STATE OF MICHIGAN
DEPARTMENT OF COMMUNITY HEALTH
LANSING

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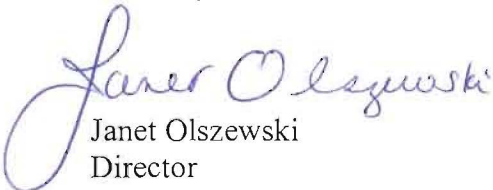200 Independence Ave. SW
Washington, DC 20201

Dear Ms. Jeeva:

Thank you for the opportunity to submit Michigan's Healthcare-Associated Infection (HAI) Surveillance and Prevention Plan. It is our sincere hope that through effective mobilization of resources provided through the American Recovery and Reinvestment Act, Michigan will be able to reduce, prevent, and ultimately eliminate healthcare-associated infections.

Michigan's Healthcare-Associated Infection Surveillance and Prevention Plan outlines the Michigan Department of Community Health (MDCH), Surveillance for Healthcare-Associated and Resistant Pathogens (SHARP) Unit's HAI activities that are currently underway and those that will be considered if additional funding becomes available. Many of these activities will be accomplished in conjunction with the Michigan HAI Prevention Advisory Group. The Advisory Group is made up of representatives from partner healthcare-related organizations, including the Michigan Health and Hospital Association Keystone Center for Patient Safety and Quality, Michigan's Quality Improvement Organization — MPRO, the Michigan Society for Infection Prevention and Control, the Greater Detroit Chapter of the Association for Professionals in Infection Control and Epidemiology, the Michigan State Medical Society, the Michigan Infectious Disease Society, the South Central Association for Clinical Microbiology, the Michigan Antibiotic Resistance Reduction Coalition, and consumers. The SHARP Unit will continue to coordinate HAI prevention activities with the Prevention and Wellness Block Grant-funded division at MDCH.

Michigan is one of the few states that has no mandatory reporting of HAIs or MRSA. The Michigan HAI Surveillance and Prevention Plan will capitalize on valuable work currently underway throughout the state. Through the Surveillance and Prevention Initiatives outlined in the Plan, Michigan will strive to reach national five-year Prevention Targets as identified in the HHS *Action Plan to Prevent Healthcare-Associated Infections*.

Sincerely,

Janet Olszewski
Director

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# Michigan's Healthcare-Associated Infection Surveillance and Prevention Plan

## The Michigan Department of Community Health
## Bureau of Epidemiology
## Division of Communicable Diseases
## Surveillance and Infectious Disease Epidemiology Section
## Surveillance of Healthcare-Associated & Resistant Pathogens (SHARP) Unit

## Grant Period 2009–2011

**Executive Summary:**

In recent years, concern about the public health impact of healthcare-associated infections (HAIs) in the United States has grown. HAIs are infections that patients acquire while they are being treated for medical or surgical conditions in a hospital, long-term care facility, ambulatory care facility, or other type of healthcare facility. There is also growing concern that many of these HAIs are becoming resistant to currently available antibiotics.

From national studies, it is well known that the burden of HAIs has significantly increased the healthcare costs of individuals and has contributed to increased morbidity and mortality. National data indicates that at least 1.7 million HAIs occurred in hospitals, with 99,000 associated deaths, in 2002 alone. The average cost of HAIs has been reported to be a staggering additional $33 billion per year.

On February 17, 2009, the American Recovery and Reinvestment Act (ARRA) was signed into law. The purpose of the Act was to stimulate economic recovery, as well as to provide a funding opportunity for state health departments to strengthen their healthcare infrastructure to address HAIs, with the ultimate goal of reducing HAIs and healthcare costs. The Michigan Department of Community Health (MDCH), Surveillance and Infectious Disease Epidemiology (SIDE) Section, Surveillance for Healthcare-Associated and Resistant Pathogens (SHARP) Unit applied for funding under this grant, and was fortunate to receive money to expand upon HAI surveillance and prevention initiatives.

Michigan's Healthcare-Associated Infection Surveillance and Prevention Plan (below) outlines the MDCH, SIDE Section, SHARP Unit's HAI activities that are currently underway and those that will be considered if additional funding becomes available. Many of

these activities will be accomplished in conjunction with partner healthcare-related organizations, including the Michigan Health and Hospital Association (MHA) Keystone Center for Patient Safety and Quality, MPRO (Michigan's Quality Improvement Organization), the Michigan Society for Infection Prevention and Control (MSIPC), the Greater Detroit Chapter of the Association for Professionals in Infection Control & Epidemiology (APIC-GD), the Michigan State Medical Society (MSMS), the Michigan Infectious Disease Society (MIDS), the South Central Association for Clinical Microbiology (SCACM), the Michigan Antibiotic Resistance Reduction Coalition (MARR), and consumers.

The four main target areas of the Michigan HAI Surveillance and Prevention Plan are listed below:
1. Development and/or Enhancement of the HAI Program Infrastructure
2. Surveillance, Detection, Reporting, and Response
3. Prevention of HAI Infections
4. Evaluation, Oversight, and Communications

Michigan's HAI Surveillance and Prevention Plan for 2009–2011 will focus on acute care facilities. For the Surveillance component of the Plan, MDCH will collect and analyze three consecutive months of data from participating hospitals, using the Lab ID Event option of the Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) Multi-Drug Resistant Organism (MDRO)/*Clostridium difficile*-associated Disease (CDAD) Module. Special attention will be given to reports of methicillin-resistant *Staphylococcus aureus* (MRSA) and *C. difficile* infection, although all data released from participating hospitals will be reviewed. Collection of surveillance data will allow 'regional' analysis of trends (and thus targeted reductions), and allow facilities to note 'community benchmark' data when comparing internal facility data. During the first year of surveillance (2010), MDCH's goal will be to collect this data from 30 hospitals, and will increase the number of participating hospitals to 50 by the end of the second year (2011).

Michigan hospitals interested in contributing to 2010 MRSA and *C. difficile* surveillance should have the following in place:
1. Enroll in the CDC's NHSN
2. Set up monthly reporting plans
3. Become familiar with the NHSN: MDRO/CDAD Module
4. Review and sign the MDCH SHARP Unit's data use agreement to protect hospital data
5. Within NHSN, join the MDCH SHARP Group
6. Within NHSN, confer rights so that MDCH can view selected data
7. No later than October 1, 2010, begin submitting MDRO/CDAD module, Lab ID event data on MRSA and *C. difficile* from one hospital location/unit for 3 consecutive months. (Note: Hospitals participating in MPRO's MRSA/MDRO Initiative are asked to select a location other than that used for MPRO data.)

As of December 11, 2009, forty three (43) Michigan hospitals have responded to a survey distributed through MHA Keystone, MSIPC, and APIC-GD regarding current and planned use of NHSN and facilities' willingness to share data with the MDCH SHARP Unit. Twenty eight hospitals are currently using NHSN. Thirteen of these have expressed an interest in sharing their data, while another twelve have indicated that they need to check with their administration prior to agreeing to share their data. Three others are currently not using NHSN but are planning to do so soon and indicated they plan to share their data. Signed data use agreements have been returned from four hospitals, and all four have conferred rights to MDCH to access their data. Three of these four hospitals are currently using the Lab ID option of the MDRO/CDAD module to report MRSA; two of the four hospitals are using the Lab ID option to track *C. difficile* infections.

For the Prevention component of the Plan, MDCH will participate in existing HAI Prevention Collaboratives conducted by partner organizations. These collaboratives will include, at a minimum, the MPRO MRSA/MDRO Initiative and the MHA Keystone: HAI catheter-associated urinary tract infection (CAUTI) initiative. Both of these collaboratives promote the use of evidenced-based practices to reduce the rates of HAI infections. Hospitals already participating in these initiatives need take no further action at this time. Those interested in joining either of the Prevention Collaboratives should contact the MDCH SHARP Unit, MPRO, or MHA Keystone for more information.

Michigan is one of the few states that has no mandatory reporting of HAIs or MRSA. The Michigan HAI Surveillance and Prevention Plan will capitalize on valuable work currently underway throughout the state. Through the Surveillance and Prevention Initiatives outlined in more detail below, Michigan will strive to reach national 5-year Prevention Targets as identified in the HHS *Action Plan to Prevent Healthcare-Associated Infections* (HHS Action Plan).

## TARGET AREAS OF THE MICHIGAN PLAN

### 1. Development and/or Enhancement of HAI Program Infrastructure

In order to accomplish the goals of a successful HAI surveillance and prevention program, a strong infrastructure is needed to define the objectives and implement the activities of the program. The outline below describes Michigan's Plan for enhancing its state infrastructure to address HAIs. The foundation for many of these activities was laid prior to the announcement of ARRA grant funding, and thus Michigan is off to a good start.

**Table 1:** State infrastructure planning for HAI surveillance, prevention, and control.

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| **Level I** | | | 1. Establish statewide HAI prevention leadership through the formation of a multidisciplinary group or state HAI advisory council | |
| | ☒ | ☐ |    i. Collaborate with local and regional partners (e.g., state hospital associations, professional societies for infection control and healthcare epidemiology, academic organizations, laboratorians and networks of acute care hospitals and long term care facilities (LTCFs)) | 9-1-09 |
| | ☒ | ☐ |    ii. Identify specific HAI surveillance and prevention targets consistent with HHS priorities (see Sections 2.4 and 3.3 for further details) | 1-1-10 |
| | | | *Other activities or descriptions (not required):* MDCH SHARP has convened a multi-disciplinary Advisory Group (referred to as the Michigan HAI Prevention Advisory Group). The Advisory Group includes representation from the MDCH SHARP Unit and from the Michigan Health & Hospital Association (MHA) Keystone Center for Patient Safety and Quality, the Michigan State Medical Society (MSMS), the Michigan Infectious Disease Society (MIDS), the Michigan Society for Infection Prevention & Control (MSIPC), the Greater Detroit Chapter of Association of Professionals in Infection Control (APIC-GD), the | |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | Michigan Antibiotic Resistance Reduction (MARR) Coalition, Michigan's Quality Improvement Organization — MPRO, the Michigan Association for Local Public Health (MALPH), the South Central Association for Clinical Microbiology (SCACM), and a voluntary consumer representative. | |
| | | | 2. Establish an HAI surveillance, prevention, and control program | |
| | ☒ | ☐ | i. Designate a State HAI Prevention Coordinator | 9-1-09 |
| | ☒ | ☐ | ii. Develop dedicated, trained HAI staff with at least one FTE (or contracted equivalent) to oversee the four major HAI activity areas (Integration, Collaboration, and Capacity Building; Reporting, Detection, Response and Surveillance; Prevention; Evaluation, Oversight and Communication) | 9-1-09 |
| | ☒ | ☐ | 3. Integrate laboratory activities with HAI surveillance, prevention, and control efforts<br>   i. Improve laboratory capacity for hospitals to detect, and for MDCH to confirm, emerging resistance in HAI pathogens and perform further analysis/characterization where appropriate (e.g., outbreak investigation support, HL7 messaging of laboratory results) | Ongoing throughout grant period |
| **Level II** | ☒ | ☐ | 4. Improve coordination, communication and education among government agencies and organizations that share responsibility for conducting HAI surveillance, prevention and control | Ongoing throughout grant period |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | ☒ | ☐ | 5. Facilitate use of standards-based formats (e.g., Clinical Document Architecture, electronic messages) by the state health department, bureau of laboratories, and healthcare facilities for purposes of bi-directional electronic reporting of HAI data | Electronic messaging will be outgoing from Bureau of Laboratories by 12-2009; bi-directional by 12-2010 |
| | ☒ | ☐ | i. Provide technical assistance or other incentives for implementation of standards-based reporting to develop capacity for HAI surveillance and other types of public health surveillance, such as for conditions deemed reportable to state and local health agencies using electronic laboratory reporting (ELR) | Ongoing |
| | ☐ | ☒ | ii. Facilitate use of standards-based solutions for external reporting to strengthen relationships between healthcare facilities and regional nodes of healthcare information (e.g., Regional Health Information Organizations — RHIOs — and Health Information Exchanges — HIEs) to yield broader benefits for public health by consolidating electronic reporting through regional nodes | Contingent on additional funding |
| | ☒ | ☐ | iii. Develop sustainable enhancements of electronic inter-communicability with laboratory information and infection control software systems with NHSN and the MDCH electronic reporting systems, the Michigan Disease Surveillance System (MDSS) and the Laboratory Information System (LIS), currently in development. MDCH will continue to use the Michigan Disease Surveillance System (MDSS) for individual case reporting | State Health Informatics Plan to be submitted April, 2010; implementation contingent on additional funding |

## 2. Surveillance, Detection, Reporting, and Response

Timely and accurate monitoring remains necessary to gauge progress towards HAI elimination. Public health surveillance has been defined as the ongoing, systematic collection, analysis, and interpretation of data essential to the planning, implementation, and evaluation of public health practice, and timely dissemination to those responsible for prevention and control.[1] Increased participation in systems such as the National Healthcare Safety Network (NHSN) has been demonstrated to promote HAI reduction. This, combined with improvements to simplify and enhance data collection, and improve dissemination of results to healthcare providers and the public are essential steps toward increasing HAI prevention capacity.

The HHS Action Plan identifies targets and metrics for five categories of HAIs and identified Ventilator-associated Pneumonia as an HAI under development for metrics and targets (Appendix 1):

- Central Line-associated Blood Stream Infections (CLABSI)
- *Clostridium difficile* Infections (CDI)
- Catheter-associated Urinary Tract Infections (CAUTI)
- Methicillin-resistant *Staphylococcus aureus* (MRSA) Infections
- Surgical Site Infections (SSI)
- Ventilator-associated Pneumonia (VAP)

State capacity for investigating and responding to outbreaks and emerging infections among patients and healthcare providers is central to HAI prevention. Investigation of outbreaks helps identify preventable causes of infections including issues with the improper use or handling of medical devices, contamination of medical products, and unsafe clinical practices.

The following section outlines Michigan's plan to conduct surveillance of HAIs, to detect clusters, outbreaks, and trends, and to report and respond to situations of public health significance.

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[1] Thacker SB, Berkelman RL. Public health surveillance in the United States. Epidemiol Rev 1988;10:164-90.

**Table 2:** State planning for surveillance, detection, reporting, and response for HAIs

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| **Level I** | | | 1. Improve HAI outbreak detection and investigation | |
| | ☒ | ☐ | i. Work with partners including CSTE, CDC, and MHA, professional organizations (e.g., MSIPC, APIC-GD, MIDS, MALPH), quality improvement agencies (e.g., MPRO), and providers across the healthcare continuum to improve outbreak reporting to state and local health departments | 9-1-09 |
| | ☒ | ☐ | ii. In collaboration with Michigan-specific professional organizations (i.e. MSIPC, APIC-GD, and MALPH), establish protocols and provide training for health department and healthcare staff to investigate outbreaks, clusters or unusual cases of HAIs | Ongoing |
| | ☒ | ☐ | iii. Develop protocols to protect facility/provider/patient identity and confidentiality when investigating incidents and potential outbreaks | Ongoing |
| | ☒ | ☐ | iv. Improve overall use of surveillance data to identify, prevent and/or stop the transmission of HAIs, multi-drug resistant organisms (MDROs), and other reportable diseases and newly emerging infections | Ongoing |
| | ☐ | ☒ | *Other activities or descriptions (not required):* The primary focus of surveillance activities will be on acute care facilities but as situations arise, there will be flexibility to expand this surveillance to long term care, ambulatory care, and outpatient care settings. | Contingent on additional funding |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | ☐ | ☒ | 2. Enhance laboratory capacity for state and local detection and response to new and emerging HAI issues<br>　　i. Develop protocols for molecular typing to characterize outbreaks<br>　　ii. Develop mechanisms for distribution of information or data from outbreaks to clinical partners<br>　　iii. Investigate the feasibility of transferring protocols to our Regional Laboratory partners for local outbreak detection/characterization | Contingent on additional funding |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| **Level II** | | | 3. Improve communication of HAI outbreaks and infection control breaches | |
| | ☒ | ☐ | 　　i. Develop standard reporting criteria including number, size, and type of HAI outbreak for health departments and reports to CDC. (In Michigan, the definition of an outbreak is 3 or more epidemiologically linked, laboratory confirmed cases) | Ongoing |
| | ☒ | ☐ | 　　ii. Establish mechanisms or protocols for exchanging information about outbreaks and aggregate data among clinical partners, surveillance partners, and state and local governmental partners | Ongoing |
| | ☒ | ☐ | 　　iii. Provide consultation and sharing of evidence-based prevention and control practices | Ongoing |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | 4. Identify at least 2 priority HAI targets for surveillance in support of the HHS HAI Action Plan | |
| | ☒ | ☐ | i. Central Line-associated Bloodstream Infections (CLABSI) | |
| | ☒ | ☐ | ii. *Clostridium difficile* Infections (CDI) | 9-1-09 |
| | ☒ | ☐ | iii. Catheter-associated Urinary Tract Infections (CAUTI) | |
| | ☒ | ☐ | iv. Methicillin-resistant *Staphylococcus aureus* (MRSA) Infections | 9-1-09 |
| | ☒ | ☐ | v. Surgical Site Infections (SSI) | |
| | ☒ | ☐ | vi. Ventilator-associated Pneumonia (VAP) | |
| | | | *Other activities or descriptions (not required):* Michigan chose MRSA and CDI as our priority surveillance targets because of the great work that MHA Keystone: ICU has already done on CLABSIs and VAPs, and the work they are undertaking through MHA Keystone: HAI on CLABSI and CAUTI prevention and improving hand hygiene. MHA Keystone is beginning a new project MHA Keystone: OR to focus on SSIs. (See mhakeystonecenter.org for more information)<br><br>The Michigan Surgical Quality Collaborative (MSQC) is also working on reducing SSIs. MSQC is a connected community of 34 Michigan hospitals seeking to measure and improve the care of patients undergoing general and vascular surgery through sharing | |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | data and providing feedback in a transparent process to identify best practices related to quality measures including surgical infections. Data is collected by hospitals participating in the American College of Surgeons, NSQIP (National Surgical Quality Improvement Project). The MSQC was created through ongoing funding from Blue Cross Blue Shield of Michigan and the Blue Care Network.<br><br>Also underway in Michigan is the MPRO MRSA/MDRO Initiative. MPRO, under the guidance of CMS has recruited hospitals to work on the initiative. Each hospital chooses one unit within their facility and agrees to use the NHSN MDRO/CDAD module to track MRSA cases. From their identified unit, facilities are required to conduct Infection Surveillance and Laboratory-Identified event reporting (LabID) according to the specifications defined within the NHSN MDRO/CDAD Module protocol. Entering data within these two components of the Module will provide two main MRSA metrics to participating facilities, MPRO, and CMS: Metric #1 which is the MRSA hospital-acquired infection rate, and Metric #2, which is the hospital onset MRSA incidence rate based on clinical cultures.<br><br>The MDCH SHARP Unit will initially focus on MRSA and CDIs in participating hospitals, using the NHSN MDRO Module, Lab ID Event option. Hospitals are asked to report for one location for 3 consecutive months. Hospitals who participate in the MPRO MRSA Initiative (Infection Surveillance and LabID Event reporting for one location monthly) will be asked to choose a different location from the data they send to MPRO. Michigan's goals for participation in MRSA and CDI surveillance are 30 acute care facilities reporting data by 12/31/2010, expanding to 50 acute care facilities reporting by 12/31/2011. | |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | 5. Adopt national standards for data and technology to track HAIs (e.g., NHSN) | |
| | ☒ | ☐ | i. Develop metrics to measure progress towards national goals (align with targeted state goals). (See Appendix 1)<br>   a. Location-specific *C. difficile* standardized infection ratio (SIR)<br>   b. Location-specific MRSA bacteremia SIR | 10-1-09 |
| | ☒ | ☐ | ii. Establish baseline measurements or prevention targets | 7-1-10 |
| | | | 6. Develop state surveillance training competencies | |
| | ☒ | ☐ | i. Conduct local general training for appropriate use of surveillance systems (e.g., NHSN) including facility and group enrollment, data collection, management, and analysis | Ongoing |
| | ☒ | ☐ | ii. Conduct specific NHSN MDRO/CDAD Module training<br>   a. Basic user level<br>   b. Advanced user level | Spring 2010 |
| | ☒ | ☐ | 7. State personnel will develop tailored quarterly reports of data analyses for the state or regions<br>   i. Distribute to stakeholders<br>   ii. Post publicly on MDCH website<br>   iii. Advisory Group partners to provide links to reports on agency websites | 1-10-10 and quarterly thereafter |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| **Level III** | | | 8. Validate data entered into HAI surveillance (e.g., through healthcare records review, parallel database comparison) to measure accuracy and reliability of HAI data collection | |
| | ☒ | ☒ | i. Develop a validation plan, including a specific protocol for laboratory assessment<br> a. Peer-to-peer evaluation<br> b. Compensation of evaluators<br> c. Assessment of laboratory methods/tests used to diagnose *C. difficile* infections | Overall validation plan by 6-1-10, *C. difficile* laboratory assessment contingent on additional funding |
| | ☒ | ☐ | ii. Pilot test validation methods in a sample of healthcare facilities | 10-1-10 |
| | ☒ | ☐ | iii. Modify validation plan and methods in accordance with findings from pilot project | 2-1-11 |
| | ☐ | ☒ | iv. Implement validation plan and methods in all healthcare facilities participating in HAI surveillance | Contingent on additional funding |
| | ☐ | ☒ | v. Analyze and report validation findings | Contingent on additional funding |
| | ☐ | ☒ | vi. Use validation findings to provide operational guidance for healthcare facilities that target any data shortcomings detected | Contingent on additional funding |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | 9. Develop standardized MDCH response plans to reports of HAIs, suspect cases/clusters, and outbreak | Ongoing |
| | ☒ | ☐ | i. Include evidence based practice in consultation for outbreak mitigation efforts<br>   a. Confirm the outbreak<br>   b. Establish case definitions<br>   c. Characterize by person, place and time<br>   d. Establish compliance to standard control measures<br>   e. Determine the need for active surveillance cultures<br>   f. Determine the need for/provide pulsed field gel electrophoresis testing of available isolates<br>   g. Develop a corrective action plan<br>   h. Implement the plan<br>   i. Evaluate results<br>   j. Conduct on-site consultation as requested | Ongoing |
| | ☒ | ☐ | ii. Assess expanse of outbreak (local vs. regional vs. state) to include additional regional and federal partners | Ongoing |
| | ☒ | ☐ | iii. Communicate results | Ongoing |
| | ☐ | ☒ | iv. Develop mechanism for dissemination and wide implementation of lessons learned, proven strategies, and best practices | Contingent on additional funding |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | 10. Collaborate with professional licensing organizations in order to develop procedures for referring complaints related to provider infection control practice in healthcare settings, and to consult with them regarding standards for continuing infection control education and training | |
| | ☒ | ☐ | i. Acute care settings | 12-1-09 |
| | ☐ | ☒ | ii. Ambulatory care settings | Contingent on additional funding |
| | ☐ | ☒ | iii. Long-term care settings | Contingent on additional funding |
| | | | 11. Adopt integration and interoperability standards for HAI information systems and data sources | When developed by CDC, CMS, and/or AHRQ |
| | ☐ | ☒ | i. Improve overall use of surveillance data to identify and prevent HAI outbreaks or transmission in HC settings (e.g., hepatitis B, hepatitis C, multi-drug resistant organisms (MDRO), and other reportable HAIs) across the spectrum of inpatient and outpatient healthcare settings | See statement #11 above |
| | ☐ | ☒ | ii. Promote definitional alignment and data element standardization needed to link HAI data across the nation utilizing the developed NHSN modules | See statement #11 above |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | 12. Enhance electronic reporting and information technology for healthcare facilities to reduce reporting burden and increase timeliness, efficiency, comprehensiveness, and reliability of the data | |
| | ☒ | ☐ | i. Using de-identified, aggregated Michigan NHSN data, report HAI data to healthcare partners and the public | 1-10-10 |
| | ☒ | ☐ | ii. Increase number of hospitals who participate in NHSN | Ongoing |
| | ☒ | ☐ | iii. Increase the number of modules utilized by hospitals participating in NHSN | Ongoing |
| | ☒ | ☐ | 13. Make available risk-adjusted HAI data that enables healthcare facilities to make comparisons among regional, state, and national NHSN participants<br>i. Stratify HAI data by location within the hospital<br>ii. Use SIR rates for comparisons | 10-15-10 |
| | ☐ | ☒ | 14. Enhance surveillance and detection of HAIs in nonhospital settings<br>i. Assist surveillance participants to expand case findings to include healthcare that takes place outside of acute care | Contingent on additional funding |

## 3. Prevention of HAI Infections

State implementation of HHS Healthcare Infection Control Practices Advisory Committee (HICPAC) recommendations is a critical step towards the elimination of HAIs. CDC with HICPAC has developed evidence-based HAI prevention guidelines cited in the HHS Action Plan for implementation. These guidelines are translated into practice and implemented by multiple groups in hospital settings for the prevention of HAIs. CDC guidelines have also served as the basis for the Centers for Medicare and Medicaid Services' (CMS) Surgical Care Improvement Project. These evidence-based recommendations have also been incorporated into Joint Commission standards for accreditation of U.S. hospitals and have been endorsed by the National Quality Forum.

Outlined below are Michigan's planned activities for reducing the occurrence of HAIs.

**Table 3:** State planning for HAI Prevention activities

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| **Level I** | ☒ | ☐ | 1. Implement HICPAC recommendations<br>   i. Develop strategies for implementation of HICPAC recommendations for at least 2 prevention targets specified by the state multidisciplinary group | Ongoing |
| | | | *Other activities or descriptions (not required):* As previously stated under Section 2.4 (description) Michigan is already home to many renowned HAI prevention collaboratives: MHA Keystone: ICU; MHA Keystone: OR; MHA Keystone: HAI; MSQC; and the MPRO MRSA/MDRO Initiative.<br><br>These historic and/or existing prevention collaboratives focus on implementation of HICPAC recommendations for CLABSIs, CAUTIs, MRSA, SSIs, and VAPs. At this time, no HICPAC recommendations specific for CDI prevention exist, therefore, the Society for Healthcare Epidemiology of America (SHEA) and the Infectious Disease Society of America (IDSA) compendium (http://www.journals.uchicago.edu/toc/iche/2008/29/s1?cookieSet=1) will be referenced. | |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | 2. Establish a prevention working group under the state HAI advisory council to coordinate state HAI collaboratives | |
| | ☒ | ☐ | i. Assemble expertise from MHA Keystone Center for Patient Safety and Quality, MSIPC, APIC-GD, MPRO, MARR, MALPH, MSMS/MIDS and SCACM to consult, advise, and coach inpatient healthcare facilities involved in HAI prevention collaboratives | |
| | ☒ | ☐ | ii. Reference the CDC DHQP-provided 'toolkits' on general and specific Prevention Collaborative development and maintenance | When developed by CDC DHQP |
| | | | 3. Establish HAI collaboratives with at least 10 hospitals | |
| | ☒ | ☐ | i. Identify staff trained in project coordination, infection control, and collaborative coordination | Ongoing |
| | ☒ | ☐ | ii. Develop a communication strategy to facilitate peer-to-peer learning and sharing of best practices | Ongoing |
| | ☒ | ☐ | iii. Establish and adhere to feedback of a clear and standardized outcome data to track progress | Ongoing |
| | | | *Other activities or descriptions (not required):* Under ARRA funding, the MDCH SHARP Unit will actively participate in the MPRO MRSA/MDRO Initiative and in the MHA Keystone: HAI – CAUTI Initiative. | |
| | | | If additional funds become available, the MDCH SHARP Unit and the Michigan HAI Advisory Group plans to:<br>i. Establish a CDI Prevention Initiative (and to reference SHEA/IDSA compendium for CDI prevention in the absence of HICPAC recommendations)<br>ii. Extend the MHA Keystone: OR – SSI Initiative into the ambulatory surgical center (ASC) setting | |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | 4. Develop state HAI prevention training competencies | |
| | ☒ | ☐ | i. Work with the Michigan HAI Prevention Advisory Team and other healthcare partners to establish HAI prevention training and certification for best practices | Ongoing |
| | | | ii. Collaborate to provide statewide education and training for: | |
| | ☒ | ☐ | a. Targeted healthcare professionals | Ongoing |
| | ☒ | ☐ | b. MDCH licensing and surveyor staff | Ongoing |
| | ☒ | ☐ | c. Data validation | Ongoing |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | 5. Highlight and promote strategies for adherence to HICPAC recommendations | |
| | ☒ | ☐ | i. Work with healthcare partners to establish best practices to ensure adherence | Ongoing |
| | ☒ | ☐ | ii. Coordinate/liaise with regulation and oversight activities such as inpatient or outpatient facility licensing/accrediting bodies to provide consultation and professional society resources for prevention of HAIs | Ongoing |
| **Level II** | ☒ | ☐ | iii. Collaborate with state personnel who provide regulatory oversight of hospitals, enhancing surveyor training and tools, and adding sources and uses of surveillance data | Ongoing |
| | ☒ | ☐ | 6. Enhance prevention infrastructure by increasing joint collaboratives with at least 20 hospitals. Work with existing prevention collaboratives to support their current activities and encourage additional facilities to join the collaboratives | Ongoing |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| **Level II** | ☒ | ☐ | 7. Establish collaboratives to prevent HAIs in nonhospital settings, especially ambulatory and long term care facilities<br>  i. MHA Keystone: OR for SSI Prevention to be expanded to include ambulatory surgical centers (ASCs)<br>  ii. MARR: a broad coalition of local professional and community organizations and individuals built around the issue of unwarranted use of antibiotics in treating self-limiting respiratory ailments.<br>    a. Most recently, MARR and Wayne State University School of Medicine developed a new educational program designed to promote appropriate management of upper respiratory infections. The presentation was webcast live on October 6, 2009. Healthcare professionals can access each of the three one-hour modules and obtain CME credits until October 5, 2010.<br>    b. MARR has also published the Long-term Care Tool Kit based on the CDC's 12 steps to Prevent Antimicrobial Resistance Among Long-Term Care Residents. Available at: http://www.mi-marr.org/LTC_toolkit.html | |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| | | | iii. MI STA\*AR (Michigan State Action on Avoidable Rehospitalizations): a 15 hospital collaborative within Michigan focused on reducing avoidable, unplanned, related rehospitalizations. Enrolled hospitals must:<br>  a. Be willing to dedicate staff time, resources and leadership at all levels of the organization to redesign processes of care<br>  b. Have a commitment to engaging clinicians and staff across the continuum of care to actively participate in the improvement work.<br>  c. Include front-line improvement teams with demonstrated success in implementing and sustaining clinical improvements.<br>  d. Develop a transitions team to identify those in their community with whom they share patients (including long-term care, physicians, home health and others) with the intent of developing local partnerships to improve patient transitions, thereby preventing avoidable rehospitalizations<br>iv. MPRO Care Transitions: MPRO has selected the Greater Lansing area (Eaton, Clinton and Ingham counties) as a targeted area for promoting seamless transitions from the hospital to home, skilled nursing care or home health care. MPRO aims to reduce unnecessary readmissions to hospitals that may increase risk or harm to patients and cost to Medicare. CMS is looking to MPRO to implement projects that affect process improvements to address issues in medication management, post-discharge follow-up and plans of care for patients who move across health care settings | |

### 4. Evaluation, Oversight, and Communications

Program evaluation is an essential organizational practice in public health. Continuous evaluation and communication of practice findings integrates science as a basis for decision-making and action for the prevention of HAIs. Program evaluation and communication allow for learning and ongoing improvement to occur. Routine, practical evaluations can inform strategies for the prevention and control of HAIs.

Outlined below are Michigan's plans for evaluating progress with Surveillance and Prevention goals, and for communicating this progress to stakeholders.

**Table 4:** State HAI communication and evaluation planning

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| **Level I** | | | 1. Conduct needs assessment and/or evaluation of the state HAI program to learn how to increase impact | |
| | ☒ | ☐ | i. Establish evaluation activity to measure progress towards targets | 12-31-10 |
| | ☒ | ☐ | ii. Establish systems for refining approaches based on data gathered | 6-1-11 |
| | | | 2. Develop and implement a communication plan about the state's HAI program and progress to meet public and private stakeholders needs | |
| | ☒ | ☐ | i. Disseminate state priorities for HAI prevention to healthcare organizations, professional provider organizations, governmental agencies, and non-profit public health organizations | 10-10-09 |
| | ☒ | ☐ | ii. Michigan State HAI Plan to be posted publicly | 2-1-10 |
| | ☒ | ☐ | iii. Michigan HAI Prevention: Annual Surveillance Reports to be posted publicly and shared with HAI Advisory Group partners | 10-10-10 |
| | ☒ | ☐ | iv. Convene a joint MDCH SHARP Unit/APIC-GD/MSIPC membership conference call for questions and answers regarding the Michigan HAI Surveillance and Prevention Plan | 2-1-09 |

| Planning Level | Check Items Underway | Check Items Planned | Items Planned for Implementation (or currently underway) | Target Dates for Implementation |
|---|---|---|---|---|
| Level II | ☒ | ☐ | 3. Highlight where consumers may access other useful healthcare quality measures<br>   i. Hospital Compare at http://www.hospitalcompare.hhs.gov/hospital<br>   ii. Hospital Inform at www.mihospitalinform.org<br>   iii. Greater Detroit Area Health Council at http://gdahc.org/save_report.asp<br>   iv. Agency for Healthcare Research & Quality (AHRQ) at http://www.ahrq.gov/data/hcup<br>   v. Nursing Home Compare at http://www.medicare.gov/NHCompare<br>   vi. Blue Cross/Blue Shield at http://www.bcbs.com/innovations/doctorhospital-information<br>   vii. Healthgrades at http://www.healthgrades.com<br>   viii. Commonwealth Fund at http://WhyNotTheBest.org<br>   ix. MARR Consumer Programs and Materials at http://www.mi-marr.org/cons_programs.html and http://www.mi-marr.org/cons_materials.html, respectively<br>   x. Individual hospital websites occasionally provide quality/safety data. Consumers are reminded to check hospital websites for more information | Ongoing |
| Level III | ☒ | ☐ | 4. Identify priorities and provide input to partners to help guide patient safety initiatives and research aimed at reducing HAIs | Ongoing |

**Appendix 1.**

The HHS Action plan identifies metrics and 5-year national prevention targets. These metrics and prevention targets were developed by representatives from various federal agencies, the Healthcare Infection Control Practices Advisory Committee (HICPAC), professional and scientific organizations, researchers, and other stakeholders. The group of experts was charged with identifying potential targets and metrics for six categories of healthcare-associated infections:

- Central Line-associated Bloodstream Infections (CLABSI)
- Clostridium difficile Infections (CDI)
- Catheter-associated Urinary Tract Infections (CAUTI)
- Methicillin-resistant Staphylococcus aureus (MRSA) Infections
- Surgical Site Infections (SSI)
- Ventilator-associated Pneumonia (VAP)

Following the development of draft metrics as part of the HHS Action Plan in January 2009, HHS solicited comments from stakeholders for review.

**Stakeholder feedback and revisions to the original draft Metrics**

Comments on the initial draft metrics published as part of the HHS Action Plan in January 2009 were reviewed and incorporated into revised metrics. While comments ranged from high level strategic observations to technical measurement details, commenters encouraged established baselines, both at the national and local level, use of standardized definitions and methods, engagement with the National Quality Forum, raised concerns regarding the use of a national targets for payment or accreditation purposes and of the validity of proposed measures, and would like to have both a target rate and a percent reduction for all metrics. Furthermore, commenters emphasized the need for flexibility in the metrics, to accommodate advances in electronic reporting and information technology and for advances in prevention of HAIs, in particular ventilator-associated pneumonia.

To address comments received on the Action Plan Metrics and Targets, proposed metrics have been updated to include source of metric data, baselines, and which agency would coordinate the measure. To respond to the requests for percentage reduction in HAIs in addition to HAI rates, a new type of metric, the standardized infection ratio (SIR), is being proposed. Below is a detailed technical description of the SIR.

To address concerns regarding validity, HHS is providing funding, utilizing Recovery Act of 2009 funds, to CDC to support states in validating NHSN-related measures and to support reporting on HHS metrics through NHSN. Also, most of the reporting metrics outlined here have already

been endorsed by NQF and for population-based national measures on MRSA and *C. difficile*, work to develop hospital level measures will be conducted in the next year utilizing HHS support to CDC through funds available in the Recovery Act.

Finally, to address concerns regarding flexibility in accommodating new measures, reviewing progress on current measures, and incorporating new sources of measure data (e.g., electronic data, administrative data) or new measures, HHS and its constituent agencies will commit to an annual review and update of the HHS Action Plan Targets and Metrics.

Below is a table of the revised metrics described in the HHS Action plan.

| Metric Number and Label | Original HAI Elimination Metric | HAI Comparison Metric | Measurement System | National Baseline Established (State Baselines Established) | National 5-Year Prevention Target | Coordinator of Measurement System | Is the metric NQF endorsed? |
|---|---|---|---|---|---|---|---|
| 1. CLABSI 1 | CLABSIs per 1000 device days by ICU and other locations | CLABSI SIR | CDC NHSN Device-Associated Module | 2006-2008 (proposed 2009, in consultation with states) | Reduce the CLABSI SIR by at least 50% from baseline or to zero in ICU and other locations | CDC | Yes[*] |
| 2. CLIP 1 (formerly CLABSI 4) | Central line bundle compliance | CLIP Adherence percentage | CDC NHSN CLIP in Device-Associated Module | 2009 (proposed 2009, in consultation with states) | 100% adherence with central line bundle | CDC | Yes[†] |
| 3a. C diff 1 | Case rate per patient days; administrative/discharge data for ICD-9 CM coded *Clostridium difficile* Infections | Hospitalizations with *C. difficile* per 1000 patient discharges | Hospital discharge data | 2008 (proposed 2008, in consultation with states) | At least 30% reduction in hospitalizations with *C. difficile* per 1000 patient discharges | AHRQ | No |

| Metric Number and Label | Original HAI Elimination Metric | HAI Comparison Metric | Measurement System | National Baseline Established (State Baselines Established) | National 5-Year Prevention Target | Coordinator of Measurement System | Is the metric NQF endorsed? |
|---|---|---|---|---|---|---|---|
| 3b. C diff 2 (new) | | *C. difficile* SIR | CDC NHSN MDRO/CDAD Module LabID[‡] | 2009-2010 | Reduce the facility-wide healthcare facility-onset *C. difficile* LabID event SIR by at least 30% from baseline or to zero | CDC | No |
| 4. CAUTI 2 | # of symptomatic UTI per 1,000 urinary catheter days | CAUTI SIR | CDC NHSN Device-Associated Module | 2009 for ICUs and other locations  2009 for other hospital units  (proposed 2009, in consultation with states) | Reduce the CAUTI SIR by at least 25% from baseline or to zero in ICU and other locations | CDC | Yes[*] |
| 5a. MRSA 1 | Incidence rate (number per 100,000 persons) of invasive MRSA infections | MRSA Incidence rate | CDC EIP/ABCs | 2007-2008  (for non-EIP states, MRSA metric to be developed in collaboration with EIP states) | At least a 50% reduction in incidence of healthcare-associated invasive MRSA infections | CDC | No |
| 5b. MRSA 2 (new) | | MRSA bacteremia SIR | CDC NHSN MDRO/CDAD Module LabID[‡] | 2009-2010 | Reduce the facility-wide healthcare facility-onset MRSA bacteremia LabID event SIR by at least 25% from baseline or to zero | CDC | No |
| 6. SSI 1 | Deep incision and organ space | SSI SIR | CDC NHSN Procedure- | 2006-2008 | Reduce the admission and readmission SSI[§] SIR by at | CDC | Yes[¶] |

| Metric Number and Label | Original HAI Elimination Metric | HAI Comparison Metric | Measurement System | National Baseline Established (State Baselines Established) | National 5-Year Prevention Target | Coordinator of Measurement System | Is the metric NQF endorsed? |
|---|---|---|---|---|---|---|---|
| | infection rates using NHSN definitions (SCIP procedures) | | Associated Module | (proposed 2009, in consultation with states) | least 25% from baseline or to zero | | |
| 7. SCIP 1 (formerly SSI 2) | Adherence to SCIP/NQF infection process measures | SCIP Adherence percentage | CMS SCIP | To be determined by CMS | At least 95% adherence to process measures to prevent surgical site infections | CMS | Yes |

[*] NHSN SIR metric is derived from NQF-endorsed metric data

[†] NHSN does not collect information on daily review of line necessity, which is part of the NQF

[‡] LabID, events reported through laboratory detection methods that produce proxy measures for infection surveillance

[§] Inclusion of SSI events detected on admission and readmission reduces potential bias introduced by variability in post-discharge surveillance efforts

[¶] The NQF-endorsed metric includes deep wound and organ space SSIs only which are included the target.

**Understanding the Relationship between HAI Rate and SIR Comparison Metrics**

The Original HAI Elimination Metrics listed above are very useful for performing evaluations. Several of these metrics are based on the science employed in the NHSN. For example, metric #1 (CLABSI 1) for CLABSI events measures the number of CLABSI events per 1000 device (central line) days by ICU and other locations. While national aggregate CLABSI data are published in the annual NHSN Reports these rates must be stratified by types of locations to be risk-adjusted. This scientifically sound risk-adjustment strategy creates a practical challenge to summarizing this information nationally, regionally or even for an individual healthcare facility. For instance, when comparing CLABSI rates, there may be quite a number of different types of locations for which a CLABSI rate could be reported. Given CLABSI rates among 15 different types of locations, one may observe many different combinations of patterns of temporal changes. This raises the need for a way to combine CLABSI rate data across location types.

A standardized infection ratio (SIR) is identical in concept to a standardized mortality ratio and can be used as an indirect standardization method for summarizing HAI experience across any number of stratified groups of data. To illustrate the method for calculating an SIR and understand how it could be used as an HAI comparison metric, the following example data are displayed below:

| Risk Group Stratifier | Observed CLABSI Rates | | | NHSN CLABSI Rates for 2008 (Standard Population) | | |
|---|---|---|---|---|---|---|
| Location Type | #CLABSI | #Central line-days | CLABSI rate[*] | #CLABSI | #Central line-days | CLABSI rate[*] |
| ICU | 170 | 100,000 | 1.7 | 1200 | 600,000 | 2.0 |
| WARD | 58 | 58,000 | 1.0 | 600 | 400,000 | 1.5 |

$$\text{SIR} = \frac{\text{observed}}{\text{expected}} = \frac{170 + 58}{100000 \times \left(\frac{2}{1000}\right) + 58,000 \times \left(\frac{1.5}{1000}\right)} = \frac{228}{200 + 87} = \frac{228}{287} = 0.79 \qquad 95\% \, \text{CI} = (0.628, 0.989)$$

[*]defined as the number of CLABSIs per 1000 central line-days

In the table above, there are two strata to illustrate risk-adjustment by location type for which national data exist from NHSN. The SIR calculation is based on dividing the total number of observed CLABSI events by an "expected" number using the CLABSI rates from the standard population. This "expected" number is calculated by multiplying the national CLABSI rate from the standard population by the

observed number of central line-days for each stratum which can also be understood as a prediction or projection. If the observed data represented a follow-up period such as 2009 one would state that an SIR of 0.79 implies that there was a 21% reduction in CLABSIs overall for the nation, region or facility.

The SIR concept and calculation is completely based on the underlying CLABSI rate data that exist across a potentially large group of strata. Thus, the SIR provides a single metric for performing comparisons rather than attempting to perform multiple comparisons across many strata which makes the task cumbersome. Given the underlying CLABSI rate data, one retains the option to perform comparisons within a particular set of strata where observed rates may differ significantly from the standard populations. These types of more detailed comparisons could be very useful and necessary for identifying areas for more focused prevention efforts.

The National 5-year prevention target for metric #1 could be implemented using the concept of an SIR equal to 0.25 as the goal. That is, an SIR value based on the observed CLABSI rate data at the 5-year mark could be calculated using NHSN CLABSI rate data stratified by location type as the baseline to assess whether the 75% reduction goal was met. There are statistical methods that allow for calculation of confidence intervals, hypothesis testing and graphical presentation using this HAI summary comparison metric called the SIR.

The SIR concept and calculation can be applied equitably to other HAI metrics list above. This is especially true for HAI metrics for which national data are available and reasonably precise using a measurement system such as the NHSN. The SIR calculation methods differ in the risk group stratification only. To better understand metric #6 (SSI 1) see the following example data and SIR calculation:

| Risk Group Stratifiers | | Observed SSI Rates | | | NHSN SSI Rates for 2008 (Standard Population) | | |
|---|---|---|---|---|---|---|---|
| Procedure Code | Risk Index Category | #SSI[†] | #procedures | SSI rate[*] | #SSI[†] | #procedures | SSI rate[*] |
| CBGB | 1 | 315 | 12,600 | 2.5 | 2100 | 70,000 | 3.0 |
| CBGB | 2,3 | 210 | 7000 | 3.0 | 1000 | 20,000 | 5.0 |
| HPRO | 1 | 111 | 7400 | 1.5 | 1020 | 60,000 | 1.7 |
| | | | | | | | |

$$\text{SIR} = \frac{\text{observed}}{\text{expected}} = \frac{315 + 210 + 111}{12600 \times \left(\frac{3.0}{100}\right) + 7000 \times \left(\frac{5.0}{100}\right) + 7400\left(\frac{1.7}{100}\right)} = \frac{636}{378 + 350 + 125.8} = \frac{636}{853.8} = 0.74 \qquad 95\% \text{CI} = (0.649, 0.851)$$

[†] SSI, surgical site infection
[*] defined as the number of deep incision or organ space SSIs per 100 procedures

This example uses SSI rate data stratified by procedure and risk index category. Nevertheless, an SIR can be calculated using the same calculation process as for CLABSI data except using different risk group stratifiers for these example data. The SIR for this set of observed data is 0.74 which indicates there's a 26% reduction in the number of SSI events based on the baseline NHSN SSI rates as representing the standard population. Once again, these data can reflect the national picture at the 5-year mark and the SIR can serve as metric that summarizes the SSI experience into a single comparison.

There are clear advantages to reporting and comparing a single number for prevention assessment. However, since the SIR calculations are based on standard HAI rates among individual risk groups there is the ability to perform more detailed comparisons within any individual risk group should the need arise. Furthermore, the process for determining the best risk-adjustment for any HAI rate data is flexible and always based on more detailed risk factor analyses that provide ample scientific rigor supporting any SIR calculations. The extent to which any HAI rate data can be risk-adjusted is obviously related to the detail and volume of data that exist in a given measurement system.

In addition to the simplicity of the SIR concept and the advantages listed above, it's important to note another benefit of using an SIR comparison metric for HAI data. If there was need at any level of aggregation (national, regional, facility-wide, etc.) to combine the SIR values across mutually-exclusive data one could do so. The below table demonstrates how the example data from the previous two metric settings could be summarized.

| HAI Metric | Observed HAIs | | | Expected HAIs | | |
| --- | --- | --- | --- | --- | --- | --- |
| | #CLABSI | #SSI[†] | #Combined HAI | #CLABSI | #SSI[†] | #Combined HAI |
| CLABSI 1 | 228 | | | 287 | | |
| SSI 1 | | 636 | | | 853.8 | |
| Combined HAI | | | 228 + 636 = 864 | | | 287+853.8 = 1140.8 |

| | | |
|---|---|---|
| | $\mathrm{SIR} = \dfrac{\text{observed}}{\text{expected}} = \dfrac{228+636}{287+853.8} = \dfrac{864}{1140.8} = 0.76 \qquad 95\%\,\mathrm{CI} = (0.673, 0.849)$ | |

[†] SSI, surgical site infection