

PART 2: ELC-ACA THIRD FUNDING PERIOD REQUEST
8/1/2012-7/31/2013

SECTION A: CONTINUATION OF ACTIVITIES A-D

Activity A: Epidemiology

1) Objectives and Operational Plan

Objective 1: Enhance outbreak investigative response and reporting.

The flexible epidemiologist's duties will continue and include the following:

- On-call duty and participation in all outbreaks reported to the Epidemiology Program.
- Participation in surge response.
- Cross-training in all areas of disease response within the responsibility of the Epidemiology Program.
- Communication with local boards of health (LBOH) staff regarding cases associated with outbreaks that are large, complex or of national significance. This will include all PFGE clusters
- Augmenting LBOH capacity as needed and requested.
- Continued evaluation of the impact of the addition of specific raw milk consumption questions on enteric disease case report forms (CRF).
- Plan regional meetings of the Working Group on Foodborne Illness Control (WGFIC) throughout the year and invite LBOH to increase their awareness of outbreak investigations and better manage expectations.

Activities Timeline (8/1/12 – 7/31/13):

- The epidemiologist continues to participate in all the activities described above.

Objective 2: Upgrade and develop surveillance for viral hepatitis, healthcare-associated infections (HAI) and transfusion-associated (TA) infections.

The Senior Epidemiologist and Program staff will continue the following activities begun in the 1st budget period and continued in the 2nd budget period:

- Provide oversight of staff working on routine viral hepatitis surveillance and all related assessment and reporting activities.
- Act as liaison on viral hepatitis issues between the Epidemiology Program and the Office of Integrated Surveillance and Informatics Services (ISIS).
- Provide technical assistance and training to other epidemiologists and LBOHs on hepatitis surveillance, CRF review for acute hepatitis B and C infections, and the routine analysis of hepatitis surveillance data.
- Review and update CRFs for acute HBV and HCV.
- Monitor babesiosis reports biweekly for possible TA cases and follow-up all suspect or known TA cases; maintain the newly established listserv for communication with Massachusetts

blood centers; produce and distribute an annual surveillance summary of TA babesiosis based on identified cases and distribute clinical advisories when indicated.

- Oversee the data and analysis activities of the MA HAI efforts; work closely with the state HAI coordinator to determine reporting priorities and timelines; serve as a liaison on HAI for the leadership group, the Technical Advisory Group (TAG), and any additional state and community partners; and serve as the primary contact for infection preventionists (IP) reporting mandated data to NHSN.

Activities Timeline (8/1/12-7/31/13):

- Proposed changes to acute HBV and HCV forms are outlined and to the Office of Integrated Surveillance and Informatics Services (ISIS) by 12/31/2012.
- Maintenance of the MA blood center listserv will be on-going; an annual surveillance summary, based on identified cases will be produced by 3/31/13 and distributed by 5/1/13.
- A public report of acute care hospital data regarding HAI will be published by 2/28/2013; a six month update will be published by 7/31/2013 updating statewide summary data from acute care hospitals; 12 monthly reports will be created and distributed for monitoring the impact of the Comprehensive Unit-based Safety Program (CUSP) on central line associated blood stream infection rates; four quarterly reports will be created and appropriately distributed for the Mass NeoQIC.
- Appropriate meetings and training sessions will be attended; training for hospital users interested in utilizing the advanced NHSN analysis features will continue to be available.
- The State HAI plan will be reviewed and updated by 6/30/2013 to reflect new federal priorities and reporting requirements.
- Data validation options for NHSN data will be explored by 1/31/2013

Objective 3: Continue active surveillance for HUS cases in Massachusetts.

Staff will:

- invite community and hospital-based nephrologists involved in active surveillance for 2012-13 to re-enroll for 2012-2013.
- provide an annual summary of HUS and Shiga toxin-producing *E. coli* (STEC) surveillance data to participants.
- provide additional information to infection preventionists (IP) regarding the case definition for HUS without an identified bacterial agent.
- work with IPs to identify hospital practitioners, other than nephrologists, most likely to encounter HUS cases for enrollment in the project.

Activities Timeline 8/1/12-7/31/13:

- Re-enrollment activities will be completed by 5/1/13.
- An annual summary of HUS and STEC from 2012 will be provided to participants by 5/1/13.
- Participants will be contacted on a weekly basis from June-September and on a monthly basis thereafter and asked about any newly identified cases of HUS.

Objective 4: Active surveillance for Shiga Toxin-Producing *E. coli* (STEC), invasive Group A strep (GAS) and listeriosis.

Staff will:

- use the STEC Case Investigation Worksheet for the follow up of cases of STEC infection with organisms that are indistinguishable by PFGE. This will include non-O157:H7 serotypes such as O26, O45, O103, O111, O121 and O145.
- obtain information regarding childbirth or surgery history on every case of invasive GAS to identify clusters possibly resulting from hospital transmission and healthcare worker carriage.
- ensure that all isolates of GAS on cases following childbirth or surgery are sent to the Hinton State Laboratory Institute (HSLI) for banking for future PFGE testing.
- investigate every case of listeriosis to ensure that all isolates are sent to the HSLI for PFGE testing and case report forms (CRF) are completed in a timely manner.

Activities Timeline 8/1/12-7/31/13:

- MDPH receives CRF on >80% of all non-O157 STEC cases from 2012.
- Isolates are received at the Hinton State Laboratory Institute (HSLI) from all listeriosis cases identified.
- A CRF is completed on every case of listeriosis identified.
- Every case of invasive GAS is investigated and all nosocomial case isolates are received at the HSLI and banked for future PFGE testing.

Objective 5: Continue laboratory-based surveillance of select organisms in Massachusetts in collaboration with hospital partners and encourage the use of ELR.

Staff will:

- recruit remaining hospitals to participate in ELR, reporting data on all notifiable diseases.
- present educational session at the 2012 annual American Society for Clinical Pathology (ASCP) conference. Presentation is entitled *Building Antibigrams: A Team Approach*.
- disseminate Bugs and Drugs newsletters relevant to IPs and microbiology supervisors.

Activities Timeline:

- All MA hospitals and commercial laboratories are fully certified to transmit results using ELR by 7/31/13.
- MDPH presents an educational session on building antibigrams during the annual ASCP conference, 10/31/12 – 11/3/12.
- Bugs and Drugs newsletters and other relevant data will be disseminated to IPs and micro supervisors. Target publishing dates are 11/30/12 and 5/31/13.

Objective 6: Collect annual population-based aggregate antibigrams from MA laboratories. Provide hospital-specific and statewide antibiogram data to hospital personnel.

Staff will:

- include regulations requiring all hospitals to submit annual antibiograms to MDPH in the 2012 revision of the MDPH Reporting, Surveillance and Isolation and Quarantine Requirements.
- request 2011 antibiogram data that have not already been received and encourage reporters to submit data using the new standard electronic submission form.
- evaluate and revise the new electronic submission form and revise and encourage participation for 2012 data submission.
- analyze 2011 statewide antibiograms and publish individual hospital results compared to the state mean.
- evaluate data for possible trends in susceptibility for hospitals that have submitted data in consecutive years.

Activities Timeline:

- Regulations are promulgated and information is disseminated to hospital laboratories within one month of promulgation (target date: 12/31/12).
- Statewide 2011 antibiogram data is analyzed and disseminated by 7/31/12.
- Antibiogram trend analyses are performed and provided to hospitals by 12/31/12.
- Statewide 2012 antibiogram data is requested, using updated standard electronic submission form by 3/1/13.
- Statewide 2012 antibiogram data is analyzed and disseminated by 7/31/13.

Objective 7: Assess *C. difficile* infection in MA by evaluating hospital ELR reports and examining hospital identification procedures and best practices.

Staff will:

- develop surveys to be distributed to acute care hospital IPs and microbiology supervisors to assess appropriate testing, identification and diagnosis of *C. difficile*.
- analyze survey data, comparing *C. difficile* incidence reported by IPs to microbiology supervisors as well as reports received through ELR.
- continue to review death certificate data to investigate the mortality rate associated with *C. difficile* Associated Diarrhea (CDAD).
- monitor *C. difficile* hospital discharge data, including *C. difficile* classification as either the primary diagnosis or non-primary diagnosis.

Activities Timeline:

- Surveys are distributed to IPs and microbiology supervisors by 8/1/12.
- Survey analysis is performed by 9/30/12.
- Death certificate data are analyzed to determine rate of *C. difficile*-associated deaths by 5/31/13.
- *C. difficile* hospital discharge data are analyzed by 7/31/13.

Objective 8: Surveillance, Reporting and Control Education/Training Activities

Staff will:

- develop trainings for LBOH to disseminate information on new reporting and isolation regulations and to introduce the revised foodborne illness control manual. Trainings may be classroom based or web-based depending on available resources. Target date: Spring of 2013.
- assist in the revision of the Legal Nuts and Bolts of Isolation and Quarantine training programs, scheduled for the Fall of 2012.

Activities Timeline 8/1/12-7/31/13:

- Discussions regarding the development of the trainings will begin by 10/1/12.
- Planning will continue until the spring of 2013.
- The web-based version of the ID, Surveillance, Reporting and Control and the Legal Nuts and Bolts of Isolation and Quarantine training programs will continue to be offered.

Objective 9: Food Safety, Handwashing, Respiratory Hygiene Educational Activities

- The MDPH Educational Materials Catalog will be kept up to date and promoted to audiences through the MDPH website, trainings, mailings, conferences and special events.
- Evaluation will occur via analysis of the tracking of order forms, tracking of web hits, audience responses to existing educational materials to identify response to current materials and to identify unmet educational needs.
- Epidemiologists will be responsible for handling requests for educational presentations.
- Educational efforts will continue regarding food safety that started in 2010 focusing on farmer's markets and community supported agriculture farms. Efforts will focus on the development and distribution of education materials regarding the consumption of raw milk in response to pending legislation in Massachusetts relaxing current requirements for the sale and distribution of raw milk.

Activities Timeline 8/1/12-7/31/13:

- MDPH epidemiologists will be available for presentations on ID surveillance and response.
- The need for educational materials will be prioritized and will be developed as appropriate throughout 2012-13.
- Order forms for educational materials will be tracked monthly and a report will be available by 7/31/13.
- Web hits to educational materials are tracked monthly and inform decisions regarding additional educational materials or changes in the materials available.

Objective 10: ELC Coordination Activities

Activities Timeline 8/1/12-7/31/13:

- The preparation and submission of program applications and the integration of epidemiology, laboratory and health information system activities will be overseen.
- A liaison to CDC will be available to address program concerns.

Objective 11: Continue Activities Regarding Young Adults with Hepatitis C Virus (activity from D.3.C)

Activity 1: Conduct enhanced surveillance interviews with people ages 18 to 25 years recently reported with HCV infection.

Staff will:

- review all cases of reported HCV infection among people ages 18 to 25 years of age.
- initiate investigations of all cases in this age group.
- contact all cases in this age group to conduct enhanced surveillance phone interviews using the instrument developed by MDPH/CDC. Contact will be made via phone, text messages, and email depending on information available for each case.
- document all contact attempts and outcomes and all questionnaire data in MAVEN.

Activities Timeline (8/1/12-7/31/13):

- The MDPH contractor will continue to take the lead on contacting cases to request participation in this project.
- All investigations will be initiated within one month of receipt of laboratory test results.
- All cases in the age group will be contacted for enhanced surveillance interviews with the approved instrument within three months of being reported to MDPH.

Activity 2: Analyze standard and enhanced surveillance data and prepare a report summarizing findings.

Staff will:

- document all contact attempts and outcomes and all questionnaire data in MAVEN.
- conduct analyses of MDPH disease surveillance data and data from the enhanced questionnaire.
- develop a report based on these data and any findings and recommendations that are indicated.

Activities timeline:

- All data collected for this project will be entered promptly into MAVEN.
- Analysis will be initiated in 1/2013, once sufficient numbers of cases have been interviewed.
- The analysis and report will be finalized by 7/2013.

2) Monitoring and Evaluation:

Performance Measures:

Objective 1: Enhance outbreak investigative response and reporting.

- All five epidemiology positions are filled. Timeline: throughout grant year. Baseline: currently filled. Target: positions remain filled.

- The percentage of CRFs with missing information about the consumption of high risk foods. Timeline: 8/1/12-7/31/13. Baseline: 66% (2/29/11-3/1/12). Target: < than 55%.
- The average time from onset of illness of first case to reporting in NORS. Timeline: 8/1/12-7/31/13. Baseline: 63 days (prior year average). Target: < 60 days
- Average time from the notification of an outbreak to the availability of an outbreak report. Timeline: 8/1/12-7/31/13. Baseline: < three months (Prior year average). Target: maintenance of baseline.
- Percentage of infectious disease outbreaks investigations that generate outbreak reports. Timeline: 8/1/12-7/31/13. Baseline: 100%. (PHEP measure). Target: 100%.
- The percentage of infectious disease outbreak investigations reported in NORS which include the following elements: # of laboratory –confirmed cases indicated, age of cases indicated, sex of cases indicated, # of hospitalized cases indicated, # of case deaths indicated. Timeline: 8/1/12-7/31/13. Baseline: # of laboratory –confirmed cases=100%, sex of cases=92%, # of hospitalized cases=92%, # of deaths=100% (established calendar year 2011). Target: Maintain levels for each indicator at >90%. (PHEP measure).
- The percentage of infectious disease outbreak investigations reported in NORS which include all of the following: # of laboratory –confirmed case, the age of cases indicated, the sex of cases, the # of hospitalized cases, and the # of case deaths. Timeline: 8/1/12-7/31/13. Baseline: has not been established. Target: Outbreak reports with all elements = 75%. (PHEP measure).
- The median response time from calls coming into Epidemiology Program to response. Timeline: 8/1/12-7/31/13. Baseline: 17 minutes (established from 6/1/2010 to 5/30/2011). Target: Maintain or improve baseline response.
- Improvement of jurisdictional response in enteric CRF completion. Timeline: 8/1/12-7/31/13. Baseline: cities/towns with 0% completion rates for *Campylobacter* (34/351), *Giardia* (34/351), STEC (7/351), *Salmonella* (27/351), *Shigella* (7/351), *Vibrio* (6/351) – established calendar year 2011 – see table in progress report. Target: 10% reduction in cities/towns with 0% completion rates for enteric CRFs.

Objective 2: Upgrade and develop surveillance for viral hepatitis, healthcare-associated infections (HAI) and transfusion-associated (TA) infections.

- Appropriate training provided to epidemiologists involved in viral hepatitis surveillance. Timeline: 8/1/12-7/31/13. Baseline: Training is currently provided on an ad hoc basis and not measured. Target: The hepatitis team epidemiologists are provided continuing education on hepatitis A/B/C, CRF review and current surveillance methods as often as needed but no less than twice yearly.
- Evaluation of acute HBV and HCV reporting forms. Timeline: 8/1/12-7/31/13. Baseline: Forms are evaluated on an ad hoc basis. Target: HBV and HCV reporting forms are reviewed for changes yearly with changes provided to ISIS by year's end for distribution the following year.
- Data collection through NHSN. Timeline: calendar year 2012. Baseline: Complete data was available from all acute care hospitals for the second statewide report, released in 2/2012.

Target: Complete data is collected through NHSN on selected HAI from all 74 acute care hospitals and relevant ambulatory care centers in MA and included in the 2012 statewide report, released in 2013.

- Response to NHSN reporting issues. Unusual NHSN reporting issues are identified early. Feedback of performance data is given to providers on a routine basis. Facilities are asked enter data into NHSN within 90 days. Timeline: 8/1/12-7/31/13. Baseline: analysis is done every six months. Target: Facilities that consistently failed to report data within 90 days are contacted to discuss obstacles to reporting and those hospitals that consistently reported data more quickly were provided with commendation letters to encourage continued support.
- Public acute care hospital specific reports. Timeline: 8/1/12-7/31/13. Baseline: currently available. Target: Complete, accurate HAI data continue to be prepared for inclusion in hospital specific reports and made available to the Public Health Council and for other requestors, such as the Consumer Union, Mass NeoQIC, etc.
- Availability of resources for questions. Timeline: 8/1/12-7/31/13. Baseline: currently available. Target: An epidemiologist 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.
- Epidemiologist attendance at meetings. Timeline: 8/1/12-7/31/13. Baseline: Attendance occurs at 12 HAI Leadership Group meetings, four AG meetings and all *ad hoc* meeting where data collection and analysis is discussed. Target: The same level of involvement is maintained.
- Epidemiologist participation in state planning. Timeline: 8/1/12-7/31/13. Baseline: Epidemiologist currently participates and offers input to state planning process. Target: The epidemiologist continues to serve as a resource for the update of the State HAI Plan.
- Transfusion-associated babesiosis cases. Timeline: 6/1/12-7/31/13. Baseline: nine cases (6/1/11-5/31/12). Target: 10% increase.
- Percentage of time a donor recall is initiated in response to TA babesiosis cases. Timeline: 8/1/12-7/31/13. Baseline: 100% (6/1/11-5/31/12). Target: 100%.
- Promote and achieve participation in the NHSN hemovigilance module among MA blood centers. Timeline: 8/1/12-7/31/13. Baseline: Promotion has occurred, participation has not. Target: Achieve participation among a pilot group of 5-10 blood centers.

Objective 3: Continue active surveillance for HUS cases in Massachusetts.

- Enroll nephrologists and IPs for 2012-13. Timeline: 6/1/12-5/31/13. Baseline: seven nephrologists and one IP were enrolled 2011-2012. Target: All currently enrolled participants are re-enrolled and participate in active surveillance for HUS.
- Increase participation from health care providers who might treat HUS cases with assistance from IPs. Timeline: 6/1/12-5/31/13. Baseline: Currently only nephrologists and IPs are enlisted. Target: Three additional health care providers agree to participate in HUS active surveillance.

Objective 4: Active surveillance for Shiga Toxin-Producing E. coli (STEC), invasive Group A strep (GAS) and listeriosis.

- CRF completion on reported non-O157 STEC cases. Timeline: calendar year 2012. Baseline: >90% (2011) Target: Levels are maintained at >90%.
- Percentage of *Listeria* isolate submitted to HSLI on reported cases. Timeline: calendar year 2012. Baseline: 93% (2011). Target: 100% of isolates from reported cases of listeriosis are received at the HSLI.
- CRF completed on reported listeriosis cases. Timeline: calendar year 2012. Baseline: 94% (2011). Target: 100% of listeriosis cases reported to MDPH have a completed CRF.
- Invasive GAS investigation for nosocomial transmission. Timeline: calendar year 2012. Baseline: 100% (2011). Target: 100% of cases reported to MDPH are investigated for the possibility of nosocomial acquisition of infection.
- Isolate submission for nosocomially acquired invasive GAS. Timeline: calendar year 2012. Baseline: 33% (2011). Target: 75% of isolates of invasive GAS reported to MDPH suspected of being nosocomially acquired are received at the HSLI for banking for future testing.

Objective 5: Continue laboratory-based surveillance of select organisms in Massachusetts in collaboration hospital partners encouraging the use of electronic laboratory reporting.

- Newsletters to IPs and microbiology supervisors. Timeline: calendar year 2012. Baseline: Two editions (2011). Target: Two editions of the Bugs and Drugs newsletter are distributed to IPs and microbiology supervisors.

Objective 6: Collect annual population-based aggregate antibiograms from Massachusetts laboratories. Provide hospital-specific and statewide antibiogram data to hospital personnel.

- Requirement of antibiogram submission from acute care hospitals by regulation. Timeline: by 12/2012. Baseline: not currently required. Target: Regulations are passed requiring acute care hospitals to report antibiogram data.
- Submission of hospital antibiogram data electronically. Timeline: April 2012 – April 2013. Baseline: 18/50 hospitals as of April 2012. Target: 36/50.
- Hospital antibiogram analysis. Timeline: calendar year data 2012. Baseline: Antibiogram data are collected and analyzed annually and reports provided to institutions to assist in antibiotic stewardship efforts Target: Statewide mean susceptibility data for 2012 is analyzed and distributed in July 2013.

Objective 7: Assess C. difficile infection in MA by evaluating hospital ELR reports and examining hospital identification procedures and best practices.

- Evaluation of *C. difficile* data collection. Timeline: 8/1/12-7/31/13. Baseline: not established. Target: IP reporting is compared to ELR.
- Mortality-associated CDAD. Timeline: 8/1/12-7/31/13. Baseline: not established. Target: A mortality rate is calculated for CDAD from death certificate data.
- *C. difficile* classification. Timeline: 8/1/12-7/31/13. Baseline: to be established. Target: Hospital discharge data is used to compare *C. difficile* cases with a primary diagnosis to those with a non-primary diagnosis.

Objective 8: Surveillance, Reporting and Control Education/Training Activities

- Local board of health (LBOH) training. Timeline: 8/1/12-7/31/13. Baseline: No trainings were held in 2011. Target: Trainings will be developed for LBOHs to disseminate information on new reporting and isolation regulations and to introduce the revised foodborne illness control manual. Trainings may be classroom based or web-based depending on available resources.

Objective 9: Food Safety, Handwashing, Respiratory Hygiene Educational Activities

- Availability of foodborne illness data on the MDPH website. Timeline: 8/1/12-7/31/13. Baseline: Very little foodborne illness data is currently on the website. Target: Foodborne illness data from 2011 is posted on the BID, BLS and FPP webpages.
- Educational Materials and Web Hits. Timeline: 8/1/12-7/31/13. Baseline: data from prior year will be used. Target: Requests for educational materials through order forms from 8/1/12-7/31/13 increases and web hits to educational materials are tracked monthly.

Objective 10: ELC Coordination Activities

- ELC coordination. Timeline: 8/1/12-7/31/13. Baseline: all activities are coordinated. Target: The preparation and submission of program applications and the integration of epidemiology, laboratory and health information system activities is overseen and ensured.

Objective 11: Continue Activities Regarding Young Adults with Hepatitis C Virus (activity from D.3.C)

- Investigations of youth cases of HCV. Timeline: 8/1/12-7/31/13. Baseline: 100% Target: Investigations continue to be conducted on 100% of reported HCV cases in 18-25 year olds.
- Enhanced surveillance interviews. Timeline: 8/1/12-7/31/13. Baseline: 25 interviews are completed. Target: At least 100 enhanced surveillance interviews among recently diagnosed HCV cases ages 18 to 25 years of age will be conducted.

Activity B: Laboratory

1) Objectives and Operational Plan

Objective 1: Expand and enhance molecular diagnostics capacity.

BLS Staff will:

- maintain a multi-purpose ELC Bacteriologist III to perform RT-PCR assays for measles, mumps and rubella using existing automated nucleic acid extraction platforms and real-time PCR platforms, such that extraction and PCR kits for the new assays are interchangeable with those of existing assays.
- cross train additional staff to perform RT-PCR for measles, mumps and rubella.
- cross train additional staff on CDC protocols for detection of oseltamivir and adamantane resistance using existing PyroMark pyrosequencer platform.

- establish and validate the norovirus PCR and sequencing assay for norovirus diagnostics and surveillance via CaliciNet.
- cross train additional staff to perform norovirus PCR and sequencing for submission to CaliciNet using BioNumerics.
- enhance their technical and professional knowledge by attending meetings and/or trainings relevant to molecular diagnostic assays for vaccine-preventable diseases, influenza, and/or foodborne illnesses.
- improve laboratory coordination and outreach by establishment of a laboratory liaison to assist with vaccine preventable and other respiratory diseases.

Activities Timeline (8/1/2012-7/31/2013)

- The multi-purpose Bacteriologist III will cross-train the remaining two molecular laboratory staff for a total of five proficient staff to assist with testing of measles, mumps and rubella samples submitted for RT-PCR testing.
- The number of routine laboratory tests submitted for measles, mumps and rubella RT-PCR will increase.
- In support of ELC-funded enhanced measles surveillance activities, measles testing will increase, as needed.
- Influenza resistance pyrosequencing methods will be validated and implemented for the 2012-2012 influenza season beginning in 10/2012.
- BLS molecular diagnostics staff will cross-train two additional laboratory staff to assist with influenza antiviral resistance using pyrosequencing methods.
- CaliciNet certification to perform norovirus PCR and sequencing assays will be completed by the multi-purpose Bacteriologist III in 8/2012; cross-training of at least two additional staff will be completed by 7/31/2013.
- The multi-purpose ELC Bacteriologist III and/or other molecular diagnostic laboratorian(s) will attend monthly meetings with the vaccine-preventable disease epidemiologists to discuss topics related to vaccine-preventable diseases, influenza and coordination between clinical laboratories within the state.
- The multi-purpose Bacteriologist III and/or other molecular diagnostic laboratorian(s) will attend and participate in bi-monthly meetings of the Working Group on Foodborne Illness Control (WGFIC) to represent norovirus laboratory testing.

Objective 2: Reduce turnaround times for testing associated with foodborne disease.

BLS Staff will:

- maintain a fully trained Bacteriologist I in the foodborne disease surveillance laboratories to allow for faster salmonella serotyping. The Bacteriologist I will be available to support enterics, PFGE, and food laboratory testing activities as needed.
- continue to monitor turnaround times for serotyping and PFGE to identify and address the causes of testing delays.
- complete implementation of MLVA for *Salmonella* Typhimurium and STEC. At least two laboratorians will be certified for MLVA for *S. Typhimurium* and STEC.

- implement the Luminex bead array assay for salmonella serotyping.
- complete implementation of the immunomagnetic bead separation (IMS) method for STEC in human stool.
- Be available to act as an IMS reference center for cases of HUS where an STEC has not been isolated by conventional methods.

Activities Timeline (8/1/12-7/31/13)

- The Bacteriologist I will continue to perform all enteric testing as needed
- *Salmonella* serotyping transitions to the molecular based Luminex when possible, to allow faster identification of serotype and reporting of results.
- Immunomagnetic bead separation (IMS) methodology for STEC in human stool will be implemented.
- MA is available to serve as an IMS Reference lab for cases of HUS in the Northeast region.
- A total of three technicians will be certified for MLVA for STEC, *S. Typhimurium* and *S. Enteritidis*.

Objective 3: Expansion of capacity for molecular detection of causative agents of foodborne illness in clinical specimens. (NEW ACTIVITY)

Background, Need and Understanding:

Massachusetts seeks funding to expand its capacity for molecular detection of causative agents of foodborne illness in clinical specimens. During foodborne outbreaks which have been linked to a specific establishment, it is often necessary to test all food-handling employees to demonstrate these employees are not carriers or shedders of the causative agent in question. In accordance with Massachusetts regulations, these foodhandlers may be required to produce two consecutive negative stools before being cleared to return to work. Currently, the Hinton State Laboratory Institute (HSLI) tests these specimens by bacterial culture which can take several days to conclusively result as negative. Testing these foodhandlers by PCR will provide a rapid answer after as little as one day, ultimately reducing the time for foodhandlers to be out of work, which is often without pay. It will also direct staff time and resources to those specimens that screen positive, and to reduce time spent on chasing negatives. Focusing on those that may be positive will ultimately result in isolating the organism, completing the subtyping, and having the PFGE pattern available for comparison to other strains.

In addition, in accordance with recently published APHL guidance for Public Health Laboratories on Isolation and Characterization of Shiga-toxin producing *Escherichia coli* (STEC) from Clinical Specimens (April 2012), the HSLI will characterize the target genes of interest (stx1, stx2, eae and Ehly). Having this additional information will enhance the information learned from surveillance activities, as well as help to expand the library of serotype and strain information circulating throughout Massachusetts and the US.

Lastly, the HSLI will enhance its capability for speciation of *Campylobacter*. As described in CDC communications, there are several species of *Campylobacter* which cannot be definitely identified by culture and require PCR for speciation. For the purposes of *Campylobacter*

surveillance, the HSLI will be able to fully speciate each *Campylobacter* isolate submitted. Doing so will enhance outbreak detection in *Campylobacter*, which is the most common bacterial agent implicated in foodborne illness cases.

The HSLI will validate and implement real-time PCR assays for three of our most common and severe foodborne pathogens, *Salmonella*, *Campylobacter*, and STEC. In order to implement this, a microbiologist who has extensive experience with molecular and foodborne pathogen experience will be hired. Additional staff members will be trained after assay implementation.

Operational Plan

- Validate and implement a PCR based assay for clinical isolates and original samples submitted for STEC characterization.
- Identify and optimize a PCR based assay for the detection of *Salmonella* species in original stool specimens
- Identify and optimize a PCR based assay for the identification and speciation *Campylobacter* species in clinical isolates.

Activities Timeline (8/1/2012-7/31/2013)

- A PCR based assay will be identified, optimized, validated and implemented for clinical isolates and original samples for STEC.
- A PCR based assay will be identified and optimized for *Salmonella* in original samples and *Campylobacter* species in clinical isolates and original samples.

1) Monitoring and Evaluation:

Performance Measures:

Objective 1: Expand and enhance molecular diagnostics capacity.

- Two bacteriology positions are filled. Timeline: throughout grant year. Baseline: currently filled. Target: positions remain filled.
- Mumps and rubella samples tested within one day of receipt. Timeline: 8/1/12-7/31/13. Baseline: 0%. Target: 90%.
- Measles testing within one day of receipt. Timeline: 8/1/12-7/31/13. Baseline: $\geq 90\%$. Target: maintenance at $\geq 90\%$.
- Norovirus testing within two days of receipt. Timeline: 8/1/12-7/31/13. Baseline: 0%. Target: 90%.
- Staff trained for norovirus testing. Timeline: by 10/1/12. Baseline: one person. Target: two additional staff will be proficient to perform and report results to the submitter and CaliciNet.
- Percentage of pre-defined respiratory samples tested for influenza virus antiviral resistance within 48 hours of receipt. Timeline: 8/1/12-7/31/13. Baseline: 0% - MA does not currently report antiviral resistance. Target: 90% but highly dependent on CDC surveillance guidelines for the 2012-13 influenza season.
- Staff trained in influenza virus antiviral resistance testing. Timeline: 8/1/12-7/31/13. Baseline: one person. Target: Two additional staff will be proficient to perform and report antiviral resistance results to the submitter and the CDC Influenza Branch.

- Staff collaboration with epidemiologists. Timeline: 8/1/12-7/31/13. Baseline: not established - these meetings have not been planned or scheduled. Target: At least one laboratory representative will attend 80% of the meetings with our vaccine-preventable disease epidemiologists to discuss topics related to vaccine-preventable diseases, influenza and coordination between clinical laboratories within the state.
- Working Group on Foodborne Illness Control (WGFIC) meetings. Timeline: 8/1/12-7/31/13. Baseline: 100% attendance. Target: maintenance at 100% of meetings.

Objective 2: Reduce turnaround times for testing associated with foodborne disease.

- Percentage of PFGE patterns uploaded. Timeline: 8/1/12-7/31/13. Baseline: 79% (*Listeria*), 90% (*Salmonella*), 96% (STEC). Target: The percentage of PFGE patterns uploaded within four days of receipt will be 85% for *Listeria* isolates, 90% for *Salmonella* isolates and 96% for STEC.
- Serotyping of *Salmonella* isolates by Luminex. Timeline: 8/1/12-7/31/13. Baseline: 0%. Target: 75% of all *Salmonella* serotyping will be completed by Luminex.
- *Salmonella* serotyping data available within seven days of receipt. Timeline: 8/1/12-7/31/13. Baseline: 67% Target: $\geq 75\%$.
- MLVA testing. Timeline: 8/1/12-7/31/13. Baseline: Currently MLVA testing is being performed sporadically, and when requested by CDC. Target: MLVA will routinely be performed on all isolates of *S. Typhimurium* and *S. Enteritidis* and STEC linked to outbreaks, and other isolates as requested by CDC.
- Regional testing for STEC. Timeline: 8/1/12-7/31/13. Baseline: Currently Massachusetts does not receive any specimens from regional cases of HUS. Target: Massachusetts will be available to receive specimens from regional cases of HUS to aid in STEC isolation and characterization.

Objective 3: Expansion of capacity for molecular detection of causative agents of foodborne illness in clinical specimens. (NEW ACTIVITY)

- Real time PCR assay testing for STEC toxin and virulence gene targets. Timeline: 8/1/12-7/31/13. Baseline: not yet established – new activity. Target: A real-time PCR assay for STEC will be validated and implemented into routine use in referred clinical isolates and original stool samples.
- Real time PCR assay testing for *Salmonella* and *Campylobacter*. Timeline: 8/1/12-7/31/13. Baseline: not yet established – new activity. Target: A real-time PCR assay will be identified and optimized for *Salmonella* in original samples and *Campylobacter* species in clinical isolates and original samples.

Activity C: Health Information Systems

1) Objectives and Operational Plan

The Director of the Office of Integrated Surveillance and Informatics Services (ISIS) and Director of Information Technology within the Bureau of Infectious Disease (BID), and the

Director of Information Technology within the Bureau of Laboratory Sciences (BLS) have overall responsibility for ensuring the objectives outlined below are met. It should be noted that the nature of infectious disease surveillance and informatics in MA has resulted in an integrated infrastructure and workforce supporting the activities of the BID. These objectives were developed in consideration of the objectives and performance measures outlined under the PHEP Cooperative Agreement and there is significant overlap between the two Cooperative Agreements.

Objective 1: Participate in ELC ELR Implementation Support and Monitoring effort.

Appropriate BID and BLS staff will continue to participate in all ELC ELR Implementation Support and Monitoring activities.

Staff will:

- participate in relevant conference calls and meetings
- continue to provide CDC with requested metrics

Activities Timeline (8/1/12 – 7/31/13):

- By 7/31/13, BID and BLS staff will have contributed to the ELC ELR Implementation Support and Monitoring activities and provided CDC with requested data.

Objective 2: Advance national implementation of ELR by improving capacity to accept and work with incoming ELR messages in surveillance systems as well as develop and implement capacity to handle messages according to MU standards.

The BID will ensure accurate and timely notifiable disease and laboratory data are received via ELR and transmitted to MAVEN.

Staff will:

- expand the number clinical and commercial laboratories submitting notifiable disease results via ELR to the BID.
- expand the number of BLS SLIS components certified to submit data via ELR.
- send monthly quality assurance reports to ELR sites to ensure accurate and timely laboratory data are received in MAVEN; routinely assess and measure the timeliness and completeness of reporting notifiable disease via ELR.
- continue to identify new and relevant LOINC and SNOMED codes for all notifiable diseases.
- continue to expand the number of local health departments utilizing MAVEN for disease investigation and follow up.
- ensure program staff receive notifications in a timely and complete manner.
- ensure ELR infrastructure continues to meet Meaningful Use requirements.

Activities Timeline (8/1/12 – 7/31/13):

- By 7/31/13, the remaining clinical laboratories will be certified to submit data via ELR.
- Quality assurance reports for ELR are sent to participating sites on a monthly basis.

- A formal assessment of timeliness and completeness of the surveillance system will be finalized with concrete recommendations for improvement.
- Both the ELR portal and MAVEN are current with appropriate LOINC and SNOMED codes.
- Program staff receive notifications in a timely and complete manner.

Objective 3: Implement and enhance electronic laboratory information exchange.

Staff will:

- integrate the remaining viral molecular laboratory component in LIMS infrastructure. This includes ELR interfacing and HL7 2.5.1 reporting to BID. Deployment of the viral molecular laboratory component will include interfacing with ELR and sending reportable laboratory results using the existing IT infrastructure.
- upgrade Rhapsody IDE and Engine to version 4.0.
- purchase Rhapsody IDE and BtB LIMS support and maintenance for LIMS, ELR and MAVEN interface and interoperability expansion.
- build the norovirus PCR and sequencing assays components into the LIMS once the assays are validated by the laboratory. Reporting will include submission of results to CaliciNet.
- continue participation in PHLIP and ETOR activities and LIMSi workgroups.

Activities Timeline (8/1/12-7/31/13):

- The viral molecular LIMS component will be deployed and interfaced with ELR and MAVEN.
- Rhapsody IDE and engine will be upgraded to version 4.0.
- Rhapsody IDE and BtB LIMS support and maintenance will be purchased to support interoperability and LIMS expansion efforts.
- The norovirus PCR and sequencing assay components will be developed and integrated into the LIMS infrastructure.

Objective 4: Build capacity to accept, process, and analyze standards-based electronic messages from sending electronic health records (EHR) as set out in the Centers for Medicare and Medicaid Services Meaningful Use (MU) Notice of Proposed Rule Making.

The same infrastructure that is utilized to transmit laboratory results via ELR may be used to support EHR data exchange and was certified to meet MU requirements for ELR. BID in partnership with Harvard Medical School developed the proof of concept to transmit EHR data and would like to develop additional algorithms to report notifiable diseases from EHR as well as expand the number of participating sites.

Staff will:

- ensure infrastructure is robust to support increased data exchange.
- ensure appropriate data elements are transmitted to MDPH and assess protocols for data exchange with EHR.
- identify regional health information exchanges (HIE) and specific sites with HIE willing to transmit EHR data to MDPH.

- create an inventory of currently available standards, guides, tools and collaboration opportunities.

Timeline (8/1/12 – 7/31/13):

- During this cooperative agreement BID staff will continue to reach out to potential sites with EHR as well as HIE to engage in discussion on reporting notifiable diseases.

2) Monitoring and Evaluation:

Performance Measures:

Objective 1: Participate in ELC ELR Implementation Support and Monitoring effort.

- Participation in conference calls and meetings. Timeline: 8/1/12-7/31/13. Baseline: 100% participation. Target: Staff participates in 100% of all relevant conference calls and meetings
- Requested metrics. Timeline: 8/1/12-7/31/13. Baseline: all required metrics are provided. Target: BID continues to provide CDC with requested metrics complying with established timelines.

Objective 2: Advance national implementation of ELR by improving capacity to accept and work with incoming ELR messages in surveillance systems as well as develop and implement capacity to handle messages according to MU standards.

As of 5/23/2012, 66/72 clinical laboratories and two commercial laboratories were certified to submit notifiable disease results via ELR. All clinical and commercial laboratories have been recruited to participate in ELR.

- Laboratory recruitment for ELR. Timeline: 8/1/12-7/31/13. Baseline: 66 clinical laboratories and two commercial laboratories are certified to transmit. Target: All 72 clinical laboratories and three additional commercial labs are certified to transmit notifiable disease results via ELR.
- Percentage of sites submitting data via ELR receiving monthly quality assurance reports. Timeline: 8/1/12-7/31/13. Baseline: 100% Target: 100%.
- Meaningful Use. Timeline: 8/1/12-7/31/13. Baseline: the ELR infrastructure meets MU requirements. Target: The ELR infrastructure continues to meet MU requirements.
- Timeliness and completeness. Timeline: 8/1/12-7/31/13. Baseline: As the last assessment is older than five years this process will establish a new baseline. Target: A formal assessment of timeliness and completeness of the surveillance system will be finalized with concrete recommendations for improvement. Assessment will include:
 - proportion of laboratory results received electronically
 - completeness of laboratory reports received via ELR measured against reports generated in LIMS
 - completeness of laboratory reports received in terms of demographic information
 - completeness of notifications to local jurisdictions
 - number of days between receipt of laboratory reporting and initiation of investigation

Objective 3: Implement and enhance electronic laboratory information exchange.

- Deployment of Viral Molecular Laboratory LIMS component and interface with ELR. Timeline: 8/1/12-7/31/13. Baseline: Only molecular influenza results are currently sent to ELR and to BID in HL7 2.5.1 format. Target: The Viral Molecular Laboratory LIMS component is deployed and interfaced with ELR and reportable results sent to BID in HL7 2.5.1 format for BID certification.
- Upgrade of Rhapsody IDE and Engine. Timeline: 8/1/12-7/31/13. Baseline: Rhapsody version 2.4 Target: Rhapsody IDE and Engine is upgraded to version 4.0
- The development of the Norovirus PCR and sequencing assays components and integration into the LIMS infrastructure. Timeline: 8/1/12-7/31/13. Baseline: Norovirus PCR component is not currently included in LIMS. Target: Successful development and integration.
- Continued support and maintenance of Rhapsody IDE and BtB LIMS. Timeline: 8/1/12-7/31/13. Baseline: Support and maintenance for Rhapsody expires on 6/30/12. Target: Support and maintenance is renewed.

Objective 4: Build capacity to accept, process, and analyze standards-based electronic messages from sending EHR as set out in the Centers for Medicare and Medicaid Services MU Notice of Proposed Rule Making.

- Active submission of case report data from EHR and HIE.

Number and Percent of Labs using ELR in Grantee Jurisdiction		
Current Status as of: 4/15/2011		
Grantee: <u>MA</u>		
	Large Commercial Labs ("Independent Labs" per CLIA)	Hospital Labs
<i>Example data</i>		
Total Number of Labs Reporting to the Jurisdiction	7	74
Labs Reporting via 2.3.1 Messaging Std	2	48
Labs in Testing Stage for Reporting via 2.5.1 Messaging Std	0	0
Labs in Production for Reporting via 2.5.1 Messaging Std	0	0
Labs Reporting electronically via format other than 2.3.1 or 2.5.1	0	0

Activity D: Targeted Prevention and Control Activities

1. Healthcare Associated Infections (HAI)

A: HAI Prevention Infrastructure

1) Objectives and Operational Plan

All activities below will be a continuation of efforts undertaken 1/1/12 and include all core activities as described in the funding opportunity. These activities will continue from 8/1/2012 through 7/31/2013. They will be overseen by the HAI coordinator who is a member of the HAI Leadership Group. She will continue to manage and monitor state HAI prevention activities, report on progress toward state and national prevention targets, track and report performance measures, plan and facilitate the work of the Technical Advisory Group (TAG), provide project management for prevention activities, and prepare HAI reports and communications. MDPH will not face any delayed expenditure challenges due to delayed hiring as this position is currently filled. The expectation is that all awarded funds will be spent by the end of the budget period.

Objective 1: Ensure the ongoing implementation and coordination of statewide HAI prevention activities, measure progress toward state and HHS goals and metrics and optimize the role of the HAI Technical Advisory Group (TAG).

Activities and Activities Timeline (8/1/12-7/31/13):

The HAI Coordinator will:

- continue to track, report and evaluate progress on meeting state HAI goals as described in the five year HAI plan during monthly internal leadership meetings, quarterly TAG meetings and as directed by CDC.
- coordinate updating the five year MA HAI plan to ensure consistency with current HHS HAI Action Plan.
- continue to work with MDPH Leadership, HAI TAG, and additional stakeholders to assess and prioritize prevention needs.
- continue to plan and facilitate quarterly meetings of the HAI TAG.
- continue to work with State Epidemiologist and collaborative director to establish prevention activity enrollment goals and develop strategies to promote participation.
- continue to assess the impact of prevention activities by monitoring facility enrollment, number of facility specific participants and additional process and outcome measures.
- ensure HAI goals and metrics are in alignment with the MA Standard Quality Measure Set that is currently under development, by the Statewide Healthcare Quality and Cost Council.
- continue to coordinate prevention activities with internal MDPH and external partners including but not limited to: the MA Hospital Association/Health Research and Education Trust Partnership Partnership for Patients, MassPro, (the state QIO), the Region 1 New England Dialysis Collaborative, MA Hospital Association CUSP/CLABSI Safe Care Initiative, Sharps Injury Surveillance and Prevention Project, MA Senior Care Association,

the Neonatal Quality Improvement Collaborative of MA (NEOQIC), to ensure state and regional HAI activities are complementary and not duplicative.

- provide project management for the prevention activity described in Activity D.1.B.
- attend HAI related trainings and meetings including one CDC sponsored meeting during the performance period.

2) Monitoring and Evaluation

Performance Measures:

The following table summarizes the performance measures, activities, timeframe, baseline and targets for the key tasks.

Activity	Performance Measures	Timeframe	Baseline	Target
1. Maintenance of MDPH HAI Coordinator position	Preservation of MDPH HAI Coordinator position	8/1/12- 7/31/13	HAI Coordinator in place since 9/09	Continuation of HAI Coordinator position
2. Continue to track, report and evaluate progress on meeting state HAI goals as described in the five year HAI plan during monthly internal leadership meetings, quarterly TAG meetings and as directed by CDC.	Progress on meeting state HAI goals as described in the five year plan is monitored and evaluated	8/1/12- 7/31/13	Progress meeting goals	Maintain and improve
3. Plan and facilitate quarterly meetings of the HAI TAG	4 TAG meetings are held	8/1/12- 7/31/13	Quarterly meetings held since 5/08	Completed
4. Review and update the MA HAI 5 year prevention plan	The plan is updated to ensure consistency with current HHS HAI Action Plan and statewide goals.	8/1/12 - 7/31/13	Some Progress	Completed
5. Coordinate prevention activities with internal MDPH and external partners	Prevention activities with internal MDPH and external partners are complementary and not duplicative.	8/1/12 - 7/31/13	Ongoing since 9/09	Maintain and improve

	HAI goals and metrics are aligned with other state, and national goals			
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B. Prevention of HAI across the Spectrum of Healthcare

Background, Need and Understanding:

Antibiotic stewardship has received increasing attention as the prevalence of multi-drug resistant organisms (MDRO) has increased. *Clostridium difficile* is a spore-forming, gram-positive anaerobic bacillus that is a common cause of antibiotic-associated diarrhea (AAD), accounting for 15-25% of all episodes of AAD. Reported rates for *C. difficile* infection (CDI) range from one to 10 per 1,000 discharges and 17-60 cases per 100,000 patient days. *C. difficile* is responsible for a spectrum of infections including uncomplicated diarrhea, pseudomembranous colitis, and toxic megacolon which can, in some instances, lead to sepsis and even death. Increasing age has been identified as a risk factor for *C. difficile* infection; most individuals with symptoms due to *C. difficile* are older than 60 years of age. It is, therefore, not surprising that this infection also commonly occurs in long term care facilities (LTCFs). One study revealed a prevalence of nursing home-onset CDI of 263,000 cases, resulting in approximately \$2.2 billion in excess costs, and 16,500 deaths annually.

Antibiotic use has been associated with *C. difficile* acquisition. Antibiotics are among the most frequently used drugs in LTCFs, accounting for up to 40% of all systemic drugs prescribed. Surveys of LTCF residents found an antibiotic usage point prevalence of approximately 7%-10%, with antibiotics frequently given for extended periods of time. A substantial portion of the antibiotic use in LTCFs is considered inappropriate; reports indicate that 25% to 75% of systemic antibiotics are prescribed inappropriately. Nicolle et al. suggest that “probably the most important adverse outcome of inappropriate antibiotic use in this high-risk population is the increased opportunities for transmission of resistant organisms to other patients in the LTCF. Long term care residents are more susceptible to antibiotic resistance. Smith et al note that the frequent use of antibiotics in LTCF has led to the selection of a resistant flora, and the proximity of residents and contact between residents and healthcare workers facilitates the spread of these organisms. They further propose that promoting the appropriate use of antibiotics has the potential to limit antibiotic resistance in LTCF, while improving treatment efficacy, minimizing drug-related adverse events and reducing treatment-related costs.

The challenge of evaluating and treating urinary tract infections across the continuum of care

Long term care: Urinary tract infection (UTI) is the most common infection in residents of LTCF, accounting for 32% of infections treated with antibiotics in those settings. Recently published guidelines do not recommend treatment of asymptomatic bacteriuria (ASB) in residents of LTCFs. This is supported by prospective clinical trials that reveal no difference in survival of symptomatic UTI in treated vs. non-treated institutionalized elderly. Despite this recommendation, inappropriate treatment of these residents is not uncommon. In a recent review of two nursing homes, 41% of residents that did not meet the McGeer criteria for symptomatic

UTI were treated with antibiotics. In a study reviewing antibiotic use in chronic care, one third of treated UTI were determined to be asymptomatic bacteriuria. In a hospital based study 32.8% of patients with ASB were treated and in another review 52% of hospitalized patients with asymptomatic catheter-associated bacteriuria were prescribed antibiotics.

Evaluation and treatment of UTIs is a challenge that crosses organizational boundaries. Long term care providers in our current Collaborative have expressed frustration that residents admitted or readmitted from acute care settings received prescriptions for medications including antibiotics, with no clear indication or details about critical factors such as length of treatment. A common situation described was that of a nursing home resident, who presents to the emergency department (ED), receives an evaluation that nearly always includes a urinalysis, and is treated on the basis of a positive test, even in the absence of specific UTI symptoms.

Following up on this concern, we spoke with several ED directors in both community and teaching hospitals and learned there is a clear need for increased collaboration across sites of care. Urinary tract infection is among the top diagnoses annually given in the ED but differentiating UTI from ASB can be challenging. Although ASB in the elderly is a well recognized phenomenon, the transition from this to a UTI may be difficult to define. Interpreting positive urine tests is challenging in the elderly who may present with non-specific symptoms, such as generalized fatigue or change in mental status. Urine testing in elderly patients without specific symptoms can easily lead to inappropriate antibiotic treatment. Many positive cultures in elderly patients with non-focal systemic symptoms are false-positive tests reflecting ASB and not UTIs. Misdiagnosis of UTI based on reagent strip testing before culture results are available has been shown to yield misdiagnosis of UTI in 20%-40% of cases. Given the fact that urinalyses may be performed even when not indicated, it is possible that many older ED patients receive unnecessary antibiotics. Unnecessary antibiotic prescription for ASB may put patients at risk for development of antibiotic resistance and adverse reaction. Recent studies of the older adult population in a variety of settings have demonstrated a high prevalence of antibiotic resistant microorganisms among urinary tract pathogens.

Suboptimal evaluation of UTIs in the ED and hospital impact long term care providers as well. Inappropriate testing and treatment when residents are patients in the hospital setting creates a challenge for providers when the resident returns to the LTCF as they must piece together the rationale for prescribed medications and whether and how to maintain, adjust or discontinue the current regimen. Communication between facilities becomes an essential piece of a successful handoff and review of current therapies. We have the opportunity to work with providers in both types of settings, support improved evaluation and treatment of UTIs, and encourage enhanced strategies for communication at the time of transfer.

Massachusetts is in a unique position to demonstrate the impact of a learning collaborative addressing antibiotic stewardship across the continuum of care. The following sections address the combination of expertise and key relationships that we bring to the work.

Ongoing collaborative relationships

There is a long history of collaboration among key MA healthcare quality stakeholders that will benefit from the proposed work. The MA Coalition for the Prevention of Medical Errors (the Coalition) will be charged by MDPH to lead the work of the proposed Collaborative. The Coalition is a multi-stakeholder membership organization whose mission is to improve patient safety and eliminate medical errors. They have undertaken numerous initiatives in partnership with the MDPH. The Coalition has worked under contract to MDPH on initiatives in infection prevention and antibiotic stewardship targeting practice improvement and the elimination of HAIs with funding from MDPH (2007-2009), reducing *C. difficile* infection hospital-wide and central-line associated blood stream infections in ICUs, through a CDC grant with ARRA funding (2009-2011), statewide program on antibiotics stewardship (2011), and developing partnerships between hospitals and LTCF to reduce CDI, with the MA Senior Care Association and MDPH with CDC funding (2011-2012).

Infection prevention work in MA is enhanced by relationships with a variety of academic experts throughout the state. Physicians and pharmacists from the UMASS Medical School, Hebrew SeniorLife, Brigham and Women's Hospital, Tufts Medical Center, and Baystate Medical Center have served as faculty at a state-wide Acute Care Antibiotic Stewardship Workshop (about 200 participants from more than 45 facilities) 9/2011, and programs for antibiotic stewardship in LTCF in spring 2012 (about 90 Collaborative participants). Finally, active participation in CDC sponsored infection prevention work has led us to develop valuable working relationships with the CDC staff and individuals in other states who are involved in CDC sponsored work. Dr. Arjun Srinivasin joined our faculty for a set of antibiotic stewardship calls in our prior Collaborative, and Dr. Nimalie Stone continues to be a valuable resource, connecting us with people across the country with expertise in long term care infection prevention and antibiotic stewardship. The work described in this proposal has been influenced by conversations with colleagues in TX, NY, CA, VT and NC and relationships developed through participation in CDC sponsored initiatives.

Leveraging partnership initiatives

Through ongoing improvement work in MA, many hospitals have developed collaborative relationships with partner LTCF. Seventy five percent of hospitals in MA are involved in the IHI sponsored STAAR project (State Action on Avoidable Readmissions) with leadership and coordination by the Coalition and the MA Hospital Association. In this initiative, acute care hospitals and LTCFs are working together to improve care coordination and reduce readmissions, through improvements in patient assessment on admission, effective teaching and learning for the patient and supporting caregivers, appropriate handoffs to the next providers of care, and effective post-acute care. MA Senior Care Association plays a leadership role in the INTERACT program, an initiative with the goal to reduce hospital admissions for residents in LTCF. Approximately 200 LTCFs in MA have already received INTERACT training.

We are currently in the final quarter of the MA *C. difficile* Infection Prevention Partnership Collaborative. With this program we leverage the infection prevention expertise of 17 acute care hospitals as they have teamed up with over 70 LTCF throughout the state. A description of this

work is included in the progress report above. Most recently, we conducted a series of antibiotic stewardship programs, which were enthusiastically received.

Through the Partnership Collaborative, we have gained experience and learned many important lessons, both about implementing improvement strategies in long term care, and the challenges of gathering the “team” of long term care participants together for the work. We learned that the work of the pharmacists is dictated by contracts in place, and in many instances additional payment would be required for them to take time outside of their contracted hours. We have since developed relationships with the MA Medical Directors Association (MAMDA), and have begun reaching out directly to management in the largest pharmacy vendors in the state as well as the MA Chapter of the American Society of Consultant Pharmacists (MASCP). These organizations can support communications with important stakeholders. These relationships have already begun to bear fruit; we have been invited to develop and present a long term care antibiotic stewardship session at their combined annual meeting in October, 2012.

The ongoing Partnership Collaborative offers a valuable advantage for the proposed antibiotic stewardship work, in that we will enjoy greater impact by reaching out to current participants. Reducing recruitment efforts allows us to focus our attention on more quickly beginning work with Collaborative improvement teams and materials development.

Expertise in key areas

The team we have assembled for this work offers us valuable expertise in content areas as well as successful experience in conducting quality improvement collaborative and other methods to change practice and provider behavior change. Our core expertise, as detailed below, will be augmented by clinical consultants and an expert stakeholder steering committee. Through our current collaborative work we have developed relationships with hospital and long term care staff in a variety of roles, including long term care physicians, nurse practitioners and consultant pharmacists, and hospital ID physicians, pharmacists, and ID specialists. All have been actively engaged in our work and have expressed enthusiasm for the work ahead. The leadership of the Principal Investigator Alfred DeMaria, Jr., MD has guided our effort both within the Department and with our external partners.

Conducting successful learning collaboratives

The Coalition and MDPH have collaborated on numerous improvement collaboratives. Two such initiatives successfully engaged 90% of hospitals statewide in improving medication reconciliation and communication of critical test results (2002-2005). From 2007-2009, Paula Griswold and Susanne Salem-Schatz led the Coalition’s Infection Prevention educational programs, with sharing among participants, with commitment by acute care hospital leadership for 100% participation. Currently we engage 61 hospitals throughout the state in one or more of our improvement collaboratives.

Our *C. difficile* Prevention Collaborative (2009-2011) brought 27 hospitals together to implement strategies to prevent transmission of hospital-acquired *C. difficile* infection (HA-CDI). By program’s end we achieved a 25% reduction in HA-CDI per 10,000 patient days. This work was recognized this past spring, when it was included in the MMWR Vital Signs:

Preventing *Clostridium difficile* Infections report (3/6/12), and we shared our strategies on the CDC and the Office for State, Tribal, Local and Territorial Support Town Hall teleconference titled: Making Healthcare Safer: Stopping *Clostridium difficile* Infections held on 3/13/12. The *C. difficile* Prevention Partnership Collaborative, described above, brings together 17 acute care hospitals and 70 LTCF for cross continuum *C. difficile* prevention. This work has expanded our portfolio into long term care infection prevention and provided important lessons we bring to the proposed work.

Quality improvement in Long Term Care Facilities (LTCF)

During the past year, the MA Coalition for the Prevention of Medical Errors has been working in close partnership with the MA Senior Care Association on our *C. difficile* Prevention Partnership Collaborative, gaining valuable knowledge about approaches to engaging LTCF teams in quality improvement and infection prevention. Additionally MA Senior Care Association engages its member organizations in numerous quality improvement initiatives, including, Advancing Excellence, a nationwide campaign to improve the quality of care for nursing facility residents. Sixty per cent of the state's nursing facilities have signed on to the campaign. They lead the Interventions to Reduce Acute Care Transfers program (INTERACT), to improve care transitions from hospital to nursing facility and nursing facility to home and play an active partnership in the IHI's STAAR program (detailed above). Many MA skilled nursing facilities are currently participating on these cross continuum care teams, and MA Senior Care is a key partner in promoting effective coordination across the continuum of care.

Antibiotic Stewardship

Our initial acute care CDI Prevention Collaborative included programming on antibiotic stewardship for hospitals, with experts from Tufts Medical Center, along with Dr. Arjun Srinivasin from the CDC. The state-wide acute care antibiotic stewardship program was co-lead by MDPH and the MA Coalition for the Prevention of Medical Errors. This program consisted of a series of conference calls including assigned pre-conference readings, and a full day conference attended by almost 200 participants, fostering new relationships with experts in microbiology, pharmacy and IT.

Antibiotic Stewardship in Long Term Care

Our current Collaborative programming in antibiotic stewardship in LTCF has put us on a path for success in future work. We have worked closely with both academic experts as well as providers in the field and are developing a clear understanding of high leverage topics for change. Experts with experience in long term care antibiotic stewardship who will serve as advisors or consultants to the proposed work, Ruth Kandel, MD (Assistant professor, Harvard Medical School and Infection Control Director, Hebrew Rehabilitation Center), Shira Doron, MD (Assistant Professor of Medicine, Division of Geographic Medicine and Infectious Diseases, Tufts Medical Center), Terrance O'Malley (Medical Director Partners Health Care System, Inc) and David Goldwater, RPh (Partners Pharmacy).

Organization development strategies form front line engagement and empowerment

Sharon Benjamin, PhD has been working with us for the past four years as valuable member of our infection prevention collaborative faculty. Her expertise in innovative approaches to front

line engagement for quality improvement (such as Positive Deviance) has led to more effective engagement of front line staff in the work of the collaborative, and greater behavior change in infection prevention practices.

Strategies for changing physician behavior including prescribing

Prior to her consulting practice in quality improvement and program evaluation, Collaborative Director, Susanne Salem-Schatz, ScD., held research positions in academic institutions and health care delivery systems with a focus on strategies for changing provider behavior. We are confident that the combination of our partner relationships and our experience in developing and supporting infection prevention collaboratives, augmented by expertise in organizational learning, prescribing in long term care, and physician behavior change place us in an excellent position to design and lead the work laid out as Activity D.1.B in the current proposal.

Proposed Program Overview

We propose a multifaceted, cross-facility program to improve decision-making in the evaluation and treatment of UTIs in hospital EDs and LTCFs, and to enhance communication as patients are transferred from long term care to hospital and back. In addition to education and training, we will create tools to facilitate decision-making and to address barriers to practice change. For example a set of patient and family/resident brochures will be developed to facilitate conversations on the risks of overusing antibiotics in response to the challenge of patient/resident and family pressure to prescribe.

1) Operational Plan (8/1/12-7/31/13)

Activity 1: Leveraging Existing Relationships for a Statewide Collaborative

In the Background Section we described important collaborative relationships that position us for successful implementation of the proposed work. Core partners include the MA Coalition for the Prevention of Medical Errors, MA Senior Care Association, and Masspro (the Massachusetts QIO). By including permanent staff from a variety of organizations we are building capacity for the future, by training these individuals in our organizational changes and improvement approaches. We are purposefully coordinating the numerous improvement initiatives in which many MA facilities are participating. Our goal is to leverage these opportunities, and to avoid unnecessary effort or conflicts for program participants. Relationships previously developed with clinical experts in infection prevention (IP) and antibiotic stewardship ensure that our program will have optimal clinical content and the backing of respected professionals.

To ensure that participating facilities have capacity for this work, we will outline a set of expectations and require that hospital STAAR leaders and LTCF administrators agree to a core set of participation and measurement conditions. By focusing participation in the proposed project on those facilities engaged in our current CDI Prevention Partnership Collaborative, we begin with a base of trust and respect between acute care hospitals and LTCFs, facility based teams with a foundation in IP and quality improvement, and energized participants who value the expertise and support they received from experts and their colleagues in the prior collaborative. Additionally, incorporating STAAR team members facilitates the effort to improve inter-facility communication.

Finally, participants in our recent stewardship workshop asked specifically for mass-media campaigns in their communities. Increased awareness will facilitate conversations about why antibiotics may not always be the answer. Project staff will work with communications staff at CDC, MDPH, the Massachusetts Hospital Association and hospitals to develop a strategy for publicizing the issue, for instance through newsletters and articles in local newspapers

Activity 2: Content and Curriculum Development

We will target our content on evaluation and treatment of suspected UTIs, including decisions about when to order tests, urine collection technique, interpreting test results given presenting symptoms, and determining appropriate antibiotic prescribing (including medication choice and duration). We will expand the curriculum to other issues as they impact this topic, for instance, evaluation of change in mental status, or unnecessary routine cultures in catheterized residents. There has already been substantial work done in this area, which our project will utilize. A team of clinical consultants, described in the Background section, will support the development of program content. Working closely with these experts, our current plan is to create several stand-alone presentation slide decks targeting LTCF staff, LTCF providers and pharmacists, and ED physicians and nurses.

Decision Support and Educational Materials

Targeted decision support tools and brief persuasive educational brochures will be developed and shared with providers and staff in participating facilities. To ensure that our educational materials address both clinical and non-clinical influences on testing and antibiotic prescribing decisions, we will conduct key stakeholder interviews to better understand the range of beliefs and concerns. This information will be addressed directly in our materials, and later in our training. Recent studies suggest educational interventions, including diagnostic and treatment algorithms help minimize inappropriate treatment of ASB and are well received. For our current Collaborative we identified a tool to support decision-making about testing and treating suspected UTI called SBAR (Texas A&M, 2011:

http://www.macoalition.org/Initiatives/cdifficile_infections/antibiotic_stewardship/may2012/SBAR%20UTI%20%204%2027%2012.doc).

We will adapt this based on pilot testing, currently underway.

LTCF staff frequently received pressure from families to “treat a UTI” when the resident experiences non-specific symptoms, such as fatigue or a change in mental status. To support nursing staff, we introduced a tool developed by faculty from the Center for Studies in Long Term Care at the University of North Carolina. This brochure has many of the features of persuasive communication we described above, and will be our starting point for materials for residents and families. We will create a similar brochure for use in EDs.

In addition to the presentation slide decks that will be used at workshops and on webinars, we will create “detailing sheets,” brief graphic educational sheets (usually color, 2-sided) to support practice change in both hospital and long term care settings. We have heard from hospital ED physicians that beginning with a brief and powerful educational session is best for that setting, and these tools will support these and enhance the effectiveness of these sessions.

Building on our work to prevent hospital readmissions, we will work with cross-facility teams from the STAAR collaborative to enhance communication at the time of patient / resident transfer. Tools (both paper forms and electronic) are currently being developed and tested that will become mandatory in the next two years. We will encourage hospital and LTCF teams to work with or adapt their current transfer tools, incorporating the elements on the CDC transfer form. We will recommend that the following medication information be included: indication, dose, date and time of last dose, potential adverse effects, a pre-admission medication list, and a current active medication list, culture results and time of last dose taken. We will encourage cross-facility teams to create or clarify specific processes for verbal communication between facilities before and after the transfer.

Train the Trainer education sessions will be held with nursing and physician leadership and nurse educators from the participating LTCFs and acute care hospitals, who will then be encouraged to educate staff at their facility, using tools and materials provided by the collaborative. We will supplement this with conference calls and webinars. Webinars will be available for individual viewing after the live presentation.

Activity 3: Innovative Practice Improvement Methods

The methodology for this work will be an augmented learning collaborative building on hospital/LTCF partnerships developed through our current Partnership CDI Prevention Collaborative. In addition to topic specific learning events (workshops, site visits, conference calls), we will employ innovative strategies to support front line engagement such as training and real-time practice using action research, simple ethnography tools that provide the opportunity for learning about behaviors through skilled observation, and Positive Deviance among other emergent strategies. Key features of Academic Detailing will also be employed, such as background assessment of provider motivation for current prescribing practice and barriers to change, and the preparation of graphically appealing information and tools to support desired changes in practice.

Participating teams will be multidisciplinary by design. We will include a concerted focus on building relationships by encouraging meetings and discussion across facility partners (hospital and long term care participants). We will emphasize the use of program theory and quality improvement techniques. We will create opportunities for shared learning to supplement expert presentations. Encouraging teams to establish aims, monitor measures for improvement and use small tests of change prior to facility wide- implementation may no longer be considered “innovative”, but are the foundation on which successful of improvement initiatives are built.

Our program will include a multidisciplinary advisory group representing hospital and long term care providers comprised of physicians, nurse practitioners, nursing, pharmacy, infection control, microbiology and infectious disease physicians, and acute care hospital/LTCF partnerships. We will conduct two central learning sessions (October 2012, June 2013) with opportunities for shared learning among peers. We will include exercises to promote front line engagement, using a train the trainer approach through modeling behavior. We will provide training materials and tools, coaching for spread and sustainability, four webinars, four coaching and shared learning conference calls, and two regional ½ day workshops. We will report progress and results.

Activity 4: Dissemination/Spread of the Collaborative Lessons and Resources.

The Coalition and MDPH will post on their public websites the strategies, tools, and other resources developed by the project faculty, and revised based on the experience of the Collaborative participants, in order to share these resources broadly beyond the Collaborative members. Close coordination with the STAAR and INTERACT programs enhances spread through these two existing networks within Massachusetts and beyond.

Activity 5: Enhance the existing capacity for supporting multi-facility collaborative learning and to enhance overall capacity for HAI surveillance.

The epidemiologist will:

- serve as a primary liaison to the antibiotic stewardship collaborative on issues related to surveillance, data collection analysis and reporting under the direction of the State Epidemiologist and working as a member of the HAI Program.
- be responsible for assessing automated data capabilities of hospitals, LTCFs, laboratories and pharmacy vendors, creating interactive reporting forms in excel.
- provide ongoing consultative support for new collaborative participants on standardized data collection methodology.
- assess completeness, timeliness and accuracy of reported data.
- produce and disseminate individual data reports for prevention collaborative participants and de-identified aggregate report for the HAI Program, the TAG.
- provide ongoing analysis and evaluation of the performance data.
- present findings including potential barriers to reporting at meetings and conferences and assist in the evaluation of the prevention activity.
- attend monthly HAI Leadership and quarterly HAI TAG meetings as directed.
- participate in monthly state user NHSN calls.

Activities Timeline (8/1/12 – 7/31/13)

Objective/Activities	Timeframe	Staff Responsible
Launch advisory committee	8/2012	Coalition & Partners
Strategic planning for antibiotic stewardship collaborative	8/2012	Coalition; MA Senior Care Assoc. Coordinator; Multi-stakeholder advisory committee, HAI Coordinator clinical consultants
Recruit hospital / long term care clusters • Begin with current participants • Establish expectations for participation, measurement & reporting	8/2012-9/2012	Coalition; MA Senior Care Assoc. Coordinator; ID physician, pharmacist, Long term care (LTC) IP
Conduct key stakeholder interviews to understand motivations for current practice and inform strategies for training & education	9/2012-10/2012	Program director Organization development consultant Clinical consultants
Design presentation slide decks to be used in a) real time webinars, b) on-demand webinar, c) do it	8/2012-10/2012	Clinical consultants Advisory Group

yourself guides for leaders in ED and long term care • Long term care providers & staff • ED physicians and nurses		
Develop brief educational brochures • Employ academic detailing principles in design • Create a “users guide” for do-it-yourself training within facilities	8/2012-11/2012	Program director Clinical consultants Organizational consultant Advisory group
Develop measurement and reporting tool	8/2012-10/2012	MDPH epidemiologist Advisory Group
Assess automated data and reporting capabilities of participating facilities	8/10/2012-9/2012	Program director MDPH epidemiologist Clinical consultants
Provide measurement support to facilities for data collection and reporting • Phone consultation	9/2012 and ongoing	MDPH epidemiologist
Create data reports and feed back to participating organizations	12/2012-7/2013	Coalition, Mass Senior Care, MDPH epidemiologist
Conduct four learning ,sharing, and coaching calls conference calls • Kickoff call • Learning and sharing • Just in time coaching • Ask the expert	10/2012 - through 7/2013 tbd	Coalition Program director Clinical consultants Others as appropriate for call topic
Conduct full day LTCF/Hospital partnership kickoff and closing learning sessions • Focus on clinical evidence, alternative strategies • Train the trainer approach using principles of adult education and adaptive change strategies • Combine didactic and adaptive behavior change content • Group learning and sharing • Separate track for STAAR leads on communication across facilities led by Coalition Executive Director	Early 11/2012 Late 6/2013	Coalition Advisory Group Clinical consultants Org. development consultant
Conduct four didactic webinars • Topics include clinical/technical plus adaptive behavior change strategies • Phone access for audio only • July program open for statewide participation • Webinars available for later viewing • Final webinar open statewide	11/2012 7/2013	Coalition Advisory Group HAI Coordinator Clinical Consultants
Conduct one round of ½ day regional workshops (total of 2)	3/2013	Coalition Advisory Group Clinical Consultants
Coordinate with fall and spring October STAAR	10/2012	Coalition Executive Director

meeting for a session on improved communication for antibiotic stewardship	4/2013	Mass. Senior Care Foundation
On-going review and evaluation of collaborative progress - Quarterly meetings - Follow up calls with facility leads	8/2012 and ongoing	Coalition Advisory Group
Analyze program data	Throughout 5/2012-7/2013	MDPH epidemiologist Statistician
Post on website materials developed in the Collaborative and MDPH,	11/2012-7/2013	Coalition
Coordination with INTERACT: update tools on INTERACT site as appropriate	9/2012 - 7/2013	Coalition, MDPH, Mass. Senior Care Association

2) Monitoring and Evaluation

Measurement for improvement. This program will collect and display data for conducting small tests of change, and assess impact locally over time. Measures for improvement will be linked to the specific changes a facility team is making.

We will sample resident or patient records to evaluate changes in appropriate testing and prescribing decisions compared with existing guidelines or facility protocols. Additional internal measures will include the following if data are readily available or if facilities are able to resource the data collection: Urine tests ordered in EDs when only sign or symptom is change in mental status or generalized fatigue; antibiotics prescribed in the ED when only sign or symptom is change in mental status or generalized fatigue; urine tests ordered in LTCF when only sign or symptom is change in mental status or generalized fatigue; antibiotics regimens prescribed in LTCF when only symptom is change in mental status or generalized fatigue; use of SBAR decision making tool in LTCF; test ordering and treatment decisions in LTCF consistent with updated Loeb criteria as documented in the SBAR tool.

Measuring CDI Rates over time. LTCF participating in our current Collaborative have been using a custom Excel spreadsheet for data entry that automatically generates charts and graphs so they can monitor their work over time. CDIs are identified and categorized using the CDC-NHSN lab ID definition. Rates are calculated as cases/10,000 patient days. Of 70 participating LTCF, approximately 36% are successfully submitting data. We will work directly with the remaining facilities to increase that percentage. We will also monitor “days between” index events and revise our data collection tool to incorporate this metric for the proposed project. The following table lists the process and outcome measures we propose to use for our program. In addition to these process and outcome measures we will encourage facility teams to develop measures for improvement.

Table of Process and Outcome Measures			
Measure	Definition	Numerator	Denominator
PROGRAM PROCESS MEASURES			
Collaborative Participation	Number of facilities engaged in collaborative	# Participating facilities	NA

		# Hosp /LTCF clusters # Hosp/ED participants # LTCF participants	
Implementation assessment: engagement	Number of facilities participating in a meaningful percentage of content / event opportunities* Number of teams establishing regular meetings to discuss the work (or including it on regular agenda) Number of teams holding one or more cross-facility meetings Average number of clinicians participating in Collaborative activities <i>*some providers may for instance, choose to stream webinars after the live presentation.</i>	# Participating teams attending 80% or more of content opportunities # Of teams with regular meetings or agenda items # Of teams having one or more cross-facility meetings # Of MDs/NPs/PAs participating in one or more activities	Number of LTC /ED facilities # MD/NP/PA per facility
Implementation: modules	Percentage of facilities implementing key recommendations and adopting Collaborative tools	# Facilities: -holding education sessions -adopting UTI testing protocols -reviewing status at regular meetings -using decision support tools -using patient/resident/family brochures	Total # of teams
Knowledge and Attitude and perceived behavior change	Has knowledge about the issues around evaluation of suspected UTI changed over course of the project? Has ED physician perception of long term care providers changed? % change based on responses to knowledge and attitude questions in pre-post survey	# correct responses post-pre	# correct responses pre
OUTCOME MEASURES: LONG TERM CARE FACILITIES Long term care facilities goals are to reduce testing, increase appropriate evaluation of UTIs, decrease antibiotic use and improve choice of antibiotics based on urine culture and sensitivity			
Decreased laboratory tests for UTI evaluation	Decreased ordering of urinalysis (UA) Decreased ordering of urine cultures	# of UA per month	Resident days per month

Decreased use of antibiotics	Percentage reduction in antibiotic use -antibiotics most frequently used for UTI -antibiotics	Antibiotic use per month	Resident days per month
Reduced hospital admissions	Hospital admissions for UTI diagnosis over time	# hospital transfers per month	Resident days per month
Change in CDI Rate in LTCFs	Comparison of facility- acquired CDI rates during baseline and program periods	Monthly CDI cases per the NHSN lab ID definition	10,000 resident/patient days
Balancing measures Change in occurrence of sepsis, pyelonephritis, or death	Occurrences of sepsis, pyelonephritis	Cases per month	Resident days per month
Change in mortality	Mortality rates over time	Deaths	
Change in hospital admissions	Hospital admissions over time	Monthly admissions	
OUTCOME MEASURES: EMERGENCY DEPARTMENT			
Decrease inappropriate prescribing	Percentage of elderly patients receiving antibiotics for suspected UTI whose Culture & Sensitivities show no growth.	# elderly patients with antibiotics for urinary tract with eventual negative culture	# elderly patients receiving antibiotics for urinary tract
Improved choice of antibiotic	Proportion of all antibiotic regimens given for urine that contained one of the first line agents recommended by IDSA guidelines for uncomplicated UTI	# antibiotic regimens including recommended agents	Antibiotic regimens for UTI
Balancing measures Occurrence of sepsis, pyelonephritis, or death	Number of ED visitors released to LTCF with sepsis or pyelonephritis, or death	# of patients discharged to home LTCF with no antibiotic who experience sepsis, pyelonephritis or death within seven days of ED visit.	NA

Performance Measures The following table summarizes the performance measures, activities, timeframe, baseline and targets.

Activity	Performance Measures	Timeframe	Baseline	Target
Recruit hospital / long term care clusters	Number of participating hospitals and LTCF	8/2012-9/2012	Some Progress; targeting current Collaborative participants	12 hospitals 24 LTCF

Conduct 2 day LTCF/Hospital partnership learning sessions; 4 learning, sharing, and coaching conference calls, 4 didactic webinars and 2 half day regional workshops.	Number of learning sessions, conference calls, webinars and workshops completed and made publically available	8/2012-7/2013	No Progress intervention not started	100% completion
Decreased use of antibiotics in LTCF	Percentage reduction in antibiotic use per month/resident days per month	10/2012-7/2013	No Progress intervention not started	10% reduction
Sustain HAI prevention infrastructure	Maintenance of the HAI prevention collaborative epidemiologist position	8/1/12-7/31/13	Staff epidemiologist firmly established with in the HAI and epidemiology program	Continuation of HAI prevention collaborative epidemiologist position
Develop the methodology, measurement and reporting tool for collaborative participants	Excel based measurement and reporting tool disseminated to collaborative participants	8/2012-10/2012	Activity has not been established	Completed 10/2012
Serve as the primary contact for the collection, analysis and reporting for prevention collaborative participants.	Consultative support for participants to promote complete, accurate and timely reporting Reported data will be analyzed, reviewed with senior epidemiologist staff and written reports prepared	8/1/12-7/31/13 8/1/12-7/31/13	Activity has not been established Activity has not been established	Completed 7/31/13 Completed 7/31/13

2. Vaccine Effectiveness

A. Meningococcal Conjugate Vaccine (D.2.A)

1) Objectives and Operational Plan

MDPH staff from the public health laboratory, the Epidemiology Program and ISIS, in collaboration with local health departments, will continue to aggressively identify and investigate

suspect and confirmed cases of IMD, enter data into MAVEN on cases and confirm, serotype and forward isolates. MDPH staff have established and maintained a relationship with hospital infection preventionists, emergency departments and laboratorians and frequently stress the importance of early reporting of not only confirmed IMD cases but suspect cases as well. MDPH will use contractual mechanisms to perform this work to avoid delays in the continuation of these efforts due to hiring limitations. Contractors are already in place.

Staff will:

- identify all cases of IMD in Massachusetts.
- ensure all isolates are sent to the HSLI.
- confirm and serogroup all submitted isolates.
- contact for enrollment all reported cases of confirmed IMD due to vaccine serogroup *N. meningitidis* in persons aged ≥ 11 years and born after 1/1/86.
- contact for enrollment four appropriate age-matched controls per eligible case.
- submit all IMD isolates to CDC for serogroup confirmation through the HSLI.
- complete case investigations to determine demographic information, clinical presentation and outcome, vaccination status, type of vaccine for all cases of IMD, and vaccination status, type of vaccine, and date of vaccination for controls enrolled in the investigation and described in the protocol.
- make use of the newly developed MA Immunization Information System to verify immunization status when information is available.
- participate in conference calls and trainings as scheduled.
- submit collected information to CDC as required.
- check data accuracy and completeness by coordinating information obtained by the epidemiologist investigating the case and the MDPH coordinator for this project.

The project protocols have been in place and followed since 2006 when Massachusetts became a MeningNet site. Staff had been assigned to the project as time had allowed until 9/1/09 when ARRA funds provided funding for a dedicated project coordinator.

Activities Timeline (8/1/12-7/31/13):

MDPH will submit the following data to CDC in a form and on a timeline as requested:

- Number of cases of meningococcal disease identified, number and percentage of cases enrolled, number and percentage of controls enrolled and number of complete case/control sets enrolled.

In addition to the above data, such reports will include:

- progress toward successful enrollment of cases and controls which are pending and not yet completed and estimated time of completion.
- barriers encountered toward enrollment of eligible cases.
- barriers encountered in identifying control, and
- conference calls and trainings attended.

1) Monitoring and Evaluation

- Case contact: Timeline: 8/1/12-7/31/13. Baseline: 100% Target: 100% of all eligible cases are contacted regarding the evaluation.
- Case enrollment. Timeline: 8/1/12-7/31/13. Baseline: 100% Target: Attempts are made to enroll 100% of individuals eligible for inclusion in the project.
- Submission of isolates to HSLI. Timeline: 8/1/12-7/31/13. Baseline: 100% Target: 100%.
- Submission of isolates on enrolled cases to CDC. Timeline: 8/1/12-7/31/13. Baseline: 100% Target: 100%.
- Conference calls and trainings attended. Timeline: 8/1/12-7/31/13. Baseline: 100% Target: 100% of all eligible cases are contacted regarding the evaluation.
- Provision of information to CDC. Timeline: 8/1/12-7/31/13. Baseline: 100% Target: 100% of all the following requested information is sent to CDC as requested:
 - # of cases of IMD identified
 - % of cases enrolled
 - % of controls enrolled
 - # of complete case/control sets enrolled

D. Enhanced Measles Surveillance Evaluation (D.2.D) (NEW ACTIVITY)

Background, Current Capacity, Need and Understanding

Twenty-four cases of measles were confirmed in MA in 2011, following a median of two cases per year during the 10 years prior. In 2011, an additional 103 suspect cases with rash illness were also investigated and eventually ruled out. This increased morbidity was in the context of a major international outbreak and the largest number of cases in the US in 15 years. Each of these suspect and confirmed cases requires extensive and rapid follow-up by a team of eight epidemiologists in conjunction with local partners to ensure that appropriate specimen submission and testing occurs, to obtain important epidemiologic data, and to promptly initiate control measures.

The intensive follow-up involved in measles case investigation is extremely draining on limited human resources, and diverts attention from other important public health matters. Hundreds of people were identified as contacts to measles cases in 2011 and were contacted individually to determine susceptibility and provide recommendations for control. This resulted in quarantining dozens of exposed susceptible individuals, lost days of work and school due to quarantine, hundreds of exposed people contacting providers for immunity testing and vaccination, and dozens of people receiving immune globulin post-exposure. It is difficult to know whether the benefits of our sustained, comprehensive response outweigh the costs. This raises questions about the most efficient and effective use of public health resource, about the parameters we use for defining those exposed to measles, and about the effectiveness of our interventions.

MDPH requests funding for epidemiologic and laboratory support to enhance measles surveillance, reporting and control in MA, and to review previously-investigated cases from 2011, thereby adding to the knowledge of the US measles surveillance program and improving data completeness. Given the current international trends in measles epidemiology we believe it is particularly imperative that key questions concerning our measles response be addressed.

MDPH proposes to hire a contract epidemiologist who will be specifically charged with conducting detailed follow-up of new suspect cases, and a review of past cases. In cooperation with CDC, MDPH will identify a set of key questions to be addressed in this retrospective and prospective investigation. Additional partners include:

- Integrated Surveillance and Informatics Services (ISIS) at MDPH, which oversees surveillance activities and informatics resources for the Division of Epidemiology and Immunization and enhances and optimizes the collection and distribution of communicable disease surveillance data. ISIS also develops, deploys and maintains MAVEN (Massachusetts Virtual Epidemiology Network or MAVEN) and ELR efforts.
- The Hinton State Laboratory Institute (HSLI) which conducts culture, PCR and serologic testing for measles.
- Local boards of health (LBOH), which are closely involved in surveillance, reporting and control of measles. There are 351 local boards of health in MA. Two hundred fifty of the 351 use MAVEN. There are approximately 500 individual MAVEN users.

1) Objectives and Operational Plan

Objectives: Collect complete information for routine case investigation including date of birth, vaccination dates, exposure history, and rash onset date. Conduct detailed investigation of all contacts, identifying information such as dates, locations and settings of exposures, vaccination dates, dates of birth, dates and types of post-exposure prophylaxis (MMR or IG) and history of any symptoms. Collect serology and viral specimens for all prospective cases.

- MDPH will hire a part-time contract epidemiologist (“Measles Coordinator”) to conduct detailed investigations of all prospective suspect cases of measles, in collaboration with other MDPH epidemiologists and local health staff, consistent with CDC guidance and performance measures.
- MDPH, in partnership with CDC and additional grantees, will identify a set of key questions for the retrospective and prospective investigations, and develop an official data collection tool for confirmed measles cases and their contacts. Examples of information to be collected for contacts include: duration of exposure, proximity to case, detailed description of setting, vaccination status, age and country of birth, symptoms, occupation, quarantine requirements and post-exposure vaccine, IG or titers.
- The Measles Coordinator will participate in all calls and all pertinent information will be relayed to the other epidemiologists and LBOH nurses who conduct measles investigations.
- MDPH epidemiologists and the Measles Coordinator will utilize the MDPH surveillance system, MAVEN, to monitor the routine surveillance reports for measles, ensuring immediate response and systematic case investigation and follow-up.
- MAVEN allows the collection of complete information on the clinical course of infection, vaccination history (e.g., dates, lot numbers and manufacturers), and other epidemiologic information of interest. MDPH staff will standardize and document barriers and challenges associated with data completion for each case investigation within MAVEN.

- MDPH epidemiologists and the Measles Coordinator will be responsible for data analysis and the communication of findings to CDC, LBOHs, and clinicians.
- MDPH will provide comprehensive guidance to medical providers and LBOHs for measles investigations.
- Laboratory testing of measles specimens via serologic testing, PCR and culture will be performed at the HSLI, with MDPH epidemiologists and/or the Measles Coordinator requesting viable specimens for measles testing at HSLI for all suspect measles events under investigation as well as any symptomatic contacts identified as part of enhanced surveillance efforts. Specimens will be forwarded to CDC for confirmation and additional testing as necessary.
- The Measles Coordinator will conduct a detailed review of 2011 confirmed cases, with a focus on investigation and description of close contacts and other contacts for whom exposure can be quantified retrospectively.
- The MDPH Immunization Program is currently rolling out a new immunization registry. Once fully functional, this new tool will enable MDPH to obtain and/or verify vaccine history by linking immunization registry data with measles surveillance data. Until the registry is fully implemented, we will use it whenever possible but will continue to acquire vaccine information directly from providers in most cases.

Activities Timeline

- Hire the contractor within six weeks of funding becoming available to program.
- Design and implement an enhanced data collection tool for comprehensive measles investigation within one month of Measles Coordinator hire.
- Complete training of the Measles Coordinator within two months of hire.
- The Measles Coordinator will review individual case information on a biweekly basis to assess data completion and actively provide follow-up for missing data fields.
- On a monthly basis, the Measles Coordinator will evaluate aggregate program performance for completeness of case information.
- Initiate retrospective case review within three months of hire, 2012 measles morbidity permitting.
- All specimens submitted to HSLI will be tested as soon as possible. All positive results will be communicated by an MDPH epidemiologist or trained local health professional within 24 hours of the result being finalized, to CDC and the LBOH.

2) Monitoring and Evaluation

Performance Measures – For all performance measures, progress will be evaluated using the range of “No progress” to “Completed,” as recommended by CDC.

- Measles coordinator will be hired. Timeline: by 10/1/12 Baseline: new activity – N/A Target: Measles coordinator is hired.
- Development of data collection tool. Timeline: by 11/16/12. Baseline: N/A. Target: The tool will be developed and ready for use.

- MAVEN training for Measles Coordinator. Timeline: by 11/1/12 Baseline: New activity, N/A, Target: Measles coordinator will complete MAVEN Proficiency Training.
- CDC required metrics will be obtained, and barriers to data collection and completion will be documented where applicable.
 - Case investigation data will be 90% complete for 10 key variables within 30 days of each suspect case reported for all new measles cases. Baseline: 77% complete in 2011 (preliminary data).
 - Contact investigation data will be 85% complete for high-priority variables (to be determined) for each identified close contact within one month of identification of contact. Baseline: N/A
 - Number and types of contacts will be determined for:
 - Household contacts
 - Employment contacts
 - Medical facility contacts
 - Miscellaneous contacts
- Laboratory testing of measles specimens will be obtained for 90% of suspect cases:
 - Serologic testing of measles specimens will be performed at the HSLI for 90% of suspect cases.
 - Specimens for virus isolation and PCR will be obtained for testing at the HSLI in 80% of suspect cases.
 - Eighty-five of virus isolation and PCR specimens processed at HSLI will meet submission criteria. Baseline: 79% met submission criteria in 2011 (21% of specimens for virus isolation were discarded in 2011 because they were dry, contaminated, or otherwise unsuitable for testing).
 - Measles PCR and serology results will be available within two business days of receipt of specimen at HSLI. Baseline: 2-3 business days in 2011.
- Retrospective case review for each confirmed 2011 measles case will be conducted.
 - Proportion of case investigation data complete for 10 key variables: 85% complete within six months of initiation of retrospective case review. It is assumed that due to international travel and moves out of this area that a few cases may be lost to follow up. Baseline: 77% complete in 2011 (preliminary data).
 - Proportion of information complete for each identified close contact: 75% of key variables (to be determined) will be obtained retrospectively for each close contact. Baseline: N/A.
 - Proportion of retrospective cases with documentation of data collection barriers and challenges: barriers and challenges will be documented for 90% of retrospective cases investigated within one month of re-opening investigation.

SECTION B:
CONTINUATION OF FY 2012 ELC PROGRAM COMPONENTS ACTIVITIES

ATTACHMENT 1

NATIONAL ELECTRONIC DISEASE SURVEILLANCE SYSTEM (NEDSS)

Operational Plan

Both MAVEN and ELR infrastructure are currently operational, were developed using PHIN guidelines and are fully interoperable. The objectives outlined are in various stages of implementation and sustained funding to support these efforts is critical to their success.

Massachusetts agrees to continue to participate with CDC and its public health partners in NEDSS- related planning and development, to brief key partners in our progress of implementation, and to collaborate with CDC in the planning, design and execution of all phases and aspects of these projects.

Activity 1: NEDSS Personnel Infrastructure

Currently, two FTEs are partially funded on this Cooperative Agreement (split funded with the PHEP Cooperative Agreement). The NEDSS Project Manager and NEDSS Lead will provide ongoing support for the implementation and continued enhancement of MAVEN and ELR. The NEDSS Project Manager will also provide technical oversight of the deployment of MAVEN at LBOHs.

Activity 2: Meeting Program Objectives

- a) Develop, acquire or purchase interoperable public health surveillance systems that adhere to NEDSS and PHIN specifications and requirements

Objective 1: Maintain and enhance MAVEN to ensure surveillance and case management needs of the BID programmatic areas and local boards of health (LBOH) are met.

Staff will:

- Continue to make enhancements and upgrades to MAVEN for use at the state and in LBOHs in a timely manner.
- Upgrade technical infrastructure to ensure MAVEN performance issues are resolved.
- Convert specific functionality within MAVEN to address performance issues.
- Continue to enhance MAVEN for use by the Division of STD Prevention.
- Begin requirements gathering to enhance MAVEN for use by HIV Surveillance.
- Develop plan to assess co-morbidity.
- Begin development of MAVEN evaluation plan.

Year 1 (1/1/12-12/31/12):

- By 3/30/12, MAVEN will be upgraded to be hosted in a clustering environment, thus improving system performance.
- By 6/30/12, the STD module will be fully deployed and the Division of STD Prevention will utilize MAVEN for their surveillance and case management needs.
- By 12/31/12, all appropriate workflows will be converted to improve system performance.

Years 2-5 (1/1/13-12/31/16):

By 6/30/13, document management functionality will be deployed. Plans to conduct comprehensive evaluation of MAVEN will be complete; these will include evaluation of timeliness and completeness of case reports to both BID and to the CDC, and an assessment of co-morbidity. By 12/31/13, HIV Surveillance will utilize MAVEN. By 12/31/14, comprehensive evaluation of case reports is complete as will a comprehensive evaluation of co-morbidity.

- b) Ensure standards-based electronic exchange of laboratory results (ELR) between clinical laboratories and public health surveillance systems.

Objective 2: Continue implementation of electronic laboratory reporting (ELR) efforts.

Staff will:

- Continue to work with CDC to assess implementation of ELR.
- Continue to facilitate implementation of ELR by national and clinical laboratories.
- Ensure mapping interface is current with preferred LOINC and SNOMEDs.
- Perform quality assurance to ensure data are timely and accurate.
- Implement HL7 2.5.1 messaging between the ELR data store and MAVEN.

Year 1 (1/1/12-12/31/12):

- By 6/30/12, messaging between the ELR data store and MAVEN is converted to HL7 2.5.1.
- By 12/31/12, all clinical laboratories in Massachusetts will report via ELR.
- By 12/31/12, two additional national laboratories report via ELR.
- Quality assurance reports are sent monthly and quarterly.

Years 2-5 (1/1/13-12/31/16):

By 12/31/13, remaining high volume national laboratories report via ELR and quality assurance reports are sent monthly and quarterly.

- c) Ensure standards-based electronic exchange of laboratory results between public health laboratories and public health surveillance systems.

Objective 3: Continue implementation of electronic laboratory reporting (ELR) efforts by Hinton State Laboratory Institute (HSLI).

Staff will:

- Continue to facilitate implementation of ELR by the HSLI as new laboratory information systems (SLIS) are deployed.
- Ensure mapping interface is current with preferred LOINC and SNOMEDs.

- Perform quality assurance to ensure data are timely and accurate.

Year 1 (1/1/12-12/31/12):

- By 3/30/12, reference laboratory sends results via ELR.
- By 12/31/12, viral serology laboratory sends results via ELR.
- Quality assurance reports are sent monthly and quarterly.

Years 2-5 (1/1/13-12/31/16):

Quality assurance reports are sent monthly and quarterly.

- d) Establish standards-based electronic exchange of surveillance data between local health departments and state health departments or between different surveillance systems.

Objective 4: *Continue deployment of MAVEN at local boards of health (LBOH) and ensure data exchange with the City of Boston Surveillance System (BoSS).*

Staff will:

- Continue deployment of MAVEN at the local level.
- Continue to work with the BPHC to ensure appropriate data exchange with MAVEN.

Year 1 (1/1/12-12/31/12):

- By 06/30/12, a road map for data exchange with BoSS is established.
- By 12/31/12, 95% of LBOHs utilize MAVEN.

Years 2-5 (1/1/13-12/31/16):

Will assess barriers to MAVEN deployment at remaining LBOHs, identify additional locally-based surveillance and case management MAVEN enhancements and document business requirements and develop and implement new MAVEN functionality.

- e) Establish standards-based electronic exchange of nationally notifiable disease reports between state health departments and the CDC.

Objective 5: *Utilize PHIN-MS to send nationally notifiable disease reports to CDC.*

Staff will:

- Work with CDC to implement PHIN-MS utilizing the PHIN Case and Public Health Report Message Mapping Guides.
- Utilize legacy methods of messaging until PHIN-MS is certified for all notifiable diseases.
- Work with CDC to certify MAVEN as PHIN compliant.

Year 1 (1/1/12-12/31/12):

- By 12/31/2012, BID will send appropriate notifiable disease conditions via PHIN-MS where mapping guides have been approved.

Year 2-5 (1/1/13- 12/31/16):

By 9/30/13, MAVEN is PHIN certified. Work continues with CDC to update notifiable disease messaging formats to current standards and ensure CDC is notified within appropriate timelines.

- f) Establish standards-based electronic exchange of case report data among public health agencies, state health departments and Health Information Exchanges (HIEs).

Objective 6: Engage in Department-wide efforts to promote health information exchange.

Staff will:

- Continue to facilitate and expand the implementation of the *Electronic Support for Public Health (ESP)* initiative, as supported by resources.
- Participate in all appropriate Department and EOHHS working groups to ensure the BIDs needs are promoted.

Year 1 (1/1/12-12/31/12):

- By 12/31/12, Lyme disease and pertussis disease detection algorithms for ESP are validated (resource dependent).
- By 12/31/12, appropriate data elements to be transmitted to BID by HIEs are formalized and new protocols for data exchange with EHRs are developed.

Years 2-5 (1/1/13-12/31/16):

Engagement in HIE efforts continue.

Measures of Effectiveness/Measurable Outcomes

Activity 2:

- a) Develop, acquire or purchase interoperable public health surveillance systems that adhere to NEDSS and PHIN specifications and requirements.
- MAVEN is responsive to surveillance and case management needs of the BID.
 - Surveillance and case management functionality is successfully evaluated and plans to respond to deficiencies are developed.
 - ISIS will provide CDC with the total number of case reports received with a break down of the number received electronically.
 - MAVEN is fully deployed for all notifiable conditions using Interoperable Data Repository.
 - ISIS provides CDC with a report detailing co-morbidity.
- b) Ensure standards-based electronic exchange of laboratory results (ELR) between clinical laboratories and public health surveillance systems.
- ISIS will provide CDC with all relevant information to assess the implementation of ELR. This will include:
 - Total number of case reports/ time period per condition.
 - Number of case reports/ time period including laboratory information per condition.
 - Number of case reports/ time period receiving Meaningful Use-compatible laboratory data by ELR per condition.
 - Number of case reports/ time period where report was initiated by an ELR of a positive laboratory test per condition.

- ELR infrastructure meets Meaningful Use requirements.
 - Data received via ELR are complete, timely, and accurate.
- c) Ensure standards based electronic exchange of laboratory results between public health laboratories and public health surveillance systems.
- HSLI is certified to transmit results within two months of new deployments.
 - Data received via ELR are complete and accurate.
- d) Establish standards-based electronic exchange of surveillance data between local public health departments and state health departments or between different surveillance systems.
- 95% of LBOHs are utilizing MAVEN.
 - MAVEN is meeting surveillance and case management needs for local public health.
- e) Establish standards-based electronic exchange of nationally notifiable disease reports between state health departments and the CDC.
- MAVEN is PHIN certified.
 - MAVEN is sending CDC notifiable disease reports according to CDC standards and timelines.

ATTACHMENT 2

FOODBORNE DISEASES

- A. Outbreak Surveillance Activities – reporting of outbreaks to CDC**
- B. OutbreakNet – personnel and training for outbreak detection and response**

Proposed Activities

The MPDH requests continued support for a foodborne/waterborne epidemiologist. This position has resided in the Bureau of Environmental Health, Food Protection Program (FPP) for many years and is invaluable for both the state health department and the LBOHs whom it must support. We have little control over how LBOHs retain and fund sufficient staff for all their public health responsibilities so it is imperative that Massachusetts remain in a position to provide support to the local jurisdictions regarding foodborne and waterborne outbreak response. This is an on-going need for next year and each year after.

Part A: Outbreak Surveillance Activities – reporting of outbreaks to CDC

Operational Plan

Activity 1: To continue to report foodborne illness outbreaks to CDC using NORS part-time staff specifically dedicated to timely reporting of outbreaks to CDC.

Staff will:

- Report enteric outbreaks via the NORS system to include foodborne illness outbreaks, waterborne outbreaks and person-to-person norovirus outbreaks such as those that occur in institutions such as long term care facilities, hospitals and schools.
- Receive training by trained MDPH staff to use NORS.
- Continue to strive for real time reporting.

Year 1 (1/1/12-12/31/12):

- All outbreak reports will be entered into NORS.
- All data in NORS will be validated and cleaned during the annual close out of data.
- Information collected on outbreaks will include laboratory-confirmed cases, age and sex of cases, number of hospitalizations and number of deaths.

Years 2-5 (1/1/13-12/31/16):

Massachusetts will continue to participate in NORS or any other outbreak reporting systems identified by our federal partners. Massachusetts will strive for complete data for inclusion into these systems for the accurate accounting of outbreaks both within Massachusetts and those that are multi-state in nature. All data will continue to be entered into the system in a timely manner and all data will continue to be validated and cleaned as required.

Measures of Effectiveness:

- 1) MAVEN is developed and deployed, and all staff within MDPH are using it to collect information on foodborne and waterborne complaints by 12/31/12.
- 2) At least six outbreaks are reported annually to NORS.
- 3) All Massachusetts outbreak reports are finalized within 60 days of CDC initiation of annual data closeout.
- 4) Proportion of final reports with complete case data in NORS:
 - Number of lab-confirmed cases (100%)
 - Age groups of cases (100%)
 - Sex of cases (100%)
 - Number of hospitalizations (75%)
 - Number of deaths (70%)

Each business day, two epidemiologists are assigned to investigate outbreaks that occur that day. Approximately 15 epidemiologists are trained for this response and assume this responsibility on a rotating basis. The investigating epidemiologist handles all aspects of the investigation from start to completion, including reporting the outbreak to NORS if appropriate.

NORS Statistics for 12-Month period of July 1, 2010 through June 30, 2011

# NORS outbreak reports/1,000,000 persons	% NORS reports with number of laboratory-confirmed cases indicated	% NORS reports with age groups of cases indicated	% NORS reports with sex of cases indicated	% NORS reports with number of hospitalized cases indicated	% NORS reports with number of deaths indicated
1.22/1,000,000	100%	87.5%	75%	87.5%	100%

Eight foodborne outbreaks and 170 unspecified gastrointestinal illness clusters were reported during the above 12 month time period

Part B: OutbreakNet – personnel and training for outbreak detection and response

Operational Plan

Activity 1: Improve capacity of state and LBOHs to fully investigate enteric disease outbreaks.

Staff will:

- Continue to investigate foodborne illness complaints and outbreaks, with an emphasis on the coordination of environmental, epidemiologic and laboratory investigations, including retail and manufactured foods.
- Contact LBOH personnel in the 20 largest jurisdictions on a regular basis to ensure all complaints are forwarded to the FPP within 24 hours, until a stable reporting system has been developed (see proposal in *Activity 1* in Part A above).
- Request Hazard Analysis Critical Control Point (HACCP) risk assessments for suspect food items, as well as investigation summary reports.

- Evaluate investigation results received from LBOH for completeness and food-specific detail.
- Include all available environmental data in the Foodborne Illness Database.

Year 1 (1/1/12 – 12-31/12):

- Program staff will provide assistance in foodborne illness investigations, including laboratory-confirmed and epidemiologically linked outbreak investigations.
- During foodborne illness outbreak investigations, all available environmental, epidemiological and laboratory information will be obtained and outbreak reports will be written.

Years 2-5 (1/1/13-12/31/16):

All activities described above will continue in addition to any further activities suggested by federal partners. We expect improved capabilities in LBOH with increasing use of technologies such as wider use of MAVEN and ELR.

Activity 2: Increase and/or enhance state/local health department staff to allow for adequate response to enteric disease outbreaks.

Staff will:

- Provide on-the-job-training and field demonstrations during environmental investigations.
- Assist in the collection of pertinent case information.
- Provide technical assistance by phone as needed.
- Coordinate and participate in field assistance.
- Assist in the proper collection of food and environmental samples.
- Publish guidelines and tools on the website on an ongoing basis as they are developed.
- Develop and update training tools and job aids to use when investigating and tracking suspect FBI outbreaks.
- Continue the local public health internship program which provides master's degree candidate interns to assist LBOHs in public health response during the summer.

Year 1 (1/1/12 – 12-31/12):

- Program staff will provide assistance to local/state health agents for foodborne illness investigations.
- MDPH will recruit interns and health departments to host them from 6/1/12-8/15/12.

Years 2-5 (1/1/13-12/31/16):

Throughout years 2-5 MDPH will continue to strive to assist LBOH in their response to foodborne and waterborne diseases and continue to make the case to appropriate entities of the importance of adequate staff in LBOHs. The local public health internship program will continue each summer as it has for the past eight years.

Activity 3: Ensure personnel responding to outbreaks have sufficient training.

Staff will:

- Attend trainings to further enhance knowledge regarding new trends in foodborne and waterborne illness.
- Implement basic training based on the FDA ORA-U curriculum that introduces basic HACCP principles, and risk-based inspection for new food inspectors, and application of these principles for risk-based inspections in routine foodborne illness investigations.
- Develop and implement foodborne illness outbreak investigation training as a component of courses for new food inspectors, as well as a component of additional FPP trainings.

Year 1 (1/1/12 – 12-31/12):

- Staff will attend the CDC sponsored OutbreakNet annual meeting, the Northeast Region Epidemiological Conference, and the Epi Ready Course.
- Foodborne Illness Outbreak Investigation trainings will be developed and given.
- Food safety, inspection and investigation courses are promoted in cooperation with the Massachusetts Environmental Health Association and the Massachusetts Health Officers Association..

Years 2-5 (1/1/13-12/31/16):

Throughout years 2-5 we will continue to ensure that all staff within MDPH are fully trained in the latest methods of foodborne and waterborne outbreak investigation. We will continue to extend training to as many LBOH as possible.

Activity 4: Enhance capacity for cross-jurisdictional collaborations, particularly during response to enteric disease outbreaks.

Staff will:

- Develop Standard Operation Procedures (SOPs) for joint inspections with FDA regarding manufactured foods.
- Conduct joint inspections with FDA and LBOHs.
- Participate in multi-state conference calls as they occur.
- Publish, coordinate, and distribute information about foodborne illness and foodborne illness investigations.
- Invite LBOHs to join WGFIC discussions regarding outbreak investigations in their jurisdictions.

Year 1 (1/1/12 – 12-31/12)

- SOPs are developed and joint inspections conducted.
- Information about foodborne illness and foodborne illness investigations are distributed via the HHAN.

Year 2-5 (1/1/13-12/31/16)

Throughout years 2-5 all activities above will continue as resources remain available from either federal or state sources or both. We will continue to invite our local health partners to participate in all outbreak investigations within their jurisdictions.

Measures of Effectiveness/Measurable Goals

- 1) MDPH continues to fill positions supported through this cooperative agreement.

Number of staff currently supported:

Tara Harris, Food Protection Program Foodborne Illness Coordinator, 100% of time (37.5 hours a week)

- 2) MDPH continues to ensure that staff are properly trained and participate in trainings that are available either at no cost or low cost as no training resources have historically been available through this cooperative agreement. Any trainings attended are recorded in an on-going FPP database. Information regarding these trainings will be obtained from this database.

Ms. Harris completed 20 FDA ORA-U Foodborne Illness trainings, and attended an FDA Special Processes Course, from the period from 7/1/10 to 6/30/11.

- 3) MDPH continues to support the attendance at appropriate meetings for personnel supported through this cooperative agreement as there are no resources provided other than time. Meetings attended are also recorded in the FPP database. Information will be obtained from this database in order to track the number of meetings attended in the next year.

Ms. Harris participated in OutbreakNet Quarterly Conference Calls.

Ms. Emily Harvey, Epidemiology Program Foodborne/Waterborne Illness Project Manager attended OutbreakNet in October, 2011 in Long Beach, CA with resources provided directly from CDC.

- 4) The epidemiologist supported in this cooperative agreement along with representatives from the Epidemiology Program and the Bureau of Laboratory Sciences continues to participate in outbreak responses where multi-state collaborations are required. Outbreak investigations are tracked in a shared foodborne illness database and also in an outbreak module in MAVEN. The foodborne illness database collects information on the larger and more complex outbreaks while information regarding all outbreaks and clusters, including all PFGE clusters, are entered into an outbreak module of MAVEN.

From 7/1/10 to 6/30/11 Massachusetts became involved in four large scale multi-state outbreaks and an additional 36 smaller multi-state clusters.

- 5) The WGFIC continues to meet twice monthly to discuss all issues related to foodborne and waterborne illness complaints, to coordinate all outbreak response among epidemiology staff, environmental staff and laboratory staff, to include all appropriate local health department in the discussions and to collaborate with federal partners.

ATTACHMENT 2

FOODBORNE DISEASES

C. PulseNet

Operational Plan

Activity 1: Coordinate with local laboratories to submit isolates for surveillance, and to upload PFGE patterns to the national database within four days of receipt in the PFGE Laboratory.

Year 1 (1/1/12-12/31/12) staff will:

- Provide mail-out/mail-in specimen collection kits to assist in obtaining specimens.
- Provide courier delivery system to transport clinical specimens from patients to the local board of health (LBOH) and from the LBOH to HSLI when needed.
- Educate LBOH regarding the appropriate collection of specimens, and to provide specimen collection material.
- Determine the need for engaging couriers to facilitate submission of isolates from hospitals to HSLI.
- Coordinate with epidemiologists to confirm that the laboratory receives isolates for all reported cases.
- Ensure all isolates are uploaded to the national database within four days of receipt in PFGE.

Years 2-5 (1/1/13-12/31/16):

All activities will continue in years 2-5 with expected improvements in performance.

Activity 2: Continue to perform PulseNet activities.

Year 1 (1/1/12-12/31/12) staff will:

- Participate in PulseNet, with reporting of results to CDC as requested.
- Perform PFGE on all *Salmonella*, *E. coli* O157:H7, non-O157 STEC, *L. monocytogenes*, *Campylobacter*, *Vibrio parahaemolyticus*, and *Shigella* isolates.
- Use communication protocols to communicate clusters to the Epidemiology Program.
- Post clusters to the CDC Team in a timely fashion.
- Monitor CDC Team Forum activity and respond to new postings within 48 hrs.
- Attend the annual PulseNet meeting.

Years 2-5 (1/1/13-12/31/16):

All activities will continue in years 2-5 with expected improvements in performance.

Activity 3: Development of next generation subtyping technologies

Year 1 (1/1/12-12/31/12):

- Two analysts will complete initial certification for all current existing MLVA protocols
- Analysts will participate in development and validation of new technologies as requested by CDC

- Isolates will be serotyped routinely using the Luminex methodology when the validation of the Luminex platform for molecular Salmonella serotyping is completed.

Years 2-5 (1/1/13-12/31/16):

All activities will continue in years 2-5 with expected improvements in performance.

Activity 4: Continue to perform the expanded responsibilities of a PulseNet Area Lab.

Year 1 (1/1/12-12/31/12) staff will:

- Train PulseNet laboratorians from other states as requested.
- Provide phone or on-site consultation to other state laboratories in area as requested.
- Process and analyze isolates received from other state laboratories in area as requested.
- Provide assistance with second enzyme testing to laboratories in the Northeast region as requested.
- Participate in additional projects and validations with CDC as needed.
- Participate in all Area Lab conference calls coordinated by the CDC and APHL.
- Attend the annual PulseNet meeting.
- Coordinate biannual conference calls among all Northeast Regional states.
- Initiate planning for 4th Northeast Regional PulseNet meeting, to be held in 2012.
- Continue to coordinate development and implementation of regional projects discussed during the 2007 and 2010 Regional PulseNet meetings.
- Continue to lead Northeast Regional working group activities.
- Coordinate a Northeast Regional Working Group in-person meeting to be held in 2012.

Years 2-5 (1/1/13-12/31/16):

All activities will continue in years 2-5 with expected improvements in performance.

Participation in additional projects and validations with CDC will continue to occur as identified.

Measures of Effectiveness/Measurable Goals

Measures of Effectiveness:

Activity 1:

- At least 95% of reported cases of *Salmonella*, *Shigella*, and STEC has an accompanying isolate submitted to the HSLI. For the period 7/1/10 to 6/30/11, 94% of all reported cases had an isolate submitted for PFGE.
- At least 95% of *Salmonella* isolates are uploaded to the Pulsenet National Database within four days. For the period 7/1/10 to 6/30/11, 94% were uploaded to the Pulsenet National Database within four days.
- A baseline of the time an isolate is received at HSLI from the time of collection of the specimen and the time of isolation in the local clinical laboratory is developed.

Activity 2:

- *E. coli* O157:H7, non-O157 STEC, and *L. monocytogenes* are tested by PFGE and uploaded to the CDC National database within 96 hours of receipt in the HSLI PFGE Laboratory.

- All Salmonella and Shigella isolates submitted for PFGE testing are run and uploaded to the CDC National database within one week of receipt in the HSLI PFGE Laboratory.
- Cluster and outbreak information is communicated to epidemiologists in a timely manner.
- Lab staff scores >85% in annual competency exams specific for the PFGE Laboratory.
- The annual PulseNet meeting is attended by one PulseNet laboratorian.

Activity 3:

- Two analysts are certified by CDC for MLVA of *Salmonella* Enteritidis, *Salmonella* Typhimurium, *Listeria monocytogenes*, and *E. coli* O157:H7 by 06/30/2012.
- MLVA is completed on outbreak isolates and other isolates of interest from Massachusetts as requested by CDC.
- PFGE Analysts participate in validations of new technologies as they become available from CDC.

Activity 4:

- High-priority isolates from regional laboratories are analyzed within three business days.
- At least 75% of low-priority isolates from regional laboratories are analyzed within five business days.
- Requests for technical assistance are responded to within 24 hours of receipt of request.
- Requests for training are met within one month from receipt of request.
- The annual PulseNet meeting is attended by at least one senior PFGE staff member.
- Steering Committee calls and in person meetings are attended.
- Area Lab conference calls and in person meetings are attended.
- Northeast Regional conference calls are coordinated at least twice each year.
- A Northeast regional meeting is coordinated and held in 2012.
- Participation in additional projects and validations with CDC occur as needed.

Measurable Goals:

Please refer to Activity 1 regarding our plans to enhance and encourage the collection of clinical specimens from LBOHs and clinical facilities to the HSLI. In outbreak situations there will be specific coordination with both the Epidemiologists and the FPP regarding facilitated transport.

The MDPH PFGE Laboratory currently has four FTEs devoted to PFGE. At least one analyst is fully certified in each PulseNet organism. Each analyst maintains annual competency for each organism they are certified for. Refer to the following table for a breakdown of current trained analysts.

PulseNet Personnel	New/ Continuing	If New, Start Date	% Time on PFGE/PFGE Analysis (est.)
Ex: John Smith	New	10/23/2010	50%
Lawrence Connolly	Continuing		100%
Janis Parrin	New	11/01/2010	85%

Tudor Chiorean	New	02/14/2010	75%
Brandon Sabina	New	07/06/2010	100%

From 7/1/10 to 6/30/11, Massachusetts ran close to 800 gels.

(07/01/2010 through 06/30/2011)					
	Total # of isolates received during past 12 months*	Total # of isolates run by PFGE during past 12 months*	How many isolates were run with primary enzyme?	How many isolates were run with secondary enzyme?	How many isolates were run using next generation typing methods?
<i>E. coli</i> O157:H7	56	46	32	32	0
Non-O157:H7 STEC	31	23	12	12	0
<i>Listeria</i>	21	22	22	22	0
<i>Salmonella</i>	1339	1264	1264	265	0
<i>Shigella</i>	176	176	176	0	0
<i>Campylobacter</i>	104	85	85	4	0
<i>Vibrio cholerae</i>	3	0	0	0	0
<i>Vibrio parahaemolyticus</i>	18	16	16	11	0

Area Lab Responsibility	Area Lab Notes
Training of personnel in area labs: include number of people trained, dates, subject matter	No requests for training were made during the specified time period.
Travel to labs within area: travel for training, troubleshooting, etc.	No travel to any labs was requested.
Surge Capacity: list number of isolates rec'd from each state for PFGE; include supplies sent to states	Massachusetts sent supplies to NJ while they were running short. We routinely perform PFGE on <i>Listeria</i> for Maine and Rhode Island. A total of 5 were run during this time period. During outbreaks Massachusetts offers to assist in surge capacity testing or to send enzymes and other reagents as needed to other states in our region.

ATTACHMENT 2

FOODBORNE DISEASES

D. PulseNet – Surveillance for Shiga toxin-producing *E. coli*

Operational Plan

Activity 1: Increase the number of STEC isolates, stools, or broths submitted for testing and decrease the travel time from collection or isolation to receipt at HSLI.

Year 1 (1/1/12-12/31/12) staff will:

- Distribute a clinical advisory requesting all clinical laboratories in the state perform a test for detection of Shiga toxin in all stool specimens in children under the age of five, or send those stool specimens to HSLI for Shiga toxin detection.
- Request stool specimens on all HUS patients where no causative agent has been identified.
- Determine the baseline time in number of days for an isolate, broth, or stool to be received at HSLI following collection or isolation.

Years 2-5 (1/1/13-12/31/16):

Further activities will be planned for subsequent years if the desired result is not achieved after instituting the abovementioned actions.

Activity 2: Enhance testing capability by implementing a PCR-based testing platform for STEC.

Year 1 (1/1/12-12/31/12) staff will:

- Implement a PCR based test for STEC genes (i.e. *stx*₁, *stx*₂, *eae*, *ehxA*)
- Validate the method in accordance with APHL guidance for validating a non-FDA approved test.

Years 2-5 (1/1/13-12/31/16):

The validated method will be put into routine use for all stool specimens, broths, and isolates received from the local labs, suspected of containing an STEC

Activity 3: Routinely implement IMS technology to enhance likelihood of detection of STEC

Year 1 (1/1/12-12/31/12) staff will:

- Routinely use already validated O157 non-O157 bead sets in the top six serotypes to enhance the recovery of STEC from clinical stool specimens.

Years 2-5 (1/1/13-12/31/16):

These methods will continue in general use until other methods are developed and suggested as a replacement for current methods with the advice of our federal partners. Additional projects and validations with CDC will continue to occur as identified.

Measures of Effectiveness/Measureable Goals

Measures of Effectiveness:

Activities 1-3:

- As a result of the distributed clinical advisory, an increase in clinical laboratories testing occurs for detection of Shiga toxin in all stool specimens in children under the age of five.
- The baseline time in number of days is determined for an isolate, broth, or stool to be received at HSLI following collection or isolation.
- A PCR-based detection method is researched, validated and implemented.
- IMS technology continues to be used routinely for stool specimens, broths, and mixed cultures.
- New bead sets are validated as new serotypes are identified and bead sets become available.

Measurable Goals:

The following table illustrates the burden of illness in Massachusetts for the time period 7/1/10 to 6/30/11.

	Numbers received in the public health laboratory	Numbers sent to CDC for Isolation and/or Serotyping		STECs Identified	Person Hours* (estimating 3 total hours per specimen)
			O157	62 (including positive repeats)	186
Cultures/ Isolates	67	46	Non-O157	116 (including positive repeats) (Plus 17 shiga toxin positive, no organism isolated)	348
Specimens/Broths	258	0	Negative/ Repeat Tests	147	441
Total	325	46	Total	325	975

ATTACHMENT 2

FOODBORNE DISEASES

G. NARMS – Surveillance Activities – reporting of foodborne events to CDC

Operational Plan

Activity 1: Human illness surveillance

Year 1 (1/1/12-12/31/12):

- All isolates that meet the specified criteria will be correctly identified and submitted.
- All calls will be attended by appropriate laboratory and epidemiology staff.
- All additional isolates requested by NARMS will be submitted to NARMS.
- The lab will participate in the CDC *Salmonella* QA/QC Program; discrepant results will be investigated and corrective actions will be documented.

Years 2-5 (1/1/13-12/31/16)

Massachusetts will continue to participate in all NARMS related activities as required by the program

Activity 2: Retail meat surveillance

The following plan should be considered a draft and subject to change as guidelines are provided from federal partners.

Year 1 (1/1/12-12/31/12):

- Two whole chickens (or equivalent meat product) will be collected every other week during the grant period. Products will be purchased on Mondays by staff at HSLI and brought directly to HSLI. Appropriate chain of custody will be adhered to. Locations for collections will be determined prior to the start of the project with input from federal partners.
- Collected chicken or alternate meat product will be processed into up to 10 sub-samples, each enriched in accordance with FDA BAM protocols for *Salmonella* (pathogen of interest may be modified by CDC or FDA partners).
- After 24 hours incubation, each subsample will be screened by both BAX and Vidas, while the culture is continued following appropriate protocols.
- Any positive isolates will be serotyped or speciated, and tested by PFGE in the Massachusetts PFGE lab. PFGE fingerprints will be maintained in the local Massachusetts database and uploaded to the national PulseNet database if indicated by federal partners.
- Each representative isolate will also be sent to CVM's Office of Research for species and serotype confirmation, antimicrobial susceptibility testing, and genetic analysis.

Years 2-5 (1/1/13-12/31/16):

The purchasing timeline will be adjusted based on feedback from federal partners and the results of the project from Year 1. All products obtained will continue to be tested in accordance with established protocols for organisms selected for study. This most likely will continue to be FDA BAM protocols for *Salmonella*. Isolates will continue to be tested by PFGE and added to the local database. Representative isolates will continue to be submitted to CVM's Office of Research.

a) Measures of Effectiveness/Measurable Goals:

Measures of Effectiveness

Activity 1:

- All 2012 isolates that meet the specified criteria are correctly identified and submitted.
- All 2012 calls are attended by appropriate laboratory and epidemiology staff.
- All additional isolates requested by NARMS are submitted to NARMS.

Activity 2:

- Products are purchased every other week and submitted to the lab on Mondays.
- Products are tested in accordance with FDA BAM protocols for *Salmonella*, (or other pathogens if indicated by federal partners).
- Isolates are tested by PFGE and added to the local database.
- Representative isolates are submitted to CVM's Office of Research.

Measurable Goals

The following table outlines the number of isolates received from 7/1/10 to 6/30/11, and the numbers submitted to CDC as part of the NARMS program. Please note, Massachusetts underwent significant staffing changes and shortages in 2010-early 2011. We missed a shipment of isolates that should have been included in the quarter three submission. Because of these staffing changes, we also did not send our routine paratyphi A isolates (we did not have any paratyphi C). As of April 2011 staffing issues have been rectified and are committed to continuing to participate in the program by submitting the appropriate numbers of isolates.

Pathogen	Total # of routine human isolates submitted to NARMS	Total # of routine human isolates received by site laboratory	Percentage of isolates shipped to NARMS	Isolate submission frequency	Number of conference calls attended
Non-typhoidal <i>Salmonella</i> example	34*	1264	2.6% (**4.1%)	quarterly	4
<i>Salmonella</i> Paratyphi A and C	4*	16	25%(*100%)	quarterly	4
<i>Salmonella</i> Typhi	17	31	54%	quarterly	4
<i>Shigella</i>	4*	176	2.2% (**4.5%)	quarterly	4

<i>E. coli</i> O157	1*	56	1.7% (**5.3%)	quarterly	4
Non-toxigenic <i>Vibrio</i>	11	36	30%	quarterly	4

* due to staffing shortages and turnover in the lab, our 3rd quarter 2010 isolates and all paratyphi A isolates did NOT get submitted.

(**percentage if all of the appropriate isolates had been submitted)

ATTACHMENT 5

WEST NILE VIRUS AND OTHER ARBOVIRAL DISEASES

Operational Plan

Activity 1: Maintenance of human surveillance activities for WNV and other arboviral diseases of public health importance. Basic requirements of a human surveillance program should involve:

- 1) Participation in ArboNET, the computerized national surveillance system developed to track activity of WNV and other arboviral diseases of public health importance. CDC requests weekly submission of data during the transmission season, including:
 - a) Human cases meeting current case definition
 - b) Presumptive viremic blood donors

Arbovirus Program staff will upload the following to ArboNET weekly:

- Human WNV and EEEV positive results and appropriate demographic data.
 - Results for evidence of infection by other arboviruses found in human specimens.
 - Information on presumptive viremic blood donors as it becomes available from the blood centers
- 2) Maintenance and/or enhancement of laboratory capacity to identify WNV and other arboviral infections in humans. Testing protocols include but are not limited to assays to detect immunoglobulin (Ig) M, IgG, and neutralizing antibodies (e.g., enzyme-linked immunosorbent assay [ELISA], microsphere immunoassay [MIA], and plaque reduction neutralization tests [PRNT]), nucleic acid amplification tests (e.g., real-time detection [RT-PCR]), virus isolation techniques and virus identification using virus-specific monoclonal antibodies (requires BSL3 level containment).

Laboratory staff will:

- Screen for WNV and EEEV human infections using IgM and IgG EIAs.
- Screen for dengue human infections using an IgM capture ELISA and using RTD-PCR (real-time detection PCR).
- Use PRNT to confirm EIA reactive specimens via assay for WNV, EEEV, and SLE specific antibody (sera and/or CSF from non-human species may be tested by PRNT).
- Test CSF specimens and serum from meningoencephalitis and encephalitis cases by cell culture; excess CSF may be tested by RTD-PCR for rapid WNV/EEEV diagnosis.
- Test samples from clinically suspicious horses and select other species (e.g., emu, llama, alpaca) (pre-screened for rabies virus) by RTD-PCR and/or cell culture.

The State Public Health Veterinarian and Epidemiology Program staff:

- Facilitate sample collection for WNV/EEEV from clinically suspicious horse cases and from select other species (e.g., emu, llama, alpaca) with neurologic symptoms.

- Obtain and confirm clinical specimens testing positive for WNV at commercial laboratories during local WNV transmission season.
 - Maintain communication with MA Department of Agricultural Resources (MDAR) and USDA regarding surveillance for and testing of suspect animal WNV and EEE cases.
- 3) Participation in the WNV laboratory proficiency program to evaluate laboratory capacity to perform WNV MIA/ELISA, PRNT and PCR assays.

Laboratory staff, under the direction of the Virology and Molecular Diagnostics Laboratory Director, will:

- Maintain CLIA compliant laboratory practices by participating in the CDC Arboviral Branch's annual proficiency testing program in which one PT survey for each RTD-PCR, IgM and IgG EIAs, and PRNT assay are completed. Supplemental in house PT surveys will be completed for these same assays as needed.
- 4) Data analysis and interpretation and dissemination of results.

Arbovirus Program staff will:

- Perform statistical analyses of potential predictors of risk for human disease, such as mosquito infection rates.
- Produce weekly summary reports of surveillance data for LBOHs and MCP officials.
- Report human WNV and EEE cases by phone to MCPs within four hours of confirmed results.

Epidemiology Program staff will:

- Report human WNV and EEE cases by phone to appropriate health care providers (HCP) and LBOHs within four hours of confirmed results.
- Post WNV and EEEV information regarding human and animal cases, mosquito results and updates to risk assessment maps to the MDPH arbovirus public website within 24 hours.
- Provide sample press releases describing assessment of human risk based on current surveillance findings to LBOHs upon their request.

Year 1 (1/1/12 –12/31/12):

- By 01/01/12, the Virology and Molecular Diagnostics laboratories will continue to test human clinical specimens submitted for arbovirus testing.
- By 05/31/12, the State Public Health Veterinarian will work with the State Veterinarian at the MDAR to perform outreach to large animal veterinarians regarding surveillance and testing of animal clinical cases.
- By 06/30/12, the Epidemiology Program staff will have updated notification protocols for reporting of human and animal cases, posting all surveillance information to the web daily and updated draft press releases for use by LBOHs.
- By 07/01/12, sample collection and testing on animal clinical specimens will begin and continue for the duration of the local transmission season.

- By 07/01/12, Virus Serology staff will verify and implement dengue IgM capture ELISA for screening human cases.
- By 07/01/12 Molecular Diagnostics staff will validate and implement dengue RTD-PCR for supplementing diagnostic testing of human cases.
- By 07/15/12, the Arbovirus Program staff will begin analyzing data from the 2012 season and will produce weekly reports for distribution.
- By 12/31/12 the Virology and Molecular Diagnostics laboratories will have participated in the CDC's annual proficiency testing.

Years 2-5 (1/1/13-12/31/16)

Throughout years 2-5 all activities above will continue. As needed, laboratory diagnostic assays for new or emerging arboviral diseases of public health concern in Massachusetts will be implemented.

Activity 2: Maintenance or expansion of environmental surveillance systems to include:

- 1) Participation in ArboNET, the computerized national surveillance system developed to track activity of WNV and other arboviruses of public health importance. CDC requests weekly submission of data during the transmission season, including:
 - a) Positive environmental surveillance results (e.g., mosquitoes, dead birds, sentinel animals, veterinary cases, etc.)
 - b) Denominator data describing the total number specimens tested as part of environmental surveillance programs.

Arbovirus Program staff will upload the following to ArboNet weekly:

- All mosquito numerator and denominator data.
 - Equine, llama, alpaca or other animal WNV and EEEV positive results and appropriate demographic data.
- 2) Maintenance and/or enhancement of laboratory capacity to identify WNV and other arboviruses of public health importance for environmental surveillance purposes. Specific environmental surveillance activities include sustaining capabilities to capture, identify and test mosquito vectors, avians, and other vertebrates for infection with WNV and other arboviruses of public health importance.

Arbovirus Field staff will:

- Set mosquito traps in areas with historic arbovirus activity, increased activity late in the previous season, and locations that could serve as virus amplification sites as determined by ecological survey. Sites will be fixed or flexible depending upon ecological surveys and surveillance and distributed in collaboration with the nine different MCPs.
- Perform routine trapping for *Culiseta melanura* using CDC light traps at the long-term fixed sites and in areas with EEEV activity detected in 2004 through 2010. CO₂ baited traps will be added at these sites to collect putative bridge vectors.
- Set BG Sentinel mosquito traps, if funding permits, in selected areas to provide surveillance for the presence of *Aedes albopictus*.

- Hire seasonal staff, if funding permits, and train on mosquito collection, identification, and pool processing.
- Ensure statewide procedures for gravid and light trap deployment will continue, with added trap sites for collection of potential bridge vectors. Collections will begin by 7/15/2012.

Laboratory staff will:

- Ensure mosquito pools are tested for WNV and EEE virus following a rapid screening and identification algorithm using real time detection PCR (RTD-PCR).
- Investigate reports of unusual avian mortality and procure specimens for viral studies (EEEV) if appropriate.

The State Public Health Veterinarian will:

- Investigate reports of unusual avian mortality and procure specimens for viral studies (EEEV) if appropriate.

3) Conduct data analysis and interpret and disseminate results.

Arbovirus Program staff will:

- Enter mosquito abundance and mosquito pool test results into the WNV database for tracking and analysis.
- Ensure access to mosquito results by epidemiologists and MCPs in real time via the MDPH web-based database.
- Send notifications for positive mosquito arboviral findings to directly affected MCPs via phone and email.
- Perform statistical analyses of potential predictors of risk, such as mosquito infection rates.
- Create reports of surveillance data to distribute to LBOHs and (MCP) officials.

Epidemiology Program staff will:

- Send notifications for positive mosquito arboviral findings to directly affected LBOHs and LBOHs of bordering towns via the Massachusetts Alert Network (HHAN).
- Post WNV and EEEV information regarding mosquito pool results and updates to surveillance maps to the MDPH WNV public website within 24 hours.

Year 1 (1/1/12 –12/31/12):

- By 06/01/12, Virus Isolation staff performs viral cell culture on all *Aedes albopictus* pools submitted for RTD-PCR testing of WNV and EEE virus.
- By 06/30/12, the Arbovirus Program Staff hires seasonal staff and begin training.
- By 06/30/12, Epidemiology Program staff updates notification protocols for reporting of mosquito sample positive results, posts all surveillance information to the web daily and updates draft press releases for use by LBOHs.
- By 07/15/12, the Arbovirus Program Staff starts mosquito trapping for the season and mosquito testing in the laboratories.
- By 07/15/12, the Arbovirus Program staff begins analyzing data from the 2012 season and produces weekly reports for distribution.

- By 07/15/12, the State Public Health Veterinarian begins investigating avian mortality reports for possible arboviral testing.

Years 2-5 (1/1/13-12/31/16):

Throughout years 2-5 all activities above will continue.

Activity 3: Support prevention and educational activities for WNV and other medically important arboviruses.

- 1) Provide timely updates on arbovirus transmission activity for use by local jurisdictions in implementing vector management and public education activities.

Arbovirus Program staff will:

- Schedule and coordinate WNV/EEEV planning meetings to review surveillance findings, solicit input on statewide WNV activities and review the existing Massachusetts Arbovirus Surveillance and Response Plan. Changes will be made to the plan, based on participant feedback and in conjunction with the CDC's Revised Guidelines for WNV Surveillance, Prevention and Control.
- Attend the annual Northeast Mosquito Control Association meeting to present a programmatic overview and promote public health messages.

Epidemiology Program staff will:

- Maintain a recorded information line with information about arboviral diseases, their transmission and ways to reduce the risk of exposure.
- Provide emergency on-call coverage 24/7.
- Develop educational lectures and displays and provide them throughout the season upon request, to both professionals and the public, in a variety of forums.
- Coordinate and participate in regional public health conference calls to discuss regional arboviral findings and strategies.
- Respond to questions about risk assessment from LBOHs.
- Support the information line 24/7, May through October.
- Produce an annual summary of arbovirus activity.

- 2) Provide access to public education materials to local jurisdictions.

Epidemiology Program staff will:

- Provide updated WNV and EEEV fact sheets, prevention resource guides and an updated Arbovirus Surveillance and Response Plan to all LBOHs and MCPs in the spring.
- Distribute relevant updated information through the HHAN, the web and a mailing to physicians, hospitals, blood donations centers, etc.

Year 1 (1/1/12 –12/31/12):

- By 01/01/12, 24/7 on-call coverage will continue.
- By 03/30/12, all educational materials and lectures will be updated with 2011 end-of-season data.

- By 05/15/12, the first meeting with the MCPs, Arbovirus Program staff, Laboratory Staff and Epidemiology Program staff will be held to plan for the arbovirus season.
- By 05/30/12, relevant educational materials will have been distributed via the HHAN to all stakeholders.
- By 06/30/12, the Massachusetts Arbovirus Surveillance and Response Plan will have been completely reviewed, updated, approved and posted to the public website.
- By 06/01/12, the recorded information line will be changed from influenza messaging to arbovirus messaging.
- By 11/30/12, Arbovirus Program Staff will have attended the Northeast Mosquito Control Association meeting.
- By 12/31/12, the arbovirus annual summary will be completed and posted on the public website.

Years 2-5 (1/1/13-12/31/16):

Throughout years 2-5 all activities above will continue

Measures of Effectiveness/Measurable Goals

- 1) Maintain or enhance diagnostic laboratory capacity and proficiency to conduct human surveillance for WNV and other arboviral diseases of public health importance.
 - a) Number of arbovirus assays the state diagnostic laboratory is capable to perform and demonstrated proficiency in key assays for which proficiency evaluation is provided (data reported in Tables 3 and 4).

Effectiveness will be indicated by maintaining the capacity to perform WNV, EEE and SLE assays at HSLI. Improvement will be indicated if the capacity to run dengue virus assays is added. Proficiency effectiveness will be indicated by participation in the EIA, PRNT and PCR proficiency panel evaluation.

- 2) Report all identified human cases of WNV and other arboviral diseases of public health importance to ArboNET.
 - a) Number of cases of arboviral diseases, including WNV, reported via ArboNET.

Effectiveness will be indicated if all laboratory confirmed cases are reported to ArboNET. Confirmation that all cases are reported will be achieved by comparing weekly summary reports to ArboNET data.

- 3) Report all WNV presumptive viremic donors to ArboNET.
 - a) Number of WNV presumptive viremic donors reported to ArboNET

Effectiveness will be indicated if all WNV presumptive viremic donors known to MDPH are reported to ArboNET. Confirmation that all cases are reported will be achieved by comparing epidemiologist of the day (EOD) notes to ArboNET data.

- 4) Increase the proportion of public health laboratory confirmed human disease cases from WNV and other arboviral diseases of public health significance reported to ArboNET.

- a) Ratio of confirmed cases to probable-suspect cases reported to ArboNET.

All confirmatory testing for arboviral diseases endemic to Massachusetts is performed at HSLI which enables MDPH to ensure that all confirmed cases are available for reporting to ArboNET. This measure of effectiveness will not be used since 100% of laboratory confirmed cases are already reported.

- 5) Report all numerator and denominator data for dead birds and mosquitoes tested for WNV and other arboviral diseases of public health importance.

- a) Proportion of local jurisdictions (e.g., counties) conducting mosquito or dead bird surveillance with data reported to ArboNET (from Table 6).

Effectiveness will be indicated if all numerator and denominator data for mosquitoes tested for WNV and EEE are reported to ArboNET. Confirmation that all cases are reported will be achieved by comparing weekly summary reports to ArboNET data. However, each of the 351 municipalities in Massachusetts makes an individual decisions to participate or not in regional Mosquito Control Projects. Therefore, MDPH does not have control over the proportion of local jurisdictions conducting mosquito surveillance. This measure of effectiveness will not be used. It is unlikely that the proportion of jurisdictions participating will change substantially from what is currently reported in Table 6.

Table 1. WNV ELC expenditures by category: January 1, 2011 through June 30, 2011. In March 2012, the CDC will request verified data for January 1, 2011 – December 31, 2011.

Spending category	Amount (\$)
Personnel – Epidemiology*	\$30,723
Personnel – Laboratory*	
Supplies*	\$3,348.00
Equipment*	
Travel*	
Indirect Costs*	\$4,547.00
Grants and contracts	
Other expenditures (please specify below) Fringe	\$10,728.00
Unspent: We anticipate all funds will be spent	
Total FY11 WNV award plus any carryover or unspent used	\$49,346.00

*Include actual expenditures from the ELC program at the state or district health department level.

Table 2. WNV ELC expenditures by activity: 1/1/2011 through 6/30/2011. *In March 2012, the CDC will request verified data for 1/1/2011 – 12/31/2011.*

Program activity	Amount (\$)
Human surveillance*	\$45,998.00
Environmental surveillance†	\$3348.00
Education/community outreach	
Vector control	
Other expenditures (please specify below)	
Unspent	
Total FY11 WNV award plus carryover or unspent used	
*Includes all ELC-supported human surveillance activities (e.g., diagnostics, epidemiology and reporting of human disease cases, viremic blood donors)	
†Includes all ELC-supported environmental surveillance activities (e.g., mosquito collection/testing, dead bird collection/testing, veterinary cases, sentinel animals etc.)	

Table 3. Applicant diagnostic laboratory arbovirus testing capacity: 1/1/2011 through 6/30/2011*. *In 3/2012, the CDC will request data for 1/1/2011 – 12/31/2011.*

	ELISA		MIA		IFA			
Virus	IgM	IgG	IgM	IgG	IgM	IgG	PRNT	PCR
California serogroup†								
Chikungunya								
Colorado tick fever								
Dengue								
Eastern equine encephalitis	X	X					X	X
Japanese encephalitis								
Powassan								
St. Louis encephalitis							X	
Western equine encephalitis								
West Nile	X	X					X	X

Table 4. WNV diagnostic proficiency panel evaluation: 1/1/2011 through 6/30/2011. *In March 2012, the CDC will request data for 1/1/ 2011 – 12/31/ 2011.*

Panel	Participated in 2011	
Enzyme-linked immunosorbent assay/Microsphere immunoassay	X Yes	☐ No
Plaque reduction neutralization test	X Yes	☐ No
Polymerase chain reaction	X Yes	☐ No

Table 5. Number of human specimens tested by your laboratory for WNV anti-IgM antibodies: 1/1/11 through 6/30/11. *In 3/2012, the CDC will request data for 1/1/11 – 12/31/11.*

Specimen type	Number of human specimens tested for WNV anti-IgM antibodies
Serum	75
Cerebrospinal fluid	42
Total	117

Table 6. Arboviral surveillance and control programs by county: 1/1/11 through 6/30/11*. *In 3/2012, the CDC will request data for 1/1/11 – 12/31/11*

County name (list)†	Any arboviral surveillance performed				Mosquito control program
	Mosquito pools	Dead birds	Sentinel chickens	Live/wild birds	
1. Barnstable	30				Cape Cod
2. Berkshire	15				Berkshire
3. Bristol	58				Bristol
4. Dukes	2				Cape Cod
5. Essex	67				North East
6. Middlesex	81				Central Massachusetts, East Middlesex
7. Norfolk	26				Norfolk
8. Plymouth	46				Plymouth
9. Suffolk	64				Suffolk
10. Worcester	86				Central Massachusetts

ATTACHMENT 6

LYME DISEASE

Operational Plan

Activity A: Core Surveillance: Perform surveillance for Lyme disease. Conduct data analysis, interpret, and disseminate results.

MDPH staff will:

- Maintain a part-time epidemiologist for Lyme disease surveillance and data analysis activities.
- Receive and maintain a database of reports within ISIS, consisting of Lyme disease cases and positive laboratory results as required by Massachusetts' regulations.
- Ensure the Lyme disease epidemiologist runs quarterly reports to identify case reports with missing county of residence information with subsequent request to HCP for information.
- Report confirmed and probable cases of Lyme disease and appropriate demographic data to CDC via NEDSS from ISIS.
- Analyze surveillance data to identify key demographic or geographic parameters and produce an annual surveillance summary report, including that year's incidence map by town, as directed by the State Public Health Veterinarian (SPHV).
- Distribute annual surveillance summary to all local boards of health (LBOH), to HCPs through the Massachusetts Medical Society (MMS) and post on the MDPH website as directed by the SPHV.
- Respond to requests for information and statistics on Lyme disease from the media, members of the public, HCPs and local public health officials through the SPHV and ISIS.
- Participate in any scheduled Lyme disease conference calls and in-person meetings hosted by CDC through the SPHV, and/or their specific designee(s).

Year 1 (1/1/12 –12/31/12):

- By 1/1/12, the part-time epidemiologist will be retained by MDPH.
- By 1/1/12 a letter requesting missing case data will be available for mailing to HCPs.
- By 4/15/12 all CRFs received to date will be classified as confirmed, probable, suspect or not a case. Data will then be available for public release in response to requests for information.
- By 5/1/12 all Lyme disease case reports received to date will be analyzed and reported in the annual surveillance summary and will include an incidence map.
- By 6/1/12 the report will be posted to the website, distributed to all 351 LBOH and submitted to MMS for inclusion in their newsletter.
- By 12/31/12, we will have participated in all scheduled quarterly conference calls and in-person meetings.

Years 2-5 (1/1/13-12/31/16)

Throughout years 2-5 all activities above will continue.

Activity B: Innovation: Develop, refine, or enhance existing surveillance capacity and activities to create a more sustainable and informative Lyme disease surveillance system.

MDPH will:

- Evaluate completeness of case report data to identify demographic fields with greatest proportion of missing data and summarize completeness of data and geographic distribution analyses in an informal report to disseminate to HCPs and LBOHs as directed by the SPHV.
- Work with large HMO through ISIS to receive EMR reports of Lyme disease cases and assess proportion of CRFs that are received out of all medical record-based reports.

Year 1 (1/1/12 –12/31/12):

- By 5/1/12 all Lyme disease case reports received to date will be analyzed for data completeness and an informal summary report will be produced.
- By 6/1/12 the report will be distributed to all 351 LBOHs and submitted to MMS for inclusion in their newsletter.
- By 12/31/12 will have met with ISIS to arrange receipt of EMR reports.
- By 06/30/12 a part-time contractor will be hired to conduct medical record review and sentinel sites will be enrolled (dependent upon receipt of additional funding).
- By 12/31/12 medical record review will be complete and data analysis to evaluate the effect of ELR on Lyme disease case reporting will begin.

Years 2-5(1/1/13-12/31/16):

By 3/1/13 receipt of EMR reports will begin. Throughout years 2-5 all activities above will continue dependent upon assessed effectiveness

Measures of Effectiveness/Measurable Goals

The following measurable goals will be reported on for each reporting period over the five years of the grant cycle as required. Please see each goal for current status, current availability of requested information or examples of how the information will be provided using 2011 information.

Activity A & B

- 1) Number of qualified personnel hired or retained

One part-time epidemiologist is retained to perform Lyme disease surveillance activities.

- 2) Number of personnel trainings conducted (Activity A & B)

Part-time epidemiologist is to be retained and no additional training is required. This measure will not be used.

Activity A:

- 3) Number of confirmed and probable Lyme disease cases reported to CDC (via NEDSS) in a timely manner

Information on when a case report is completed, when it is reviewed and when it is reported to CDC is captured and stored in an electronic database developed and maintained within ISIS (MAVEN). Of the 3,227 confirmed and probable Lyme disease cases from 2010 reported to CDC, 98% of them were transmitted within 90 days of the case report review date. 100% of them were reported within 160 days or just over five months.

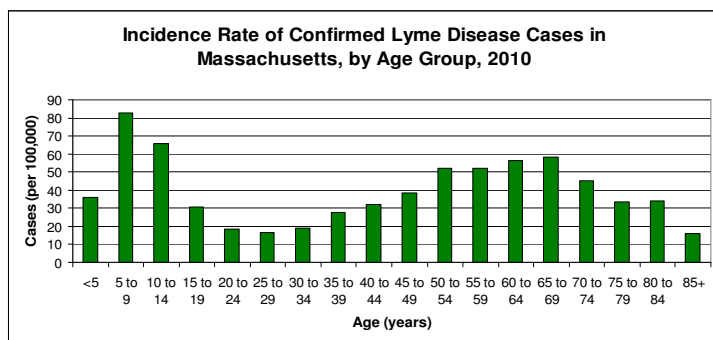
4) Number of cases classified as suspect and/or not-a-case

The MDPH case classification for Lyme disease deviates from the national one in the suspect category. MDPH captures all positive laboratory reports without accompanying clinical information in this category. Number of suspect cases will not be used as a measure of effectiveness. However, MDPH does review all cases for whom clinical information is received and revokes those that do not meet the case definition. In 2010, there were 768 reviewed cases classified as not a case.

5) Evaluation of key demographic or geographic parameters (used to target prevention)

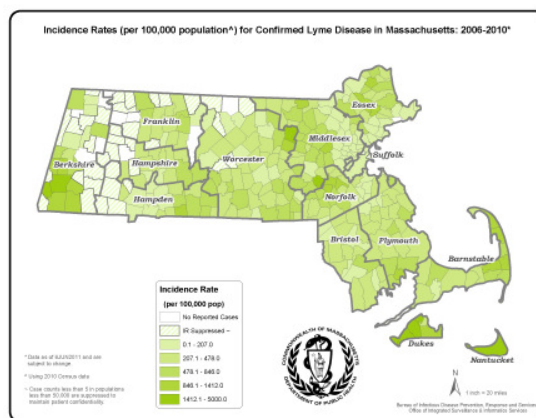
Data is analyzed for this annually and the information is included in the annual surveillance summary. Inclusion in the annual summary indicates successful completion of goal. The age-adjusted and county of residence incidence rates are presented from 2010 data.

County*	2010 Confirmed Cases (#)	2010 Incidence Rate (per 100,000)
Barnstable	117	54
Berkshire	93	71
Bristol	141	26
Dukes	25	151
Essex	184	25
Franklin	42	59
Hampden	130	28
Hampshire	80	51
Middlesex	414	28
Nantucket	27	265
Norfolk	267	40
Plymouth	230	47
Suffolk	34	5
Worcester	252	32
State Total	2593	40



- 6) Development of maps detailing endemic counties and/or high-risk areas (annually evaluated).

A map is produced by ISIS geographic information system specialist using data after it has been cleaned and analyzed. Data is provided to GIS staff and map is produced for inclusion in annual surveillance summary. Inclusion in the annual summary indicates successful completion of goal. The incidence map for 2010 is included below.



- 7) Number and type of improvements in data due to routine data quality/completeness checks.

Annual comparisons between the data quality analysis reports will be done. Improvement will be indicated by a decreasing percentage of missing data in identified fields of interest (see #10).

- 8) Number of quarterly Lyme calls with state participation.

At least one individual will be assigned to each scheduled quarterly call. The assigned individual will participate on the call and provide a brief written summary to all program epidemiologists regarding the call.

- 9) Number of reports (webpage, annual reports) disseminated having summary data

The Lyme disease annual surveillance summary is distributed via an electronic alerting network to all 351 LBOH once it is completed. It is not currently possible to track the number of website

visits to a specific page, however, the state government website is currently undergoing a complete renovation. The potential for tracking visits utilizing the new site will be assessed.

Activity B

- 1) Development and dissemination (e.g. to public health partners of informal reports regarding quality and coverage of surveillance data)

Information regarding cases within an unknown town and county of residence is already included in the annual Lyme disease surveillance summary. A more complete analysis of missing data to include race/ethnicity, date of symptom onset, and tick exposure will be performed and disseminated via the electronic alerting network to all 351 LBOH.

- 2) Percentage of licensed HCPs, diagnostic laboratories, and/or hospitals in jurisdiction providing Lyme disease case reports to the state

As not all HCPs are likely to practice in specialties relevant to Lyme disease diagnosis and treatment, MDPH does not intend to use the percentage of licensed HCPs submitting case reports to the state as a measure of effectiveness. Currently, 82% of hospital labs in Massachusetts transmit Lyme disease laboratory test results electronically. Only two large commercial laboratories in Massachusetts report electronically (as opposed to paper reports), However, the commercial laboratory responsible for the majority of tick-borne disease testing in the state is currently working towards electronic reporting. Improvement will be demonstrated if there is an increase in the number of total laboratories reporting electronically.

- 3) Number of CRFs submitted by providers

The fact that a case report is received from a provider is documented in the surveillance database and can readily be extracted. In 2010, there were 8,995 individuals with some type of Lyme disease report information submitted, either clinical data or laboratory results or both. CRFs were received on 6,405 of them. Improvement will be demonstrated by an increase in the proportion of total reports with an associated CRF.

- 4) Percent of case reports that are complete at the time of submission

The MDPH CRF collects symptom information in a yes/no/unknown format. Providers frequently do not answer for symptoms not displayed by their patient. This does not truly represent an incomplete CRF. Analysis for data completeness will be done using designated fields of particular importance including town and county of residence, symptom onset date, race/ethnicity and tick exposure. Improvement will be demonstrated by year-over-year decreases in the percentage of incompletely captured data.

ATTACHMENT 8

INFLUENZA

A. Influenza Surveillance

Operational Plan

Activity 1: Expand and enhance ILINet participation, including virologic specimen submission. Arrange for year-round reporting from a subset of sites.

Massachusetts currently has 57 ILINet sites throughout the state. While this number is well above the recommended one site per 250,000 population, there is room for improvement in the timeliness and regularity of reporting and geographical representation. All currently enrolled sites have reported for some portion of the weeks in the 2010-2011 influenza season; however, some sites reported for only a limited number of weeks while others reported for most weeks but submitted data much later than the weekly reporting deadline, making data less useful. In addition, while some regions of the state contain a large number of reporters, particularly concentrated around the large cities of Boston and Worcester, areas of the western and southeastern regions of the state remain poorly represented. A primary responsibility of the influenza epidemiologist is to optimize reporting from existing sites and increase the coverage and diversity of the ILINet system in Massachusetts. In the past two years, MDPH has also focused more on influenza testing for surveillance; MDPH now requests up to two specimens per week from all ILINet sites as compared to six specimens per season requested prior to 2009 H1N1. These specimens are tested for influenza as well as an expanded respiratory panel that includes adenovirus, RSV and parainfluenza. Throughout the award period, the epidemiologist will continue efforts to expand and diversify the ILINet system and to encourage regular specimen submission to increase the efficacy of virologic surveillance in the state.

Year 1 (1/1/12-12/31/12):

- Between February and April 2012 MDPH will host an informational conference call for ILINet sites, including updates on influenza activity and current recommendations.
- By May of 2012, the epidemiologist will contact ILINet sites about interseasonal ILI reporting and enlist $\geq 25\%$ of enrolled sites to report ILI throughout the summer.
- By September of 2012, the epidemiologist will recruit ILI sites as needed to ensure that each of Massachusetts' seven surveillance regions includes at least four regularly reporting sites.
- By October of 2012, staff will send specimen collection kits to sites at the beginning of the season via regular mail, to be returned via an overnight mail delivery service or courier for free influenza and respiratory virus panel testing. Additional kits will be sent to ILINet sites throughout the season as needed.
- Throughout the year, staff will target recruitment efforts to increase the geographic coverage and diversity of the sites in order to ensure representative population-based information, with a focus on sites (hospitals, emergency departments) that will identify influenza in specific subpopulations (e.g., high-risk groups, children, healthy adults, those likely to travel or have visitors particularly from Asia and the Southern Hemisphere).

- During influenza season (from 1/1/12 through 5/19/12 and from 9/30/12 through 12/31/12), the epidemiologist will contact sites regularly to ensure they are both reporting ILI and submitting specimens for testing appropriately.
- Throughout influenza season, support is offered to all sites as needed, especially those not meeting reporting and specimen submission goals. This may include telephone support, educational materials and/or possible site visit.
- During influenza season, data are summarized in weekly activity reports sent to ILINet physicians and laboratories and posted on MDPH's influenza website, and in an annual report and other reports as needed.
- During influenza season, the epidemiologist will respond to ILI outbreaks, including sending specimen collection kits to outbreak facilities and arranging transportation of samples to HSLI via courier or an overnight mail delivery service to facilitate diagnosis and outbreak control.

Years 2-5 (1/1/13-12/31/16):

On a yearly basis, the epidemiologist will continue to recruit sites to increase geographic coverage and increase diversity of patient populations covered by surveillance sites; they will continue efforts towards increasing the number of specimens submitted to HSLI from ILINet sites and increase the number of ILINet sites that submit specimens on a regular basis ($\geq 50\%$ of weeks in flu season). On a yearly basis, staff will continue efforts towards increasing the proportion of ILINet sites reporting regularly (≥ 16 weeks throughout the season) with an emphasis for all sites on timely reporting. Each year in the late winter/early spring, MDPH will host a conference call for ILINet sites. Each May a proportion of enrolled ILINet sites will be recruited to report throughout the interseason. At the end of each season, the influenza epidemiologist will analyze all laboratory-confirmed influenza reported to MDPH, including rapid influenza reports. This will be compared to previous seasons. On an ongoing basis, the epidemiologist will recruit additional ILINet sites that are currently using electronic data sources to report their weekly data to CDC and to compare it with traditionally gathered ILI data.

Activity 2: Report significant cases to CDC according to existing protocols and explore additional electronic methods of influenza morbidity and mortality surveillance. Facilitate the improvement of influenza surveillance as recommended by the Council of State and Territorial Epidemiologists (CSTE).

Since the fall of 2006, MDPH has collected and managed infectious disease surveillance data using the MAVEN online surveillance system. For influenza, the primary role of MAVEN has been to store information on positive laboratory findings indicative of influenza as well as document reported clusters of influenza-like illness. While the system has the capacity to store additional clinical and demographic information and was used for case investigation during 2009 H1N1, there is currently no automated method with which to collect comprehensive demographic and clinical data on a routine basis. During the 2011-2012 season, MDPH will send an automated teleform for ordering providers to complete and return for each positive influenza PCR or culture result reported through MAVEN. These teleforms are currently able to collect only basic information, but possible methods to collect expanded data on these cases are

under investigation. In addition to providing additional demographic information describing the burden of influenza disease in Massachusetts, these data will aid the epidemiologist in identifying high risk cases in a timely manner and offering the potential to provide guidance on testing and treatment on a situational basis. Additional clinical data will also help the epidemiologist better track severity of disease during the course of the influenza season.

First implemented in the late summer of 2009 in response to the circulation of 2009 H1N1, MDPH collects aggregate counts of laboratory-confirmed influenza hospitalizations and deaths on a weekly basis using an internet-based survey tool. Fifty-five of 72 acute care hospitals in the state reported data during the 2010-2011 season, with an average of 49 hospitals reporting each week. These data are currently collected using an internet-based survey tool and MDPH is exploring methods to integrate these data into MAVEN. An additional electronic source of influenza morbidity data currently available to MDPH includes rates of influenza-like illness in Massachusetts emergency departments through the AEGIS syndromic surveillance system. The system is maintained by research partners at the Children's Hospital Informatics Program. This system will be maintained through the 2011-2012 system, but funding for the program beyond that time period is uncertain.

Development of an electronic death reporting system continues by the Massachusetts Registry of Vital Records and Statistics. Once funding has been secured and the system is rolled out, MDPH will work with the Massachusetts Registry of Vital Records and Statistics to utilize this capability to monitor influenza-related deaths in a timely way and integrate the death data into MAVEN. Pediatric influenza deaths are reportable in Massachusetts, and clinicians are reminded through advisories and other clinical guidance annually to report any suspected or confirmed deaths due to influenza in pediatric patients immediately to MDPH.

Year 1 (1/1/12-12/31/12):

- By July of 2012 staff will explore possible methods of integrating laboratory-confirmed influenza hospitalization and death reporting into MAVEN surveillance system.
- By September of 2012, the epidemiologist will recruit an additional 5 Massachusetts acute care hospitals to participate in the laboratory-confirmed influenza hospitalizations and deaths reporting program.
- By September of 2012 staff will work with the Bureau of Vital Statistics as they continue development of an electronic death reporting system. Staff will develop a detailed plan for implementation and integration of the electronic death reporting system into MAVEN, with a primary focus being influenza mortality surveillance.
- During influenza season (from 1/1/2012 through 5/19/2012 and from 9/30/2012 through 12/31/2012), the epidemiologist will weekly activity level for the State and Territorial Epidemiologists Report.
- During influenza season the epidemiologist will use MAVEN to collect limited clinical and demographic data on PCR and culture-confirmed influenza cases and will explore methods to utilize MAVEN to collect expanded demographic and clinical information in future seasons.

- During influenza season, the epidemiologist will monitor reports of laboratory-confirmed influenza hospitalizations and deaths, pediatric influenza deaths and other unusual deaths related to influenza infection and follow up as needed.
- During influenza season, the influenza epidemiologist will monitor and respond to rates of influenza-like illness in Massachusetts emergency departments, as detected by the AEGIS syndromic surveillance system.
- Throughout the year, the epidemiologist will report all influenza-related pediatric deaths through CDC's Secure Data Network.
- Throughout the year, the epidemiologist will fully investigate all cases and suspect cases of novel influenza A using MDPH's detailed protocol which includes the collection of epidemiologic information, and also assist with specimen collection and guidance with control measures.

Years 2-5 (1/1/13-12/31/16):

The epidemiologist will continue working with the Office of Integrated Surveillance and Informatics Services (ISIS) to improve and expand influenza data collected through the MAVEN system. This expansion will include both the implementation of new or improved methods of data collection as well as outreach to clinicians to reinforce the importance of timely and complete reporting. Together with the Massachusetts Registry of Vital Records and Statistics, the immunization program will continue collaboration to integrate the electronic death reporting data into MAVEN; following implementation, all deaths listing influenza as a cause of death will be reviewed by Immunization Program epidemiologists. On a yearly basis, the epidemiologist will review recommendations from CDC and CSTE regarding improvement of influenza surveillance and implement enhancements to existing systems as needed.

Measures of Effectiveness/Measurable Goals:

Activity 1:

- The number of ILINet sites remains above 52 (two sites per 250,000 population), with at least one regularly reporting site per 250,000 population, and additional sites are recruited to increase geographical and demographic diversity. *Baseline:* 57 sites during 2010-2011 season.
- At least 70% of ILINet sites report regularly (≥ 16 weeks of the influenza season). *Baseline:* 69% in 2010-2011 season.
- Reporting by ILINet sites is monitored weekly and follow up occurs on a monthly basis with non-reporting sites.
- At least 60% of ILINet sites submit at least two specimens during the influenza season. *Baseline:* 53% in 2010-2011 season.
- At least 20% of ILINet sites submit specimens for at least eight weeks of the influenza season. *Baseline:* 14% in 2010-2011 season.
- Emails with up-to-date flu information, recommendations and surveillance data are sent to all ILINet sites throughout the year.

- An annual conference call between MDPH and the ILINet sites is held at least once per season. Additional calls may be added to address major changes in procedures, recommendations or influenza activity.
- A minimum of 25% of surveillance sites continue to report regularly (≥ 10 weeks) and submit specimens as appropriate during the interseason. *Baseline:* 25 sites seeing patients in the summer reported during the 2011 interseason (44%).
- Analysis of all laboratory-confirmed influenza reported to MDPH, including rapid influenza reports, is conducted at the end of the influenza season and compared to previous seasons.
- Historical baselines are established incorporating several years of ILINet and laboratory data, using methodology established and made available by CDC. Baseline data is integrated into weekly data analysis throughout the season.

Activity 2:

- The State and Territorial Epidemiologists Report is submitted to CDC each week during the influenza season. *Baseline:* 100% during 2010-2011 season.
- All influenza-related pediatric deaths are reported through the National Notifiable Diseases Surveillance System within 24 hours of notification, with case report forms completed within one month of death. *Baseline:* one (total) case (100%) was reported within 24 hours and completed within one month during 2010-2011 season.
- All reported cases or suspect cases of novel influenza A are fully investigated and appropriately tested. *Baseline:* One case of suspected H5N1 infection was investigated and ruled out in June 2010.
- The MAVEN surveillance system is maintained to summarize and track ILI information, outbreak data, clinical data and demographics on pertinent cases. Data are reviewed throughout the season to monitor data quality.
- Complete aggregate influenza hospitalization and death data is collected from acute care hospitals throughout Massachusetts using an internet-based system. *Baseline:* 55 of 72 acute care hospitals participated in reporting in 2010-2011 season, with an average of 49 hospitals reporting per week.
- MDPH continues development of its electronic death reporting system to identify deaths from influenza and pneumonia in a timely manner, with availability anticipated by 1/1/13.

B. Influenza Diagnostic Testing

Operational Plan

Activity 1. *Expand laboratory capacity to perform influenza virus detection (by PCR and culture), typing and sub-typing year round.*

The Massachusetts Hinton State Laboratory Institute's (HSLI) Virus Isolation and Molecular Diagnostics laboratories, within the Bureau of Laboratory Sciences (BLS), will continue to work closely to maintain expanded laboratory testing capacity year-round.

Laboratory staff will:

- Perform year-round virus isolation, as well as typing and sub-typing of influenza viruses using both molecular and antigen-based methods.
- Maintain year-round the ability to detect avian and novel influenza viruses using PCR-based assays (H5a and H5b targets).
- Perform real-time reporting of influenza test results by HSLI to the CDC (U.S. WHO) using HL-7 PHLP format via the Public Health Information Network Messaging System (PHIN-MS).
- Ensure (semi-monthly) systematic submission of influenza virus isolates and clinical material, based on CDC Influenza Branch guidelines, to the CDC for the purposes of providing representation from Massachusetts for national virologic surveillance.
- In coordination with the Influenza Surveillance Coordinator, the lab staff will continue efforts to collaborate and coordinate with hospital-based laboratories and rapid influenza testing sites across the state to submit virologic testing results data and specimens for further virologic testing.
- The lab staff will coordinate with the LIMS administrator to ensure annual mapping of new PHLP messages for each influenza season.
- The LIMS administrator will coordinate with the Molecular Diagnostics Division Director to ensure that new providers will be set up and trained with an ELR license in order for their facility to receive electronic laboratory test results.

Year 1 (1/1/12-12/31/12):

- From 1/1/2012, continue to send five of the most recent and representative influenza isolation and/or matching clinical material every two weeks to the designated CDC contract lab.
- Year-round, notify CDC immediately of all influenza A unsubtypeable or inconclusive indicating possible swine origin influenza for further characterization; prepare for immediate shipping.
- Year-round, maintain all PCR-based assays to detect avian and novel influenza viruses and notify CDC immediately of all suspect avian influenza; prepare for immediate shipping.
- During influenza season (from 1/1/2012 through 5/19/12 and from 9/30/12 through 12/31/12), lab staff will coordinate with the Influenza Surveillance coordinator to supplement influenza surveillance samples by soliciting additional influenza original specimens and virus isolates (usually type Bs) for further characterization.
- During influenza season (from 1/1/12 through 5/19/12 and from 9/30/12 through 12/31/12), lab staff will coordinate with the Influenza Surveillance coordinator to acquire virologic test result data from other clinical diagnostic laboratories to supplement HSLI virologic surveillance data.
- By November 2012 (start of each influenza season) or as new strains emerge, the lab staff and LIMS administrator will map new PHLP messages.
- By 12/30/12, 100% of the ELR licenses will be put into use by facilities submitting samples for influenza testing.

Years 2-5 (1/1/13-12/31/16):

Throughout years 2-5 all activities above will continue.

Measures of Effectiveness/Measurable Goals:

- Year-round HSLI submits 100% of its influenza test results to CDC within two weeks of the test date.
- HSLI submits a minimum of 20 influenza virus isolates to CDC for further characterization each influenza season.
- HSLI continues to demonstrate proficiency in PCR methods for influenza virus detection, typing, and subtyping by enrolling in a proficiency testing program and scoring 80% or better as per CLIA qualifications.
- Year-round, 100% of influenza A viruses tested by HSLI are subtyped.
- HSLI identifies at least three sites to submit their virologic test result data to supplement the HSLI virologic data for the 2011-2012 season.
- Year-round, new or emerging influenza strains are mapped to new PHLIP messages within 14 days.
- HSLI puts into use 100% of the ELR licenses by 12/31/12.

ATTACHMENT 12

OTHER INFECTIOUS DISEASES NOT ELSEWHERE COVERED

A. Rabies

Operational Plan

Activity 1: Provide training on detection of rabies using the national standard protocol for Direct Fluorescent Antibody (DFA) testing.

Laboratory staff will:

- Have received training on the national standard DFA protocol.
- Continue to participate in the Wisconsin State Laboratory of Hygiene's Rabies Proficiency Testing Program for DFA with PT samples being shipped twice per year.

Activity 2: Enhance or implement immunological and/or molecular diagnostics to accurately detect rabies and improve viral characterization

Laboratory staff will:

- Perform PCR testing on specimens that test unsatisfactory by DFA and have reported human or domestic animal contact as the reason for submission.
- Perform strain characterization on all specimens testing positive by DFA on a quarterly basis.

Year 1 (1/1/12 –12/31/12):

- By 6/30/12, the Rabies Laboratory staff will verify and implement a raccoon-specific rabies RT-PCR assay.
- By 6/30/12, the Rabies Laboratory staff will verify and implement a universal rabies RT-PCR assay.
- By 6/30/12, molecular rabies testing results will be added to the rabies database for inclusion in the rabies surveillance reports.
- By 12/31/12, all specimens unsatisfactory by DFA will be tested by PCR within 24 hours.
- By 12/31/12, 50% of rabies positive specimens from 2012 will have strain characterization performed on them within three months of submission.
- By 12/31/12, Rabies Laboratory staff will include available sources of bat-specific strain typing reagents to allow identification of bat strains.

Years 2-5 (1/1/13-12/31/16):

Throughout years 2-5, all activities above will continue with the expectation that by the end of year five, 100% of rabies positive specimens will have strain characterization performed within at least three months of submission. The Rabies Laboratory staff will continue to participate in the WSHL Rabies Proficiency Testing Program and maintain an 80% or above testing score.

Activity 3: Improve routine surveillance and epidemiology of rabies

Program staff will:

- Include specimens tested by the USDA using DRIT and confirmed by the CDC rabies lab in our annual rabies surveillance report and map.
- Include specimens tested by HSLI using PCR in our annual rabies surveillance report and map.
- Include strain typing information in the annual rabies surveillance report and map.

Year 1 (1/1/12 –12/31/12):

- By 3/30/12, DRIT rabies positive specimens from 2011 will be added to the 2011 annual rabies surveillance summary that is publicly posted on our website and distributed to local rabies control partners.
- By 12/31/12, PCR testing data will be included in the 2012 annual rabies surveillance summary.
- By 12/31/12, strain typing information will be included in the next quarter report and in the 2012 annual rabies surveillance summary.

Years 2-5(1/1/13-12/31/16):

Throughout years 2-5 all activities above will continue

Measures of Effectiveness/Measurable Goals

1) Number of human exposures reported

We will not be using this as a measure of effectiveness as none of the activities proposed will change the number of human exposures reported.

2) Number of human vaccination episodes avoided

The number of people with exposures to a rabies suspect is provided on the specimen submission form and is entered into the HSLI Rabies Laboratory database. Both DFA and PCR results will also be entered and the number of individuals exposed to all specimens unsatisfactory by DFA testing can be easily extracted. Of these, individuals exposed to low risk species that ultimately test negative by PCR can be counseled that post-exposure prophylaxis is unnecessary and will be tallied as human vaccination episodes avoided. This information will also be captured in the rabies consult database that documents all risk assessments done by epidemiologists.

3) Number of isolates collected from suspect animals that are characterized.

All specimens submitted for rabies testing and the corresponding information on the specimen submission form are entered in the HSLI Rabies Laboratory database. A data field exists for collection of strain typing information. This information is readily extracted and analyzed and will be done during the quarterly rabies data analysis. Data will be presented as a proportion of all positive specimens in order to measure progress against the stated goal of at least 50% during each quarter.

4) Number of suspected rabies cases investigated

We will not be using this as a measure of effectiveness as none of the activities proposed will change the number of suspected rabies cases investigated. All submitted specimens that test positive or unsatisfactory are followed-up to identify both human and domestic animal contacts for risk assessment.

ATTACHMENT 12

OTHER INFECTIOUS DISEASES NOT ELSEWHERE COVERED

A. Tickborne Disease Surveillance and Response (not including Lyme disease)

Operational Plan

Activity 3: Build and/or expand epidemiological capacity to measure burden, trends, and to track emergence of (non-Lyme) tickborne diseases, including: babesiosis, human granulocytic anaplasmosis (HGA), human monocytic ehrlichiosis (HME), Rocky Mountain spotted fever (RMSF), Southern tick-associated rash illness (STARI), tick-borne relapsing fever (TBRF), and tularemia. [Please see Section 5 on “West Nile virus and other arboviral diseases”, for guidance involving Colorado tick fever and Powassan encephalitis].

Program staff will:

- Contact healthcare providers of suspect cases with positive PCR results for either babesia or HGA to obtain clinical information if the LBOH has not obtained that information within two weeks of receipt of the initial report.
- Contact healthcare providers of suspect cases with positive babesia smear results to obtain clinical information if the LBOH has not obtained that information within two weeks of receipt of the initial report.
- Contact laboratories for complete demographic information on reports missing town of residence information.
- Provide informal quarterly reports on the number of incomplete CRFs on all non-Lyme tickborne diseases to LBOHs.
- Produce annual surveillance summaries for all tick-borne diseases and distribute to LBOHs and post publicly for healthcare providers and the public.
- Annual reports on data quality will be completed for babesia and HGA and disseminated to LBOHs.

Year 1(1/1/12 –12/31/12):

- By 3/31/12, a part-time non-Lyme tick-borne disease epidemiologist will be hired.
- By 06/1/12, the part-time epidemiologist will be trained and will be following-up on positive laboratory reports and contacting laboratories for demographic information.
- By 06/01/12, quarterly reports on data quality will be produced and disseminated to LBOHs via the electronic alerting network.

Years 2-5(1/1/13-12/31/16):

By 3/31/13, 2012 annual surveillance summaries will be produced and posted on the public website and distributed to LBOHs. The final data quality report will also be completed. All other activities will continue

Measures of Effectiveness/Measurable Goals

- 1) Hiring or retention of qualified personnel.
 - a) Percentage of staff positions for the activity that are filled
One half-time epidemiologist is retained to perform non-Lyme tick-borne disease surveillance activities.
- 2) Training of personnel.
 - a) Number of trainings attended
The epidemiologist will be trained by existing staff and will not require outside training. This measure will not be used.
- 3) Reporting of confirmed and probable cases to CDC in a timely manner.
 - a) Number of confirmed cases reported to CDC within specified days of detection
Information on when a CRF is completed, when it is reviewed and when it is reported to CDC is captured and stored in an electronic database developed and maintained within ISIS. Improvement will be demonstrated by a decrease in the number of days between case report form review and transmission to CDC.
- 4) Development and dissemination (e.g. to public health partners) of informal reports regarding quality and coverage of surveillance data.
 - a) Percentage of quarterly reports distributed to partners
Information regarding cases within an unknown town and county of residence is already included in the annual surveillance summary. A more complete analysis of missing data to include, reports with incomplete follow-up, race/ethnicity, date of symptom onset, and tick exposure will be performed annually and disseminated via the electronic alerting network to all 351 LBOHs. Quarterly reports on the number of laboratory reports with incomplete follow-up will occur quarterly if an epidemiologist position is funded.
- 5) Steps taken towards development or expansion of information technologies or electronic reporting.

ISIS will continue to pursue 100% ELR. However, this is an activity separate from the activities proposed for the tick-borne disease epidemiologist. This measure will not be used.
- 6) Development of pilot projects designed to better understand the incidence of tickborne diseases or their pathogens in a defined area.
 - a) Number of counties that monitor tickborne pathogens
Enhanced follow-up on laboratory reports likely to be associated with a confirmed case, PCR babesia and HGA results, for example, will improve understanding of the true incidence of tick-borne diseases other than Lyme disease in Massachusetts. Improvement will be demonstrated by a decrease in the proportion of cases with

incomplete clinical information. There are currently no MDPH supported programs that monitor tick-borne disease pathogens in any county in MA. This measure will not be used.

7) Assignment of suspect cases to town of residence

Contacting laboratories for demographic information on suspect cases associated with positive laboratory reports will allow assignment of suspect cases to a town of residence which enables forwarding of the information to the LBOH for case investigation. Improvement will be demonstrated by a decrease in the proportion of cases that cannot be assigned to a town and county of residence.