BioSense 2.0 Final Evaluation Plan

April 2013

Prepared for
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Public Health Surveillance and Informatics Program Office
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RTI Project Number 0212633.002.002

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Definition of Common Terms

Performance: The system or application functions as designed and intended by developers and key stakeholders.

Use: Logging into the BioSense 2.0 Web-based application to carry out specific surveillance tasks and functions.

Utility: The degree to which BioSense 2.0 supports and adds value to existing surveillance capacity including (1) the ability to carry out surveillance tasks and functions; (2) achieve surveillance goals; and (3) integrate into existing workflow.

Usability: The characteristics and qualities of the BioSense 2.0 Web-based application that support individuals' ability to use the system effectively for their desired purposes.

User: Any individual who registers and logs into the BioSense 2.0 Web-based application to carry out surveillance tasks.

Partner: Any organization that has formally (through a cooperative agreement with CDC data sharing agreement or participation in governance activities) agreed to support the development and implementation of BioSense 2.0.

Data Contributor: Any organization or entity that provides data to the BioSense 2.0 system including hospitals, clinics, government agencies, or vendors.

Onboarding Costs: The time, materials, and other resources expended to join the BioSense system, including both direct and indirect costs. Not included are ongoing/use costs associated with BioSense 2.0

1. BACKGROUND

In 2003 the Centers for Disease Control and Prevention (CDC) launched BioSense 1.0 as a nationwide integrated system for early detection and assessment of bioterrorism-related illness that would receive automated data feeds from hospitals and medical facilities operated by the U.S. Department of Veterans Affairs (VA) and Department of Defense (DoD). In the years that followed, BioSense 1.0 added syndromic data from state health departments, anti-infective prescription data, and laboratory data from selected vendors. In June 2010 a 4-year effort, the BioSense Redesign project, was initiated to transform BioSense 1.0 to BioSense 2.0—an all-hazards surveillance system that would provide multipurpose value and timely data for regional and national public health situation awareness, routine public health practice, and health outcomes and public health improvement.

Drawing upon 8 years of programmatic experience, stakeholder meetings, U.S. Senate's input, General Accounting Office (GAO) reports, and a year of intensive user requirements gathering, the redesigned BioSense 2.0 aims to:

- Incorporate state and local public health partners' input into the BioSense Program design and governance.
- Promote a proactive, collaborative, and transparent community.
- Support the transmittal of syndromic surveillance data to meet Meaningful Use requirements.
- Support an open, distributed computing model.
- Improve the utility of the data/data sources.
- Facilitate real-time interjurisdictional communication and collaboration.
- Promote innovative epidemiological methods and practices.
- Enhance the capacity of the public health workforce for surveillance practice.

BioSense 2.0 represents a significant realignment of structure and governance from the previous system. Now in its third year, the BioSense Redesign has focused on coordinating efforts across multiple stakeholders [CDC, Association of State and Territorial Health Officers (ASTHO), National Association of County and City Health Officials (NACCHO), Council of State and Territorial Epidemiologists (CSTE)], and the International Society for Disease Surveillance (ISDS), enhancing program visibility and recognition, building local capacity through training and technical assistance, and supporting the expansion of BioSense 2.0 through targeted recruitment and onboarding activities. The BioSense

Redesign effort now requires a formative evaluation to ensure it is on track to achieve BioSense 2.0 aims.

1.1 Purpose of the BioSense 2.0 Evaluation

This BioSense 2.0 evaluation will assess the performance, use, utility, usability, and costs of the BioSense 2.0 system as well as the onboarding experience. The evaluation is intended to guide the BioSense 2.0 Governance Group, CDC, state, local, and territorial (STLT) stakeholders and the RTI BioSense Redesign team in their deliberations and decisions about the development of BioSense 2.0. The evaluation plan proposed here emphasizes process and short- and mid-term outcomes over long-term outcomes; it does not assess the overall impact or value of the program. However, this evaluation plan includes performance monitoring and cost measurement from which impact and longer-term outcomes can be evaluated. We have developed this plan in consideration of the following BioSense 2.0 Key Performance indicators:

1. Increase the proportion of jurisdictions contributing data into BioSense 2.0 to improve the national picture of population health.

2. Increase the percentage of public health agencies that can receive production syndromic surveillance Meaningful Use compliant messages from certified electronic health record (EHR) technology.

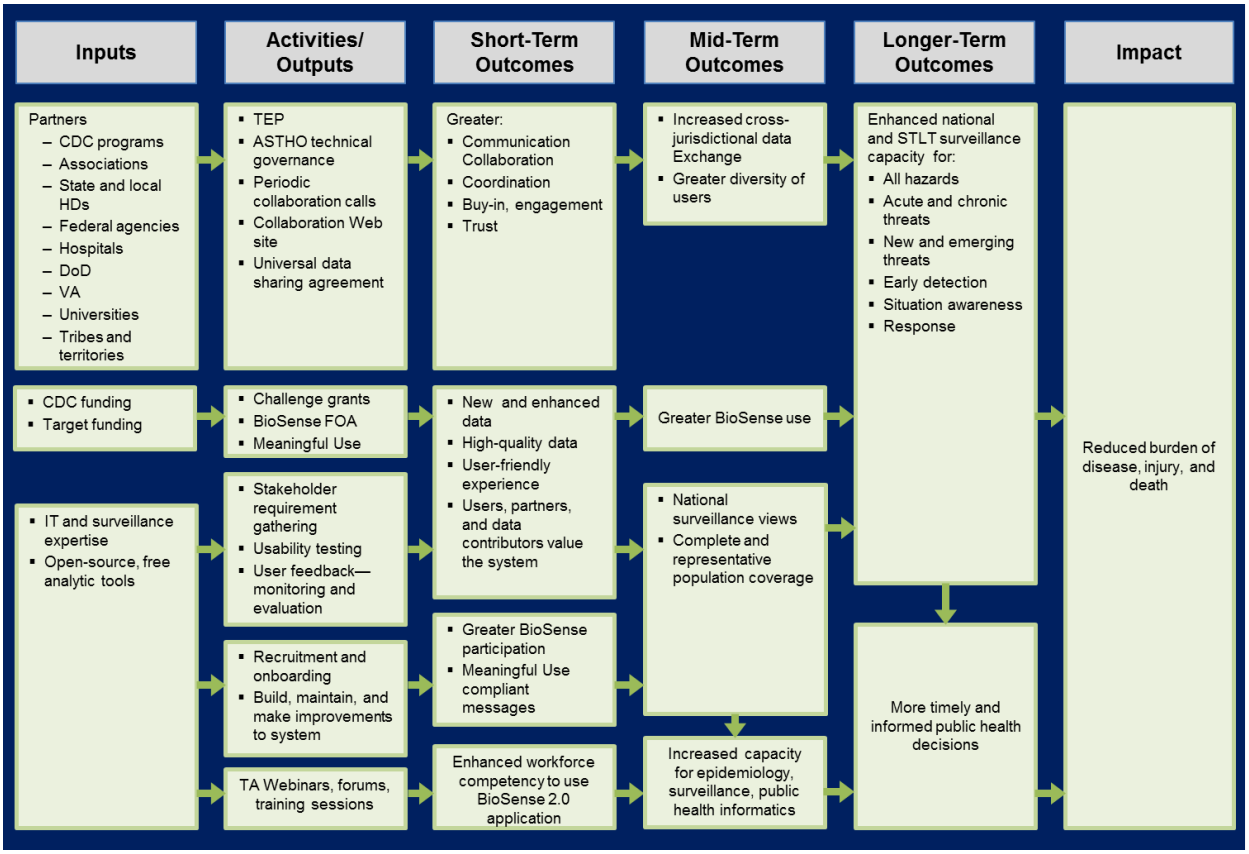
The plan sets forth a logic model and the evaluation goals and questions; describes the various methods for addressing these questions; and includes reporting formats, a timeline, and next steps.

In the remainder of the document we use the term "partner" to define those individuals or institutions that provide data to BioSense and also use the system. We use the more discrete term "user" when we refer specifically to those who use the system.

1.2 BioSense 2.0 Logic Model

Exhibit 1 specifies a logic model that describes the BioSense Program inputs, activities, and outcomes (short-, mid-, and long-term) for the BioSense 2.0 application. Performance measures that are linked to each short- and mid-term outcome in the logic model are presented in Appendix A. This logic model was developed in Option Year 1 of this contract collaboratively with the working group of the Technical Expert Panel (TEP). Members of that working group included Julia Gunn (Boston DOH), Richard Hopkins (Florida DOH), Dan Sosin (CDC), and Tom Chapel (CDC). The logic model is intended to be a dynamic representation of the program and should be continually refined and updated to capture the evolution of BioSense 2.0.

Exhibit 1. BioSense 2.0 Logic Model



BioSense 2.0 will give users a flexible, user-friendly application with enhanced data that facilitates timely exchange of data across jurisdictions to support many surveillance needs (e.g., early detection, situation awareness, event response). A redesigned BioSense 2.0 will lead to greater and more diverse users with new skills and capacity to conduct routine and cutting-edge surveillance. Greater participation will lead to increased population coverage and provide a complete and robust (timely, representative, complete, reliable, and flexible) national view of the nation's health in real time (Sosin, 2003).

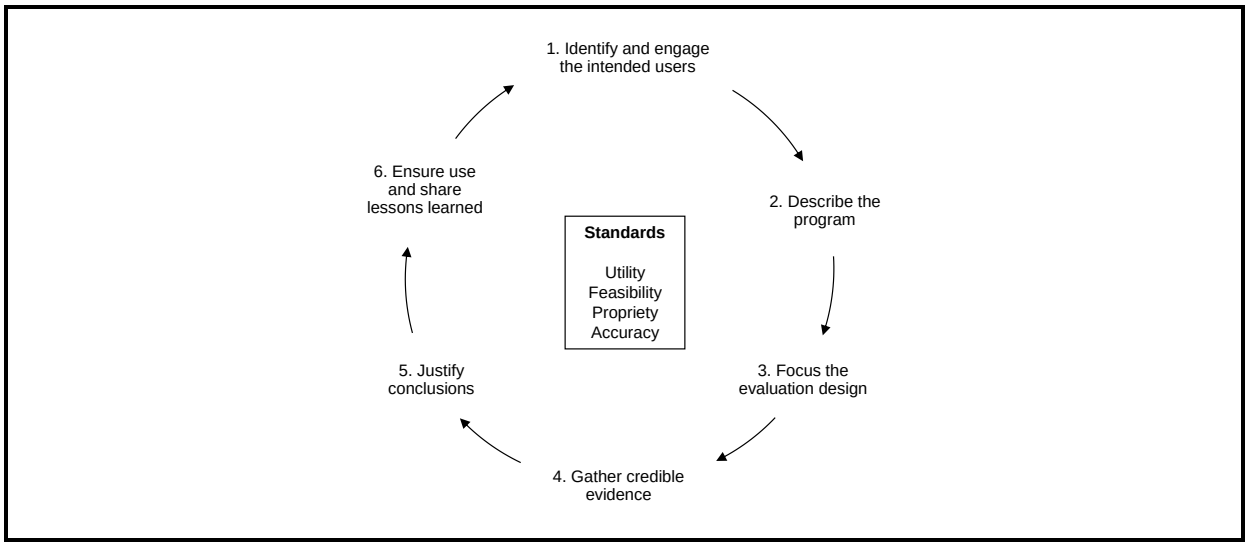
2. OVERVIEW OF THE EVALUATION PLAN

The Evaluation Plan of the BioSense 2.0 system is described in four sections: Section 2.1 describes the evaluation approach; Section 2.2 presents goals and objectives for the evaluation; Section 2.3 presents evaluation questions and the methods we will employ to address them; Section 3 describes the proposed methods in detail; Section 4 presents the timeline for evaluation activities; and Appendix A includes the performance measures for short- and long-term outcomes.

2.1 BioSense 2.0 Evaluation Approach

The BioSense 2.0 evaluation approach shown in ***Exhibit 2*** is based on CDC's Framework Program Evaluation (http://www.cdc.gov/eval/framework/index.htm), and is intended to help BioSense stakeholders use and apply the evaluation findings to the fullest. The evaluation team, by involving end users from the onset, enables the evaluation to meet high standards for utility, feasibility, propriety, and accuracy. Thus, the engagement of BioSense 2.0 stakeholders early and throughout the evaluation is critical to the evaluation's success. Accordingly, we will solicit the input and guidance of the ASTHO-led BioSense 2.0 Governance Group to refine the evaluation design, instruments, and procedures; assess relevance and feasibility of this evaluation plan; and interpret and use evaluation findings.

Exhibit 2. CDC Framework for Program Evaluation



2.2 Evaluation Goals and Objectives

For the public health workforce and others who are responsible for monitoring and securing the public's health, a well-designed BioSense Program will enhance their capacity to detect, track, assess, and respond to health threats at the state, local, regional, and national levels.

The goals of this BioSense 2.0 evaluation plan and associated objectives are described below. Unless otherwise indicated, all objectives will be completed in Option Year 3.

Goal Area 1: Performance Monitoring

- Establish with the input of BioSense stakeholders a protocol (including performance measures, timing and frequency of reporting, sources of data, and reporting formats) for monitoring the performance of the BioSense 2.0 system in achieving short- and mid-term outcomes. To achieve this goal, the evaluation will:
  - Objective (1a): develop a performance monitoring template and protocol for the collection of data from the BioSense 2.0 application by June 1, 2013;
  - Objective (1b): establish a timeline for reporting performance measures collected in 1a by June 2013; and
  - Objective (1c): initiate the performance monitoring protocol by July 1, 2013.

Goal Area 2: Use and Utility

- Assess the types of users who are adopting BioSense 2.0 and the extent of their use.
- Assess how BioSense 2.0 is being used and integrated into surveillance practice
- Identify the STLT surveillance needs that BioSense 2.0 is meeting or supporting and assess how it is enhancing surveillance capacity. To achieve these goals, the evaluation will:
  - Objective (2a): review the results of the surveys conducted by the Governance Group and make recommendations for addressing the surveillance needs and issues raised by the respondents.

Goal Area 3: Usability

- Assess the usability of the BioSense 2.0 application. To achieve this goal, the evaluation will:
  - Objective (3a): administer the System Usability Scale (SUS) to all newly registered partners after 40 minutes of system use.[1]
  - Objective (3b): conduct qualitative usability testing sessions with 30-35 volunteer users and 11 Advance Panel users to gather open-ended feedback on what aspects of the interface and application work well or need to be modified.

Goal Area 4: Onboarding Experiences and Participation

- Assess the barriers and facilitators to BioSense 2.0 onboarding. To achieve this goal, the evaluation will:

[1] The Redesign Team estimated 40 minutes, based on their observations to date, as the amount of time a user needs with the system in order to be able to provide meaningful responses to the SUS

  - Objective (4a): conduct six case studies by December 2013 to identify the technical, data quality, policy, program, workforce, and technical assistance factors that impede or facilitate BioSense 2.0 enrollment and onboarding.

Goal Area 5: Onboarding Costs

- Develop cost estimates for onboarding that will help jurisdictions with BioSense 2.0 adoption and planning.

- Assess the feasibility of systematically collecting cost data at the jurisdictional level to support future cost-benefit studies.

- Assess the benefits of BioSense 2.0 in helping jurisdictions meet Meaningful Use requirements for syndromic surveillance.

- Assess the benefits of BioSense 2.0 in cross-jurisdictional data exchange. To achieve these goals, the evaluation will:

  - Objective (5a): conduct six case studies by August 2013 to monetize cost burdens (and savings) incurred by state, local, and regional BioSense 2.0 participants.

2.3 Evaluation Design

To achieve the evaluation plan's goals and objectives, we propose a mixed-method design consisting of five methods: (1) performance measurement using analytic data from the BioSense 2.0 application and secondary datasets; (2) surveys conducted by ASTHO on behalf of the Governance Group; (3) usability testing and assessments with BioSense users; (4) case studies of current BioSense 2.0 participants onboarding experiences; and (5) case studies of BioSense 2.0 onboarding costs. The first three methods, performance monitoring, surveys and usability testing will examine whether BioSense 2.0 is performing as intended and is meeting users' needs. Performance monitoring also fulfills information requests needed to comply with GAO investigations of BioSense 2.0 performance. Case studies will gather insights from qualitative data (i.e., focus groups and key informant interviews) that cannot be obtained through BioSense 2.0 data or application analytics. The cost analysis captures the economic burden of BioSense 2.0 participation for STLT participants. This information can be used to make the business case for BioSense 2.0 participation and/or alert CDC and the Governance Group to critical cost barriers they must address to meet recruitment targets.

Exhibit 3 summarizes the design of the BioSense 2.0 evaluation and its discrete components: the evaluation questions (organized by goal areas), methods, and data sources and the relationships among them.

Exhibit 3. BioSense 2.0 Evaluation Questions, Methods, and Data Sources

Evaluation Questions	Method	Application Analytics*	Key Informants/ Partners	Program Data
Goal Area 1: Performance Monitoring				
Does BioSense 2.0 enhance the number and diversity of surveillance data relative to BioSense 1.0?	Performance monitoring	✓		
Do BioSense 2.0 data meet the criteria for quality (flexibility, timeliness, completeness, and reliability)? (Sosin, 2003)	Performance monitoring	✓		
Is BioSense 2.0 use increasing over time?	Performance monitoring	✓		
Do training and technical assistance enhance workforce competency to use BioSense 2.0?	Performance monitoring	✓		
To what extent is BioSense 2.0 supporting the exchange of surveillance data across jurisdictions?	Performance monitoring	✓		
Does BioSense 2.0 provide a national surveillance view?	Performance monitoring	✓		
How complete and representative is the population covered by BioSense 2.0?	Performance monitoring	✓		
Goal Area 2: Use and Utility			✓	
Who is using BioSense 2.0 and what is the extent of their use?	ASTHO survey			
How is BioSense 2.0 being used?				
How is BioSense 2.0 supporting and enhancing STLT surveillance capacity?	ASTHO survey		✓	
Goal Area 3: Usability				
Does BioSense 2.0 offer a user-friendly experience?	Usability assessment		✓	
Goal Area 4: Onboarding Experience				
What are the technical barriers and facilitators to BioSense 2.0 participation?	Case study		✓	
What are the policy barriers and facilitators to BioSense 2.0 participation?	Case study		✓	
What are the programmatic barriers and facilitators to BioSense 2.0 participation?	Case study		✓	
What are the workforce barriers and facilitators to BioSense 2.0 participation?	Case study		✓	
How satisfactory and effective is onboarding technical assistance and how could it be improved?	Case study		✓	
How could the barriers identified be addressed?	Case study		✓	

(continued)

Exhibit 3. BioSense 2.0 Evaluation Questions, Methods, and Data Sources (continued)

Evaluation Questions	Method	Application Analytics*	Key Informants/ Partners	Program Data
Goal Area 5: Onboarding Costs				
What are the adoption costs for using BioSense 2.0?	Case study		✓	✓
What are the participants' ongoing costs of using BioSense 2.0?	Case study		✓	✓
What factors influence costs of adoption and maintenance?	Case study		✓	
What are the benefits of BioSense participation in preparing jurisdictions to accept Meaningful Use data or syndromic surveillance?	Case study		✓	
What are the benefits of BioSense 2.0 in cross-jurisdictional data exchange?	Case study		✓	

* Data derived from the BioSense application.

3. METHODS

3.1 Performance Monitoring

The performance monitoring protocol that the evaluation establishes will track the program's achievement of short- and mid-term outcomes as specified in the BioSense 2.0 logic model on an ongoing basis. Appendix A lists a preliminary set of performance measures mapped to these short- and mid-term outcomes. Performance monitoring will provide timely feedback about application performance and use; identify the application's strengths and deficiencies; and inform decisions regarding application development and enhancement.

We will work with CDC to create a reporting template to capture performance measures at the appropriate level of detail with clear and concise definitions for calculation of the measures. We will establish a protocol for:

- the reporting frequency of each measure (some may be need to be reported less or more often than others);
- the key entities responsible for preparing and submitting the performance monitoring reports; and
- entities within CDC, the Governance Group, and others who should receive and review the reports.

Using the TEP-approved logic model as a guide, in Option Year 2 we identified and developed a set of new draft performance measures for each short- and mid-term outcome (see ***Exhibit 4***).

Exhibit 4. BioSense 2.0 Outcomes

Short-Term Outcomes	Mid-Term Outcomes
New data/Additional data	Increased BioSense 2.0 use
High-quality data (timely, flexible, complete, reliable)	Cross-jurisdictional data exchange
User-friendly experience	Greater diversity of users
Enhanced workforce competency to use the application	National surveillance views
Increased BioSense participation	Complete and representative population coverage
Increased capacity to receive Meaningful Use messages	

The development of the measures will proceed in stages as follows with input from CDC, the Governance Group, and the Federal Opportunity Announcement (FOA) grantees at each step:

1. Initial mapping of outcomes to candidate measures with the TEP (completed);
2. Systematic review of each candidate measure for validity, feasibility, relevance, and utility (in progress);
3. Assessment of the appropriate reporting period (monthly, quarterly, annual) and presentation format for each measure;
4. Development of a reporting template and protocol for dissemination and review; and
5. Final vetting, selection and refinement of the measures and reporting protocol.

3.2 Surveys of BioSense Use and Utility

Since its inception, the BioSense Program has had an interest in examining the application's use (e.g., how many users, what features do they use and how often) and utility (e.g. how well BioSense supports surveillance capacity, complements workflow, adds value), and CDC has documented and disseminated success stories through the CDC's BioSense Web site. However, the findings from BioSense 2.0 requirement-gathering activities (conducted in Years 1 and 2 of the BioSense Redesign) found that jurisdictions had many concerns about BioSense 2.0 and syndromic surveillance more generally. The Redesign team considered these concerns in developing BioSense 2, but periodic feedback from partners is needed to ensure that it is meeting surveillance needs as they evolve.

In late 2012 ASTHO administered a Web-based survey of BioSense partners on behalf of the BioSense 2.0 Governance Group to assess their use of BioSense. In addition, a second survey to assess user functionality needs was deployed in April 2013. The results of these surveys complement the evaluation's goals and address a number of key evaluation questions as noted in Exhibit 3. The evaluation team proposes to review the results and recommend changes and enhancements to BioSense 2.0 to address user needs.

In addition, the evaluation team proposes to work with the Governance Group to plan additional survey data collection to assess aspects not currently captured through existing surveys, including preferred algorithms, functions and features, workflow integration, and value.

3.3 Usability Testing

Usability testing assures that the graphical interface (e.g., formatting, spacing, button placement, and other design factors) of the BioSense 2.0 Web-based application facilitates access to its features and supports the individual's ability to use the system effectively. The

BioSense Redesign team has regularly engaged public health practitioners to assess the usability of BioSense 2.0 since the inception of the project.

We have used several methods to assess usability including remote and on-site testing with individuals and groups of participants; an Advanced User Panel of 11 volunteers who are expert in syndromic surveillance; and the System Usability Scale, a standardized survey instrument to measure individuals' comfort with the BioSense 2.0 interface. The most recent results of these activities are detailed in two reports prepared for CDC and were used to guide the development and refinement of the BioSense 2.0 graphical interface (Pina, Recker, Chester, & Massoudi, 2013; Pina, Recker, Chester, & Massoudi, 2012).

Evaluation of usability can be achieved through continued Web-based administration of the SUS to all users once they have logged a minimum of 40 minutes in the application. Our monitoring of usage patterns indicate that most users log in for short periods of time (3 minutes or less), so waiting until they have sufficient experience with the system will allow them to provide more complete feedback. The SUS results will be incorporated into the performance monitoring protocol and the aggregate scores and trends reported along with other performance measures. Also, we will gather qualitative feedback on usability through remote and in-person usability testing with 30-35 volunteer users at various venues such as conferences and workshops.

3.4 Case Studies of BioSense 2.0 Onboarding Experiences and Participation

The purpose of the case studies is to identify the barriers in STLT jurisdictions that hinder participation in BioSense 2.0 or obstacles they encounter during onboarding. These case studies will also explore the factors that facilitate the decision to join BioSense 2.0 and proceed through onboarding quickly and easily. An understanding of these participation barriers and facilitators will inform current efforts to recruit and engage STLT jurisdictions and establish a coordinated and responsive onboarding process. These case studies will also inform best practices and standard operating procedures to prepare a jurisdiction for onboarding and facilitate a timely and efficient experience. The ability of BioSense 2.0 to achieve national coverage hinges largely on the effectiveness of recruitment and onboarding and data sharing; therefore, these efforts are extremely important at this stage of BioSense 2.0 Program development.

Case Study Selection. Onboarding barriers and facilitators will be captured in nine case studies. To capture the fullest possible range of barriers and facilitators within the relatively small pool of cases, we have limited selection to three criteria. These criteria represent the predominant models of entry, and we view them as the most critical in determining the onboarding effort:

- One-offs (jurisdictions bringing in hospitals one by one);
- Existence of a syndromic surveillance system; and
- Existence of a health information exchange (HIE).

We have selected two jurisdictions to represent each onboarding criterion (see ***Exhibit 5***) to allow for comparison. The jurisdictions we selected have either completed or will have completed onboarding by the time of data collection. For each criterion, we will also include a jurisdiction that has opted not to participate. We would welcome additional feedback from stakeholders regarding other possible jurisdictions to include. We define completion of onboarding as having submitted at least one data feed or all the targeted feeds for a given state or jurisdiction, depending on the model of onboarding.

Exhibit 5. Preliminary Jurisdictions Identified for Onboarding Case Studies

Model	Case
One-offs	Montana, Nevada, TBD non participant
State-based HIE-system	Kansas, West Virginia, TBD non participant
Existing syndromic surveillance system	TBD (2 participant, 1 non participant)

Data Collection. Data collection will consist of key informant interviews with individuals involved in onboarding activities. The interviews will take place in person during a 1-day site visit or if the informant is unavailable during the site visit, the interview will take place by phone. If participants have similar roles and responsibilities, we may conduct a group interview. Each interview will last approximately 60 minutes. We will record the interviews, with the permission of the participants, to ensure accurate note taking and transcription.

During interviews, we will assess the following broad categories of barriers and facilitators:

- **Technical barriers/facilitators**—attributes of the existing systems, attributes of the uploading data and requesting data from other jurisdictions;
- **Data quality barriers/facilitators**—data quality concerns regarding timeliness, flexibility, completeness, reliability, representativeness;
- **Policy barriers/facilitators**—political support, development of new policies and procedures, processing data sharing agreements, and coordinating with the BioSense 2.0 community (e.g., CDC), hospitals;
- **Programmatic barriers and facilitators**—support from leadership, state and local relationships, available and dedicated resources, value proposition for BioSense 2.0 and/or syndromic surveillance, perceived needs and benefits;
- **Workforce barriers and facilitators**—training, skills and competencies; and

- **Technical assistance**—aspects of technical assistance during onboarding worked well and did not, what should be changed or improved.

Data Analysis. We will emphasize examination of the themes in the six categories listed above that facilitate or impede onboarding efforts. We will qualitatively analyze data using a set of a priori codes within each category and then compare the coding results within and across models to identify patterns. We will also develop new codes as they emerge from the data.

3.5 Case Studies of BioSense 2.0 Onboarding Costs

The purpose of the onboarding cost study is to monetize the cost burdens (and cost savings) that state, local, and regional BioSense 2.0 participants incur. We will assess both the hard costs (cash outlays) and the soft costs (utilization of resources such as labor effort) of participation in the BioSense 2.0 community. We will collect data on adoption costs and ongoing costs from the existing BioSense 2.0 participants. We will also examine the benefits of participation, focusing on how BioSense 2.0 facilitates compliance with Meaningful Use requirements which begin October 1, 2013.

Finally, we will assess the feasibility of collecting data systematically from BioSense 2.0 participants to monitor and track the costs over time to conduct cost-benefit analyses and estimate ROI.

Case Study Selection. We anticipate in-depth cost data collection from six STLT participants. We selected jurisdictions based on criteria that we hypothesize will affect BioSense 2.0 adoption costs. These selection criteria include

- jurisdiction type (city, state, regional, local);
- degree of urbanization
- years of experience with biosurveillance; and
- existence of an HIE.

Based on these characteristics we identified three cost models and selected two jurisdictions to represent each model (see ***Exhibit 6***). Selected jurisdictions have either completed or will have completed onboarding by the time of data collection. As with the onboarding case studies, we would engage stakeholders in the final selection of jurisdictions. We use the same definition for onboarding as for the onboarding case studies.

Exhibit 6. Preliminary Jurisdictions Identified for Case Studies of Onboarding Costs

Cost Model	Case
Large city	Boston, Denver
State-based HIE-system	Kansas, West Virginia
Minimal experience w/syndromic surveillance	Alabama, Montana

Because of the small pool of jurisdictions that meet the criteria for the onboarding-cost and onboarding experience case studies, three jurisdictions will be included in both sets of case studies. We have assembled a cross-case staffing to ensure efforts are coordinated and that overlapping research and data collection are mutually beneficial and increase efficiency, while not overburdening stakeholders with data requests.

Case Study Data Collection. Primary data collection will be necessary to quantify economic benefits and costs. We will leverage existing BioSense 2.0 knowledge resources, including environmental scans, usage data, and reported statistics to minimize users' burden for participating in the evaluation. Data collection will consist of key informant interviews with individuals involved in the onboarding activities and a short pre-interview questionnaire. The interviews will take place in person during a 1-day site visit or if the informant is unavailable during the site visit, the interview will take place by phone. If participants have similar roles and responsibilities, we may conduct a group interview. Each interview will last about 60 minutes. Informants who are also participating in the onboarding experience case study will have longer interviews—about 90 minutes. The interviews will be recorded, with participants' permission, to ensure accurate note taking.

During interviews, we will assess BioSense 2.0 costs in the following broad categories:

- **adoption costs**—developing new policies and procedures, processing data sharing agreements, and coordinating with the BioSense 2.0 community (e.g., CDC).
- **ongoing costs**—uploading data and requesting data from other jurisdictions.
- **Meaningful Use benefits**—using BioSense 2.0 to comply with Meaningful Use compared to an alternative method.
- **Data sharing benefits**—finding out how often, how, and from whom jurisdiction requested data pre and post BioSense 2.0.

Data Analysis. We will emphasize estimating the costs of participation in the BioSense 2.0 community—labor, capital, and services spending—including adoption costs and ongoing costs. For jurisdictions who were onboarded recently, we may need to estimate the ongoing costs as opposed to calculating them based on actual spending. We will develop six

estimates that will provide a proxy for the costs of BioSense 2.0 usage based on the cost model. We will estimate these costs as well as the time period over which they accrued. For advanced users, we will also seek to ascertain previous spending levels on labor as well as capital on existing syndromic surveillance programs.

Although the case study will focus on costs, we will examine two key benefits of participation: compliance with Meaningful Use requirements and easier access to surveillance data from other jurisdictions. For each jurisdiction we will quantitatively estimate the costs to comply with Meaningful Use Stage 2 without BioSense 2.0—that is, adoption of an alternate solution and subsequent ongoing costs—and we will compare them to the costs for BioSense 2.0. Assuming that BioSense 2.0 is less expensive, our analysis and findings will present the difference as cost savings or cost minimizing.

We will qualitatively assess the benefits of data sharing by examining the cost savings of more easily and quickly seeing trends inside and outside of the jurisdiction. This exploratory analysis of benefits could be used as input in a future, more comprehensive analysis of the private and social benefits of BioSense 2.0.

4. REPORTING

4.1 Structure, Format, and Dissemination

We will tailor the structure, format, and dissemination of the evaluation findings to achieve maximum utility for a diverse BioSense 2.0 stakeholder audience including:

- A concise Performance Monitoring Report template with appropriate visualizations that allow readers to clearly understand trends, gaps, and areas for improvement.
- Six short, 2–4-page Evaluation Briefs that highlight the findings from the onboarding experience case studies, with each brief devoted to the six categories of barriers and facilitators (technical, data quality, policy, program, workforce, technical assistance).
- One 4–6-page Evaluation Brief that synthesizes findings from multiple methods (case studies, Governance surveys, performance monitoring) and focuses on BioSense 2.0 use, utility, and usability.
- A 15–20-page Onboarding Cost Case Study Report that includes a summary of the data collection methodology, discussion of the costs calculated, and additional qualitative results from the interviews. The report will also present the cost savings to CDC of BioSense 2.0 and recommend how data on the costs of participation in BioSense 2.0 may be collected, calculated, and reported moving forward.

The format of each product will be designed to meet the information needs of specific stakeholders. The Performance Monitoring Report will be concise so CDC and the BioSense Redesign team can review it quickly on a monthly basis (or less frequently for some measures) and discuss it as needed during routine project meetings. The format of the reports will lend themselves to broader dissemination to other audiences such as CDC leadership or the Governance Group.

The brief format (Evaluation Brief) for the findings is targeted to public health officials who need programmatic information that can be applied to practice. The BioSense Redesign team will work with communication specialists to ensure that the design, tone, and style of the brief appeals to public health audiences. The brief format is also well suited for posting on CDC and the BioSense Redesign Collaboration Web Site and for distribution at meetings and conferences. We will facilitate these broader dissemination goals by ensuring all briefs are 508 compliant. We will submit drafts of briefs to CDC for approval before distribution.

The Onboarding Cost Case Study Report is intended for CDC program management and provides more detail and background necessary for weighing the significance of the recommendations in the report. The topic of the report itself, cost estimation of surveillance use, itself may be of interest to peer-reviewed journals. The structure and detail of the report will facilitate conversion to manuscript form.

5. TIMELINE

Exhibit 7 presents our project schedule contingent upon receiving CDC approval to begin evaluation activities. We assume a start date of March, 2013.

Exhibit 7. Proposed Evaluation Schedule

Description	Due Date
Presentation of Evaluation Plan to Governance Group	March 2013
Case Study Selection	March 2013
Pilot Case Study Site Visit	May 2013
Vetting of Draft Performance Measures	March–May 2013
Draft Performance Monitoring Template and Protocol	May 2013
Final Performance Monitoring Template and Protocol	June 2013
Case Study Site Visits	June–August 2013
Draft Case Study Briefs	September-October 2013
Final Case Study Briefs	November 2013
Draft Cost Report	September 2013
Final Cost Report	October 2013

Performance measures are intended to evolve with the changing needs of BioSense 2.0, and this flexible development cycle allows new measures to be added or existing ones modified or dropped based on stakeholder input. Additional CDC/stakeholder input into the selection, refinement, and presentation of the draft set of performance measures is needed to achieve the goals specified above.

6. NEXT STEPS

The evaluation plan is intended to reflect the needs of BioSense 2.0 stakeholders (CDC, Governance Group, STLT partners, FOA grantees,) and evolve with the changing needs of the program by adding or dropping goals, questions, and measures based on stakeholder input. Additional stakeholder input is necessary to move this proposed plan forward. Initially the plan will be presented to the Governance Group in March 2013. Additional input from stakeholders can be obtained in various ways by meeting with stakeholder groups individually to review all or pieces of the plan. Ideally, an evaluation workgroup would be convened with members representing the range of stakeholders who would meet periodically to review, advise, and set the direction of the evaluation. We will work with CDC and the Governance Group in the remainder of Option Year 2 to establish the best strategy for engaging stakeholders.

REFERENCES

Pina, J., Recker, A., Chester, K., & Massoudi, B. (2012, September 28). *BioSense program design concept evaluation: Report 1*. Version 1.0. Research Triangle Park, NC: RTI International.

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APPENDIX
BIOSENSE 2.0 PERFORMANCE MEASURES

Short-Term and Mid-Term Outcomes	Measurement	Data Source	Reporting Timeframe
Short-Term Outcomes			
New and enhanced data	Number of data feeds: ED Laboratory Pharmacy Poison control Ambulatory DoD VA		Monthly
	Number and percentage of queries by data type: ED Laboratory Pharmacy Poison control Ambulatory DoD VA		Monthly
High-quality data	Percentage of queries with multiple syndromes and user-defined syndromes (flexibility)	Application analytics	Monthly
	Percentage of data received on time (timeliness)	Application analytics	Monthly
	Percentage of data with missing fields (completeness)	Application analytics	Monthly
	Percentage of data with inconsistent entries (reliability)	Application analytics	Monthly
User-friendly experience	Average number of minutes from first login to first query	Application analytics	Monthly
	System Usability Scale scores	System Usability Scale survey	Biannually

Short-Term and Mid-Term Outcomes	Measurement	Data Source	Reporting Timeframe
Enhanced workforce competency to use the application	Total percentage of and average frequency of users accessing advanced features: Advanced search Alerts Sharing Change Point Analysis R EpiInfo Line listing	Application analytics	Monthly
Increased BioSense 2.0 participation	Number of jurisdictions contributing data Number of facilities contributing data (hospitals, clinics)		Monthly
Increased capacity to receive SS Meaningful Use compliant messages	Percentage of jurisdictions that can receive SS Meaningful Use compliant messages from EHR technology.		Monthly
Mid-Term Outcomes			
Increased BioSense 2.0 use	Number of distinct users [A] Number of logins [A] Application session time in minutes [A] Number of records transmitted [A] Mean number of queries per user	Application analytics	Monthly
	Number of queries during a public health event	Application analytics	As needed
Increased exchange of data among jurisdictions	Number of jurisdictions electing to share data	Application analytics	Semi-annually
	Number of comments	Application analytics	Semi-annually
	Number of shared views	Application analytics	Semi-annually
	Number of local and regional surveillance exchange hubs or networks		
Greater diversity of users	Percentage of users: by occupation by organizational affiliation	Application analytics	Annually

Short-Term and Mid-Term Outcomes	Measurement	Data Source	Reporting Timeframe
National surveillance views	Percentage of jurisdictions in BioSense 2.0 [A]	Application analytics	Monthly
	Percentage of facilities providing data: (ED, [A] hospitals, clinics)	Application analytics	Monthly
Complete and representative population coverage	Percentage of U.S. ED visits captured in BioSense 2.0 by jurisdiction	Application analytics American Hospital Association Data	Annually
	Percentage of the U.S. population covered by BioSense 2.0 hospitals	Population census NCHS hospital discharge data	Annually
	Percentage of U.S. population in jurisdictions with BioSense 2.0 DUA	Population census BioSense Program	

[A]=current performance measure