIV registry to identify new HIV diagnoses and HIV cases that have dropped out of care.
   - Alert DIS of new HIV diagnoses to work with EIS for linkage to care.
   - Alert DIS of HIV cases that have fallen out of care to work with EIS for re-linkage to care.

4. Disseminate surveillance information with affected populations, communities, providers and key stakeholders.
   - Local surveillance data and morbidity maps will be disseminated to contractual partners to ensure the testing of high risk individuals.

5. Identify the clinical and prevention service gaps for at-risk individuals who are receiving care
   - As part of a sub-contract from WSU to Horizons, establish work plan to monitor client census and adherence to screening/treatment guidelines

6. Assess the proportion of GC cases that are treated correctly according to current CDC STD Treatment Guidelines, stratified by provider type.

- Measure completeness of correct GC treatment documented in MDSS, by provider type
- For high morbidity LHDs, review proportion of GC cases documenting treatment with both ceftriaxone and azithromycin, for each provider type

7. Increase the proportion of patients with GC that are correctly treated according to current CDC guidelines in areas of high GC morbidity.
   - Complete QI reports for high GC morbidity LHDs.

8. Increase the provision of targeted and effective health department Disease Intervention Specialist (DIS) partner services for: primary and secondary syphilis cases.
   - Review quarterly, timeliness of receipt of positive laboratory results to initiation to the field.
   - Assure DIS begin case investigations within 1 business day (24 hrs.) from date received by LHD/DIS
   - Quarterly, review timeliness of interviews from date of specimen collection
   - Quarterly, review timeliness of DIS case investigation (Initiation to close).

9. Increase the provision of targeted and effective health department Disease Intervention Specialist (DIS) partner services for HIV co-infected GC and syphilis cases
   - DIS document date of interview of HIV-STD co- diagnosed cases

10. Increase the provision of targeted and effective health department Disease Intervention Specialist (DIS) partner services for GC cases with possible GC treatment failure or suspected or probable cephalosporin-resistant N. gonorrhoeae isolate using the criteria in the Cephalosporin-Resistant N. gonorrhoeae Public Health response Plan
    - STD Epi alerts District Manager of suspected case

11. Maintain a website where surveillance information and basic information about STDs is available to the public, health care providers, health planners and policy makers.
    - Complete 2016 morbidity analysis

12. Monitor and evaluate impact of relevant policies.
    - Identify priority areas based on analysis 2011-2016 data.
    - Review DIS output data

AAPPS Grant General Observations

- Focused on Data quality improvement within CRFs for reporting back to LHDs – routine variables, new variables (e.g., pregnancy), treatment (whether followed guidelines), to facilitate patient follow up.
- Reporting has high intervention-promoting component – geocoding for map overlays that show target zones (high risk populations: males, high morbidity along with racial disparities, etc.)
- Cross-program coordination – matching STD and HIV data (vet each new syphilis case against HIV database, identify out-of-care, work with DIS to provide linkage to care)
- Monitor treatment by provider type
- Partner services, including: time lag to case investigation initiation, time lag from initiation to close, time to specimen collection.
- Use of Alerts (STD Epi Alerts to district manager)
- Data for Completing annual morbidity analysis for publication
- Policy review and analysis

STD programs appear to have the most comprehensive and extensive use of MDSS. Whereas other program areas touch many aspects of MDSS, STD routinely utilizes each one, and it is MDSS data that drives each step – with Case initiation -> case prioritization -> case management assignment -> case investigation with cross-program checks -> individual and partner services -> intervention -> treatment follow-up -> case review and analysis. Additionally, each step is both monitored by the program area and is reported both downstream (timeliness and treatment reports to DIS supervisors and staff) and upstream (to funding entities).

Strategy 2: Surveillance of TB Cases and Case Reporting

To accomplish the priority 1 task of timely assessment and reporting of all confirmed TB cases and identifying surveillance infrastructure gaps and system needs, the following should be conducted:

- Report complete data on all TB cases in the Report of Verified Case of Tuberculosis (RVCT). All RVCT data items should be filled out completely according to CDC instructions for the revised RVCT:http://www.cdc.gov/tb/programs/rvct/InstructionManual.pdf
- Complete RVCT follow-up 1 and 2 reports and submit to CDC as soon as those data are available.
- Ensure that at least one isolate from persons with culture-positive TB is submitted for genotyping, and that genotyping results are linked to surveillance data within 8 weeks of genotype results becoming available. This linking should generally be performed by state TB programs and accomplished by either of the following:
    - Using the TB Genotyping Information Management System (TB GIMS), an online data management and analysis application hosted by CDC; or
    - Entering the genotyping lab accession number in item #38 on the RVCT. Genotyping records that are not linked to National TB Surveillance System (NTSS) records will not appear in TB GIMS reports and are not considered when TB GIMS issues alerts for possible outbreaks. Best practices for TB genotyping are available at www.cdc.gov/tb/publications/factsheets/statistics/Genotyping_BestPractices.pdf
- Notify CDC when experiencing large outbreaks (≥ 10 related cases diagnosed in a 3-year period). Regardless of method of detection, programs should respond to large outbreaks and report response activities to CDC. Programs experiencing large outbreaks should report on their outbreak response, including methods of intervention (e.g., aggressive LTBI treatment programs for persons experiencing homelessness, intensified case-finding that focuses on locations in addition to traditional contacts), resource utilization, and updated epidemiologic data (e.g., case counts, contacts identified, contacts evaluated, contacts initiating LTBI treatment, contacts completing LTBI treatment).
- Enhance identification, reporting, and follow-up of persons with TB and with suspected TB by establishing liaisons with appropriate reporting sources such as hospitals, clinics (e.g., TB and HIV/AIDS clinics), laboratories performing tests for mycobacteria, selected physicians (e.g., pulmonary and infectious disease sub-specialists), correctional facilities, community and migrant health centers, pharmacies, and other public and private facilities providing care to populations at risk for TB. TB programs should provide periodic feedback to reporting sources, and at least annually provide a written report summarizing TB surveillance data.
- Develop and implement active surveillance activities to ensure complete and timely reporting of persons with TB and with suspected TB.
- Develop and implement surveillance activities to ensure complete, accurate, and timely reporting and counting of TB cases, and maintain a data system of verified TB cases. Timeliness includes electronic reporting via HL7 messaging of all verified TB cases to CDC on a monthly or at least quarterly basis.

- Provide HIV testing for all persons with TB disease at time of diagnosis. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4813a2.htm
- Ensure data security and confidentiality guidelines for HIV/AIDS, Viral Hepatitis, STD, and TB Programs are followed. http://www.cdc.gov/nchhstp/programintegration/docs/PCSIDataSecurityGuidelines.pdf
- Report how each of the quality assurance (QA) components for TB surveillance data will be conducted. These components include case detection, data accuracy, data completeness, data timeliness, and data security and confidentiality.

MDSS Evaluation: Appendix B – Responsive/Illuminative Analysis – Focus Group Discussion Summaries

3.1.17 – Focus Group Discussion #1

For the attributes described in under Information Quality, System Quality, and Service Quality in the Nine Dimension Framework, which are positively represented in MDSS, how, and how does this positively impact workflows; likewise, which attributes could be better represented in the system, how, and how is workflow currently impacted by these attributes?

User #1:

- Stated that every user must be able to see case information in the system
    - Would allow nurses to save time so that they can see complete patient information (cross-jurisdictional patient information) – look up people in another county / opening MDSS access to statewide for all users.

User #2:

- Timeliness has been mostly good; instability issues (ca. late 2015) seem to have ceased; ELRs are now near real time (no more sequestering in Rhapsody and pushing to MDSS in off-peak hours) – this positively impacts case creation and timely workflows.

User #3:

- Noted that afternoon slowness/latency still seems to persist.

User #4:

- A lot of STDs come into system under an unknown case status – if lab is positive, why can't it come into system as a confirmed case?
- Middle names from Starlims; causes deduplication issues/multiple patient records where one unique record should exist. When correcting this, this can result in multiple pages of labs for Patient). Burdens the patient matching/merging process.
    - User #1 concurred

User #2:

- Representation of prisoner IDs in the system allows for variation in data entry (human error) – this suggests a need for tighter format checks/better training/guidance to promote consistency.

User #5: (commenting on User #2's comment)

- Lack of application of standardized data entry or understanding of standardized data entry process – protocols.
    - Training – data entry standards / QA standards – processes that are written out and standardized across the platform/user groups.
    - Use of ongoing monthly/bi-monthly meetings is only a recent occurrence (2015-2016) – could these be used to effect this type of standardization?

User #6:

- Data quality is often an issue with provider contact information (both phone number and address) which can be blank or simply reflect “staff”. This requires onerous amounts of work to track down the order provider; recently tracked such an issue that took ~45 minutes to resolve.
    - User #4 concurred

User #4: (following up on User #6’s comments)

- Added that there seems to be specific lab reporters for whom this issue occurs at a higher frequency (e.g., Warde, Quest, etc.)

User #1: (following up on User #6’s/User #4’s comments)

- Lab reports that require substantial tracking down of missing information aren’t actually “solving anything.” In other words, increased speed of receipt of information with lowered accuracy/completeness (over more manual forms of reporting) isn’t facilitating better workflows.

User #7:

- There is also variation in data entry that this user sees from the 4 or 5 nurses at the LHD – variation in lab data entry

User #8: (in contrast to User #7’s comments, above)

- In this user’s jurisdiction, there are 2 major health systems, so it is not as difficult to triage data quality issues; this means that there are only two ICPs with whom they customarily work – capitalizes on relationship between these two health systems and health department. Also noted that MCIR and health system EHRs can be cross-referenced (when user has appropriate access) to identify missing patient and/or provider information.

User #9: (in contrast to User #8’s comments, above)

- Stated that they have a lot of difficulty in working with this jurisdiction’s lab reporters. Cases erroneously end up in the health department’s queue; many are negatives; and with missing information, and it’s difficult to trace down the patient/provider information.

Multiple Users:

- Negative cases being created as a result of panels (e.g., Hepatitis) are problematic across the board. No filtering of negatives is a barrier in the system.

User #2:

- Suggested use of decision support software to both:
    - reduce the burden of negative results (some are wanted/needed while others are not necessary); and,
    - resolve/assist with user input validation/error correction.

User #10: (In response to larger data quality/completeness questions)

- Noted that, if reference labs don’t receive patient (or provider) info, then they don’t/can’t report it – it’s outside of Public Health’s control.

User #5:

- Quality Assurance – completeness of CRFs; maintaining guidance to local users relative to MDSS versioning – who holds the responsibility and accountability for ensuring this?

User #3:

- Alerts – if a [Hep B] ELR comes through as 'perinatal', it gets flagged & directed to Hep B perinatal group. This has been helpful functionality.

User #2: (in response to User #3's comment, above)

- Thought that expanding the outbreak alerts to include this functionality would be a good idea.

User #5:

- Stated that the case assignment process in MDSS for STDs (where case holder can change multiple times prior to case closure) works quite well.

User #8:

- The reports tab has been extremely important to this user's department in tracking diseases over time.

User #4:

- Likes the auto-entry of user information when entering a new case
    - But, that is the only place where it happens.
    - This user also noted that it can be difficult to translate the incoming lab/test names into the available drop-down selections in MDSS – attaches scanned copy of labs for clarity

User #11:

- Discussed the available guidance on manually entering labs.

User #2: (in response to the manual lab entry issues that User #4 noted, above)

- Drop-down menus in labs should be tailored for both usability and consistency
- On this note, User #2 reiterated that effecting these kinds of changes in the system have been a relative benefit of MDSS, as system development has been relatively flexible and (with some work) responsive to needed updates and meeting the ongoing needs of system users.

User #4:

- Inquired as to whether it would be possible to add a notes upload area to the lab tab (to upload copies of the lab)

User #3:

- Noted that running reports on "other" type labs is near impossible (non-discrete information)
    - This reiterated the support for standardization across user guidance and internal
    - system controls.

User #5:

- The inability to directly query the data repositories is a drawback
    - Canned reports might be good for local health departments (see User #8's comment), but is not conducive to strong ad-hoc reports.
    - Does not see exports as a substantial solution – more of a work-around.
    - Would prefer the ability to pull data under user-defined parameters in convenient formats – to minimize cleaning the export prior to analysis.

User #1:

- Frequently uses epi info and likes how it allows direct access to the data sources.
- Wondered if including a "write your own export" function might be worthwhile to meet this need for user-defined parameters, similar to user-defined/saved searches.

User #2:

- Noted that almost all data analytics are done externally to the system (SAS, Epi Info, Excel, etc.)

User #11:

- To compensate for lack of a saved export functionality, User #11 has set up cheat sheets for exports that are run frequently – this minimizes inconsistency in same export across time and helps to complete it quickly.

User #8:

- Uses line lists to gather data, then analytics are done outside the system. In addition, this user described MDSS as a tickle system to remind health department staff about information needed for case closure, follow up, and other ongoing activities.

*Post-hoc comment: One user followed up with an e-mail, with a few additional thoughts. From this, the following was noted as key points:

- General usability of the system is a positive aspect
    - Allows real-time viewing of cases which facilitates support and follow up
    - Searches are easy to use and generally quick
    - The ‘Reduplication’ functionality makes it easy to identify/fix cases that were missed in the match/merging process
    - Canned reports are often enough for quick trends analysis and data summaries
    - Full exports into a CSV can allow for easy data manipulation for weekly reports or special requests
    - Data entry (into detail forms) is easy and work queues allow for easy management of workload
- Over time, MDSS has shown itself to be a flexible system that is adaptable to changing needs and able to handle increased complexity and to meet functionality needs
- ELR data appear to be a big source of information inconsistency – but, this may also be a result up-stream actors/systems/constraints
- A single point of reference for MDSS best practices is warranted – currently, guidance is too generalized, disparate, and doesn’t cover all areas of investigations where nuance may exist in process or relative to a given condition

3.1.17 Focus Group Discussion – Organized by Attribute

Information Quality

Accuracy:

- Middle names from Starlims; causes deduplication issues/multiple patient records where one unique record should exist.
- Negative cases being created as a result of panels (e.g., Hepatitis) are problematic across the board. No filtering of negatives is a barrier in the system.

Timeliness:

- ELRs now arrive in near real time (no more sequestering in Rhapsody and loading into MDSS in off-peak hours) – this positively impacts case creation and how surveillance staff can conduct timely response.

Completeness:

- Data quality is often an issue with provider contact information (both phone number and address) which can be blank or simply reflect "staff". This requires onerous amounts of work to track down the order provider; recently tracked such an issue that took ~45 minutes to resolve.
    - Added that there seems to be specific lab reporters for whom this issue occurs at a higher frequency (e.g., Warde, Quest, etc.)
    - Lab reports that require substantial tracking down of missing information aren't actually "solving anything." In other words, increased speed of receipt of information with lowered accuracy/completeness (over more manual forms of reporting) isn't facilitating better workflows.

Relevance:

- There are STD labs coming into system under an unknown case status – could this be revisited in order to facilitate easier case closure.

Consistency:

- Representation of prisoner IDs in the system allows for variation in data entry (human error) – this suggests a need for tighter format checks/better training/guidance to promote consistency.
- There is also variation in lab data entry for manually entered labs
- ELR data appear to be a big source of information inconsistency – but, this may also be a result up-stream actors/systems/constraints

System Quality

Usability (Accessibility):

- Allows real-time viewing of cases which facilitates support and follow up
- Searches are easy to use and generally quick

Availability:

- Statewide access – difficulties with seeing cross-jurisdictional information with departmental/regional access restrictions

Reliability:

- instability issues from late 2015 seem to have largely ceased.
- Some afternoon slowness/latency still seems to persist

Adaptability:

- Facility of changes to the system have been a relative benefit of MDSS, as system development has been relatively flexible and (with some work) responsive to needed updates and meeting the ongoing needs of system users.

Response Time:

Functionality:

- The 'Reduplication' functionality makes it easy to identify/fix cases that were missed in the match/merging process
- Canned reports are often enough for quick trends analysis and data summaries
- Full exports into a CSV can allow for easy data manipulation for weekly reports or special requests
- Data entry (into detail forms) is easy
- Work queues allow for easy management of workload
- Alerts – if a [Hep B] ELR comes through as 'perinatal', it gets flagged & directed to Hep B perinatal group. This has been helpful functionality.
    - *Suggestion for future* - Expanding the outbreak alerts to include this functionality would be a good idea.
- Case assignment process in MDSS for STDs (where case holder can change multiple times prior to case closure) works quite well.
- The reports tab has been extremely important to departments in tracking diseases over time.
- The auto-entry of user information when entering a new case is nice
    - But, that is the only place where it happens
- It can be difficult to translate the incoming lab/test names into the available drop-down selections in MDSS – attaches scanned copy of labs for clarity
    - Drop-down menus in labs should be tailored for both usability and consistency
    - *Suggestion for future* - Would it be possible to add a notes upload area to the lab tab (to upload copies of the lab)?
- The inability to directly query the data repositories can be a drawback
    - Canned reports might be good for some regular, ongoing use, but the system does not support strong ad-hoc reports.
    - Exports are not a substantial solution – more of a work-around.
    - Would prefer the ability to pull data under user-defined parameters in convenient formats – to minimize cleaning the export prior to analysis.
        - *Suggestion for future* – Would a "write your own export" function be worthwhile to meet this need for user-defined parameters, similar to user-defined/saved searches?

Data Quality:

- If reference labs don't receive patient (or provider) info, then they don't/can't report it – it's outside of Public Health's control.
- Quality Assurance – completeness of CRFs has been an issue

Portability:

- All data analytics are done externally to the system (SAS, epi info, Excel, etc.)

Improved Data Capture:

Error Reduction:

- *Suggestion for future* - Use of decision support software to both:
    - reduce the burden of negative results (some are wanted/needed while others are not necessary); and,
    - resolve/assist with user input validation/error correction.

Use of Standards:

- Lack of application of standardized data entry or understanding of standardized data entry process – protocols.
    - Training – data entry standards / QA standards – processes that are written out and standardized across the platform/user groups.
    - Use of ongoing monthly/bi-monthly meetings is only a recent occurrence (2015-2016?) – could these be used to effect this type of standardization?
- Maintenance of guidance to local users relative to MDSS versioning – who holds the responsibility and accountability for ensuring this?
- A single point of reference for MDSS best practices is warranted – currently, guidance is too generalized, disparate, and doesn't cover all areas of investigations where nuance may exist in process or relative to a given condition
- Reports on "other" type labs is near impossible (non-discrete information)

Security

Service Quality (i.e., End User Support)

Reliability

Responsiveness

Assurance

Empathy

3.8.17 – Focus Group Discussion #2

For the attributes not fully described in the 3.1.17 discussion (namely: Response Time, Improved Data Capture, Security, and all of the attributes listed in the Service Quality area), which are well-represented in MDSS; which are poorly represented in MDSS; or, otherwise, is it an attribute that is unimportant/uncontrollable/doesn't require discussion in this evaluation?

User #1:

- In terms of Security, no known issues that this user knows of.
    - MDSS sits behind state firewalls
    - Accessed through a single sign on portal (MiLogin)
    - Multi-factor authentication might prove to be a barrier to access for third-party users, once it is rolled out in MiLogin
    - Security is one of the most important attributes of any system that used for communicable disease surveillance, due to the sensitive, personal information that it contains.

User #2:

- Didn't feel that he could make any comment on Security, as the specific security measures in place are beyond the scope of knowledge of many in the group – behind the scenes measures.

User #3:

- In terms of internal system security and controls, this system user noted that there might be an opportunity to augment audit features.
    - For example, this user expressed an interest in running audit functions that ensure that only people with appropriate access to certain types of data.
    - This user noted that this is a grant requirement for CDC – system monitoring and access controls
    - This user noted that not everyone feels that access should be opened in the system
        - This presents a notable tension between ensuring cross-county, open access to ensure that LHDs have access to the information that they need within any given patient record and adequate controls relative to user type.

User #4:

- Noted that a user audit is supposed to be conducted on at least a quarterly basis by LHDs – this includes access review and termination of access to former users of the system.

User #5:

- This system user noted that, as a jurisdictional user, this type of review is facilitated between LHD and regional epi coordination.

User #2: (commenting on User #3's statement regarding open access concerns)

- Discussed users in the system who may have Statewide access but not under a 'michigan.gov' domain (e.g, Meijer pharmacy users; other e-mail domains like yahoo, MSU, g-mail, etc.)

User #5 (in response to User #2's comment, above)

- Provided explanation behind the Meijer-pharmacy demonstration project that resulted in the user #2's observation.

User #6: (agreeing with User #5's comment, above)

- Explained the demonstration project that enrolled Meijer Pharm Techs for reporting purposes.

User #7: (In response to the original question posed to the group – addressing service quality attributes)

- When experiencing system issues, some issues seem to take a long time to get resolved. Per this system user, the consistent factor that seems to determine the amount of time needed for the resolution is whether the issue can be resolved in-house (at MDHHS) or needs to be referred to the development contractor.
- This user expressed concern about the length of time for follow up for many issues – the closing of the communication loop.

User #8: (commenting on improved data capture)

- Noted that, for Perinatal Hep B, the data capture for the system is largely improved over previous versions.

User #1: (in response to system User #8's comments, above)

- Noted that we do still struggle with the case reporting components within MDSS
    - While there has been increased timeliness (e.g., with increased uptake of ELRs), there has been a reduction in case reporting completeness – no longer users manually reporting cases; therefore, case reports aren't being filled out as completely as they were in the past. This represents a data capture that was richer in the past.

User #3: (concurring with User #1's comment, above)

- As an example of this previously richer case reporting – Laboratories sending ELRs often (~25% of time) don't send patient address, as they aren't' receiving it from the ordering provider. While there are many forces at play (state policy of required fields, requisition forms, providers' and labs' understanding of the value of these fields, the State's ability to report back to senders and/or hold them accountable, etc.), address fields were previously richer when manual case entry predominated.

User #5: (following up to User #'3's comment, above; re: tracking down missing patient and/or provider info)

- This user noted that it can take a while to track down this information; that ICPs who are good generally give good, complete information; and that sometimes the information ends up in the wrong places (e.g., in case notes).

User #9: (in contrast to User #5's comments, above)

- Stated that, with regard to manually entered info, the information can only be as good as the person entering the info.
    - This user suggested making more fields mandatory (can't proceed to the next page without completion)
        - This also reiterates the concern expressed on 3.1.17 regarding user training and communicating an understanding across system users so that they understand the shared value of the information that they're communicating/using.

For Information Quality, System Quality, and Service Quality attributes, how would you rank them (by scale, importance, necessity, etc.?

User #3:

- This system user stated that, while there isn't necessarily an ordinal ranking of attributes, this user saw three main ranking categories: essential attributes (those without which people wouldn't use the system); important attributes (those that promote a strong, effective system); and nice attributes (those that are good to have).
- This user provided the following rankings:
    - Essential – Reliability, Accuracy, Functionality, Usability
    - Important – Standards, Data Quality, Timeliness
    - Nice – Everything else

User #9: (following user #3's comment, above)

- Noted that it is very difficult to categorize these attributes, as it often depends on context, how users access the system, and for what purpose.
    - This user stated that Accuracy is absolutely required and that Timeliness is important.

User #5:

- Supported Timeliness and Accuracy as being important attributes

User #8:

- Noted that Data Quality and Accuracy are really important.
- The importance of other attributes might depend on context:
    - For example, the sense of urgency (need for timeliness) in Perinatal Hep B cases can depend on the reporting timeframe – during pregnancy vs. post-birth (less urgent vs very urgent)

Based on feedback, Matt wondered if the group would agree that Information Quality seemed to be the most important quality area (over System and Service qualities)

User #10:

- Agreed that, of the overarching areas, information quality might be the most important. But, if system quality isn't there, then they information quality can't be effective.

Thinking in terms of the attributes that we've been discussing, how would you rate the impact of these attributes on Individual, Epidemiological, and Communication/Reporting Use and User Satisfaction?

User #3:

- Commented on the range of uses through which this user interacts with the system – data entry; data quality review; monitoring investigations; and epidemiological use
    - Generally facilitates the needed uses

User #2:

- Data quality is better now than in earlier years of the system – e.g. MDSS is better at handling duplicate information; but there are still opportunities to make it better (include a patient alias/maiden name for deduplication)

User #11:

- As a PH Nurse, this user checks the system multiple times per day. Commented that information flows through the system quite quickly/timely – example of H. Influ. that was resulted from a lab and flagged in PH work queue, virtually instantly. This can act as a proxy bellwether for what is happening in the community.

User #5: (in contrast to User #5's comments, above)

- Commented that large caseloads require constant monitoring/interaction in the system – reviewing/QA'ing information entered by ICPs, reviewing geographic assignment of cases (e.g., STD cases in Wayne County vs. Detroit jurisdictions).

User #1:

- Primarily in terms of epidemiological use
    - Error checking has been mostly manual (exporting large volumes of data and cleaning)
    - Epidemiological analysis is also external to the system.

User #2:

- When deduping cases, this user uses a form letter to notify other jurisdictions of patient and case merges that were otherwise not visible to county/LHD users who did not have statewide access (limitation of jurisdiction-level access restrictions).

User #1:

- Checking for redundant cases in the system (targeted study done ca. 2012 = ~15% - ~20% for Hep C; ~40% for Hep B)
    - This impacts the final data products that the programs/units develop/publish

User #4:

- No real complaints
    - Can get all of the data needed for a case
    - While many users have proposed some ideas for additional features, these additional features might not be necessary for all users
    - Some data work requires use of large exports, while other can be accomplished through use of canned reports (system facilitates both)
    - Most of the data cleaning is in deduplication.

User #6:

- Overall, this user is happy with ability to access and export the information needed for use
- While this user isn't doing programmatic/unit-level type of epidemiological analysis (e.g., a 5-year review), this user does use the system for outbreak scenario analysis
- Relies on canned reports for trends analysis

User#3:

- Commented that this user doesn't really make use of alerts.

User #2:

- Mentioned that developers may want to review functionality of alerting system – it may not always be working as intended (e.g., Salmonella test alert) and there may be opportunity for enhancement.

User #1:

- Commented that the audit trail is a nice feature to track what someone did in a case – which can facilitate communication with that user

User #8:

- Alert system currently doesn't facilitate everything that this user needs:
    - For perinatal Hep B cases, this user runs an export to determine whether all perinatal hep b cases have been accounted for – can find new cases; risk of underrepresented case counts
    - Would like an alert that is triggered based on whether a CRF reflects Hep B with a pregnancy field checked (currently, alerts can be triggered by pregnancy status based on incoming ELR data – this will miss manually entered cases or updates to CRF that reflect pregnancy).

User #7:

- Felt that alerts are more meaningful to county or jurisdictional users
-

*Post-hoc comment: One use noted that this system has created additional work for PH nurses – CRFs grow and require more and more work on the part of PH Nurses (e.g., Hepatitis report form that used to be only one page that is now 6 to 8 pages worth).

3.15.17 – Focus Group Discussion #3

Thinking in terms of impact (moving away from system attributes and output), address the three levels of impact described in the third area of the nine-dimension framework and how/whether MDSS does/does not positively affect these impact areas (economic, organizational, and individual).

User #1:

- From this user's perspective, state-level users (& CDC) have benefited from MDSS with more timely data/information that can be manipulated, aggregated, analyzed.
- In terms of worker productivity, from this system user's perspective, *can* reduce the number of phone calls needed to follow up on cases.

User #2:

- Per this system user, the efficiency of MDSS can't necessarily be quantified – does the technology of MDSS enhance or limit the work done "on the ground?"

User #3:

- There have been isolated instances where emergent surveillance needs could not be addressed through the existing system – e.g., 2012/2013 nationwide fungal meningitis outbreak. These surveillance needs were addressed on an ad hoc basis, primarily through manual means – handwritten case report forms, faxes, scanned documentation, etc. These instances served as a reminder of the old, inefficient ways in which PH surveillance used to be conducted and to provide a distinction between MDSS workflows and manual/non-EDSS workflows.
- MDSS has demonstrated to be efficient at receiving/storing information (a repository), but not necessarily good at communicating/brokering this information to users – e.g., users draw down data from MDSS repositories, but all manipulation and analysis is conducted outside the system.
- Similarly, within the economic and organizational impact areas, MDSS doesn't presently interoperate with other State of Michigan (SoM) systems – e.g., vaccination data from MCIR; death data from EDRS, etc. SoM systems tend to operate within their own silos
- Lastly, deduplication of patient and case data still requires a lot of manual intervention in many cases.

User #1: (Commenting on User #3's comments, above)

- Noted that other states have had some successes in connecting their various, disparate data sources

User #4: (referring back to the concept of downstream communication/information brokering)

- Suggested making MDSS data available to other SoM systems – it should not just be viewed from the perspective of how other systems' data can be useful to MDSS; but how MDSS data can be useful elsewhere.
    - Alerts between systems (e.g., shared alerting between MCIR and MDSS re: vaccine preventable diseases)
- Limitations on MDSS system efficiency can likely be traced back to the quality of the data being entered and how it is being entered.

This was followed by some limited mention/group discussion of current and future MDSS development which does include some degree of connectivity between MCIR and EDRS.

User #2: (re: EDRS project to bring death notifications into MDSS subsequent to reportable condition-related death)

- This user recommended, in addition to the automated electronic transmission of EDRS data, that visual review of death certs be maintained to ensure data quality.

User #5:

- With uptake of ELR, LHDs get more cases on line lists
    - This increase on the line lists does not necessarily represent an increase in cases, as many senders are submitting data on non-reportables (e.g., quantiferon results, individual influenza tests, etc.)
- Could we tighten the acceptance criteria for non-reportable conditions that are submitted into MDSS?

User #2: (addressing variability in senders' submission of reportable/non-reportable conditions)

- Noted an instance when a hospital was not reporting initial salmonella positives, as they though that they had to await confirmation before reporting.

User #6: (addressing this variability from the perspective that not all diagnoses are initiate ELR communication to MDSS)

- Discussed a CJD diagnosis that was made by the physician through clinical assessment, without lab testing – reportable, but not triggered through LIMS interfaces.

Matt asked for discussion on organizational impact in terms of managing workflows.

User #7:

- MDSS does help nurses with workflow management
    - Nurses go into MDSS first thing in the morning and several times per day, thereafter.
    - The system makes it easy for her to check for case assessment and follow-up
    - The system pretty much provides what she needs to be able to access for the LHJ.

User #5:

- Has no real wishes for additional functionality in terms of managing workflows within the organization.
    - The volume of data is readily accessible
- That said, in terms of individual workflow, PH Nurses' jobs are disparate and range across clinical work and surveillance work. It would be nice if they didn't have to filter through, what can sometimes be, several hundred cases of influenza (or other non-reportable conditions) to get to the data that they need.

User #7:

- Agreed with User #5's statement, above.

User #5: (circling back to the open access issue that has been discussed across all focus group discussions)

- While this user noted access to the region's data, this user thought that the current decentralization of case holding created difficulties across the system – recommended more centralization through more open access across the system.

User #8:

- Commented that we are likely close to implementing this open access.

User #3:

- This system user expressed an interest for a management tool that could be used to flag cases that have been open for too long (without completion), in the dedup queue for too long, etc.
    - This drives follow up / QA

User #4: (following up on User #3's comments, above)

- Supported the above idea and noted that getting triggers for follow up would be helpful
    - E.g., that the pregnancy field is completed and not just noted in 'Notes' area.

Matt asked for discussion on how MDSS helps to effect meaningful health outcomes/interventions.

User #5:

- This user doesn't really see MDSS being used as a mechanism to facilitate interventions.
    - MDSS doesn't provide cues or prompts
    - It's a repository of information that lets you know that something has happened and needs to be addressed.

User #3: (follow up on User #5's point, above)

- We know what we're getting, but we don't know what we aren't getting
- Reiterated a need for QA'ing message senders and feeds over time
    - Both tools and process

User #4:

- Getting something to show [message/data] trends is a great idea.

User #5:

- This user noted that the LHD maintains a strong, ongoing collaboration with its local health partners
    - This can't really be captured in MDSS but is paramount to tracking, and acting on, disease trends.

User #2:

- Commenting on the patient status field, noted that we don't get inpatient vs outpatient and that this can impact whether an ELR represents a case – would it be possible to get more information in the message (e.g., Room #) to facilitate this.

User #3: (noting User #5's comment, earlier)

- Supported the point about an overload of non-reportables causing workflow issues – e.g., the dedup.

User #1: (commenting on User #3's comment)

- ELRs getting into system that shouldn't be there
    - Rubella that was reported a few weeks ago – not a case; should never have been transmitted to MDSS – cause a case count issue and was reflected in WSR.

User #2:

- Expressed an interest in seeing DOB and patient age on case reporting tab.

MDSS Evaluation: Appendix C: PHII EDSS Vendor Comparison – Comparability Matrix Results

		MAVEN	Trisano	WorldCare	MDSS
1.1 - Reportable Conditions Surveillance Core Matrix					
Condition Identification and Reporting					
1.1.1	Allow user to configure filter parameters (i.e. based on jurisdictional rules)	■	■	■	■
1.1.2	Send communication to sender to notify of the receipt of conditions report	■	□	■	■
1.1.3	Support specific laboratory testing requirements for each condition	■	■	■	■
1.1.4	Flag records to indicate when laboratory report results has been received	■	■	■	■
1.1.5	Support multiple lab formats for specimen type; test performed; quantity of specimen available; specimen quality (e.g., how stored, how long stored)	■	■	■	■
Event Identification and Validation					
1.1.6	Ability to receive laboratory messages in a standard format; with the ability to adjust format	■	■	■	■
1.1.7	Maintain directories of searchable data sources, including type of data contained, organized by jurisdictional area	■	■	■	■
1.1.8	Allow user to utilize geo/temporal methods to identify events	■	■	■	■
1.1.9	Support the use of algorithms to identify events	■	■	■	■
1.1.10	Have the ability to recognize event trends	■	■	■	■
1.1.11	Have the ability to classify data into syndromes based on user-defined criteria	■	■	■	□
1.1.12	Utilize pre-defined criteria for grouping data	■	■	■	■
1.1.13	Have the ability to group data across different sources	■	■	■	■
1.1.14	Promote case routing to respective program areas within the system	■	■	■	■
1.1.15	Utilize user-defined priority thresholds that can be outlined in definitions	■	■	■	□
1.1.16	Have ability to re-categorize or regroup data based on the introduction of new data	■	■	■	■
1.1.17	Support versioning of rules and data	■	■	■	■
1.1.18	Allow discrete pieces of data to be categorized in multiple ways	■	■	■	■
1.1.19	Have the ability to match event to existing data	■	■	■	■
1.1.20	Utilize user-defined/modified thresholds for matching events to cases	■	■	■	■
1.1.21	Facilitate both a manual and automated method to validate a previously reported case	■	■	■	■
1.1.22	Have the ability to log any new data obtained	■	■	■	■
1.1.23	Have the ability to match and update any new data obtained	■	■	■	■
1.1.24	Have the ability to alert user that a match/partial match has been made	■	■	■	■
1.1.25	Have the ability to view and query updates	■	■	■	□
1.1.26	Support algorithms for evaluation of event data (Provide decision support)	■	■	■	■
1.1.27	Allow data to link to event management	■	■	■	□
1.1.28	Have the ability to set user-defined algorithms based on conditions (Example: Use algorithm to weight the data streams or events. Could also include symptoms, time of year, geography, number of notifications)	■	■	■	□

		MAVEN	Trisano	WorldCare	MDSS
1.1 - Reportable Conditions Surveillance Core Matrix (Cont.)					
Event Identification and Validation (Continued)					
1.1.29	Have the ability to perform automated analysis with manual override	■	■	■	■
1.1.30	Have the ability to weight/rate all events (Triage events so that system goes after higher priority first)	■	■	■	□
1.1.31	Have ability to appropriately route referrals for additional investigation within agency/programs	■	■	■	■
1.1.32	Have the ability to log the event if additional investigation is not warranted	■	■	■	■
1.1.33	Provide explanation for why it is/is not suggesting investigation	■	■	■	□
Case Investigation					
1.1.34	Support versioning of data with retrieval capabilities	■	■	■	■
1.1.35	Ability to assign it to an investigator, capturing the date of assignment	■	■	■	■
1.1.36	Ability to generate a new case from a contact record	■	■	■	■
1.1.37	Ability to accept/reject case based upon signoff definition	■	■	■	■
1.1.38	Have the ability to send and receive needed forms from care providers	■	■	■	■
1.1.39	Allow user to design and save form templates	■	■	■	□
1.1.40	Allow user to create and save questionnaire	■	■	■	□
1.1.41	Allow for multiple methods of data entry (manual, scanning, optical character reader)	■	■	■	■
1.1.42	Identify source of information	■	■	■	■
1.1.43	Allow user to attach documents and images related to a specific case	■	■	■	■
1.1.44	Support an algorithm to perform risk evaluation prioritization of the case	■	□	■	□
1.1.45	Allow user to assign and override priority based on evaluation	■	■	■	□
1.1.46	Allow user to store prioritized data elements (disease specific)	■	■	■	■
1.1.47	Have ability to prompt user when contact tracing is necessary based on reported condition	■	□	■	■
1.1.48	Ability to evaluate criteria to determine like-kind demographic linkages (boyfriend/girlfriend residing at the same address, home phone, etc.)	■	□	■	■
1.1.49	Ability to track multiple instances of like locators (geographic, telephonic, or electronic locator)	■	■	■	■
1.1.50	Ability to track multiple instances of like identifiers assigned by external systems (driver's license, patient id, health card id, etc.)	■	■	■	□
1.1.51	Facilitate the recording of standard demographic information (race, ethnicity, etc.) as well as be extensible in nature to allow for multiple of these instances to be captured within the same area	■	■	■	■
1.1.52	Ability to define legal responsibility (parent, representative, legal guardian), and attach the appropriate documentation to the functional area	■	■	■	■
1.1.53	Provide the capability to track multiple laboratory reports for an individual case; designating the source of the report whether it be manual or ELR	■	■	■	■
1.1.54	Provide the functionality to track multiple results for a sign or symptom	■	■	■	■
1.1.55	Ability to track source of exposure	■	■	■	■
1.1.56	Support configurable auto-classification based on user-defined criteria (i.e. disease/condition and jurisdiction specific)	■	■	■	■

		MAVEN	Trisano	WorldCare	MDSS
1.1 - Reportable Conditions Surveillance Core Matrix (Cont.)					
Case Investigation (Continued)					
1.1.57	Automatically suggest and update classification, based on all information gathered at any point in case investigation	■	■	■	■
1.1.58	Support tracking of case definition changes	■	■	■	■
1.1.59	Assign case definition at time of incidence or report	■	■	■	■
1.1.60	Display data element involved in the environmental investigation (Audit trail)	■	■	■	■
1.1.61	Automatically prompt user when an outbreak investigation [is initiated]	■	■	■	□
1.1.62	Allow user to assign a status to the case	■	■	■	■
1.1.63	Allow user to save all case information	■	■	■	■
1.1.64	Record person closing case, and time of closing (audit log)	■	■	■	■
Contact Tracing					
1.1.65	Ability to link to other uniquely defined persons in the database	■	■	■	□
1.1.66	Ability to generate a new case from a contact record	■	■	■	□
1.1.67	Ability to visually represent contact linkage via the contact web (Pin map)	■	■	■	■
1.1.68	Ability to record multiple encounters for each case including the mood code	■	■	■	□
1.1.69	Allow user to capture contact information (address, phone number, email address, photos, etc...) and risk factor data	■	■	■	□
1.1.70	Allow user to upload list of contacts from spreadsheets	■	■	■	□
1.1.71	Allow user to categorize contacts per user defined characteristics	■	■	■	□
1.1.72	Allow user to sort contact list by user defined characteristics	■	■	■	□
1.1.73	Allow user to send communications to care providers to identify contacts (interface with EHR systems)	■	■	■	□
1.1.74	Allow user to associate contact with index case	■	■	■	■
1.1.75	Support contact information for an aggregate investigation or an individual case (Obtain contact info for facility rather than individual)	■	■	■	■
1.1.76	Provide ability to support algorithms to determine priority	■	□	■	■
1.1.77	Allow user to type information/notes in free-form text box	■	■	■	■
1.1.78	Support ability to manage/track interview status	■	■	■	■
1.1.79	Support ability to sort contacts based on interview status	■	■	■	□
1.1.80	Provide ability to prioritize contact follow-up	■	■	■	■
1.1.81	Support ability to track/note any instructional communications sent. Record case related workflow activities (phone call, send a letter, notification, etc.)	■	■	■	■

		MAVEN	Trisano	WorldCare	MDSS
1.1 - Reportable Conditions Surveillance Core Matrix (Cont.)					
Case/Contact Specific Intervention					
1.1.82	Display predefined intervention plans	■	■	■	□
1.1.83	Allow user to select a predefined intervention plan	■	■	■	□
1.1.84	Allow user to modify predefined intervention plans to include updated guidelines/metadata from CDC and other supporting information	■	■	■	□
1.1.85	Allow user to add the intervention plan to an existing case record	■	■	■	■
1.1.86	Support interoperability with case management system	■	■	■	□
1.1.87	Allow user to create and save a customized intervention plan	■	■	■	□
1.1.88	Have the ability to automatically suggest an intervention plan, based on the disease or condition	■	■	■	□
1.1.89	Have the ability to send order sets to care provider/case management systems	■	■	■	□
1.1.90	Allow user to select a recommended treatment plan	■	■	■	□
1.1.91	Allow user to transmit recommendations to care provider/case management systems	■	■	■	□
1.1.92	Have ability to populate forms using information from an external system	■	■	■	■
1.1.93	Allow user to document patient/contact treatment details and diagnostics	■	■	■	□
1.1.94	Allow for parameters to be established for distinct conditions	■	■	■	■
1.1.95	Have the ability to connect with pharmacy data to track filling of prescriptions	■	■	□	□
1.1.96	Have the ability to receive test reports and attach to case/contact	■	■	■	■
1.1.97	Allow user to document and save treatment and outcome information	■	■	■	■
1.1.98	Provide the ability to transmit order sets and clinical pathways to provider/case manager	■	■	□	□
1.1.99	Have the ability to alert user of missed events	■	■	■	□
1.1.100	Have the ability to alert user of follow-up test and other diagnostic results	■	■	■	■
1.1.101	Have the ability to interact with other systems to determine status of intervention	■	■	■	□
1.1.102	Alert user that case is moving out of infectious time period or incubation time period after infections	■	■	■	□
1.1.103	Provide the ability to link a case to an index case	■	■	■	■
1.1.104	Provide the ability to generate progress notes and other documentation	■	■	■	■
1.1.105	Have the ability to alert user if anyone identified as a contact subsequently becomes a case	■	■	■	□
1.1.106	Have ability to auto-suggest to close case based on defined criteria	■	■	■	■
1.1.107	Allow users to retrieve information from case management system	■	■	■	□
1.1.108	Allow user to send/receive alert from case management system	■	■	■	□
1.1.109	Identify when appropriate time periods have lapsed to close case	■	■	■	■
1.1.110	Allow user to configure an algorithm to have system automatically assign closure justification to case	■	□	■	□
1.1.111	Allow user to manually assign closure justification to a case	■	■	■	■

		MAVEN	Trisano	WorldCare	MDSS
1.1 - Reportable Conditions Surveillance Core Matrix (Cont.)					
Event/Outbreak Management					
1.1.112	Support multiple distribution methods for communications	■	■	■	■
1.1.113	Support methods to collect feedback concerning communication	■	■	■	■
1.1.114	Maintain a library of previous outbreak or event management plans	■	■	■	□
1.1.115	Allow user to generate, edit and save outbreak plans	■	■	■	■
1.1.116	Allow user to document best practices by disease/condition	■	■	■	■
1.1.117	Maintain template library of outbreak plans	■	■	■	□
1.1.118	Create dashboard of activities based on generated plan	■	■	■	□
1.1.119	Support interface with the Incident Command System (ICS)	■	■	■	■
1.1.120	Be able to store data from external sources at individual or outbreak-level	■	■	■	■
1.1.121	Track number of cases (confirmed/probable) by geography/setting and all other demographic information (e.g., age group, sex)	■	■	■	■
1.1.122	Monitor data streams based on user-defined criteria (e.g. syndromic data, diagnostic testing, absenteeism, OTC medication sales, etc.)	■	□	□	■
1.1.123	Monitor type and number of tests ordered by care providers	■	□	□	■
1.1.124	Monitor chief complaints	■	□	□	□
1.1.125	Monitor/receive reports about purchasing of over-the-counter medications	■	□	□	□
1.1.126	Monitor emergency department admissions	■	□	□	□
1.1.127	Monitor any new/identified data source	■	■	□	□
1.1.128	Provide real-time monitor feeds and views	■	■	□	■
1.1.129	Allow the user to create/define, edit, and save metrics on interventions/control/prevention	■	■	■	□
1.1.130	Have the ability to regularly update epidemiologic curves	■	■	■	■
1.1.131	Alert user of outstanding tasks in the outbreak management plan	■	■	■	■
1.1.132	Allow user to create, edit, and save user-defined templates for media reporting	■	■	■	□
1.1.133	Store contact information for distribution of communications	■	■	■	□
1.1.134	Support creation of after-action reports	■	■	■	□
1.1.135	Allow user to create, edit and save event records	■	■	■	■
1.1.136	Assign to event record creation date and unique record number, derived from the originating system	■	■	■	■
1.1.137	Identify creator of the new record	■	■	■	■
1.1.138	Allow user to update communication plan with information from partner communications	■	■	■	□
1.1.139	Support interoperability with systems such as EHRs, etc.	■	■	■	■
1.1.140	Track communication outcome and measures for reporting and refining activities	■	■	■	□
1.1.141	Maintain templates for external/internal communications	■	■	■	□

		MAVEN	Trisano	WorldCare	MDSS
1.1 - Reportable Conditions Surveillance Core Matrix (Cont.)					
Event/Outbreak Management (Continued)					
1.1.142	Be able to organize data by relevant data sources	■	■	■	■
1.1.143	Generate tables that present summary statistics of key variables, including completeness, frequencies, and means	■	■	■	■
1.1.144	Allow user to analyze by demographic and geographic subgroups	■	■	■	■
1.1.145	Allow user to program new analytic methods into system or import formulas or define new thresholds	■	■	■	◘
1.1.146	Have the ability to detect temporal and spacial clustering of cases	■	■	■	■
1.1.147	Allow user to create, edit, and save templates to document investigation	■	■	■	□
1.1.148	Maintain a searchable library of established/historical outbreak case definitions	■	■	■	□
1.1.149	Have the ability to link cases to outbreaks	■	■	■	□
1.1.150	Have the ability to assign outbreak definitions by jurisdiction	■	■	■	□
1.1.151	Identify new cases based on newly-assigned outbreak definition	■	■	■	◘
1.1.152	Have the ability to link to the environmental investigation system or import relevant environmental data as needed	■	■	■	□
1.1.153	Send test order to healthcare provider and laboratory	■	□	■	□
1.1.154	Have the ability to automatically link test results based on user-defined key, code or other selected information that is included with request for testing	■	■	■	□
1.1.155	Have the ability to link to case/contact-specific intervention record	■	■	■	□
1.1.156	Trigger case classification in condition identification and reporting, based on outbreak definition	■	■	■	□
1.1.157	Support use of tools for specific statistical/analytic methods	■	■	■	■
1.1.158	Support reminders of incomplete questionnaires/non-responses	■	■	■	◘
1.1.159	Have the ability to link questionnaires to case investigation	■	■	■	□
1.1.160	Maintain multiple disease/condition/outbreak-specific classification criteria	■	■	■	■
1.1.161	Interface with public health registries	■	■	■	◘
1.1.162	Allow user to classify contacts based on location and/or risk factors	■	■	■	□
1.1.163	Allow user to upload lists of contacts from spreadsheets or other documents	■	■	■	□
1.1.164	Perform validation of contact information formatting and alert user of invalid data	■	■	■	■
1.1.165	Have the ability to link contacts with index case	■	■	■	◘
1.1.166	Manage/track interview status and follow-up	■	■	■	■
1.1.167	Have the ability to receive and analyze survey responses	■	■	□	■
1.1.168	Have the ability to graphically depict identified linked cases on a map (i.e. contact web)	■	■	■	◘
1.1.169	Allow user to set/modify exposure criteria	■	■	■	■

		MAVEN	Trisano	WorldCare	MDSS
1.1 - Reportable Conditions Surveillance Core Matrix (Cont.)					
Event/Outbreak Management (Continued)					
1.1.170	Automatically determine if contact meets exposure criteria	■	■	■	□
1.1.171	Have ability to track distribution/receipt of education materials	■	■	■	□
1.1.172	Support calculation of epidemiologic statistics	■	■	■	■
Public Health Alerts					
1.1.173	Allow "receiving agency" to alert "sharing agency" of receipt /non receipt of data or problem(s) with data	■	□	■	■
1.1.174	Interface with public alert networks	■	■	■	■
1.1.175	Interface with social networks to send alerts	□	□	□	□
1.1.176	Allow user the ability to create/edit and send alert messages	■	■	■	■
1.1.177	Utilize Home Area Network (HAN) Interface to transmit or receive information to smart devices in the home	■	■	■	□
1.2 - General System Requirements					
System Support					
1.2.1	System has supporting documentation	■	■	■	■
1.2.2	Program has Release Notes, that accompany each release	■	■	■	■
1.2.3	Program has multiple ways for end users to get help and training materials (i.e.: User Manuals, Use Cases, Online User Guides, Helpdesk Module to submit help tickets)	■	■	■	■
Functionality					
1.2.4	Allow workflow management	■	■	■	■
1.2.5	Data can be imported to the program (Additional List of Supported Formats)	■	■	■	■
1.2.6	Data can be exported from the program (Additional List of Supported Formats)	■	■	■	■
1.2.7	Form Builder capability - Facilitate the customization of questionnaires on the fly	■	■	■	□
1.2.8	Ability to import questionnaires from other systems	■	■	■	□
1.2.9	Ability to reuse customized questionnaires	■	■	■	■
1.2.10	Ability to create and save letter templates	■	■	■	□
1.2.11	Software contains audit tracking capabilities (log, etc.)	■	■	■	■
1.2.12	User-friendly data input validation and error handling (business rules)	■	■	■	■
1.2.13	System generated messages/ emails/ notifications	■	■	■	■
1.2.14	Data Quality Assurance/Quality Control functionality (report of validation errors)	■	■	■	■
1.2.15	Allow user to override to move on to next process step, even if elements are determined to be missing	■	□	■	■
1.2.16	Search functionality -Allow user to apply search filters, cross reference data and retrieve specific data matches	■	■	■	■
1.2.17	Auto-complete/auto-suggest word functionality (i.e.: IntelliSense functionality)	■	■	■	□
1.2.18	Program supports multiple languages	■	■	■	□
1.2.19	Provides a sandbox environment to test in	■	■	■	■
System Administration					
1.2.20	Program allows for system administration roles and responsibilities	■	■	■	■

		MAVEN	Trisano	WorldCare	MDSS
1.2 - General System Requirements					
Data Capture					
1.2.21	Supports multiple reportable conditions (see list of all nationally notifiable diseases in Appendix section)	■	■	■	■
1.2.22	Allows for capturing data specific to Global Communicable Diseases (GCD)	■	■	■	■
1.2.23	Allows for capturing data specific to Vaccine Preventable Diseases (VPD)	■	■	■	■
1.2.24	Allows for capturing data specific to Hepatitis B	■	■	■	■
1.2.25	Allows for capturing data specific to Hepatitis C	■	■	■	■
1.2.26	Allows for capturing data specific to Tuberculosis	■	■	■	■
1.2.27	Allows for capturing data specific to Sexually Transmitted Diseases (Gonorrhea, Chlamydia, Syphilis and other STDs)	■	■	■	■
1.2.28	Allows for capturing data specific to HIV/AIDS	■	■	■	■
1.2.29	Allows for capturing data specific to Condition Reporting	■	■	■	■
1.2.30	Allows for capturing data specific to Case Identification	■	■	■	■
1.2.31	Allows for capturing data specific to Case investigation	■	■	■	■
1.2.32	Allows for capturing data specific to Contact Tracing	■	■	■	□
1.2.33	Allows for capturing data specific to Case/Contact Specific Intervention	■	■	■	■
1.2.34	Allows for capturing data specific to Event/ Outbreak Management	■	■	■	■
1.2.35	Allows for both receiving and distributing Public Health Alerts	■	■	■	■
1.2.36	Program provides a case centric view of the data to the end user	■	■	■	■
1.2.37	Program provides a Person-centric view of the data to the end user	■	■	■	■
1.2.38	Program supports user defined validation.	■	■	■	□
1.3 - Technical Design					
Technical Design and Architecture					
1.3.1	Program meets best practices for Technical Design and architecture	■	■	■	■
1.3.2	Program is on a platform which is supported and will be supported in the near future	■	■	■	■
1.3.3	Support client-server environment	■	■	■	■
1.3.4	Uses SOA architecture	■	■	■	■
1.3.5	Supports a modular design	■	■	■	■
1.3.6	Supports multiple users	■	■	■	■
1.3.7	Program is developed in a language that is supported and will be supported in the future	■	■	■	■

		MAVEN	Trisano	WorldCare	MDSS
1.3 - Technical Design (Cont.)					
Security / Privacy					
1.3.8	Compliant with national computer security standards & technology - Federal Info Processing Stds (FIPs 140-2)	■	■	■	■
1.3.9	System recovery and backup system functions (frequent archiving of data)	■	■	■	■
1.3.10	Microsoft Active Directory & Lightweight Directory Access Protocol capable	■	■	■	■
1.3.11	Program offers users single sign on functionality	■	□	■	■
1.3.12	TLS 1.0 or SSL 3.1 is supported	■	■	■	■
1.3.13	Automatic password expiry definable	■	■	■	■
1.3.14	Stored passwords are encrypted	■	■	■	■
1.3.15	Security violations are automatically logged	■	■	■	■
1.3.16	Program provides ability to use role-based security	■	■	■	■
1.3.17	Program will be HIPAA compliant	■	■	■	■
1.3.18	Allows for secure data encryption while data are at rest	■	■	■	■
1.3.19	Allows for secure data encryption while data are being transferred	■	■	■	■
1.3.20	Support definitions of roles with assigned levels of access, viewing, data entry, editing and auditing	■	■	■	■
1.3.21	Authenticate each user by role before allowing access to system	■	■	■	■
1.3.22	Program provides User Tracking (Audit log) e.g. who accessed the record and when	■	■	■	□
1.3.23	Provide flexible password control to align with national policy and standard operating procedures	■	■	■	■
1.3.24	Restrict user password revisions and force users to change their passwords at determined intervals	■	■	■	■
1.3.25	Log-in restrictions - Terminate user log-in screen after determined number of unsuccessful attempts to log in	■	■	■	■
1.3.26	Timeout restrictions-Automatically log off idle workstations after predetermined time period	■	■	■	■
1.3.27	Create rights and privilege groups by type of user	■	■	■	■
1.3.28	Create unique user rights based on functions and screen displays	■	■	■	■
1.3.29	Store data centrally in a physically secure location	■	■	■	■
1.3.30	Store data centrally using cloud computing software	□	■	□	■

		MAVEN	Trisano	WorldCare	MDSS
1.3 - Technical Design (Cont.)					
User Interface					
1.3.31	Intuitive UI that is easy to use	■	■	■	■
1.3.32	Consistent and well-defined interface	■	■	■	■
1.3.33	Supports Browser based UI (i.e. IE, Firefox, Safari, etc)	■	■	■	■
1.3.34	Search functionality to easily find data in any/multiple field(s) and retrieve matches	■	■	■	■
1.3.35	Ability to configure users interface per user	■	□	■	□
1.3.36	Ability to configure users interface globally	■	■	■	■
1.3.37	Supports multiple monitor resolutions	■	■	■	□
1.3.38	ConsistentGUI (e.g., windows, icons, mouse, pull-down menus)and effective use of color	■	■	■	■
1.3.39	Support internationalization- Supports international use	■	■	■	□
1.3.40	User interface is customizable allows for corporate branding	■	■	■	■
1.3.41	Section 508 Compliant	■	■	■	■
1.3.42	Dashboard capability	■	■	■	□
1.3.43	Ability to easily navigate between screens	■	■	■	■
1.3.44	Action buttons (Search, Back, Save, Next, Delete, etc...)	■	■	■	■
1.3.45	Displays screen headers with user information or other user-defined information	■	■	■	■
1.3.46	Displays screen labels/headers	■	■	■	■
1.3.47	Help text configuration ability to provide field description and definition	■	■	■	□

		MAVEN	Trisano	WorldCare	MDSS
1.4 - Data Exchange and Integration					
Data Exchange and Integration					
1.4.1	Allows for interoperability with other designated systems (including systems outside of public health e.g. lab systems, state systems, etc.)	■	■	■	■
1.4.2	Program provides an API	□	■	■	□
1.4.3	Compliant with Health Level Seven (HL7) data exchange standards	■	■	■	■
1.4.4	Allow for a protocol definition for case acceptance/transfer from other public health jurisdictions	■	■	■	■
1.4.5	Allow automatic processing of scheduled batched jobs based on user-defined triggers (hourly, daily, weekly, etc.)	■	■	■	■
1.4.6	Report data stream/ job failures	■	■	■	■
1.4.7	Perform regular data processing procedures	■	■	■	■
1.4.8	Have the ability to notify "sharing agency" of data changes in the system	■	■	■	□
1.4.9	Support merging and standardizing data into a uniform format	■	■	■	■
1.4.10	Have the ability to perform data quality checks	■	■	■	■
1.4.11	Support de-identification of patient data	■	■	■	■
1.4.12	Allow sharing agency to specify sharing rules	■	□	□	□
1.4.13	Have ability to implement jurisdictional/geographically-based rules	■	■	■	■
1.4.14	Allow user to set up and modify rules to provide differential views for "receiving agency"	■	■	■	□
1.4.15	Utilize privacy- and security-based rules	■	■	■	■
1.4.16	Have the ability to notify appropriate "receiving agency" of available data	■	□	■	■
1.4.17	Support versioning and saving of data and metadata	■	■	■	■
1.4.18	Allow "receiving agency" to view, import, or retrieve/receive allowable data in designated format	■	■	■	■
1.4.19	Allow "receiving agency" to identify data that are new or updated	■	□	■	■
1.4.20	Support automatic system-to-system transmission of data	■	■	■	■
1.4.21	Support notification alerts to receiving system	■	□	■	■
1.4.22	Support versioning of rules and data	■	■	■	■
1.4.23	Allow receiving agency the ability to retrieve data for information shared by sharing agency	■	■	■	■
1.4.24	Log date and timestamp when data are made available to "receiving agency"	■	■	■	■
1.4.25	Have the ability to identify user who made the data available to "receiving agency"	■	■	■	■
1.4.26	Allow "receiving agency" to alert "sharing agency" of receipt /non receipt of data or problem(s) with data	■	□	■	■
1.4.27	Support electronic or manual logging of data-sharing errors	■	□	■	■

		MAVEN	Trisano	WorldCare	MDSS
1 .5 - Data Analysis, Visualization, and Reporting					
Data Analysis, Visualization and Reporting					
1.5.1	Available canned reports (workflow, surveillance)	■	■	■	■
1.5.2	Uses custom reporting technology (Ad Hoc Reporting)	■	■	■	□
1.5.3	Program supports Electronic Laboratory Reporting (ELR)	■	■	■	■
1.5.4	Allow user to select multiple variables for analysis	■	■	■	■
1.5.5	Allow for predefined parameters	■	■	■	■
1.5.6	Support robust search logic capability	■	■	■	■
1.5.7	Allow user to select and save parameters for future use	■	■	■	■
1.5.8	Allow user to view all available parameters	■	■	■	■
1.5.9	Allow user to view definition of predefined variables	■	■	■	■
1.5.10	Allow user to set filters and defaults for each variable	■	■	■	■
1.5.11	Date/time-stamp when data are pulled in and saved	■	■	■	■
1.5.12	Allow user to convert one-time queries to routine queries	■	■	■	■
1.5.13	Allow recurring scheduling of queries/reports and option to push to distribution list of recipients	■	■	■	□
1.5.14	Allow user to create selected charts, graphs and GIS maps	■	■	■	■
1.5.15	Allow user to isolate a subset of data on the chart or graph for further analysis	■	■	■	□
1.5.16	Allow user to select a predefined statistical analysis method	■	■	■	□
1.5.17	Allow user to export data	■	■	■	■
1.5.18	Allow user to view estimated time required to wait before requested data are displayed	□	□	□	□
1.5.19	Allow user to apply filters to data returned from query/filters	■	■	■	■
1.5.20	Allow user to customize report templates	■	■	■	■
1.5.21	Allow user to predefine report templates	■	■	■	□
1.5.22	Allow user to select a predefined report template	■	■	■	■
1.5.23	Allow user to create customized maps and graphs	■	■	■	■
1.5.24	Allow user to apply filters to map and underlying data	■	■	■	■
1.5.25	Allow user to perform various statistical analyses on dataset	■	■	■	□
1.5.26	Allow scheduling of recurring reports and option to push to distribution list of recipients	■	■	■	□
1.5.27	Allow user to design and save report template	■	■	■	□
1.5.28	Allow user to archive final reports	■	■	■	□
1.5.29	Data Quality Assurance /Quality Control reporting functionality (report of validation errors)	■	■	■	■

MDSS Evaluation: Appendix D – Building an Informatics-Savvy Health Department: A Self-Assessment – Completed for MDHHS CD Division

The following questions are copied directly from the Public Health Informatics Institute's (PHII) "Building and Informatics-Savvy Health Department: A Self-Assessment Tool." The responses, hereunder, were developed vis-à-vis the Communicable Disease (CD) Division, as the business owner of MDSS (the EDSS of concern for this project). This assessment does not attempt to address bureau, administration, or department-wide informatics capacity. Outside (non-CD Division) processes, policies, or protocols are only addressed if when they rule over such CD Division activities - for example, when policy and procedure from the Department of Technology, Management, and Budget (DTMB) controls CD Division system security measures, it is discussed herein as the de facto authority, impacting the relevant CD Division activities in question.

Each question in this appendix is formatted in the following manner:

1.) Each question is numbered in an indexed format, sequentially within the section - the first number (being 1, 2, or 3) represents the overarching section.
    - Section 1 refers to Vision, Strategy and Governance;
    - Section 2 refers to Skilled Workforce; and,
    - Section 3 refers to Effectively Used and Well-Designed Systems
2.) The second number represents the sequential order of the question within that section.
3.) Each question is followed by a description of key concepts, as cited directly from PHII informatics capacity self-assessment for that question.
4.) The response level and text (specific to that question) are then provided.
    - While the response text addresses the question directly, each response can be said to fit within generalized "levels". The levels are categorized, as follows:
        - 0 = Absent (Not Present / No Attempt Made)
        - 1 = Initial (Initial or ad-hoc Efforts)
        - 2 = Managed (Developed; but Inconsistent Application)
        - 3 = Defined (Developed; and Consistent Application; but no progress measure)
        - 4 = Measured (Developed; and Consistent Application; and Evaluation Component Established)
        - 5 = Optimized (Developed; and Consistent Application; and Evaluation Component; and Evaluation Is Used to Inform Subsequent Activities)
5.) The discussion prompts that are posed in the self-assessment to facilitate larger exploration for that question are then outlined beneath each response level and text. These prompts were used to determine each final response level for each respective question. While the original self-assessment did not specifically number each prompt, a sequential alphanumeric ordering system was used here to facilitate easier reference. The ordering system follows a simple indexing strategy, where the overarching section and question are first referenced (see items #1 and #2, above); followed by the sequence of the discussion prompt; and, lastly, the sub-part to the specific prompt (if needed).
    - Format: '[Section].[Question].[Prompt].[Subpart]:'
    - Example: '1.6.2.a:'

Section 1: Vision, Strategy and Governance

1.1 Vision and Strategy - Does your agency have a documented informatics vision and strategy?

- "Informatics vision refers to a statement of what the agency/organization seeks to achieve as a result of establishing a high level of information capability. The term strategy refers to a written (emphasis added) "plan of action" for achieving specific goals or outcomes related to the agency's established information capability. Information management refers to the processes and practices that support acquisition, collection, storage, retrieval and use of data and information from multiple sources and formats, and the distribution of that information to multiple audiences, stakeholders and/or other users."

- Response: Level 1 - Agency has made initial, but isolated, ad hoc efforts to develop a strategy.

1.1.1.a: Does the agency have an "informatics vision"?

- Agency (used herein as the Communicable Disease Division [a.k.a., the CD Division]) has informal, ad-hoc efforts that serve as a proxy for a written strategy. These efforts include ongoing coordination meetings, participation of multiple staff in activities and projects, and peer review of draft work prior to publishing (e.g., Implementation Guide, Auto-dedup evaluation, etc.). The CD Division has a small team of informatics professionals who regularly coordinate and lead informatics activities. This team is largely cohesive and operates in a generally unified direction.

1.1.1.b: Does the agency have a written strategy document that specifically seeks to achieve the informatics vision?

- No

1.1.1.c: If so, is that document widely distributed and known by most employees?

- N/A

1.1.2: Does the agency have strategies and action steps that address workforce needs, funding, information technology infrastructure, and partnership with both internal groups and external organizations?

- Agency regularly responds to grant RFPs for informatics activities. Agency regularly reviews funding use and future need, and organizational structure of information professionals.

1.1.3.a: Are there established metrics designed to measure progress toward goals?

- Existing grant activity and metrics serve as division's proxy for informatics goal measures.

1.1.3.b: How is data collected and used to measure progress?

- Progress is measured relative to funding source directives.

1.1.3.c: Are the results broadly shared and discussed with staff, partners and leadership?

- No

1.1.3.d: Do metrics inform decisions and shape interventions?

- Not as a general rule - outside of that which happens on either an ad-hoc basis (e.g., a specific unit's request for system enhancement), the division has no documented set of internally-developed informatics goals, objectives, metrics, decision-making process, or interventions.

1.2 Information Assessment and Needs - Has your agency completed an assessment intended to describe its information assets and information needs?

- "Information assets refer to any definable piece or grouping of information which is managed and used to bring value (emphasis added) to the organization. Typically, information assets are not easily replaceable without significant costs, skills, time and/or other resources. Examples include data sets from surveillance systems and registries, or from surveys or health statistics. Information needs refer to the data and information that is required for public health practitioners to accomplish work goals and objectives. Examples of work goals for common public health functions might include: conduct analysis; inform decisions; perform surveillance activities; confirm a case; manage operations; etc."

- Response: Level 0 - Agency has not undertaken this assessment.

1.2.1.a: Have needs or challenges been identified that could be met by informatics practices?

- Not under a formalized assessment of information asset and needs.

1.2.1.b: Has the agency considered how to assess these needs?

- Not yet assessed.

1.2.1.c: Do gaps between needs and assets or capabilities impact achievement of the vision or strategy?

- Not yet assessed.

1.2.2.a: Does the agency have sufficient informatics capability to meet current demands for information exchange with community partners?

- Not yet assessed. However, there is not readily apparent evidence to suggest that this need is not being met.

1.2.2.b: Across programs within the agency?

- Not yet assessed. Anecdotal evidence suggests that there is room for improved information coordination across units within the CD Division.

1.2.2.c: Are there efforts to build internal capabilities in this area?

- Ad hoc efforts between units within the CD Division exist. A formalized information assessment has not yet been planned to assess inter-unit needs, opportunities, and information solutions.

1.3 Governance Process - Does your agency have a governance process that guides implementation of the informatics strategy?

- "Governance process refers to a formal process for decision making. This may include a written plan which describes who participates in decision making, a governance structure, such as committees or coalitions, and descriptions of how decisions are made."

- Response: Level 1 - Agency has made periodic efforts to govern information systems projects.

1.3.1.a: What kinds of decisions about information strategy and investments are made at the various levels of the agency?

- Decisions primarily surround the electronic disease surveillance system in use (MDSS) - its ongoing maintenance and development, participation in departmental projects (EDRS, MPI, etc.), and participation in national-level projects (NMI, Digital Bridge [eCR], etc.)

1.3.1.b: How effective is the process?

- The CD Division has placed itself as a leader within Public Health, demonstrating an ongoing desire to ameliorate systems and services. To date, under current division leadership, the CD Division has worked to continually improve electronic surveillance activities and systems and has garnered national recognition for its participation and leadership in Public Health information systems projects and activities.

1.3.2.a: Is there written guidance or policy that reflects or supports the processes associated with information decisions?

- There is no written guidance for such decisions at the division level.

1.3.2.b: How well-known is the policy?

- N/A

1.3.2.c: Is there a high degree of compliance (or non-compliance)?

- As the existing informatics team is small in size, compliance and coordination are high, albeit ad-hoc.

1.3.3.a: Can a rational approach and process for prioritization, selection, procurement and development of information systems, both paper-based and automated, be described?

- Somewhat - as Division activities are largely, if not entirely, funded through CDC grant awards, the process for prioritization, selection, procurement, and development are largely dictated by third party grant metrics. There is not, however, a process that can be described as a separate, but parallel system, to account for the Division's internal processes.

1.3.3.b: Is it practiced effectively?

- N/A

1.3.3.c: Widely-known?

- N/A

1.4 Funding Plan - Does your agency have a systematic, sustained approach to funding informatics activities, including those to support staffing needs, physical facility and information systems funding?

- "A sustained approach to funding may include activities undertaken to identify the potential sources of revenue (where will money come from) and how the organization will seek the funds (legislative strategy, grants, partnerships, monetized services) to support informatics activities. An approach may include development of a funding plan that describes revenue goals and includes measurable objectives or benchmarks, as well as action steps related to the funding strategy. It may also include an analysis of the financial, physical facility, and human resources (both staff and volunteer) needs."

- Response: Level 3 - Agency routinely plans for informatics funding and can sustain critical informatics functions over time.

1.4.1.a: What efforts have been made related to a comprehensive funding strategy with associated informatics activities?

- Part C to CDC's Epi-Lab Coordination (ELC) grants is largely focused on informatics-based activities. These make up the bulk of the informatics funding used by the CD Division. Additionally, limited Medicaid dollars have been used through the Advanced Planning Document (APD) process. Lastly, individual programs within the CD Division have also funded extensions within MDSS for their unit's use. This facilitates initial development of system enhancements, under a program-specific scope, that can then be expanded and capitalized on by other programs/units within the CD Division that also use MDSS. There are no legislature-appropriated general fund dollars that have been dedicated to the CD Division for ongoing activities of any nature, including informatics.

1.4.1.b: How effective have these efforts been?

- The ELC and APD funding mechanisms have been largely successful in funding desired informatics activities. Program-specific dollars have been successful in building enhancements needed in order to meet a given program's grant requirements objectives.
- That said, activities focused on informatics-based solutions outside of MDSS have been few in number. RFP responses are generally tailored to available funding rather than identifying funding to meet CD Division's internal informatics plan objectives – a plan with such objectives is also not known to exist. These would otherwise represent attributes of a funding system that has attained a higher degree of maturity.

1.4.1.c: How do we ensure that the approach brings value to programs?

- The informatics team conducts bi-monthly MDSS meetings where ongoing informatics activities are reviewed/discussed with the leadership of the sections and units that fall under the auspices of the CD Division. This facilitates program feedback to the MDSS team.

1.4.2.a: How stable are the identified funding sources?

- Until recently, it was not believed that CDC funding was at risk. Recent political changes, however, have highlighted that no one source should be presumed safe. This has highlighted a need for more diversified funding streams for all activities (including informatics) within the CD Division.

1.4.2.b: How diversified?

- Funds are not diversified - the majority result from CDC ELC grant dollars.

1.4.3.a: Are informatics activities sufficiently funded to achieve the operational goals and objectives?

- Yes. But, as noted above, the goals and objectives are largely determined by the funds available.

1.4.3.b: Are there currently or anticipated gaps in funding that require specific strategies?

- Potentially; CDC has been able to ensure continuation dollars from congressionally-appropriated carry-over funding to meet Public Health needs, for the forthcoming fiscal year. But, even these carry-over dollars are being awarded within an atmosphere where funding beyond this timeline is uncertain and yet to be determined.

1.5 Stakeholder Engagement (Internal Partners) - Has the agency completed an assessment to improve data exchange with internal stakeholders?

- "Stakeholder refers to any individual, group or organization that may be affected by decisions or actions of the agency. Stakeholder engagement refers to the process by which those individuals and organizations are identified and invited to participate. Evidence of a stakeholder strategy could be documented through an assessment. Internal stakeholders may be programs that wish to exchange with each [other] that do not currently do so, decision makers, or members of executive leadership."

- Response: Level 1 - Agency has made isolated and ad hoc efforts to conduct such an assessment.

1.5.1.a: Have key internal stakeholders been identified?

- Yes, informally (i.e., not through a formalized assessment)

1.5.1.b: Have they been categorized by type or function; e.g., key decision makers/influencers, end users, data generators, consumers, data sharing partners, etc.?

- No.

1.5.2.a: Is there a process that includes specific engagement and communication plans for internal stakeholders?

- Yes; bi-monthly MDSS meetings with internal CD Division sections/units.

1.5.2.b: How are roles determined and described for stakeholders?

- At the bi-monthly MDSS meetings, open invitations exist for any internal user for whom MDSS is a critical tool. Typically, program/unit leadership attends these meetings. Roles are not formally described vis-à-vis this group of stakeholders.

1.6 Stakeholder Engagement (External Partners) - Has the agency completed an assessment to improve data exchange with external stakeholders?

- "Stakeholder refers to any individual, group or organization that may be affected by decisions or actions of the agency. Stakeholder engagement refers to the process by which those individuals and organizations are identified and invited to participate. Evidence of a stakeholder strategy could be documented through an assessment."

- Response: Level 1 - Agency has made isolated and ad hoc efforts to conduct such an assessment.

1.6.1.a: Have key external stakeholders been identified?

- Yes, informally (i.e., not through a formalized assessment). These informal efforts have not been documented or carried out under a specific, coordinated external stakeholder engagement plan.

1.6.1.b: Have they been categorized by type or function; e.g., key decision makers/influencers, end users, data generators, consumers, data sharing partners, etc.?

- No.

1.6.2.a: Is there a process that includes specific engagement and communication plans for external stakeholders?

- No.

1.6.2.b: How are roles determined and described for stakeholders?

- External stakeholder engagement is generally a delegated function of funding source requirements (e.g., quarterly ELC meetings).

1.7 Data Sharing Agreement Procedures - Has the agency adopted procedures for establishing data sharing agreements?

- "The concept here refers to compliance to the procedure, not compliance to the terms of the data sharing agreements. The term procedure is intended to cover the wide range of actions needed to ensure compliance with data sharing agreements. Data sharing agreements are used to establish clear parameters for exchange between organizations or operational units within an agency. These are written agreements that may include: descriptions of allowable use of data, responsibilities of the parties to the agreement, the legal authority or business reason to share data, frequency of data exchange, provisions for reporting violations of agreements, including breeches of privacy or security, privacy provisions and security provisions, and agreement of the purpose for the data exchange and agreement on specific data elemenst to be exchanged."

- Response: Level 3 - Agency has a written data sharing agreement procedure that is consistently followed across the agency.

1.7.1.a: Has the agency adopted procedures for establishing data sharing agreements?

- Yes. Department employs specific policy and procedure for development and implementation of data sharing agreements.

1.7.1.b: Do most staff members know about the procedures?

- Yes.

1.7.2.a: To what degree are they effectively used?

- These policies and procedures are effectively followed.

1.7.2.b: Are staff members trained and supported to execute the development of data sharing agreements?

- Yes.

1.7.2.c: Do they have access to resources to support the development, execution and monitoring of compliance to data sharing agreements?

- Resources are provided for development and execution of data sharing agreements. Historically, staff within the CD Division have not been involved in the monitoring and evaluation of data sharing agreements, nor in the recommendations that result from such monitoring and evaluation.

1.8 Privacy, Confidentiality, and Informed Consent Procedures - Has your agency established policies and procedures to ensure privacy, confidentiality, and informed consent?

- "The term procedures here is intended to cover the wide range of actions, defined and driven by written policy, and needed to ensure privacy, confidentiality, and informed consent practices to achieve appropriate privacy protections. These mechanisms may include training, policies, procedures, and optimized technology attributes to protect data in electronic environments."

- Response: Level 3 - Agency has a written data sharing agreement procedure that is consistently followed across the agency.

1.8.1.a: Are enforceable practices in place to ensure privacy, confidentiality and informed consent?

- Yes, through department policy and procedure.

1.8.1.b: Are they adhered to?

- Yes.

1.8.2.a: Are processes or procedures in place that allow for measurement of compliance to policies in place?

- While mechanisms are in place to confidentially report non-adherence to required practice, there is no known practice in place by which the department or division measure compliance to these policies and procedures.

1.8.2.b: Is the data generated from these procedures used to improve practice?

- N/A

1.8.3: Are the policies and procedures regularly reviewed and updated as needed?

- Yes.

1.9 Informatics Focal Point - Does your agency have an organizational focal point for informatics (e.g., an informatics unit, a Chief Informatics Officer) with cross-agency responsibility and authorities, including those related to the agency's information vision, strategies and policies?

- "Informatics is the science and discipline that supports effective use of information and information technology. As an emerging discipline, it is often not well-understood, and often misunderstood. Informatics as a practice is increasingly seen as critical to the future capability of health departments. For leading-edge agencies, establishing a focal area dedicated to informatics is one way in which health departments are working to address agencies' information needs."

- Response: Level 2 - Agency has made sustained attempts at organizing or coordinating informatics capabilities across the organization.

1.9.1.a: If the agency has considered or is currently building informatics capability through establishing [an] informatics focal area, have key decisions been identified?

- Yes. Currently, current informatics activities within the CD Division fall primarily under the purview of the Surveillance and Infectious Disease Epidemiology (SIDE) section, with some input from other sections/units. While presently loosely organized (informatics activities are handled primarily by three individuals within the SIDE section), efforts are currently underway to align these activities under a formally organized unit within the SIDE section.

1.9.1.b: What types of responsibilities are within the scope of informatics?

- Management of the Michigan Disease Surveillance System (MDSS); interoperability projects (Electronic Death Registry connection; Master Patient Index connection; piloting NMI and MTS as a CDC partner; etc.); enhancement of information exchanges (increased bidirectional, interstate communications via HL7 v.2.5.1; piloting the Digital Bridge for building eCR capacity; etc.).

1.9.1.c: How will/are informatics and IT efforts coordinated?

- Division leadership serves as the division's informatics champion, both locally and nationally. Ongoing efforts are led primarily under direction of the team leader.

1.9.2.a: If you have a designated individual or unit, is [sic] their cross-agency responsibilities and authority clearly defined?

- While job descriptions are clearly defined, these roles are not necessarily described in terms of informatics or informatics capacity. Across the CD Division, cross-unit and cross-section coordination occurs on an ad-hoc basis and is largely dependent on that section's or unit's understanding of the informatics staffs' roles.

1.9.2.b: Accepted by the program units?

- Yes. However, there is no overarching mission or vision of the informatics team that individual program units would all recognize uniformly.

1.9.2.c: By senior leadership?

- Within the CD Division, yes. Beyond division leadership, however, informatics activities within the CD Division tend to occur isolated away from higher levels of leadership (at the Bureau, Administration, and Department levels).

1.9.2.d: IT services?

- I.T. services are fragmented in Michigan State government across several bodies. The Department of Technology Management and Budget (DTMB) is the overarching body that governs I.T. services. Additionally, other bodies have very specific roles with which they are charged (Information Security, Business Integration Center [BIC], etc.). While these I.T. service providers and decision makers do recognize the business ownership rights of the CD Division over MDSS, the “informatics team” is not necessarily recognized, per se.

1.9.3: Is any funding from more than one source, so that the individual/unit is not beholden to a particular program that might be underwriting the position?

- The three positions that loosely form the informatics team are funded through three separate entities. Additionally, the projects that are undertaken by this team tend to be funded, primarily, from two funding sources. In specified circumstances, other funding opportunities have been maximized in order to augment or target specific activities (e.g., PHEP dollars and the Ebola Supplement for development of an Outbreak Management System).

1.9.4: Is the scope of activity only internal or does it extends [sic] to working with, for instance, the Medicaid program, health information exchanges or other entities external to the agency?

- The scope of activity often extends to other entities like Medicaid (e.g., HIT APD), CDC and its partners (e.g., NMI, Digital Bridge), various advisory councils and leadership (e.g., CSTE), and Health Information Exchanges (substate HIEs for ELR onboarding, MiHIN on several projects, etc.).

1.10 Effective Relationship IT/Informatics - Does your agency have a strategy to support relationships with an information technology (IT) unit or services provider (internal or external) to support achievement of informatics goals and objectives?

- "Evidence of effective relationships may include: (1) formally-established agreements that outline the nature of services provided by the IT unit to program staff (such as service level agreements); (2) clear decision-making guidance practices described and followed for technology investments, or forums or processes for dispute resolution and other decision making; (3) evidence that each organizational unit is aware of and responsive to the strategies of the other; (4) level and type of end-user engagement and satisfaction with IT services and practices."

- Response: Level 2 - Agency frequently partners with an IT unit or service provider.

1.10.1.a: Do programs and IT service providers have mutual agreement regarding roles/responsibilities, decision making[,] and service expectations?

- Agreement exists informally. While the CD Division (as MDSS business owner) exhibits authority over MDSS development (with some decisions needing to pass through BIC and/or Information Security), this system operates on the DTMB network and hardware.

1.10.1.b: Do both parties benefit from the relationship?

- DTMB is funded through use of billable services to other administrative departments. Its continued ability to operate depends on the provision of I.T.-related services; they presumably desire to provide high quality services in order to maintain their customer base (i.e., other state departments). The CD Division (and MDHHS in general) receives I.T. services, in turn, in the form of system security, hardware (e.g., web and application servers), and network access/maintenance.

1.10.1.c: Are they aware of and responsive to each other's strategies and goals?

- Not always. The boundaries, degree, and scope of DTMB authority are not always clear and can change without notice.

1.10.1.d: Are end users consulted or engaged in IT decision-making processes?

- For general I.T. decisions: no, the CD Division has not historically been consulted or engaged. For items specific to MDSS decisions, the CD Division is sometimes engaged, but not always. Many decisions are communicated as mandate or policy. But such directives are frequently unclear, subjective, or erroneous.

1.10.2.a: Do formal service level agreements exist?

- None is known.

1.10.2.b: Are they widely known and used?

- N/A

1.10.3.a: Are metrics established to assess user satisfaction?

- No.

1.10.3.b: Do the results inform changes in practices, procedures or services?

- N/A

1.10.4: Is there a clear process by which agency program [sic] can define and communicate their business requirements to IT?

- DTMB does provide a business analyst who serves are the CD Division liaison for in DTMB interactions. While the person in this role has often been highly engaged with the CD Division, this person tends to exhibit little authority within the DTMB superstructure.

1.11 Collaboration with Community Partners to Meet Population Health Goals/Objectives - Does your agency effectively collaborate with community partners who have an interest/responsibility for population health assessment and/or management (ACOs, health plans, QIOs, etc.)?

- "Collaborative processes and relationships are those activities designed to achieve goals or outcomes that require significant contributions from multiple organizations, individuals or groups. Examples of effective collaboration may include joint development of, and agreement to a set of common goals; shared responsibility for achieving the goals; and shared expertise and resources of collaborating partners."

- Response: Level 3 - Agency has established collaborative relationships with such partners.

1.11.1.a: Do partners generally believe that collaborative relationships are working well and are effective?

- The CD Division has worked diligently to ensure that its partner perceive it as cooperative and collaborative. Much of this results from the federated nature of Public Health in Michigan, where the CD Division's success depends highly on the work conducted by LHJs and other regional entities. In this sense, the current environment is reflective of positive working relationships. Additionally, the CD Division engages in many demonstration and pilot projects with organizations at all levels (local health departments, hospitals/healthcare providers, HIEs, professional organizations, and federal partners)

1.11.1.b: Are roles known and understood?

- While not formalized in any ongoing partnership assessment, the roles seem to be well understood.

1.11.1.c: Is there clarity around decision making?

- Decision making is achieved as democratically as possible. The formality of the process depends on the decision and partnerships in question.

1.11.2.a: Does collaborative work have defined metrics associated with assessing both the collaboration and the outcomes?

- This depends - for grant funded activities and pilot projects where partnership assessment is a critical component of the project, yes. But, not all partnership and collaborations occur in such a formalized atmosphere. In such cases, collaboration assessment is not always reviewed.

1.11.2.b: Do measures reflect that partners are moving toward achieving intended outcomes?

- For the measures that are intended to reflect such progression, yes (e.g., LHD accreditation).

1.11.3.a: Are there sufficient resources dedicated to collaborative work?

- Presently, yes. But, more resources would be optimal in order to expand current collaboration and joint activities.

1.11.3.b: For example, does the agency have staff dedicated to the collaboration?

- For collaborative efforts where tracking metrics are necessary, yes.

1.11.4.a: Are the collaborations in the right areas?

- The collaborations that are currently happening are necessary. Upon further critical review, additional areas would likely be identified (e.g., feedback to ELR reporters).

1.11.4.b: Are there new public health priorities or opportunities for which collaborations have not yet been created?

- This is evaluated on an ongoing basis.

Section 2: Skilled Workforce

2.1 Workforce Strategy - Does the agency have a workforce strategy that describes its needed informatics capabilities and/or positions and have action plans for recruiting, hiring and/or developing existing staff to meet those needs?

- "Strategies and action plans for human resources often include agency-wide efforts to meet organizational performance needs. Workforce planning strategy may include assessment, recruitment, training and development, retention, and succession planning. For informatics, the workforce strategy may include creating new positions or, because that is not always possible or desirable, training existing staff who have the interest and aptitude in informatics."

- Response: Level 2 - Agency has made or is making a sustained attempt to develop a workforce strategy.

2.1.1.a: Is informatics recognized as a discipline distinct from IT?

- Formally, yes. I.T. services are separately provided through DTMB and the three current informatics staff in the CD Division are all recognized as informaticians, informaticists, or informatics fellows. Amongst other division staff, however, these distinctions are not always clear and it is often requested of the informatics team resolve I.T. issues.

2.1.1.b: Do you have messages for how to effectively clarify the distinction?

- Such a coordinated message does not yet exist.

2.1.2: Has any assessment of human resource needs for informatics capacity been explored?

- Yes, there are currently efforts underway targeting a review of the informatics team structure. Ultimately, the desired outcome would be for improved informatics capacity development, including intra-division messaging of informatics roles and responsibilities.

2.1.3: Is there a formal written plan for recruitment, training and development, and retention of informatics professionals?

- Not currently.

2.2 Job Classifications for Informatics Professionals - Does the agency have appropriate job classifications, including position descriptions and pay scales, for informatics professionals?

- "Human resources professionals must have job classification systems, position descriptions and pay scales for all hiring situations. Because informatics is an emerging discipline, many agencies struggle to establish these positions within existing classifications. A major challenge is defining the informatics competencies, duties and minimum requirements in ways that that clearly distinguish them from IT classifications."

- Response: Level 1 - Agency has made initial, isolated ad hoc efforts to adopt such informatics job classifications.

2.2.1: Does the agency have classifications for informatics professionals?

- Yes, but not specifically to informatics professionals. The State employs classification levels; while some are specific, many are general descriptions and titles. Informatics tends to be grouped into these more general classification levels. The CD Division exhibits no control over these classification levels. Once an informatics position description is written (and this is written by Division leadership, with specific informatics roles and responsibilities delineated), Human Resources handles the classification within the given constraints.

2.2.2.a: If so, do they support specific programs areas?

- As noted above, these descriptions are more general in nature. They tend not to include informatics-specific competencies, duties, or minimum requirements. Those items tend to be delineated within specific job descriptions which are then fit into existing classification structures.

2.2.2.b:The agency as a whole? Both?

- N/A

2.2.3: Do their performance evaluations capture feedback from whatever scope of responsibility they have (programs, agency-wide, etc.)?

- Specific employees performance evaluations are tailored to their job descriptions. These job descriptions are not based on boilerplates for informatics positions.

2.3 Training - Does the agency support staff members across a broad range of job classifications to participate in informatics training?

- "This question seeks to assess the availability of informatics training for individuals in a variety of job classifications. These positions can include those that support informatics capacity directly, as well as data analysts, epidemiologists, public health nurses, program managers, data quality specialists and IT staff."

- Response: Level 3 - Policies and practices exist that support informatics training for a broad range of job classifications.

2.3.1a: Does the agency have a mechanism to identify current staff that has an interest and aptitude in informatics?

- Yes. Aside from the core informatics team of three, several other individuals at various program/unit levels engage in some degree of informatics-like activities. Informatics trainings, when available, are prioritized for such individuals who have a professional need for additional informatics skills

2.3.1.b: Do agency policies support training activities (for example, is reimbursement for training available)?

- Yes. Within standard training reimbursement protocols, informatics trainings are made available to staff just as any other training that meets the individual's professional domain.

2.3.2.a: Has the agency conducted any assessment of training needs related to the practice of informatics?

- Yes. Informal review (feedback) of informatics training needs has resulted in demonstrated need for a couple of different trainings across the core informatics staff and other staff who engage in frequent informatics activities.

2.3.2.b: Has the agency identified training opportunities that match those needs?

- Yes.

2.3.3: Are "on the job" training opportunities provided, such as informatics fellowships?

- While the CD Division does not, itself, provider informatics fellowship opportunities, one of the three members of the core informatics team is a CSTE fellow. Fellowships are certainly supported, even within the realm of informatics.

2.4 Informatics Professionals - Does the agency have highly experienced or academically prepared informaticians in key roles at department and/or program levels, with backgrounds and training commensurate to their responsibilities?

- "Highly experienced informaticians refer to those individuals that have the necessary combination of knowledge, demonstrated skills and abilities to successfully contribute to effective informatics practice. While an academically prepared informatician may not be possible or feasible in many agencies, perhaps especially for local health departments, it is a good measure of informatics maturity within an agency. Key roles refer to the placement, availability and access of individuals with informatics experience. Discussion prompt 2 below suggests titles and descriptions that may inform this concept."

- Response: 4 - The agency evaluates its needs for academically prepared informaticians or highly experienced at both the agency and programmatic levels.

2.4.1.a: Has the agency evolved sufficiently in its informatics capacity building efforts to a point at which recruiting an academically prepared informatician is a next logical step?

- Yes. This took two important steps forward in 2016 with the addition of a formally trained public health informatician and an informatics fellow. Additionally, the MDSS Coordinator is a formally trained GIS specialist with extensive I.T. knowledge and background; this training and experience parlayed nicely into meeting existing informatics needs of the CD Division.

2.4.1.b: What competencies, knowledge and/or credibility would we be looking for from this individual that we do not currently have?

- N/A

2.4.2.a: Do staff members have access to experts in specific areas of informatics, such as health IT vocabulary, messaging, and transport standards?

- Yes. Between the core informatics team and the contracted development team at Altarum Institute, this type of knowledge is readily accessible.

2.4.2.b: Is staff available with sufficient expertise to gather and assess national level standards for adoption and use by programs?

- Yes. This can be demonstrated through current the current EDRS project (through use of CDA and ICD-10 coding)l; the eCR project (implementation of the forthcoming eICR standard); the future MPI project (use of an ESB and MPI); and through existing, ongoing work which relies heavily on HL7 2.5.1, LOINC, and SNOMED coding; among others.

2.4.2.c: Does staff have access to project management professionals and business analysts?

- Yes. Between MDHHS, DTMB, and the BIC, all such professionals are readily accessible.

2.5 Informatics Knowledge and Skills (Program Level) - Do staff members at the program level (e.g., epidemiologists, public health nurses, data analysts, data quality specialists) have the skills to effectively use information systems and tools, and the knowledge of how to identify and document needed system improvements?

- "Users of information systems need to know when those systems are not meeting their needs—requiring frustrating work-arounds, inefficient workflows or other problems—and be savvy enough to state or document their needs in sufficiently clear terms to serve as requirements for enhancements."

- Response: 2 - Some users have such informatics knowledge and skills.

2.5.1: Are staff savvy in identifying when a system does not match their workflows, business needs or other requirements?

- Historically, LHD representation and input has been sought on an advisory basis (through ongoing ELC meetings). Ongoing needs are typically addressed through contact with regional epidemiologists and escalated up the chain as needed. There has not, historically, been efforts from the State-level to inform local users of informatics practices.
- At the State-level, program-level staff tend to be less engaged in the informatics activities that support the system than program management (which, has been pretty effective at advocating for the informatics needs of their staff).

2.5.2: Can staff articulate or document their needs in terms of what the systems need to do and support?

- At the local level, staff are able to represent their needs in terms of describing desired functionality to achieve a particular result. But, typically, staff do not communicate these needs in a manner that would necessarily represent a considerable understanding of informatics.
- At the State-level, again, it is primarily the program/unit leadership that is represented in informatics solutions discussions.

2.6 Informatics Knowledge and Skills (Program Managers) - Do managers/supervisors of large information system programs have knowledge and skills of informatics principles, concepts, methods, and tools gained through education, training or experience?

- "Informatics principles, concepts, methods and tools refer to the set of knowledge and skills necessary for managers to know what should be expected in terms of system performance, IT support, and the quality and value of the information contained in the system.For senior managers, it can mean understanding how requirements were gathered and vetted, whether end users were involved in the design,where the risks lie, and whether the system is delivering value. For those who manage the information system directly, it can include understanding the IT lifecycle, instituting sound requirements gathering and change control mechanisms, and being able to manage risks, problem solve and ensure quality information is produced to support meeting program objectives."

- Response: 3 - All managers/supervisors of large information systems have such informatics knowledge and skills.

2.6.1.a: Are senior managers appropriately engaged and knowledgeable about the information systems under their authority?

- Yes.

2.6.1.b: Do they have the knowledge to ask "tough" questions of the systems managers, IT or vendors?

- Yes.

2.6.2: Do information system managers have the informatics knowledge and skill necessary to systematically identify system requirements for enhancements, and ensure appropriate change control and roll-out of those enhancements?

- Yes.

2.6.3: Do information system managers have the informatics knowledge and skill necessary to effectively manage IT support, whether internal or external?

- Yes.

Section 3: Effectively Used and Well-Designed Systems

3.1 Software Development Process - Does the agency practice a standard software development process for requirements definition, system design, implementation and maintenance?

- "A standard software development process may include some or all components to support the IT lifecycle, including initiation and concept, planning, requirements definition, design and development, testing, training and implementation, operations and maintenance, and disposition. A detailed requirements definition is particularly essential, as it includes understanding what the information system must do to support the program to meet its objectives. The output of requirements definition identifies, in very granular detail, the new product to be built or how an existing system is to be enhanced."

- Response: Level 2 - The agency frequently uses a standard software development process.

3.1.1.a: Does the agency have a recognized and documented software development process?

- While DTMB has a prescribed set of processes that are outlined in policy (SUITE), these processes are only followed with DTMB development teams. When outside development resources are used, each development follows a process outlined between the business owners and the development team.

3.1.1.b: Is the process standardized across the agency?

- Within the CD Division, there are three main systems that require ongoing development, support, and versioning - MDSS, MSSS, and LMS. These are maintained/developed under the direction of each business owner team.

3.1.1.c: Is the process available to all stakeholders, both within the programs and within information services/central IT?

- The policy and process descriptions for initial system procurement are available for public access. These initial procurement and development processes, however, tend to involve those in program management and leadership roles and the I.T. services development teams. They tend not to include program/service-level staff (e.g., local users). Ongoing system maintenance and versioning generally consists of program management/leadership and the contracted development team; local level users are included in the proposal feedback phases (ELC, MSIPC, MALPH, etc.).

3.1.2.a: Is the software development process used routinely and systematically?

- Yes. System versioning occurs two to three times per year in MDSS and LMS, and occasionally in MSSS.

3.1.2.b: Is there a high degree of adherence across the agency?

- Yes. To the degree that each business team and development team has established a routine development cycle

3.1.3.a: Is there a method to measure how broadly the process is utilized?

- No.

3.1.3.b: Are these findings shared and used for process improvement?

- No.

3.2 Project Management - Has your agency adopted and documented standard project management procedures for information technology projects?

- “In this context, project management procedures refer to methods and strategies designed to accomplish information system goals or projects. Typical project management components or steps include initiation, planning, execution, monitoring/controlling and close-out. Project managers may also be responsible for coordinating or conducting stakeholder communication and vendor contract management. Adhering to a standardized methodology of project management can help to mitigate risk, maintain timelines, and ensure success within a project .”

- Response: 1 - The agency has made initial efforts to use project management procedures for information systems projects.

3.2.1.a: Do documented project management procedures exist across the agency?

- Within the CD Division, there are not specific, documented project management procedures for system development or enhancement. Rather, system development and enhancement tend to occur through informal processes that have been organically developed across team members, over several cycles of system enhancement. This is true across all three primary systems employed by units/programs within the CD Division (MDSS, MSSS, and LMS).

3.2.1.b: If so, are they well-understood?

- N/A

3.2.1.c: Are they used routinely?

- N/A

3.2.2.a: Are project management positions and resources (project managers, business analysts) available across the agency?

- Project Management tends to be a delegated function of the contracted development teams and varies by business application/program/unit/team.

3.2.2.b: Are these resources most heavily utilized by (and available to) IT, or are they as accessible to all programs within the agency?

- I.T. (as in DTMB) tends not to be utilized for ongoing development/enhancements of existing systems. To the extent that development contractors serve in I.T. roles, and are the actors who most heavily utilize their own internal project management resources (software, projectment management professionals, etc.), project management tools and procedures are generally available to these team members.

3.2.3.a: Is there an approval process for new informatics or IT projects?

- For systems with cross-program utilization, enhancements tend to be proposed/discussed in common settings (i.e., MDSS User Group meetings) and funded on an individual program/unit basis, as the funds are made available. Each program/unit manages its own grant cycles and funds program-specific enhancements to such systems at its own discretion. Single-business unit systems are funded/developed/managed by individual units at their own discretion (e.g., LMS).

3.2.3.b: Is this process transparent and well-understood?

- This process is generally understood, in high-level terms, but individual application of requirements gathering, securing development funds, project planning, etc., tends to be employed by each group in its own way. These tend to be more stylistic than substantive differences in process. There is not guidance that the CD Division has provided to its units/programs on how to approach system development/enhancement.

3.3 Information Systems Inventory - Has the agency conducted an inventory of its information systems and the services/information they provide?

- "In general, an information system is defined as any computerized database designed to collect, store[,] and process data for the purposes of delivering information and/or knowledge. In considering an inventory of information systems, it may be important for the agency to determine a uniform definition of information systems to be included and counted. An inventory of information systems and the services provided by existing systems can be a starting point toward a larger needs assessment to evaluate the degree to which information systems meet the needs of program staff and end users. Such assessments could include identify or enumerate the number and types of information systems that are in use, which standards are used, the current and possible future external and internal data exchange partners/users, technical capabilities, and resource needs. Such an activity may identify opportunities to reduce duplication or address multiple uncoordinated systems."

- Response: Level 1 - The agency has made isolated, ad hoc efforts to inventory its information systems.

3.3.1: What efforts have been made toward an agency-wide inventory of information systems?

- DTMB and the BIC have occasionally requested assessments of this nature, in order to categorize and prioritize I.T. services management to each of these systems. Additionally, these types of assessment facilitate NIST security analysis and enterprise architecture analysis.
- The CD Division has not, however, conducted such an inventory at its own discretion, tailored to meaningful results that may be of use for future analysis. The DTMB and BIC inventories tend to have little use to the CD Division.

3.3.2.a: Have these efforts been conducted on a routine basis?

- The DTMB and BIC inventories occur on either an annual or biennial basis (depending on the inventory).

3.3.2.b: If so, is the frequency appropriate to ensure timeliness and relevance?

- It can only be assumed that these meet DTMB and BIC needs. They do not, however, prove to be of much use to the CD Division's understanding of its own systems.

3.3.3: Are system inventories used along with needs assessments to ensure the system focus remains on user needs?

- Historically, no.

3.3.4.a: With whom is inventory data shared?

- For the DTMB and BIC inventories, the results are rarely, if ever, shared. The CD Division certainly has not recognized any meaningful subsequent action as a result of these inventories.

3.3.4.b: How is the inventory information used (e.g., for decision making, resource allocation, etc.)?

- The DTMB and BIC inventories tend to be used for non-owners of information systems to describe each system within the overarching enterprise architecture of MDHHS and the State of Michigan. This allows for system categorization within the overall complex of information systems, ensuring that system and security needs are met on an ongoing basis - especially for critical systems (i.e., red card systems).

3.4 Information Systems Usability - Has the agency conducted an assessment of information system usability and effectiveness based on the needs of staff and programs?

- “An assessment of information system usability and effectiveness is an important practice to ensure that the technology truly supports the work and workflows of staff. Evidence of poorly designed software includes inefficient processes, high levels of staff frustration and ‘work arounds.’ The ability [to be] able to conduct such an assessment implies that the desired workflows and practices are well documented (as opposed to current practices which may be ruled by limitations of the information system).This documentation establishes a standard against which the systems can be assessed.”

- Response: Level 1 - The agency has made isolated, ad hoc efforts to conduct such an information systems assessment.

3.4.1: Are information systems assessed for usability and effectiveness?

- Isolate, ad-hoc efforts have been made to assess usability and effectiveness of portions of MDSS, vis-à-vis impact on individual programs’ and units’ workflows.
- No large-scale, system-wide assessment has been conducted across all of MDSS, MSSS, or LMS.

3.4.2: Have the ideal-state workflows and practices been documented through a collaborative process that engaged the relevant staff?

- Prior to this project, no such system-wide workflows documentation was conducted.

3.3.3: If needs assessments of information systems are conducted routinely, is the frequency appropriate to ensure timeliness and relevance?

- N/A

3.5 Standards Adoption and Implementation - Does the agency have information systems that use nationally recognized vocabulary, messaging[,] and transport standards?

- “Vocabulary, messaging[,] and transport standards support efficient development and interoperability for health information exchange. Adopting nationally recognized standards where available can decrease the time and resources needed for software development and for building interfaces and supporting connectivity. Examples of nationally recognized standards for vocabulary include CVX, CPT, ICD, LOINC[,] and SNOMED. Messaging standards like HL7 and CDA often call for the use of specific vocabulary standards; for electronic laboratory messages, LOINC and SNOMED codes are recommended for tests and results, while immunization messages recommend CVX and ICD codes for vaccines and administration methods. Transport standards direct how messages should be sent between systems, for example SOAP web-services, secure FTP or VPN, or direct secure messaging.”

- Response: Level 3 - The agency’s information systems have adopted and implemented nationally recognized standards with coordination across programs.

3.5.1: Are standards considered and, when possible, implemented for new systems or modules?

- Vocabulary, messaging, and transport standards are widely implemented across all three core information systems used by the CD Division. New standards (like FHIR) are considered as they become available, while existing (proven) standards continue to make up the core components of system and communication architecture and functionality.

3.5.2.a: Does the agency support discussions or exchange of information about established and emerging standards, both locally and nationally?

- Yes. The CD Division is a recognized leader within the department for the efforts it has made to participate in, and prove, use of existing and emerging standards and practices.

3.5.2.b: When the agency does adopt standards as described in standards organizations’ implementation guides, does the agency typically adhere to that guidance or deviate from it?

- The CD Division makes every effort possible to adhere, as strictly as possible, to the standards’ guidance.

3.3.3: Is there a venue to explore the value and cost of incorporating nationally recognized standards for systems that are not currently using them?

- There is not a formal venue in which these discussions tend to take place; but, they are welcomed, and encouraged, within a variety of informal forums.

3.6 Data Exchange (Internal) - Does the agency have the capability to electronically send, receive and process data and/or messages internally between programmatic information

systems?

- "Electronic exchange of data or messages refers to the ability to send, receive and process data that are electronically transferred from one information system to another. Generally, this does not include FAX or email messages. Technical capabilities for electronic data exchange might include automated scripts for querying or extracting information from one system and securely transferring it to another. Internal data sharing might require enabling legislation, or cross-program data use agreements. In some cases, it may be technologically possible to exchange data internally, but policy or programmatic hurdles may exist. Electronically processing information may refer to the ability to accurately match and merge records, reconcile differences and automate de-duplication processes."

- Response: Level 2 - The agency exchanges data internally, but some manual effort is required to process these data.

3.6.1: Do programs across the agency currently have the ability to exchange data?

- As a general rule, the CD Division does not have automated inter-system communication for data exchange. Currently, systems within the CD Division do not communicate with one another. There are current projects in various stages of development through which MDSS will ultimately exchange data with other MDHHS systems (Electronic Death Registry [EDRS], and the Master Patient Index); but, these projects will not result in communication between CD Division systems.

3.6.2: Are existing data exchanges automated, or do they require significant human intervention?

- To the extent that the CD Division does exchange data between its own internal systems (e.g., HIV patient matching out of LMS and eHARS to STD patient records in MDSS), these data exchanges are both ad hoc and manually intensive. They are based the standardized extraction of data from these information systems; but the actual exchange is manual.

3.6.3.a: Does a routine process exist for initiating and operationalizing data exchange with internal partners?

- As in the above example, the STD and HIV surveillance units have developed, unto themselves, a process through which this exchange occurs. As these matches occur on a semi-regular basis, these processes are more-or-less standardized (in a high-level sense of regularity of process) but should be considered a work around to current systems limitations, in that the STD data repositories in MDSS do not communicate with the HIV data repositories in LMS and eHARS.

3.6.3.b: Do tools exist to support this exchange (e.g., standardized data use agreements, standard operating procedures, Master Person Index, record matching and merging tools, etc.)?

- For the above example, third party record matching tools are used. For other projects involving entities outside of the CD Division (e.g., MDSS exchange with EDRS) data-use agreements are used. And, while MDSS uses its own master patient index (MPI) for for record deduplication within the MDSS, MDHHS-wide interoperability integration will require MDSS to be linked with the MDHHS MPI through the statewide enterprise service bus (ESB) - this project is on the near horizon and will soon start the requirements gathering process.

3.7 Data Exchange (External Partners) - Does the agency have the capability to receive and process electronic data and/or messages sent from external partners?

- "Receiving a message means that the message reaches its intended target. Processing a message includes the ability to parse, store[,] and retrieve data. It also implies that the recipient is able to "read" or access the information contained in the message. Message processing capability also includes validating that the information contained in the message conveys an expected or appropriate value. Ideally, message receipt and processing would be automated, requiring minimal manual effort and human intervention."

- Response: Level 4 - The agency evaluates its capability to receive and process electronic messages sent from external partners.

3.7.1.a: Do programs or applications currently receive electronic data from external partners?

- Yes. For each information system in use, automated receipt, processing, and provisioning of data is the key to each system's ability to meet it business need.

3.7.1.b: Are these programs or applications standards-based?

- Yes, all programming, vocabulary, messaging, and transport of information is standards-based to the best extent possible.

3.7.2: Are these programs or applications capable of receiving and processing incoming messages in an automated way, or is human intervention needed to accomplish these tasks?

- All three core CD Division systems are designed to automatically process data with a little human intervention as possible.

3.7.3.a: Does the agency have a process for evaluating their current capabilities for receiving or processing data from external partners?

- These capabilities are implicitly evaluated in a variety of settings, including ongoing weekly meetings with information system management, development teams, DTMB business analyst liaisons, and other State of Michigan partners. There is not, however, an explicit evaluation of this capability that is so directly addressed.

3.7.3.b: If so, are these evaluation data used to expand the agency's capacity for data exchange?

- Absolutely. When anomalies or shortcomings are identified in systems, business owners and development team address these needs within given constraints (e.g., funding).
- That said, the CD Division does not have a standardized, ongoing methodology to evaluate the quality of data received on a regular basis in order to provide continual feedback to data providers, post-onboarding.

3.8 Data Exchange (Clinical Partners) - Does the agency have the capability to securely send and receive electronic health data with clinical partners?

- "Clinical partners may have a particular need to interact with public health data to meet reporting requirements and/or to leverage data for clinical decision support. For some areas of public health, clinical data exchange involves receiving health data through a uni-directional pathway, while others may have a need to securely exchange electronic health information bi-directionally. Uni-directional exchange is exemplified by electronic laboratory reporting where the external partner submits data to public health and may (or may not) receive an acknowledgement of that receipt. Alternatively, bi-directional exchange of data occurs when one system (e.g., a clinician's electronic health record system) submits data to or queries another (e.g., an immunization information system or registry), and that system returns a response that is incorporated by the requesting system. The configuration of the data exchange process may vary by jurisdiction; in some areas, health data and/or queries may flow through a formal Health Information Exchange (HIE) at the state, region or community level."

- Response: Level 3 - The agency routinely exchanges health data securely with clinical partners.

3.8.1.a: Do secure data interfaces exist between the agency and clinical partners?

- Currently, MDSS receives automated messages and, with the exception of the standardized HL7 acknowledgement process, does not return automated messages to clinical partners. Clinical partners (e.g., physicians, infection control and prevention specialists at hospitals, laboratorians, etc.) do have secure MDSS access to the data that they have sent, to manually enter cases or additional data, and to QA the quality and quantity of their data. MSSS and LMS do not currently allow for third-party access.
- Additionally, MDSS does initial notification to CDC through NNDSS messaging, using PHINMS as the transport mechanism.

3.8.1.b: Are these interfaces uni-directional or bi-directional?

- These current systems are generally uni-directional. However, with the advent of standardized electronic case reporting (eCR), bi-directionality is being built and piloted within MDSS. This will allow for automated follow-up with clinical partners, after the initiation of an electronic initial case report (eICR).

3.8.1.c: Is there an unmet need for additional data interfaces with clinical partners?

- There is not an unmet need for additional data interface, per se. But, there is always opportunity for improvement of existing data interfaces - for example, in terms of ongoing message QA'ing, additional tools built into the existing interfaces could result in improved feedback to message initiators, thus resulting in improved data quality.

3.8.2: Are standardized data exchange tools being used by the agency for message format, transport, and or security?

- Yes, for all of the above.

3.8.3.a: Is there an active Health Information Exchange (HIE) in the agency's jurisdiction?

- The is a well-established and mature network of HIE networks in Michigan. Michigan has had much success in the implementation of its HIE structure and this serves as the basis for all communicable disease reporting.

3.8.3.b: If so, does the HIE support or expand the agency's capacity for secure data exchange with clinical partners?

- Yes, the HIE structure allows for efficient, timely onboarding and message exchange.

3.9 Data Management and Quality Assurance (Internal) - Has the agency adopted procedures for data management and quality assurance for data housed in the agency's information systems?

- "Robust data management procedures include systematized plans and processes to collect, retain, protect and enhance the value of data. Security and confidentiality protocols, data use agreements, and applicable statutes or rules may all inform or be included in data management procedures. Data quality assurance procedures include protocols to assess and ensure the accuracy, completeness, and timeliness of incoming and existing data. "

- Response: Level 1 - The agency has made initial attempts at documenting procedures for data management and quality assurance.

3.9.1.a: Are data management and data quality assurance procedures documented?

- Data management is largely prescribed in DTMB policy and protocol. Data quality assurance procedures exist largely exist in the form on onboarding. Ongoing data assurance is less prescriptive, as it is not found in a set processes, but tends to be more ad hoc - current quality assurance, across all core CD Division systems, relies on user identification of quality issues. They are then addressed by the respective information system's management team.

3.9.1.b: If so, are they fully implemented?

- Data management and security measures are fully implemented. Data quality assurance is not fully implemented.

3.9.1.c: Are these procedures standardized and shared across the agency?

- Data management and security, being largely controlled by DTMB as the authoritative body, is fully implemented across all systems.

3.9.2.a: Are the processes for data handling evaluated consistently across the agency?

- Data management and quality assurance processes are not regularly evaluated by the CD Division. While individual data management and quality assurance practices are occasionally addressed by various teams and through development of particular aspects of the core systems employed by the CD Division, they are not comprehensively evaluated in a systematic manner.

3.9.2.b: Are these findings used to improve upon and expand data management and data quality procedures?

- N/A

3.9.2.c: Do these findings influence programmatic, operational or IT development decisions?

- N/A

3.10 Information Technology Systems Plans and Budgets - Does the agency plan or budget for information technology systems maintenance?

- "IT systems maintenance is separate from enhancements or development work, but includes all forms of computer or server maintenance needed to keep the system running smoothly. Comprehensive systems maintenance may include corrective or preventive maintenance to ensure the system meets current and expected upcoming demand, and that the system is performing efficiently and effectively. Identifying and ensuring funding for maintenance and support of IT systems is a critical component of a successful plan."

- Response: Level 3 - The agency routinely plans and budgets for IT systems maintenance.

3.10.1.a: Does a uniform process exist across the agency for planning and budgeting for the agency's IT systems maintenance?

- Each core system within the CD Division is maintained through funding secured by the individual team acting as the system's business owner. Therefore, such maintenance is subject to the requirements and constraints of the available funds - they are not comprehensively maintained through a singular funding stream that would otherwise facilitate cross-system maintenance through a singular set of processes.

3.10.1.b: If so, is this process exercised routinely?

- Routine maintenance for each system exists, but varies in frequency and scope, depending on the system. For example, maintenance of MSSS is substantively less intense in scope and frequency than the maintenance of MDSS, which tends to be very frequent and more complex.

3.10.1.c: Is the frequency adequate to meet programmatic and stakeholder needs?

- As a general rule, yes. However, there is an evident lack in a standardized tracking system that would facilitate timely closure of issues and allow for retrospective analysis of such issues in an effort to identify larger maintenance needs and trends.

3.10.2.a: Do service level agreements (SLAs) between programs and IT resources exist?

- Yes.

3.10.2.b: If so, are the SLAs standardized (where possible)across the agency?

- Yes.

3.10.2.c: Is information documented in SLAs complete and comprehensive, and is it known and followed by all parties?

- Yes.

3.11 Shared Services - Do the agency's programs share relevant services across the agency, such as an integrated provider registry, master person index, integration engine or other applicable services?

- "Shared or centralized services such as provider registries or master patient indexes (sic) that are leveraged across an agency can allow programs access to resources and tools they would not otherwise be able to implement. Shared services can also facilitate a uniform and standards-based adoption of programmatic functions, while supporting common goals and processes."

- Response: Level 3 - The agency's programs are actively sharing services across the agency.

3.11.1.a: Do shared services exist across the agency?

- Shared services exist, but within the current context of uni-directional message exchange. Incoming, standardized electronic reports (whether lab or ADT messages) all arrive at the CD Division through a singular integration engine, the DQT. DQT processes initial receipt, error correction, format standardization (i.e., 2.3.z messages constrained to a 2.5.1 version), and end-system provisioning. DQT, as a shared service, also handles all outgoing NNDSS notifications (through PHINMS) and interstate communication (through AIMS hub via PHINMS).
- There are forthcoming projects to connect at least MDSS to external systems through additional shared services (e.g., MPI and ESB).

3.11.1.b: Are programs across the agency represented in design and development discussions?

- Generally speaking, when any one core system is undergoing development planning, other core systems are not considered, as they are developed independently of one another.

3.11.2.a: Do standardized processes exist for updating and sharing these resources centrally?

- Not currently.

3.11.2.b: Are these standardized processes adhered to?

- N/A

3.11.3: Are shared or centralized services supported financially and operationally across the agency?

- No, but this largely depends on the service. For example, DQT is independently funded throug the SIDE Section within the CD Division. But, MPI and ESB (forthcoming projects) are owned and operated by DTMB which is not a funded department of the State. All DTMB resources and services are reimbursed by the departments to whom the services/resources are provided - this will include shared services operated under the DTMB superstructure.

3.11.4.a: Does a process exist to evaluate the degree to which the shared service meets end users' needs?

- For the integration engine, DQT, no such process exists on a formal basis. But, each system can also request changes to be implemented within DQT without necessarily affecting the other systems that use DQT. So, as long as each system has a mechanism by which it can ensure that its integration engine needs are being met, a coordinated evaluation process may not be necessary.

3.11.4.b: Are the evaluation findings used to direct future enhancements or expansions of shared services?

- See above - as needed changes are identified, it is generally within the purview of each business owner to request such changes, ensure usefulness, and use the results of these changes to inform future enhancements/expansion within the integration engine and how it interacts with the individual system.

Score Assessment

Score Value	0	1	2	3	4	5
Score Value Meaning	**Absent**	**Initial**	**Managed**	**Defined**	**Measured**	**Optimized**
Vision, Strategy, and Governance						
1.1 - Does your agency have a documented informatics vision and strategy?		X				
1.2 - Has your agency completed an assessment intended to describe its information assets and information needs?	X					
1.3 - Does your agency have a governance process that guides implementation of the informatics strategy?		X				
1.4 - Does your agency have a systematic, sustained approach to funding informatics activities, including those to support staffing needs, physical facility and information systems funding?				X		
1.5 - Has the agency completed an assessment to improve data exchange with internal stakeholders?		X				
1.6 - Has the agency completed an assessment to improve data exchange with external stakeholders?		X				
1.7 - Has the agency adopted procedures for establishing data sharing agreements?				X		
1.8 - Has your agency established policies and procedures to ensure privacy, confidentiality, and informed consent?				X		

1.9 - Does your agency have an organizational focal point for informatics (e.g., an informatics unit, a Chief Informatics Officer) with cross-agency responsibility and authorities, including those related to the agency's information vision, strategies and policies?			X				
1.10 - Does your agency have a strategy to support relationships with an information technology (IT) unit or services provider (internal or external) to support achievement of informatics goals and objectives?			X				
1.11 - Does your agency effectively collaborate with community partners who have an interest/responsibility for population health assessment and/or management (ACOs, health plans, QIOs, etc.)?				X			
Score Count	1	4	2	4	0	0	**11**
Score Count Value (Score Count X Value)	0	4	4	12	0	0	**20**
					Section Average Score		**1.81818**

Score Value	0	1	2	3	4	5
Score Value Meaning	**Absent**	**Initial**	**Managed**	**Defined**	**Measured**	**Optimized**
Skilled Workforce						
2.1 - Does the agency have a workforce strategy that describes its needed informatics capabilities and/or positions and have action plans for recruiting, hiring and/or developing existing staff to meet those needs?			X			
2.2 - Does the agency have appropriate job classifications, including position descriptions and pay scales, for informatics professionals?		X				
2.3 - Does the agency support staff members across a broad range of job classifications to participate in informatics training?				X		
2.4 - Does the agency have highly experienced or academically prepared informaticians in key roles at department and/or program levels, with backgrounds and training commensurate to their responsibilities?					X	
2.5 - Do staff members at the program level (e.g., epidemiologists, public health nurses, data analysts, data quality specialists) have the skills to effectively use information systems and tools, and the knowledge of how to identify and document needed system improvements?			X			

2.6 - Do managers/supervisors of large information system programs have knowledge and skills of informatics principles, concepts, methods, and tools gained through education, training or experience?				X			
Score Count	0	1	2	2	1	0	**6**
Score Count Value (Score Count X Value)	0	1	4	6	4	0	**15**
					Section Average Score		**2.5**

Score Value	0	1	2	3	4	5
Score Value Meaning	**Absent**	**Initial**	**Managed**	**Defined**	**Measured**	**Optimized**
Effectively Used and Well-Designed Systems						
3.1 - Does the agency practice a standard software development process for requirements definition, system design, implementation and maintenance?		X				
3.2 - Has your agency adopted and documented standard project management procedures for information technology projects?	X					
3.3 - Has the agency conducted an inventory of its information systems and the services/information they provide?	X					
3.4 - Has the agency conducted an assessment of information system usability and effectiveness based on the needs of staff and programs?	X					
3.5 - Does the agency have information systems that use nationally recognized vocabulary, messaging[,] and transport standards?			X			
3.6 - Does the agency have the capability to electronically send, receive and process data and/or messages internally between programmatic information systems?		X				
3.7 - Does the agency have the capability to receive and process electronic data and/or messages sent from external partners?				X		
3.8 - Does the agency have the capability to securely send and receive electronic health data with clinical partners?			X			

3.9 - Has the agency adopted procedures for data management and quality assurance for data housed in the agency's information systems?		X					
3.10 - Does the agency plan or budget for information technology systems maintenance?				X			
3.11 - Do the agency's programs share relevant services across the agency, such as an integrated provider registry, master person index, integration engine or other applicable services?				X			
Score Count	0	4	2	4	1	0	**11**
Score Count Value (Score Count X Value)	0	4	4	12	4	0	**24**
					Section Average Score		**2.18181**

Score Value		0	1	2	3	4	5	
Score Value Meaning		**Absent**	**Initial**	**Managed**	**Defined**	**Measured**	**Optimized**	
Overall Score								
	Score Count	1	9	6	10	2	0	**28**
	Score Count Value (Score Count X Value)	0	9	12	30	8	0	**59**
						Section Average Score		**2.10714**