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Regional Disease Surveillance Workshop

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Regional Disease Surveillance Workshop

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Tacoma-Pierce County Health Department
Washington State Department of Health
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June 1, 2006

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Executive Summary

On June 1, 2006, public health officials working in surveillance, epidemiological modeling, and information technology communities from the Seattle/Tacoma area and State of Washington met with members of the Pacific Northwest National Laboratory (PNNL) to discuss the current state of disease surveillance and gaps and needs to improve the current systems. The workshop also included a discussion of PNNL initiatives that might be appropriate to enhance disease surveillance and the current tools being used for disease surveillance. Participants broke out into two groups to identify critical gaps and needs for improving a surveillance system, and discuss the requirements for developing improved surveillance. Each group developed a list of key priorities summarizing the requirements for improved surveillance.

The objective of this workshop was to work towards the development of an improved disease surveillance system. The highlights of some of the key issues and themes emerging from the workshop include:

- Resources for public health disease surveillance are very limited and stretched thin by existing commitments. As a result, any new initiatives need to be carefully evaluated to ensure that system benefits will outweigh development and operational costs and will substantially assist public health agencies in meeting their goals.
- Current systems for disease surveillance are not compatible, and do not capture all the necessary information. The necessary data inputs of a surveillance system should be mapped, and the existing systems (including the analytical tools that serve as their backbone) themselves assessed and validated before considering expanding to other surveillance systems or new analytic tools.
- Lack of standardized data is a challenge. There are no universal standards describing what type of information should be reported, how it should be reported, or who should report it. This lack of standardization is a challenge for both human and animal health.
- Data acquisition is also a problem – getting early information on symptoms is necessary for a predictive surveillance system. However, much of the necessary information would come from health care providers and often there are not easy or standardized mechanisms for collecting this information.
- An ideal system must be easy to use, episodic, and have strong predictive value. An integrated system, which could be used by public health and animal health, could be extremely valuable.

Current needs are primarily related to data collection and analysis; however, highly selective and appropriate use of advanced tools, such as sensors and detectors, can be of significant use for biosurveillance.

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1.0 Introduction and Objectives

When assessing the situation and responding to a bioterrorist attack or emerging pandemic, time is critical. The sooner public health officials know about a disease event, the more decisively they can intervene to try to contain and eradicate it. However, the problem remains as to how best to gain this additional time. Although several U.S. government and public health agencies at the national, state, and local levels are developing and deploying systems intended to increase surveillance capabilities and provide "early warning," it is unclear if any of these systems will provide a clear signal. Such information can be used to gain additional time to permit anticipation and response. Time is the critical dimension. If time is gained, multiple alternate courses of action might be possible.

On June 1, public health officials working in surveillance, epidemiological modeling, and IT communities from the Seattle/Tacoma area and State of Washington met with members of the Pacific Northwest National Laboratory (PNNL) to discuss the current state of disease surveillance and gaps and needs to improve the current systems. The workshop also included a discussion of PNNL initiatives that might be appropriate to enhance disease surveillance and the current tools being used for disease surveillance. (See Appendix A for a list of participants.) Participants broke out into two groups to identify critical gaps and needs for improving a surveillance system, and discuss the requirements for developing improved surveillance. Each group developed a list of key priorities summarizing the requirements for improved surveillance. The objective of this workshop was to work towards the development of an improved disease surveillance system. Specific goals included the following:

- Identify technologies to aid in the early detection of a disease outbreak;
- Identify requirements for a predictive disease surveillance system;
- Identify key gaps in surveillance-related information sharing and communications;
- Communicate concepts supporting disease surveillance being developed at PNNL;
- Develop a shared understanding of the real-world needs of disease surveillance and early outbreak detection.

This report presents summaries of the presentations made by public health officials and by PNNL staff. It also identifies the gaps and needs of a disease surveillance system, presents the prioritized needs identified by workshop participants, and provides a list of action items identified at the close of the workshop.

2.0 Effective Disease Surveillance: Current Status and Future Needs

Public health participants shared their perspectives on the current state, as well as the future of disease surveillance, in order to develop a common baseline of understanding. Full presentations are available in Appendix C.

2.1 Current Systems and Capabilities

Atar Baer, Seattle-King County Public Health, presented information on current systems and capabilities used in the State of Washington. Some currently existing systems include: ESSENCE, BioSense, ODIN, as well as other proprietary systems. The capabilities of these systems vary; each has benefits and drawbacks. There is a need to evaluate system utility

regarding: sensitivity, specificity, predictive value, timeliness. There is also a need to evaluate: chief complaint categories, detection algorithms, chief complaint text processors. It was noted that any system that is developed must be easy to use, inexpensive, and practical.

A summary of current functionalities, benefits and drawbacks of these surveillance systems can be seen in Table 1.

Table 1: Highlights of Locally Used Surveillance Systems

SYSTEM	TOOLS	POSITIVE ASPECTS	DRAWBACKS
ESSENCE	• Line-lists, time series, queries • Create chief complaint categories • Interactive drill-downs • Regression, exponentially weighted moving average, CuSum, Space-and-time scan statistic • GIS mapping	• Advanced analytical techniques • Regional data view • Collaboration with JHU-APL • Standardization across jurisdictions	• Difficult to change system features • Cannot view or modify chief complaint coders or algorithms • Requires extensive training • No email notification • Doesn't identify all data sources
BioSense	• CuSum, SMART scores (regression-based method) • Sentinel Infection Alerts – warning when provisional disease diagnoses indicate certain illnesses	• Advanced analytical techniques, data displays • Regional data view • Standardization across jurisdictions	• No chief complaint data • Cannot import local data • Frequent miscodes • Communication pathways not well established • Rigorous evaluation lacking • Lack of coordination local and state public health agencies
ODIN	• System functionality not defined • Goals include: tools to gather, analyze, and respond to syndromic and other health surveillance information	• Will provide a regional data view • Funding may be available for evaluation of system components	• Uncertain future funding • Poor working relationship with local partners • Duplication of existing systems, without prior evaluation
NRDM	• Time series charts and maps • Drill down by zip code, county • Wavelet model, spatial scan statistic • Analyzes sale, short-term, and long-term trends • Stratify according to whether product is on sale	• Available to LHJs free of charge (for now) • Data on retail trends not available elsewhere	• Evaluation mechanism? • Unknown denominator • No control over groupings of drugs/products
Proprietary Systems	• Chief complaint based on RODS or NYC classifications • CuSum • Web-based reports (hospitals can view their own data) • Automated alerting tools • Remote access	• Total control -- can make the system do anything you want • Build local capacity • Less dependent on uncertain future funding	• Resources are limited • Time-consuming to maintain algorithms, etc. • Evaluation needed

2.2 Surveillance in Human and Animal Health

Mark Kinsel, Washington State Department of Agriculture (WSDA), presented information on surveillance in human and animal health. WSDA has developed its own integrated electronic data system, called UDDERS. Data are shared between food safety and animal services in order to improve data analysis. However, animal health faces many of the same issues as human health – including lack of electronic records and insufficient staff. Case definition is a critical problem, due to a lack of standardized data, coding systems, and protocols for data reporting. Additionally, there are no systems for reporting information from key data collectors, such as laboratories. The lack of technology is not the critical current problem – accuracy, availability, and standardization of data are a first priority.

The WSDA Animal Services Division has three programs: animal health (veterinary related), livestock identification (branding), and animal identification. The USDA hopes to improve its tracking of reportable diseases. About 30 diseases are currently reportable by law, but the data are difficult to interpret due to lack of information regarding sample size. Key diseases being tracked include: Johne's disease, scrapie, and avian influenza. The system was developed and is managed through a cooperative agreement with the federal government, based on proposals from multiple states.

2.3 Integrating Surveillance and Detection Technologies; Information Sharing and Analytic Tools

Mike Davisson, Washington State Department of Health (DOH), discussed information sharing and analytical tools. Washington State is building systems to support surveillance in an electronic format. Systems include the Public Health Issues Management System (PHIMS), the Public Health Reporting of Electronic Data (PHRED), Laboratory Information Management System (LIMS), and SECURES.

Table 2: Washington State Information Technology Tools for Public Health

System	Key Features
LIMS	• For the state public health lab • Uses the commercial tool, STARLIMS • Available for LHJ for positive and negative results run in their jurisdictions • Reports to PHRED • Focused on human conditions, but data standards will allow the inclusion of non-human test results in the future
PHIMS	• Information on communicable diseases and sexually transmitted diseases • Includes historical data to provide routine surveillance • Information from local health jurisdictions (LHJs); source data from doctors reporting to LHJs • Feeds into the CDEPI system, with data analyzed by CDC
PHRED	• Captures data from hospitals and labs that do testing on WA residents • Lab Corp, QCEST, Group Health Cooperative, and the public health lab also provide data • Reports to LHJ on reportable diseases that are lab diagnosable as well as lead poisoning, birth defects, TB, and HIV • Hospital discharge and diagnosis data are included based on a standard (which is institution-specific)

SECURES	• Alerting and communication system • Call-out capability to LHJs at high, medium, or low priority through an automated message and receipt • System may be integrated into PHIMS, PHRED • SECURES can be managed by locals to provide information to their constituents

Systems are designed to interact as shown in Figure 1.

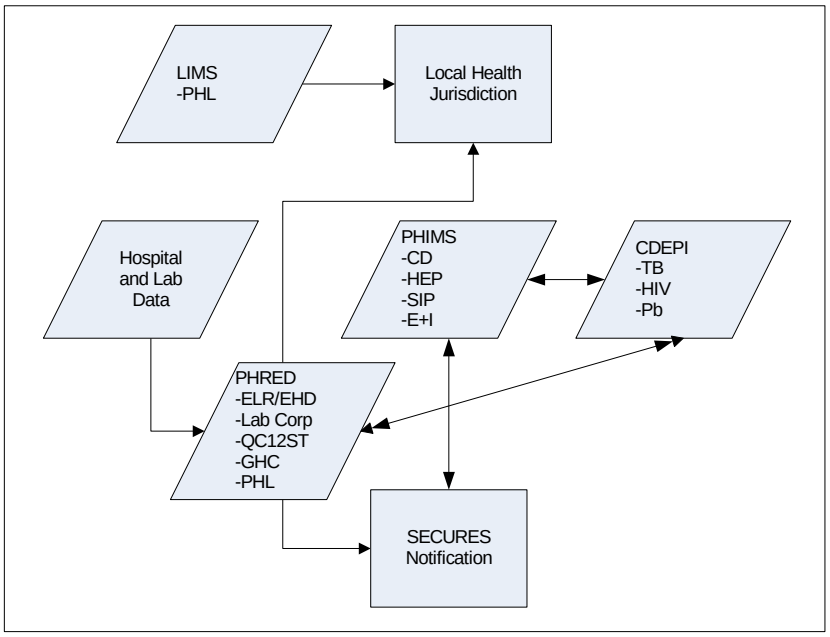

Figure 1: Public Health Data Systems for Washington State

These systems are intended to enhance information sharing and improve connections among people; however, they face significant challenges. The systems do not use standardized forms or business practices to support the systems, resulting in poor data quality. Additionally, systems lack critical data inputs, including CDC syndromic surveillance and laboratory data. Standardized data and forms, including electronic medical records, are necessary to improve the functionality of these systems.

2.4 Coordinating Incident Response

Nigel Turner, Tacoma-Pierce County Health Department, presented information on coordinating incident response. The Health Department faces challenges of having insufficient data in some instances, and too much information with insufficient understanding in others. There is a significant lack of resources to develop, monitor and analyze automated early detection systems. Data providers are difficult to reach when attempting to collect data, and lack incentives to collect and report data. For clinicians, there is no value-added in standardizing and communicating surveillance information. However, it is critical to determine whether data is accurate, verifiable, and useable. Additionally, analysis needs to be clear and actionable. Filtering out unnecessary information and making decisions based on disparate data – including notifiable conditions, vital records, and information on absenteeism – is one key challenge.

A surveillance system must be robust and adaptable. It should be easy to incorporate data from different sources, including environmental health, food, syndromic surveillance systems, sensors,

veterinarians, and the public access line. Systems and supporting information should be tested in exercises to see how they function in real-world situations. Policy questions must be addressed, and it should be determined where the authority for making certain decisions lies.

Once an event is detected and has actionable information, a clear communication and response plan is essential. A surveillance system must be robust and adaptable. It should be easy to incorporate data from different sources, including environmental, health, food, syndromic surveillance systems, sensors, veterinarians, and the public access line. Despite a significant lack of resources, Public Health communicates with duty officers, the Public Information Officer, and the public health emergency planning and response advisor. A surveillance system must be easy to update, and get rapid and meaningful environmental modeling data, which can be incorporated into overall emergency response plans. Public health works to prevent public concern and media attention, and so needs a scaleable model which can be used to prevent public concern and media attention, or ramped up to use for emergency response. Nigel saw opportunities for technology to:

- Automate data collection and processing
- Improve consistency and reliability of analysis
- Link surveillance systems between silos
- Communicate with medical providers
- Communicate with public health partners
- Capitalize on public health's established data collection role to link data systems (e.g. working towards broadly accessible electronic medical record could create benefits for medical providers and disease surveillance)

The structure of the Tacoma-Pierce County Health Department Incident Command Structure is shown in Figure 2.

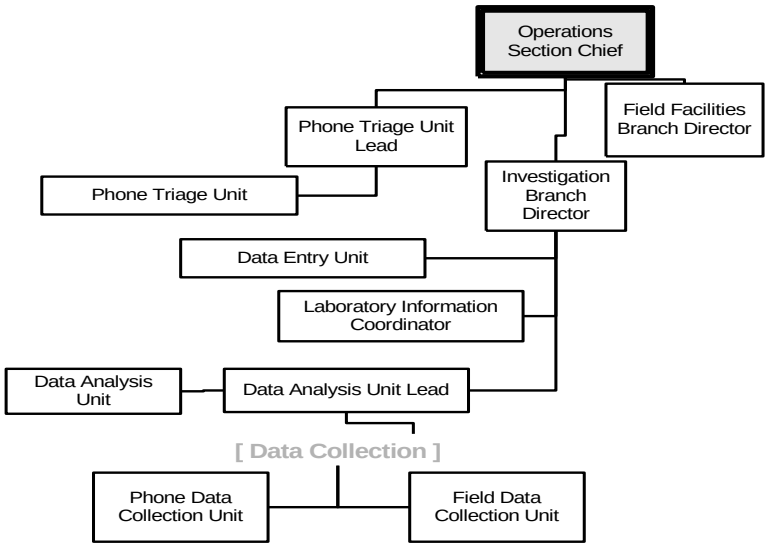

Figure 2: Tacoma-Pierce County Health Department Incident Command Structure

2.5 Surveillance in Local, Regional, and National Emergency Response

Eric Sergienko, CDC and the WA DOH, discussed the role of surveillance in local, regional, and national emergency response. In this context, he defined "emergency" as a situation which requires enhanced surveillance, and in which early detection and intervention could mitigate a real or perceived risk. Key requirements include:

- Flexible – must address a wide variety of emergencies and potential emergencies
- Episodic – easy to drop into a situation without pre-existing data
- Contextual – access to historical data in order to compare trends (i.e. recognize "normal")
- Scalable – capable of offering surveillance a large or small area
- Easy-to-use – minimal, just-in-time training requirements
- Strong predictive value – must have a strong predictive value for outbreaks, and a high confidence for negatives
- Correlative – easy to coordinate with outside databases in order to integrate information

3.0 Developing Surveillance-Related Technologies at PNNL

PNNL staff shared initiatives and ideas the lab is working on related to syndromic surveillance; full presentations are available in Appendix C.

3.1 Data-Intensive Computing Initiative

Deb Gracio of PNNL presented information on the Data-Intensive Computing Initiative. This initiative focuses on ways to improve analysis of large numbers of files or large files requiring timely resolution, such as genomics and intelligence data. Substantial knowledge can be extracted if data from existing sources are integrated and made useable. To help manage the explosion of data, the initiative plans to develop hybrid computing architectures, identify ways to do scaleable data management and high-throughput data streaming, look at data visualization and access, conduct active analysis, develop predictive modeling, and perform visual analytics. The strategic objectives of the initiative are to:

- Provide intellectual leadership to develop the next-generation of hardware and software;
- Stimulate a paradigm shift in computing to facilitate predictive science;
- Bring together computer scientists and domain experts;
- Team with partners to have an impact on regional problems where solutions can be applied and evaluated.

Key focus areas for the initiative include addressing the challenges of data-intensive computing, situational awareness and response, and decision support and control. The initiative is supporting three demonstration projects; of most interest to this group is one in the situational awareness and response area, which will deal with some aspect of public health.

3.2 Environmental Biomarker Initiative

Terri Stewart of PNNL presented information on the Environmental Biomarker Initiative. The initiative focuses on emerging technology and new research with multidisciplinary teams. The vision is to transform threat assessment into a predictive science to manage risk via biological signatures (including genes, proteins, metabolites, and/or lipids). When signatures are examined together, they present a unique pattern of molecular change in an organism, and allow

identification of an exposure or response to a specific environmental stressor. The initiative focuses on biomarkers of effect, which can be used as a platform to develop sensor applications enabling improved data analysis and data response.

The initiative builds off PNNL's core competencies in microbial and cellular biology, computational science, and environmental science. The initiative is funding projects in such areas as 3-D cell culture, proteomics of secreted proteins, volatile organic metabolic signatures, pulmonary phospholipidosis, confounding variables, and sensor platforms. This first year is devoted to methods development. The goal is earlier detection and better response to an event. For more information, see the web site at http://www.biomarkers.pnl.gov.

4.0 Breakout Session: Gaps and Needs of an Enhanced Surveillance System

The participants were divided into two groups. Group 1 consisted of Mike Davisson, Deb Gracio, Mark Kinsel, Eric Sergienko, and Nigel Turner. Group 2 consisted of Atar Baer, Peter Houck, JD Malone, Terri Stewart, and Wayne Turnburg. Groups were asked to address the following questions:

- What are the gaps and challenges of existing disease surveillance systems?
- What are the unmet gaps and needs?
- What are the requirements for an enhanced system?
- What implementation issues or challenges exist?
- What are the five priorities on which we should be focusing to meet this need?

It was noted that the health care system and its data are fractured. Public health has vast amounts of information, but the data is incomplete and not formatted for easy analysis. Certain pieces of key information are often missing. Additionally, poor design of disease surveillances systems means that information in not often available in a useful or timely fashion. Ideally, a system would be predictive, allowing for early situational awareness and response; gaps in information and analysis means that such systems are merely responsive. Improvements are possible, and the following gaps and needs should be examined.

- **Providing Real-Time Data:** What is the definition of real time? Are detectors providing data once a week really considered "real time?"[1] Does the capture of real-time data add value beyond the use of near real-time or lagged data? Are there technologies that can be duplicated to capture more real-time information? For example, the U.S. Postal Service is using a Biohazard Detection Systems (BDS) with polymerase chain reaction (PCR) technology to analyze air samples for DNA to identify anthrax spores. This system is near real time and automated.

- **Identifying Risk**: To understand and prepare for potential risk, the areas of critical concern should be identified and prioritized. This could include elaborating and accounting for certain diseases of concern, or identifying at-risk populations.

[1] The commonly accepted definition of real-time is exactly that: capturing data from the data reporter exactly as the data are being collected – e.g., if patient is seen for an Emergency Department (ED) visit, data for that record are sent to health department as soon as that info is recorded in the hospital's system.

- **Symptomatic Information:** What type of symptomatic information is appropriate? How is it best captured? There are existing data streams that could be mined, including over-the-counter prescriptions, school absentee data, and call volumes at emergency departments, laboratory information and cluster analysis.

- **Determining Appropriate Data Streams:** Data providers include hospitals, clinicians, emergency rooms, outpatient visits, and retail pharmacies, etc.

- **Codes and Standards:** How can dysfunctional systems be integrated to combine franchise and general hospital data? There are different modalities between public health labs, private physicians, etc. However, public health needs a common standard and vocabulary to mine the data. Current categories need standardization, collection, and manipulation. A chief complaint, standardized across hospitals, could be helpful. Lacking standardized chief complaints, standardized ways of coding the data – i.e., standardized syndromic categories, and standardized ways of "binning" chief complaints into these categories – would also be helpful. Text processors remain a challenge. This is an active area of research.

- **Electronic Medical Records:** Current early detection systems rely on individual reports generated by medical provider records systems. This process is inefficient and redundant, offering very limited benefit to medical providers. Public health wants to learn the procedures, the case history, and symptomology of disease development; this level of detail is not necessarily captured. Public health can provide value to data providers by helping coordinate regional health information organizations that could develop electronic medical record systems. Creating a standard data stream would be valuable to hospitals, if they are transferring individuals across health systems and facilities.

- **Pharmacy Information:** What information do hospital pharmacies give patients? Can those data fields be mined to identify clusters? The analysis would need to look at antibiotics, antivirals, and the use of Xigris and other drugs for treatment of sepsis.

- **Information System:** A coordinated information system could allow mapping against the patient's age data, point of presentation, symptom(s), and information regarding where a disease was acquired.

- **Analytical Tools:** Tools for analyzing and processing disease-related data do currently exist; however, their degree of current effectiveness is uncertain. Since the disease surveillance system is not currently effective, it is difficult to ascertain whether existing analytical tools are appropriate or if their output is being interpreted correctly. Current tools and their use in the overall system should be evaluated before developing new analytical tools.

- **Early Detection of Symptoms**: Are there sensors, detectors, biomarkers and/or arrays that can be used to screen for symptoms? If arrays and sensors are used, where should they be deployed? Should the data be screened for bioterrorist attacks and low-probability events, or for more frequent public health risks?

- **Integration of Human and Animal Data**: Improved integration of human and animal data is needed; research on biomarkers may facilitate this integration.

- **Improved Collection of Animal Data:** Public health needs to identify and trace animals. This could be done through Radio Frequency Identification, satellite tracking, or microchips. A system for animal and wildlife tracking could be developed using GIS mapping tools.

- **Means to Address and/or Identify New or Unusual Diseases**: How are previously unrecognized diseases or symptoms identified? Biomarkers may be useful in this application.

- **Determine Thresholds for Response:** Thresholds for an outbreak may differ according to incident or disease. A natural outbreak may look different than a terrorist attack; or data may be differently analyzed. Is there a way to determine a standard?

- **Lack of Funding:** There is currently a lack of funds to build and support systems, and also to integrate systems.

- **Plan for Exposure to an Imported Pathogen**. Public health must be ready to respond to new pathogens. This may require technology and policy solutions. (For instance, it may be possible to screen for the H5N1 influenza with a hand-held device using biomarkers.) Better integration between technology (including detection and surveillance mechanisms) and policy (including procedures for addressing suspected outbreaks).

5.0 Prioritized Needs to Enhance Disease Surveillance System

At the end of the workshop each group presented their top needs and priorities for developing or enhancing disease surveillance in the region. The following is a list of prioritized needs:

1. **Integrated Animal/Human Health Surveillance System:** An integrated system would help track emerging infectious diseases. Washington has a new state-wide system for human health. This could be used as a platform to develop a system for animal surveillance that would be easily integrated into a system for human surveillance. **Takeaway**: Mike Davisson will provide his IT schema to Mark Kinsel, who can start thinking about how to send data to be included in regional surveillance activities.

2. **Common Data Standards:** There are multiple standards for data, including a wide variety of terminologies and oncologies. An ideal system would include the standardization of chief complaints across hospitals and the capture of preliminary diagnosis from the previous day. A necessary first step is for hospitals to communicate to surveillance teams the data that is currently being captured; coding could be standardized either by the hospitals or by the data analysis teams. **Takeaway**: Dave Thurman and Mike Davisson to discuss technologies/mechanisms which might be helpful in collecting and standardizing information.

3. **Integrated Health Care System:** Developing a system of electronic medical records would be extremely useful in order to analyze surveillance-related information. Collaborators would need to include: hospitals, pharmacies, laboratories and clinicians. Templates, prompting data providers for information, could help standardize data reporting and also facilitate health care operations, such as billing. Other possible incentives could include: 1) potential cost savings through reduced testing repeats, 2) collaboration with the Joint Commission on Accreditation of Healthcare Organizations

(JCAHO) and/or the Agency for Healthcare Research and Quality (AHRQ), and 3) development of templates and Electronic Medical Records that would facilitate disaster management and recover planning.

4. **Evaluation and Validation of Existing Syndromic Surveillance Systems:** Existing surveillance systems should be assessed and validated before any other systems are developed. The most useful aspects can be used to improve existing systems, or captured and consolidated into a better system.

5. **Prescient Biodetection System:** Public health needs to be able to: 1) identify at-risk populations, and 2) quantify potential risk to allow decision makers to make decisions. Existing programs (such as BioWatch) are not sufficient; however a system using tools such as biomarkers may be able to improve analysis of risks. Public health would like a system that addresses user needs and requirements, incorporates critical information, and formulates a quantifiable measure of risk. The system needs to be modular, scalable, and field deployable. This system could rely on statistically validated sensor arrays that would be determined by an appropriate entity (such as a contingent of public health officials).

6.0 Conclusion and Next Steps

Participants agreed that one goal of predictive syndromic surveillance is early detection based on preliminary diagnoses as well as end results. Other goals include surveillance, monitoring an outbreatk, and case-finding. An ideal predictive system would deliver just-in-time data that delivers early warning of an outbreak with reasonable assurance. Current systems do not incorporate the necessary data streams. Developing better collaboration and cooperation among the various hospitals, clinics, and other data providers, and facilitating the reporting of disease information though clear standards and codes, will significantly enhance the ability for disease reporting.

Many existing detection devices were developed without identifying requirements or consulting human interfaces. Surveillance systems were developed in a similar fashion. Participants indicated that none of the currently existing systems fills the requirements for ideal disease surveillance. Existing systems should be assessed and validated, perhaps by screening against a known data set and identified goals, in order to identify the useful characteristics of each system. Following validation, systems could be enhanced, incorporated, or a new system built, according to user requirements. Locating funding to assess and evaluate systems, or to improve regional collaboration or create new data standards, will be one critical challenge. The National Visualization and Analytics Center (NVAC) could be a potential partner. PNNL lab initiatives could also provide input into this process. PNNL is planning an integrated demonstration which could incorporate and address issues related to disease surveillance and emergency management. Participants from this workshop could scope problem sets so the technology can be applied to real problems and demonstrate the ability to work in real-world situations.

The workshop team put forward a number of take-away action items, including:

1. Mike Davisson will provide his schema for the state-level public health information systems to Mark Kinsel, who can start thinking about how to send animal data to be included in regional surveillance activities.
2. Dave Thurman and Mike Davisson will discuss technologies that could collect terminology to standardize language and forms.

3. Dick Weller will pursue a meeting between the Purdue visualization researchers (who will be coming to PNNL in the next few months) and this team to see if there are data mining technologies that could be useful.
4. Deb Gracio and Terri Stewart will consider how this team can provide additional input to the initiatives they are leading at PNNL.

Appendix A
Agenda

Disease Surveillance Workshop
Pushing Back the Timeline: Moving from the Reactive to the Predictive

June 1, 2006
Pacific Northwest National Laboratory (PNNL)
1100 Dexter Avenue, Suite 400
Seattle, Washington

8:45 Badging

9:00	**Welcome and Introductions**	*Ann Lesperance, PNNL*
	Workshop Objectives	*Dick Weller, PNNL*
	PNNL Overview	*Dick Weller, PNNL*
9:15	**Developing Surveillance Related Technologies**	
	Data Intensive Computing Initiative	*Deb Gracio, PNNL*
	Environmental Biomarker Initiative	*Terri Stewart, PNNL*

Effective Disease Surveillance: Current Status and Future Needs

9:45	**Current Systems and Capabilities**	*Atar Baer* *Public Health-Seattle and King County*
10:00	**Surveillance in Human and Animal Health**	*Mark Kinsel* *Washington State Dept. of Agriculture*
10:15	**Integrating Surveillance and Detection Technologies; Information Sharing and Analytical Tools**	*Mike Davisson* *Washington State Dept. of Health*
10:30	**Coordinating Incident Response**	*Nigel Turner* *Tacoma-Pierce County Health Department*
10:45	**Surveillance in Local, Regional and National Emergency Response**	*Eric Sergienko* *CDC/Washington State Dept. of Health*

11:00 Breakout Session: Goals and Needs of Disease Surveillance Systems
- What are the gaps and challenges of existing disease surveillance systems?
- What are the unmet gaps and needs?
- What are the requirements for an enhanced system?
- What implementation issues or challenges exist?

12:15 Working Lunch: Working Groups Report Out
- What are the gaps and challenges of existing disease surveillance systems?

- What are the unmet gaps and needs?
- What are the requirements for an enhanced system?
- What implementation issues or challenges exist?

1:30 What are the priorities for a just-in-time or enhanced predictive system?

2:45 Closing Comments and Next Steps

3:00 Workshop Adjourns

Appendix B
Workshop Participants

The following subject matter experts were invited to the workshop:

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Appendix C
Acronyms List

AHRQ	Healthcare Research and Quality
CDC	Centers for Disease Control
CuSum	Cumulative Sum
EDI-PH	Electronic Data Interchange for Public Health
EDITH 2	Electronic Data Transfer Hub – release 2
ELHR	Electronic Laboratory and Hospital Reporting
ESSENCE	Electronic Surveillance System for the Early Notification of Community-based Epidemics
FHCQ	Foundation for Healthcare Quality
GHC	Group Health Cooperative
GIS	Geographic Information Systems
HIB	*Haemophlius influenzae* type B
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
LHJ	Local Health Jurisdiction
LIMS	Laboratory Information Management Systems
NRDM	National Retail Data Monitor
NVAC	National Visualization and Analytics Center
ODIN	Outbreak Detection Information Network
PHIMS	Public Health Information Management System
PHIMS-CDRS	PHIMS Communicable Disease Response System
PHL	Public Health Laboratory
PHRED	Public Health Reporting of Electronic Data
PNNL	Pacific Northwest National Laboratory
RODS	Real-Time Outbreak and Disease Surveillance
SECURES	Washington Secure Electronic Communication and Urgent Response System
USDA	US Department of Agriculture
WEDSS	Washington Electronic Disease Surveillance System
WSDA	Washington State Department of Agriculture

Appendix D
Presentations

- **Current System and Capabilities: An Overview of Syndromic Surveillance Systems**
- **WSDA Animal Health Surveillance**
- **Coordinating Incident Response**
- **Data-Intensive Computing Initiative**
- **Environmental Biomarkers Initiative**