Section 1
Background, Current Capacity, Need and Understanding

Massachusetts population size, demographic characteristics, and racial/ethnic makeup .

Annual Population Estimates					
Sex and Age	7/1/2009				
BOTH SEXES	**6,593,587**	**MALE**	**3,204,983**	**FEMALE**	**3,388,604**
Under 18 years	1,433,002		732,100		700,902
18 to 64 years	4,266,071		2,104,881		2,161,190
65 years and over	894,514		368,002		526,512
Median age (yrs)	39.0		37.6		40.2
Source: Population Division, U.S. Census Bureau, Release Date: June, 2010					

Annual Population Estimates					
Sex, Race, and Hispanic Origin	7/1/2009				
BOTH SEXES	**6,593,587**	**MALE**	**3,204,983**	**FEMALE**	**3,388,604**
One race	6,494,735		3,156,163		3,338,572
White	5,664,723		2,750,988		2,913,735
Black	468,838		229,420		239,418
AIAN	20,812		10,533		10,279
Asian	334,709		162,483		172,226
NHPI	5,653		2,739		2,914
Two or more races	98,852		48,820		50,032
NOT HISPANIC	**6,010,706**		**2,910,340**		**3,100,366**
One race	5,930,551		2,871,189		3,059,362
White	5,188,241		2,509,088		2,679,153
Black	395,032		193,289		201,743
AIAN	13,401		6,677		6,724
Asian	330,968		160,656		170,312
NHPI	2,909		1,479		1,430
Two or more races	80,155		39,151		41,004
HISPANIC	**582,881**		**294,643**		**288,238**
One race	564,184		284,974		279,210
White	476,482		241,900		234,582
Black	73,806		36,131		37,675
AIAN	7,411		3,856		3,555
Asian	3,741		1,827		1,914
NHPI	2,744		1,260		1,484
Two or more races	18,697		9,669		9,028
Source: Population Division, US Census Bureau Release Date: June, 2010					

Geographic distribution:

Massachusetts is the tenth most populous state in the nation, with over six million people distributed over 351 cites/towns. Only five of these cities/towns have populations greater than 100,000, while approximately 270 have populations less than 20,000 (US Census).

Health Care Delivery System

Health care is delivered through private health care providers, both for -profit and not-for-profit hospitals, and through community health centers. There is no county public health system offering health services, although some local health jurisdictions offer some preventive screening services or vaccination clinics. All residents of MA are required to have health insu rance.

Disease burden

Please see below table for a subset of notifiable, communicable diseases for 2008*.

Selected Notifiable Conditions	# Confirmed Cases	# of Probable Cases	# of Suspect Cases
Amebiasis	91	2	3
Babesiosis	52	17	495
Campylobacteriosis	1052	0	6
Cryptosporidiosis	174	0	2
Giardiasis	663	0	3
Hepatitis A	58	0	99
Hepatitis B, acute	34	0	40
Hepatitis B, chronic	211	1914	126
Hepatitis C, acute	14	0	46
Hepatitis C, chronic	4804	4224	55
Human Granulocytic Anaplasmosis	45	45	307
Invasive *Haemophilus influenzae*	83	0	1
Invasive group A streptococcus	177	0	0
Invasive meningococcal disease	22	1	3
Invasive pneumococcal disease	830	0	10
Legionellosis	94	0	46
Listeriosis	31	0	1
Lyme disease	4033	614	7909
Mumps	7	0	18
Pertussis	777	0	2
Salmonellosis	1229	1	2
Shiga-toxin producing organism	103	17	0
Shigellosis	160	0	4
Tularemia	14	6	1
Vibrio species	25	0	5

**Data as of 10SEP09 and are subject to change* .

Capacity and Need

Epidemiology

The Epidemiology Program within the MA Department o f Public Health (MDPH) Bureau of Infectious Disease Prevention, Response and Services (BID) is tasked with surveillance, response and control activities for all zoonotic, foodborne and waterborne illnesses, meningitis, all BT agents, hepatitis (A,B,C), ant ibiotic resistant organisms and health care associated infections (HAI). This is done through a public health veterinarian and a team of nine full and part-time epidemiologists with training in a variety of disciplines and extensive experience in outbreak investigations. There are existing gaps in capacity and as electronic laboratory reporting (ELR) expands, the ability to respond to laboratory -diagnosed reportable diseases will be further compromised due to volume. Some of these gaps are addressed in this application.

Local health training: Massachusetts public health operates through its 351 cities and towns, each with its own jurisdiction. Most of the 351 cities/towns have part -time boards of health with

only 24 having full time health departments. In about 20% of these jurisdictions, selectmen function as the local public health authority, most with limited or no public health training. Existing public health staffing at the local level is undertrained and inadequately supported. While nearly half of local boards of health (LBOH) utilize the Massachusetts Virtual Epidemiologic Network (MAVEN) to report cases and investigational findings, they have limited ability to analyze their data, recognize outbreaks and respond.

Hepatitis Surveillance: While MDPH has implemented innovative viral hepatitis surveillance methodologies over the past 10 years which allowed for the collection of extensive data on acute hepatitis A/B/C and chronic hepatitis B/C, we have not been able to fully analyze and evaluate the data as staffing has been limited and the volume of data extremely high. Despite these challenges, an outbreak of hepatitis A infection which occurred between 2003 and 2005 was identified among illicit drug users, the homeless and recently incarcerated indiv iduals, several of whom were foodhandlers. More recent analyses of viral hepatitis data have resulted in the detection of an ongoing epidemic of hepatitis C virus infection among adolescents and young adults, largely due to injection of heroin. It continue s to be of great importance to be able to process and evaluate the high volume of viral hepatitis data in an efficient way to ensure that further opportunities to control the spread of these serious infections are not missed.

Healthcare-Associated infecti ons: In 2006, a statewide Infection Prevention and Control Program was created in MA to address the growing problem of healthcare -associated infections (HAI). As part of this endeavor, it was recommended that MDPH begin collecting information on 10 outcome and three process measures from acute care hospitals using the CDC National Healthcare Safety Network (NHSN). While this initiative is moving forward, resources to oversee data quality and analysis are inadequate.

Transfusion-associated infection: In the last few years, there has been a recognized increase in instances of transfusion associated (TA) transmission of babesiosis throughout the Northeast. This prompted the development and adoption of a CSTE policy statement regarding the need for standardized follow-up of TA cases. MDPH has begun reaching out to blood banks and local and transfusion services to develop formalized protocols for two -way reporting of suspected cases of TA babesiosis and has been working with CDC on follow -up of suspect cases. Initial work has revealed significant communication gaps in reporting of these cases by the blood centers and in reporting of these cases by the physician to the blood centers for appropriate traceback and product recall. Additional resources are needed to address this issue.

Laboratory

The Bureau of Laboratory Sciences (BLS) is a technical resource for MDPH and supports multiple Bureaus of MDPH. The BLS Enterics, PFGE, Food, and Dairy Laboratories are staffed by 14 technical personnel, and are proficient in pathogen isolation and identification by conventional culture, biochemical testing, and PCR, and in isolate typing by conventional serotyping methods, Luminex -based typing methods, PFGE, and MLVA. The PFGE Laboratory is the Northeast Regional PulseNet l aboratory. BLS has also been a FERN Laboratory since 2004. Currently there is no capacity to develop and maintain norovirus and shiga -toxin PCR assays, and there is inadequate capacity to perform conventional Salmonella serotyping in real - time. The BLS Virus Serology and Virus Isolation Laboratories perform measles serology, measles virus isolation, mumps serology, mumps virus isolation, and rubella serology on diagnostic specimens associated with outbreak investigations. However, these assays have long

turn-around times and have limited utility in diagnosing mumps in 2-dose MMR recipients. BLS lacks the resources to develop and implement newer and faster test methods including measles, mumps and rubella RT-PCR assays, the mumps ELISpot assay, and molecular surveillance methods such as pyrosequencing for influenza antiviral resistance.

Health Information Systems

The MDPH Office of Integrated Surveillance and Informatics Services (ISIS) within the BID oversees surveillance and informatics activities to meet the data needs of the Divisions of Epidemiology and Immunization, STD Prevention and HIV/AIDS Surveillance, TB Prevention and Control, the Refugee and Immigrant Health Program (RIHP) and local health. ISIS enhances and optimizes the collection and distribution of infectious disease surveillance data, and promotes standards-based electronic reporting of notifiable disease data by hospital laboratories, electronic health records, and other public health partners.

The MDPH BLS Informatics Office supports critical public health laboratory IT functions, including evaluation and implementation of new diagnostic testing methods, development of IT capacity to respond to new public health events and emergencies, and enhancement of communications and data transfer between the BLS and its partners. Each BLS laboratory program works closely with its corresponding BID disease prevention program on joint surveillance projects, investigations of outbreaks and clinical cases, and other collaborative programmatic initiatives.

MDPH is deploying several PHIN-compliant interoperable systems to improve the flow of critical information between the state, and LBOH and clinicians (see appendix A). These include a web-based disease surveillance system, the Massachusetts Virtual Epidemiologic Network (MAVEN), an electronic laboratory and health record reporting infrastructure and the BLS Information Systems (SLIS). BLS and BID have complementary roles in the MDPH integrated public health surveillance and response system, with BLS producing test results, and BID receiving test results for analysis and subsequent action.

MDPH is strategically positioned to further build upon its existing health information infrastructure and interoperability exchange capacity to satisfy Stage 1 Meaningful Use criteria as set out in the Centers for Medicare and Medicaid Services Meaningful Use. This additional capacity will allow MDPH to successfully enhance and expand the electronic exchange of laboratory orders and test results, and clinical and lab data related to notifiable diseases among public health agencies, hospitals, reference laboratories, CDC, and other health care partners.

The Electronic Laboratory Communications and Reporting System

As a result of the strong collaboration, the BID and BLS Bureaus jointly developed the Electronic Laboratory Communication and Reporting (ELR) system to support the electronic exchange of information between public health agencies and clinical partners, including hospitals, laboratories, providers and electronic health records. ELR was deployed in October 2004. It is a secure web-based system that is utilized by both BLS and BID.

Notifiable Disease Reporting

The BID component of ELR allows hospitals and clinical laboratories to send data electronically on all notifiable conditions to the MDPH BID. These data are transmitted via HL7 messaging to MAVEN and are then triaged for notification and disease investigation by state and local health.

Laboratories utilize a web based user interface to create a mapping between MDPH selected LOINC and SNOMED codes and local lab equivalents. This mapping translates native codes into their LOINC and SNOMED equivalents before data are transmitted to MAVEN. Institutions may securely transmit messages using the HL7 2.3.1 ORU RO1 or a MDPH developed message format that is transformed into HL7 2.3.1. Once these data have been transmitted to MAVEN, the LOINC and SNOMED codes are then automatically assigned to an appropriate disease event and surveillance case status. The process to full certification takes several months. Post-certification of laboratories involves ongoing quality assurance.

There are 75 hospital laboratories in MA. In 2008, MA revised its regulations governing lab reporting to require the use of the ELR infrastructure for reporting all notifiable conditions. As of 8/10, 35 hospitals and one commercial laboratory are certified to transmit lab data via ELR. The BLS has also been certified to report influenza, TB, Quantiferon, pertussis and enteric disease results.

Electronic Health Record (EHR) Data

As a partner in one of the CDC-awarded Centers for Excellence in Informatics, MDPH is actively engaged in leveraging the ELR infrastructure to electronically receive pertinent health information to support case investigations. The *Enhanced Support for Public Health Practice (ESP)* initiative (MMWR: 2008;57:373-6), has been successfully developed algorithms to automatically send key information to MDPH BID for the following notifiable diseases: syphilis, gonorrhea, *Chlamydia*, infectious pelvic inflammatory disease, TB, hepatitis A, acute hepatitis B and hepatitis C. Data are sent to MAVEN utilizing HL7 and PHIN -MS. MDPH also collaborates with regional health information organizations, such as the Mass EHea lth Collaborative and MaSHARE to promote the use of EHRs.

Syndromic Surveillance

MDPH participates in a syndromic surveillance program in collaboration with investigators at The Children's Hospital, Boston. It utilizes chief complaint data from a statew ide, ED-based system, the Automated Epidemiologic Geotemporal Integrated Surveillance System (AEGIS). The AEGIS system utilizes the ELR infrastructure.

BLS ELR

The BLS component of ELR provides more than 40 hospital labs and other health care partners with the ability to receive test reports electronically. The system also serves as a single point of entry for MA hospitals, clinics and other health care providers to order tests electronically and receive results electronically in HL7 format; search, vie w and print patient test reports, individually or by batch; and view the status of test orders.

The Massachusetts Virtual Epidemiologic Network (MAVEN)

MAVEN is a PHIN-compliant, web-based disease surveillance and case management system that allows public health, lab, and clinical data to be shared efficiently and securely over the Internet. MDPH utilizes the PHIN Preparedness Early Event Detection Functional Requirements and Process Flows. MAVEN allows the direct reporting of notifiable diseases by clin icians and LBOH, appropriate data-sharing between state and LBOH, and improved data management and analysis. The ELR system is the conduit for all electronic data sent to MAVEN. MAVEN currently supports the surveillance and case management needs for all notifiable conditions at the

state and local level, except STDs and HIV/AIDS, and has approximately 850 users. ISIS plans to deploy the RIHP module in the Fall of 2010 and the STD module in 2011. As of 8/10, approximately 180 LBOHs are utilizing MAVEN. In addition, a pilot is underway with a provider site to assess provider capacity to utilize MAVEN directly.

The BID has been PHIN-certified to send tuberculosis data to CDC via PHIN-MS, replacing the TB Information Management System. Validation of vari cella data sent via PHIN-MS is underway.

The State Laboratory Information System (SLIS)

The BLS has implemented a flexible and practical SLIS infrastructure that allows BLS to send and receive data among public health systems, hospitals, public health ag encies and private reference labs. The SLIS infrastructure includes the BLS ELR system and a LIMS system, which includes three distinct LIMS that support specimen processing, testing, and resulting functions. Interoperability between the LIMS and ELR is a chieved with the use of standard Order Message (ORM) messaging and Rhapsody Integration Engine. ORM messaging is a subset of HL7, developed by BLS to facilitate exchange of structured data (orders, tests and results) in various data formats between the thr ee LIMS systems and ELR.

Having three LIMS components provides the flexibility needed to accommodate rapid changes and specific requirements of a given laboratory or type of testing. These components include (1) the BtB customized COTS system that support s all serological, immunological and molecular testing, (2) the in-house developed Integrated Microbiology Laboratory (IML) system that supports all BLS microbiology testing, and (3) the Perkin Elmer Labworks LIMS that supports all chemical testing. All thr ee LIMS components are secure and internal to BLS and support testing and reporting processes, instrument interfacing, rapid order entry, and result messaging. Additional functions include registration of patient information via barcoding, test and quali ty control documentation, result verification and release for reporting in ELR, internal management reports, and generation of a standard ORM.

The Rhapsody Integration Engine enables data exchange between LIMS and ELR and generates multiple HL7 message fo rmats for various external systems. Rhapsody is configured to monitor the IML LIMS queue and the network folder for new messages. Each message is replicated and routed, as required by procedure, to ELR as an ORM, to MPDH BID ELR as HL7 2.3.1(PHIN), to PHINMS Sender as HL7 2.3.1(PHLIP), and to LRN-B. Rhapsody also maps LIMS local codes to message-specific vocabularies, including LOINC and SNOMED coding vocabularies required by each messaging recipient (LRNB, PHLIP and hospitals).

BLS will use funding to bu ild the reference bacteriology and viral serology lab components into the existing LIMS infrastructure. Detailed system specifications have already been completed to ensure project completion within the 10-month project period. Upgrades will include ELR interfacing with ORM messaging to allow providers to electronically view test orders and receive and print test results, and will use Rhapsody IDE to exchange data with ELR and PHINMS.

BLS has continued to expand its use of PHINMS 2.7.0 SP1 since 5/2008. BL S now transfers data for Foodborne, Viral and Rabies LIMS systems in .csv format. Data format differences for file type are handled by each respective LIMS. The folder based pooling method is used

to centralize data for PHINMS transfer. PHINMS will also support PHLIP Influenza and LRNB messaging. BLS has completed development of the PHLIP messaging, passed structural and vocabulary validations, and is prepared to go live with their PHLIP message. BLS also developed the BioThreat LIMS component and LRNB messaging, and has passed structural and content validations according to the 2.5.4 specs.

MDPH has the ability to quickly enhance and expand participation in these projects. MDPH received funding (CI10-1007ARRA10) to provide the programmatic support and subject matter expertise for ELR, EMR, and PHIN-MS implementation. However, corresponding technical resources were not sufficiently funded to provide oversight of these efforts. BLS has received funding for development and implementation of LIMSi/LRNB and PHLIP messaging and LIMS upgrade for the Childhood Lead Screening component. MDPH specifically requests additional funding for one FTE and IT contract staff to implement continued certification of laboratories sending data via ELR, to develop quality assurance reports, integrate LIMS components, expand HL7 e-ordering and reporting, promote the use of EHR to support public health practice, and to continue PHIN-MS certification.

Section 2
Operational Plan

Activity A: Epidemiology Capacity

Objective 1: Enhance outbreak investigative response and reporting

A multi-purpose epidemiologist will be hired with flexible responsibilities to include:

- on-call duty and participating in all outbreaks reported to the Epidemiology Program
- participating in surge response for situations, such as occurred with H1N1 response
- cross-training in all areas of disease response within responsibility of Epidemiology Program
- communicating with LBOH staff regarding cases associated with outbreaks that are large, complex or of national significance. This will include all PFGE clusters
- forwarding the appropriate standardized questionnaire being used in the outbreak investigation to the LBOH(s), querying LBOH staff about their ability to participate in the particular outbreak investigations and offering assistance to LBOH as needed and requested.

Timeline (9/30/10 – 7/31/11):

- An epidemiologist is hired by 11/01/10 and trained by 12/01/10; the epidemiologist and MDPH staff participate in all the LBOH activities described above beginning 11/01/10.

Timeline (8/1/11-7/31/12)

- The epidemiologist and staff will continue with described activities in second year.

MDPH will provide advanced epidemiologic training to new epidemiologists and LBOH responders to allow for the more rapid identification of clusters or outbreaks of communicable diseases and the more rapid implementation of control measures through the following activity:

A contractor will be hired to oversee the development of 5-7, 1-2 hour training modules based on the steps of an epidemiologic investigation. Core topics will include: epidemiology overview, compilation of line-lists, accessing MAVEN surveillance data, outbreak determination, data orientation, case definition, questionnaire development, case interviews, hypothesis development, epidemic curves, analysis, and written reports. Modules can be

combined and offered as a comprehensive classroom training program, offered separately for training that is conducted over time or offered as just-in-time training. Modules will be offered as webinars.

Timeline (9/30/10 – 7/31/11):

- A contractor is hired to develop content for training modules by 10/15/10; webinars are available for pilot testing to a small number of LBOH by 2/15/11; changes are incorporated and modules finalized by 4/15/11; and webinars are available and marketed by 6/15/11.

Timeline (8/1/11-7/31/12)

- Classroom trainings are available by 11/1/11.

Objective 2: Upgrade and develop surveillance

A senior level epidemiologist will be hired to oversee both activities described below.

Improve review of ongoing hepatitis surveillance including more robust and varied analyses of surveillance data through the following activities:

Senior Epidemiologist and Program staff will:

- update all protocols for viral hepatitis case investigation and follow-up, and investigate reports of suspected nosocomial transmission of HBV and HCV
- provide technical assistance and training to other epidemiologists and LBOH on hepatitis surveillance, ensure timely case report form (CRF) review for acute hepatitis B and C infections, and ensure appropriate analysis and review of hepatitis surveillance data

Timeline (9/30/10 – 7/31/11):

- By 1/1/11 all protocols for viral hepatitis case investigation and follow-up will be updated and available to staff; all acute infection CRFs will be reviewed within one month of report; revised quarterly HBV and HCV surveillance reports will be available by 1/1/11; and training will be provided to epidemiologists on the new surveillance protocols by 2/1/11.

Timeline (8/1/11-7/31/12)

- All activities described above for enhanced hepatitis surveillance will be evaluated by 7/31/11. Additional activities may be added for the second year based on the evaluation.

Define burden of health-care associated infections (HAI) and transfusion-associated (TA) infections

Epidemiologist, with assistance of Program staff will:

- monitor babesia reports biweekly for possible TA cases, follow-up all suspect or known TA cases, identify key contacts to serve as the communication liaison at all transfusion centers, develop relationships with hospital transfusion centers, work towards formal communication/reporting of cases, and provide outreach to physicians and hospitals regarding TA babesiosis.
- manage the data and analysis portions of the Massachusetts HAI efforts, work closely with the state HAI coordinator to determine reporting priorities and timelines, serve as a liaison for the leadership committee on HAI, the technical advisory group, and any additional state and community partners, assist with any end-user trainings that were created for users within the state, and integrate HAI activities into the Program's existing efforts on antibiotic resistance, MRSA, and *C. difficile*

Timeline (9/30/10 – 7/31/11):

Transfusion-associated infections

- Bi-weekly monitoring of babesia reports will begin by 1/1/11; key contacts for communication will be identification by 4/1/11; a joint meeting of collaborators will be held by 7/1/11; and by 7/31/11, standardized protocols for follow-up of all TA cases will be developed, and blood centers and transfusion services will be contacted monthly to share information.

Health-care associated infections

- A public report of acute care hospital data will be published on the state website by 12/31/10; 10 monthly reports will be created and distributed appropriately for monitoring the impact of the Comprehensive Unit-based Safety Program on central line associated blood stream infection rates; three quarterly reports will be created and appropriately distributed for the NICU collaborative; priorities for expansion to additional sites will be determined by the epidemiologist and state HAI coordinator by 7/31/11 and timelines for expansion will be set.
- Appropriate meetings will be attended; training for hospital users interested in analyzing their data using the NHSN website will be available by 7/31/11.

Timeline (8/1/11-7/31/12)

- All activities described above for transfusion related babesiosis and HAIs will be evaluated by 7/31/11. Activities outside of initial planning activities will be maintained. Additional activities may be added for the second year based on the evaluation.

Activity B: Laboratory Capacity

Objective 1: Expand and enhance molecular diagnostics capacity

BLS Staff will:

- hire a new multi-purpose staff Bacteriologist III to implement new molecular methods.
- implement CDC RT-PCR assays for measles, mumps, and rubella using existing automated nucleic acid extraction platforms (MagNA Pure LC for high specimen numbers and manual Qiagen extraction kits for low specimen numbers) and a real-time PCR platform (ABI7500 fast Dx), such that extraction and PCR kits for the new assays are interchangeable with those of existing assays.
- implement protocols for detection of oseltamivir and adamantane resistance using existing PyroMark pyrosequencer platform, for surveillance purposes, in the upcoming flu season.
- establish and maintain a Bionumerics genotyping database to track and compare specimens submitted for oseltamivir and adamantane resistance surveillance, and in the 2nd grant year, calicivirus surveillance.
- attend ELISpot training provided by the CDC, a Molecular Virology Workshop training held by the Pan American Society for Clinical Virology and the 27th Clinical Virology Symposium held by the Pan American Society for Clinical Virology.
- use the mumps ELISpot assay during outbreak investigations in order to generate data for validation of the assay for routine diagnostic use and in the 2nd grant year, develop additional molecular assays including norovirus PCR and sequencing for CaliciNet.

Timeline (9/30/10 – 7/31/11):

- A Bacteriologist III is hired by 11/30/10; ELISpot training at CDC is completed by 12/31/10; an influenza resistance pyrosequencing method is implemented by 1/31/11; a bionumerics genotyping database is established by 1/21/11; measles, mumps and rubella RT-PCR assays

are implemented by 7/31/11; and pyrosequencing-based influenza resistance surveillance data is compiled in aggregate by 7/31/11.

Timeline (8/1/11-7/31/12)

- Additional molecular assays including norovirus PCR and sequencing for CaliciNet are developed.

Objective 2: Reduce turnaround times for testing associated with foodborne illness (FBI) surveillance

BLS Staff will:

- hire a new Bacteriologist I to allow for faster Salmonella serotyping. This person with multiple roles also will be cross-trained to support enterics, PFGE, and food lab testing activities as needed.
- purchase an additional BioRad CHEF Mapper®, to allow additional capacity to perform PFGE on multiple pathogens simultaneously.
- monitor turnaround times for serotyping and PFGE to identify and address the causes of testing delays.

Timeline (9/30/10 – 7/31/11):

- BioRad CHEF Mapper® is purchased and installed by 10/31/10; Bacteriologist I is hired by 11/30/10, trained in Salmonella serotyping by 12/31/10 and trained in PFGE and other microbiologic and molecular methods by 7/31/11.

Timeline (8/1/11-7/31/12)

- Bacteriologist I continues to perform Salmonella serotyping and other laboratory tests that would not otherwise be performed in a timely manner, and is trained in PFGE and other microbiologic and molecular methods by 7/31/12.
- One additional lab staff will attend the 2011 National PulseNet meeting by 12/31/11.

Objective 3: Integrate epidemiology, laboratory, and health information systems components within the health department and within the Northeast region

BLS Staff will:

- Continue to share relevant information, including PFGE results, among all members of the MDPH WGFIC (see Integration Efforts) in real-time, and work together to ensure prompt collection and submission of suspect foods to the Hinton State Laboratory Institute.
- Attend the Northeast Environmental and Public Health Laboratory Directors meetings attended by New England states to discuss ELC related-issues and share best practices.

Timeline (9/30/10 – 7/31/11):

- Lab staff will attend routine meetings with epidemiologists as described above, and will attend additional meetings as needed to address acute public health threats.
- Lab staff will present at the 2010 Northeast Epidemiology Conference in Lenox, MA.

Timeline (8/1/11-7/31/12)

- Attendance at meeting described above will continue.

Activity C: Health Information Systems Capacity

The Director of ISIS and Director of IT within the BID, and the Director of IT within the BLS have overall responsibility for ensuring the objectives outlined below are met. New IT staff will report directly to the Directors of IT.

Objective 1: Enhance informatics workforce
Two informaticians with appropriate technical skills to support health information exchange (HIE) among the BID, BLS, providers, laboratories and CDC will be hired.

- A dedicated Interoperability Manager will be hired to oversee and manage data exchange among BLS and external partners BID, hospitals, CDC and other health care providers. Staff position will also serve as the Rhapsody and vocabulary specialist.
- A dedicated IT contractor will be hired to oversee all technical aspects related to health information exchange among the BID, laboratories, and providers.

Timeline (9/30/10 – 7/31/11):

- By 10/30/10, above described staff will be hired.

Objective 2: Build capacity to accept, process, and analyze standards-based electronic messages from sending electronic health records (EHRs) as set out in the Centers for Medicare and Medicaid Services Meaningful Use Notice of Proposed Rule Making
Staff will:

- ensure infrastructure is robust to support increased data exchange.
- identify appropriate data elements to be transmitted to MDPH and develop new protocols for data exchange with EHRs .
- identify regional health information exchanges (HIE), including the Massachusetts League of Community Health Centers HIE, willing to transmit EHR data to MDPH.
- create an inventory of currently available standards, guides, tools and collaboration opportunities.

Timeline (9/30/10 – 7/31/11):

- By 12/31/10, a detailed assessment of the BID ELR infrastructur e that support all methods of HIE will be complete; by 2/28/11 new protocols to govern data exchange will be developed.

Objective 3. Enhance Electronic Lab Reporting (ELR) in support of National Electronic Disease Surveillance System (NEDSS) activities:
Staff will:

- expand the number of labs submitting notifiable disease and multi-resistant organism results via ELR to the BID and expand the number of BLS SLIS components certified to submit data via ELR.
- develop quality assurance reports and protocols for E LR sites to ensure accurate and timely laboratory data are received in MAVEN; develop report assessing and measuring the timeliness and completeness of reporting notifiable disease via ELR.
- continue to identify new and relevant LOINC and SNOMED codes for a ll notifiable diseases.
- continue to expand the number of LBOH utilizing MAVEN.

Timeline (9/30/10 – 8/31/12):

- By 7/31/11, additional clinical laboratories will be certified to submit data via ELR; by 3/31/11, the quality assurance reports for ELR are sent to participating sites; and by 8/31/12, the report assessing and measuring timeliness and completeness is finalized.
- Throughout the Cooperative Agreement, both the ELR portal and MAVEN are current with appropriate LOINC and SNOMED codes.

Objective 4: Implement and enhance electronic laboratory information exchange

Staff will:

- integrate the remaining laboratory components in LIMS infrastructure.
- facilitate implementation of ELR as new BLS laboratory information systems are deployed.
- expand the HL7 electronic order and result functionality to all clinical tests performed by BLS.
- purchase additional Rhapsody IDE comm. points to meet LIMS, ELR and MAVEN interfacing and interoperability expansion and additional ELR user licenses to meet expanded number of ELR users.
- continue participation in the PHLIP activities. MA has completed structural and vocabulary validation and is ready to go live with its PHLIP message.

Timeline (9/30/10 – 8/31/11):

- By 7/31/11, the reference bacteriology and viral serology LIM S components will be deployed and interfaced with ELR and MAVEN; by 3/31/11, the additional licensing will be purchased and installed; and by 7/31/11, BLS will be live with its PHLIP message.

Organizational challenges for all activities:

The MDPH hiring system requires a minimum of 3-4 weeks to identify a selected candidate. There are training requirements for Epidemiology, Laboratory and IT staff. Laboratory personnel require a minimum of three weeks for initial training to establish competency in testi ng methods. Newly hired epidemiologists require a longer training period for some aspects of the position but typically come with an MPH degree. In addition, many epidemiologists are hired from a pool of applicants with intern experience and some can contr ibute almost immediately. The training component of the Epidemiology request will be contractual to ensure that the proposed activity will be started promptly and will be completed by the end of the initial 10 month budget period. The IT position will also be contractual. Job opportunities will be posted immediately upon notification of award. In-kind contributions from multiple existing laboratory, epidemiology and IT personnel will be used to expedite training of new personnel, and to meet project activi ty needs while new personnel complete initial training.

Integration efforts

The BLS, the BID and the Food Protection Program of the Bureau of Environmental Health reside in the same building. Face-to-face interactions are frequent and communication is comprehensive and extensive. Current staff ha s been designated to ensure that integration of the ELC-funded categorical programs. The Working Group on Foo dborne Illness Control (WGFIC) was established in 1986 and consists of epidemiologists, laboratorians and environmental specialists who meet regularly to ensure that foodborne outbreak investigations are properly coordinated. Epidemiologists from the Epidemiology Program are all cross -trained in the diseases under their responsibility and also in disease resp onse for vaccine-preventable diseases, as needed. All infectious disease response clearly requires the integration of disease surveillance systems at the state and local level and laboratory systems in hospitals, commercial laboratories and the state public health laboratory. Leadership in these areas at MDPH are clearly engaged and committed to progressing to an optimal system. This is clearly described in the background section.

MDPH also strives to interact with public health partners within and outside their jurisdiction. There are frequent opportunities for these interactions. Two of many examples of opportunities

to share best practices and establish regular communications are 1) The Northeast Epidemiology Conference which is held each year and hosted by one of the jurisdictions is essential for engaging regional counterparts in discussion of common issues (this meeting is being hosted by MDPH this year and held in Lenox, Massachusetts in November) and 2) the Regional PulseNet meeting which is held annually for a similar purpose.

Section 1
Measures of Impact and Effectiveness

Activity A: Epidemiology Capacity

Objective 1: Enhance outbreak investigative response and reporting

The addition of an epidemiologist with flexible job responsibilities wil l result in improvements in many areas of disease response and reporting such as the following :

- Daily call response: A baseline average of time of call to response will be established on 10/1/2010 and measured on a monthly basis. Improving response times will be expected.
- Reporting of outbreaks to NORS: The time from onset of illness of first case to reporting in NORS will be monitored monthly. The goal will be for this to happen in <60 days.
- Availability of final outbreak reports: The time from the conc lusion of an outbreak to the availability of a final report will decrease from the current approximate 12 months.
- Provision of assistance to LBOH: A baseline will be established for the time from receipt of report to completion of questionnaire for 10/1/10 -12/31/10. Addition of staff will allow for a more pro-active approach to assisting LBOH in case interviews.

The new training modules for LBOH and new epidemiologists will be available and marketed by 6/15/11. Measures of success include the following :

- 100% of LBOHs that are on-line MAVEN users have accessed the training modules and/or classroom training by 7/31/12 and 30% are regularly accessing their surveillance data.
- 30% of all LBOH have accessed all of the training modules and/or classroom traini ng by 7/31/12.
- LBOH who have accessed the training modules actively participate in outbreak investigations.

Objective 2: Upgrade and develop surveillance

A senior epidemiologist will be hired to oversee activities described below.

Enhanced Hepatitis Surveillance

Since the high volume of HBV and HCV case reports has limited the extent to which epidemiologic review can occur, improvement in surveillance for acute HBV and HCV cases will result in:

- An increase in identified cases of acute HBV and HCV potentia lly healthcare-associated.
- Improved resource allocation for prevention and education programs based on improved understanding of HBV and HCV, particularly regarding improved completeness of race/ethnicity and risk history data.

Health-care associated infections

Epidemiologic and statistical support provided to this project will ensure the following:

- Data collected through NHSN on selected HAIs in all 74 acute care hospitals and relevant ambulatory care centers in Massachusetts is accurate and appropriate.
- Data is clean and finalized for inclusion in the annual report for acute care hospitals and the annual report for ambulatory care centers. Reports are available for presentation to the Public Health Council and for other requestors, such as Consumer Repor ts, the Newborn Intensive Care Unit Collaborative, etc.
- A newsletter is distributed every other month to NHSN users to solicit feedback on data cleaning to better understand problems that are occurring regarding appropriate reporting.
- A resource is available during business hours (9am-5pm, M-F) to answer technical questions from acute care hospitals and ambulatory care centers regarding data cleaning, reporting and the use of NHSN.
- Epidemiologic representation occurs at all Leadership Group meetings (mo nthly), Technical Advisory Group meetings (quarterly) and ad hoc meetings where data collection and analysis is being discussed

Transfusion-associated infections (TA)

Since very few cases are currently reported, improvement in surveillance for transfusio n-related babesia cases will result in:

- an increase in cases of babesiosis identified as potentially TA over the eight cases in 2008 and the five cases in 2009. Based on the total number of cases of babesiosis identified in MA and the numbers of TA cases t hat are being identified in other similar jurisdictions, e.g. New York City, MA is not successfully identifying these cases.
- more timely traceback and removal of contaminated blood products. TA babesiosis cases which result in the removal of blood products from use will be tracked, including the time from case identification to removal of product.

Activity B: Laboratory Capacity

Objective 1: Expand and enhance molecular diagnostics capacity

- CDC ELISpot training is completed by 12/31/10 and staff are trai ned on pyrosequencing and new PCR assays by 7/31/11 (lab methods for which staff are proficient will increase by four).
- Beginning 8/1/11, all suitable specimens submitted for measles, mumps or rubella testing will be tested by PCR. Results will be produce d for at least 85% of suitable specimens within two business days.
- One staff will attend the Molecular Virology Workshop held by the Pan American Society for Clinical Virology by 5/7/11 and two staff will attend the 27th Clinical Virology Symposium held by the Pan American Society for Clinical Virology by 5/11/11.

Objective 2: Reduce turnaround times for testing associated with FBI surveillance

- Beginning in 12/15/10, 100% STEC, 80% *Listeria,* and 95% *Salmonella* PFGE patterns are uploaded to PulseNet within four days of receipt of the isolate to the PFGE lab. Currently, 93% of STEC, ~63% of *Listeria*, ~88% of *Salmonella* are uploaded within four days.
- By 12/15/10, *Salmonella* serotyping data are available for at least 50% of isolates within seven days of receipt of isolate (currently 14% are serotyped within seven days, 50% within 21 days).

Objective 3: Integrate epidemiology, laboratory, and health information systems

- Lab staff will collaborate with public health epidemiologists to respond to at leas t five acute public health threats by 07/31/11.
- Lab staff will present at the 2010 Northeast Epidemiology Conference on 11/04/10.

Activity C: Health Information Systems Capacity

Objective 1: Enhance informatics workforce

The addition of two IT specialis ts to oversee HIE for the BLS and BID will result in increased capacity to support information exchange between MDPH and its public health partners. Their ability to provide direct support of HIE efforts will be critical to increasing both the number and the timeliness of reports and clinical data received (see Objectives 2 -4).

Objective 2: Build capacity to accept, process, and analyze standards -based electronic messages

- By 3/31/11, detailed protocols will be developed specifying how EHR data will be subm itted to the BID utilizing the existing ELR infrastructure.
- By 7/31/11, at least one HIE will have begun active implementation for reporting clinical data for notifiable diseases to MDPH.

Objective 3: Required Metric (number and percent of labs using ELR)

As of 8/10, 35/75 clinical labs and one commercial lab were certified to submit notifiable disease results via ELR. Progress will be measured by the following:

- By 7/31/11, all remaining clinical (40) and commercial laboratories (4) will have been recruited to participate in ELR.
- By 7/31/12, an additional 20 clinical laboratories will be certified to transmit notifiable disease results via ELR and 12 will be in active implementation. Three additional commercial laboratories will be in active implementa tion.
- By 7/31/11, an additional eight clinical laboratories will be certified to transmit notifiable disease results via ELR and 15 will be in active implementation. One additional commercial laboratory will be in active implementation.
- By 7/31/11, quality assurance reports and protocols to ensure accurate and timely laboratory data are received by MAVEN are finalized; all sites submitting data via ELR will receive quality assurance reports.
- The Epidemiology Program (and other programs wi thin the BID) will continue to have access to timely and complete laboratory data.

Objective 4: Implement and enhance electronic laboratory information exchange

- By 7/31/11, the remaining LIMS reference and viral serology LIMS components will be implemented and deployed into the SLIS system. Implementation will include ELR (HL7) interfacing and reporting to the BID MAVEN disease surveillance system.
- By 7/31/11, the number of reportable conditions reported electronically to the BID and CDC will increase. ELR capacity for 10 additional hospitals and other health care providers will be established using standard messaging and data exchange standards and vocabularies.
- By 7/31/11, influenza data will be able to be actively sent to the CDC in the PHLIP standar d message format using PHINMS.