

# HEALTHCARE-ASSOCIATED INFECTIONS IN MICHIGAN HOSPITALS

## Semi-Annual Report of Healthcare-Associated Infection Activities

October 1, 2010 – March 31, 2011

Michigan Department of Community Health

Surveillance for Healthcare-Associated & Resistant Pathogens  
(SHARP) Unit

Data Accessed: August 16, 2011

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## Executive Summary

In early 2009, the Surveillance for Healthcare-Associated & Resistant Pathogens (SHARP) Unit was created within the Surveillance & Infectious Disease Epidemiology Section, Communicable Disease Division, Bureau of Epidemiology, at the Michigan Department of Community Health (MDCH). SHARP has received funding from the American Recovery & Reinvestment Act (ARRA) and other Federal grant programs to improve state HAI prevention infrastructure, to conduct surveillance for HAIs focusing on methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (*C. difficile*/*C. diff*), and to support existing prevention initiatives in the state.

The following report contains a representation of the state-wide healthcare-associated infection (HAI) counts and rates in Michigan from October 2010 through March 2011. These surveillance data were collected from acute care hospitals who have voluntarily agreed to share their data with the MDCH SHARP Unit. HAI data from hospitals are reported to the National Healthcare Safety Network (NHSN), a secure online surveillance system developed by the Centers for Disease Control & Prevention (CDC). Hospitals agreeing to share their NHSN data with the MDCH SHARP Unit have signed a MDCH SHARP data use agreement and have conferred rights to MDCH SHARP to view their online HAI data. All NHSN data collected from participating hospitals have been aggregated and de-identified in this report. In addition, the aggregated data have been analyzed for trends and compared with national data where appropriate.

In this semi-annual report, participating hospitals are characterized by hospital affiliation, geographic region, and bed size. This report also describes units under surveillance by participating hospitals and the modules used, with a special emphasis on MRSA and *C. difficile* data collected through the Multidrug-Resistant Organism/ *Clostridium difficile* infection (MDRO/CDI) module of NHSN. Aggregate infection rates for other NHSN modules are also presented. This semi-annual report, along with the 2009-2010 annual report and multiple quarterly reports, is published on the MDCH HAI website at [www.michigan.gov/hai](http://www.michigan.gov/hai).

Surveillance efforts are ongoing. Acute care hospitals interested in contributing HAI data are encouraged to contact the MDCH SHARP Unit to participate in surveillance activities. As additional funds become available, MDCH SHARP plans to expand surveillance initiatives to include other types of healthcare facilities, including long-term care facilities and ambulatory care centers, and to include other types of HAIs. Validation studies will also be conducted to ensure the accuracy of data reported. Lastly, MDCH SHARP will continue to work with partner agencies such as the Michigan Health & Hospital Association (MHA) Keystone Center for Patient Safety & Quality and MPRO, as well as state professional societies and consumer groups, to educate the public and healthcare providers about HAIs and the roles each can play to prevent these infections, ultimately reducing healthcare costs and unnecessary deaths.

## Introduction

With American Recovery and Reinvestment Act (ARRA) funding awarded to the MDCH SHARP Unit in 2009, and the provision of other Federal grant programs, Michigan has been able to expand its infrastructure and increase state activities related to the surveillance and prevention of healthcare-associated infections (HAIs). Initial activities in 2009-2011 were directed toward acute care hospitals. Unlike many other states, Michigan has no mandate for public reporting of HAIs. Instead, Michigan has been successful in reducing infections through collaborative efforts with the MHA Keystone Center for Patient Safety & Quality, with MPRO, and through collaboration with state and regional professional organizations including the Michigan Society for Infection Prevention & Control (MSIPC), the Greater Detroit Chapter of the Association of Practitioners in Infection Control & Epidemiology (APIC-GD), and other professional groups. Activities initiated have been directly related to the U.S. Department of Health and Human Services (HHS) *Action Plan to Prevent Healthcare-Associated Infections* (<http://www.hhs.gov/ophs/initiatives/hai>), which was also released in 2009.

Primary HAI activities funded under ARRA include the following:

- Coordination and reporting of Michigan HAI prevention efforts
- Detection and reporting of HAI data (HAI surveillance)
- Establishment or partnership with Prevention Collaboratives

Broad implementation of these activities in Michigan hospitals is already showing dramatic reductions in HAIs, which will not only save lives and reduce suffering but will also result in healthcare cost savings.

## Activities

### Coordination and Reporting of State HAI Prevention Efforts

During the summer of 2009, the SHARP Unit formed the Michigan HAI Prevention Advisory Group to coordinate and oversee activities related to HAI surveillance and prevention activities. A multidisciplinary group of individuals was gathered with representatives from the Michigan Department of Community Health (MDCH), MHA Keystone Center for Patient Safety & Quality, MPRO, acute care hospitals, professional infection control and infectious disease societies, and consumers. This group has since held monthly meetings to review grant activities and collaborate on future initiatives. The Advisory Group has also played a key role in the development of a Michigan HAI Surveillance and Prevention Plan which outlines targeted HAI activities in Michigan. This plan was submitted to the Department of Health & Human Services (HHS) in December 2009, and is posted on Michigan's HAI website at [www.michigan.gov/hai](http://www.michigan.gov/hai). This Plan will be updated for 2012.

### Detection and Reporting of HAI Data (HAI Surveillance)

In September 2009, SHARP began recruiting hospitals to participate in a voluntary HAI surveillance initiative. Hospitals were asked to share their HAI data submitted to CDC using the National Healthcare Safety Network (NHSN) with MDCH. The SHARP Unit's initial focus was on methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (*C. difficile*) collected through the Laboratory-Identified Event (LabID) option of the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) module of NHSN. Additional HAI data collected through other NHSN modules were and continue to be welcomed.

To ensure confidentiality of the HAI data shared by hospitals, SHARP developed a data use agreement (DUA) which hospitals were asked to sign before sharing their data. The DUA was developed in coordination with MDCH legal counsel. The HAI surveillance initiative is considered routine public health surveillance and was deemed exempt from review by the MDCH Internal Review Board (IRB) Committee.

In 2009 and 2010, announcements regarding this surveillance initiative were distributed to hospitals through newsletters and emails from the MHA Keystone Center for Patient Safety & Quality (MHA Keystone) and MPRO, as well as through APIC-GD and MSIPC. In September 2010, hospitals were notified that SHARP would award professional development funds to participating hospitals. The first 30 hospitals to sign DUAs and to confer rights were awarded \$1,000. The next 20 hospitals were awarded \$750 each. As of October 1, 2011, 50 hospitals have signed the MDCH/SHARP Data Use Agreement and have conferred rights to SHARP to their data.

This document contains MRSA and *C. difficile* data by quarter, as well as cumulatively for the semi-annual time period of October 1, 2010 through March 31, 2011. Additional HAI data is reported cumulatively for the same semi-annual period.

### **Establishment or Partnership with Prevention Collaboratives**

As part of the third activity area under ARRA funding, MDCH SHARP has partnered with both MPRO and MHA Keystone to build on their established HAI prevention efforts. Previously, MPRO collected MRSA data from 22 participating hospitals to demonstrate reductions in MRSA infections over time. This project has now ended, and more prevention efforts are being put into place. MHA Keystone has many quality improvement initiatives in place, including their nationally-known success working with Michigan hospitals to reduce central line-associated bloodstream infections (CLABSIs) in intensive care units (ICUs) through use of a checklist. The MDCH SHARP Unit is currently supporting the MHA Keystone HAI initiative to reduce catheter-associated urinary tract infections (CAUTIs) through the use of a “bladder bundle” checklist.

### **Analysis of Data from Participating Hospitals**

As of the data accessed date, August 16, 2011, 49 hospitals had signed data use agreements with MDCH SHARP to provide data for the inclusive dates (October 1, 2010 through March 31, 2011). At that time, 49 hospitals had completed the process of conferring rights to SHARP and had a reporting plan for their facility in place for at least one month during the inclusive time period. The data from these hospitals were used for development of this semi-annual report; however, not all participating hospitals provided patient- or event-level data. The number of hospitals providing data for analysis is indicated in each table throughout this report and reflects the number of hospitals contributing data to NHSN and sharing their data with MDCH SHARP. For example, although a maximum of 49 hospitals had conferred rights to their data for the time period between October 1, 2010 and March 31, 2011, as of August 16, 2011 (see *Table 1* below), only 29 hospitals were using the Multidrug-Resistant Organism/*Clostridium difficile* Infection (MDRO/CDI) module and reporting data for LabID events. In the notes section below some of the tables, the text “n=...” is used to indicate the number of hospitals or units being referenced.

## Hospital Descriptives and Surveillance

*Table 1.*

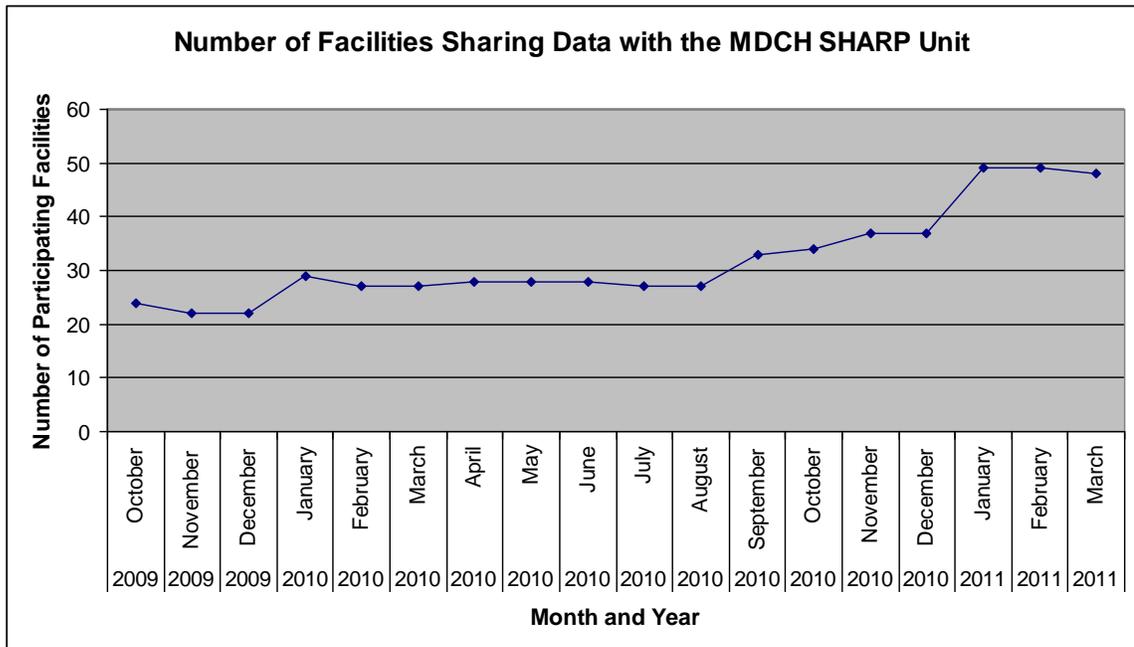
**Number of Hospitals sharing National Healthcare Safety Network (NHSN) Data with Michigan Department of Community Health by Month**

Month	Oct 2010	Nov 2010	Dec 2010	Jan 2011	Feb 2011	Mar 2011
Number of Hospitals	34	37	37	49	49	48

The above data (Table 1) reflects the number of hospitals who have conferred rights and entered a monthly reporting plan on NHSN for each respective month as of the data accessed date. A ‘monthly reporting plan’ identifies which NHSN modules and surveillance activities a hospital will be participating in during a given month. Because surveillance targets and monthly reporting plans vary for each hospital, hospitals may not report to NHSN each month. The SHARP Unit has requested three consecutive months of data for their surveillance initiative.

Figure 1 (below) displays a graphical representation of the cumulative number of facilities who have conferred rights. The number of facilities for each month represents those participating in sharing data as of August 16, 2011.

*Figure 1.*



*Table 2.***Hospital Affiliation Among those Sharing Data with Michigan Department of Community Health**

<b>Hospital Type</b>	<b>Teaching<sup>1</sup></b>	<b>Non-teaching</b>	<b>Unknown</b>	<b>Total</b>
Number of Facilities	21	24	4	49

<sup>1</sup>Teaching includes major, graduate and limited affiliation with medical schools as indicated on their facility survey

The above data (Table 2) was obtained from the 2010 NHSN Annual Facility Survey completed by participating hospitals. Hospital affiliation is relatively evenly split between both teaching and non-teaching facilities. There are only four participating facilities that did not designate their affiliation on the Annual Facility Survey.

*Table 3.***Number of Facilities by Region Among those Sharing Data with Michigan Department of Community Health**

<b>Geographic region</b>	<b>1</b>	<b>2N/2S</b>	<b>3</b>	<b>5</b>	<b>6</b>	<b>7/8</b>
Number of Facilities	4	16	9	5	10	5

To characterize the geographic distribution of the 49 participating hospitals, hospital locations were categorized according to Public Health Preparedness Regions. Regions 2N and 2S were combined as the metro-Detroit area, and regions 7 and 8 were combined as Northern Michigan. In previous reports, these regions had been grouped into 3 broader categories, but there were enough participating facilities to expand the table into additional regions. The Public Health Preparedness Regions and the counties they include can be seen on the map in Figure 2.

Figure 2. Michigan Counties and Preparedness Regions

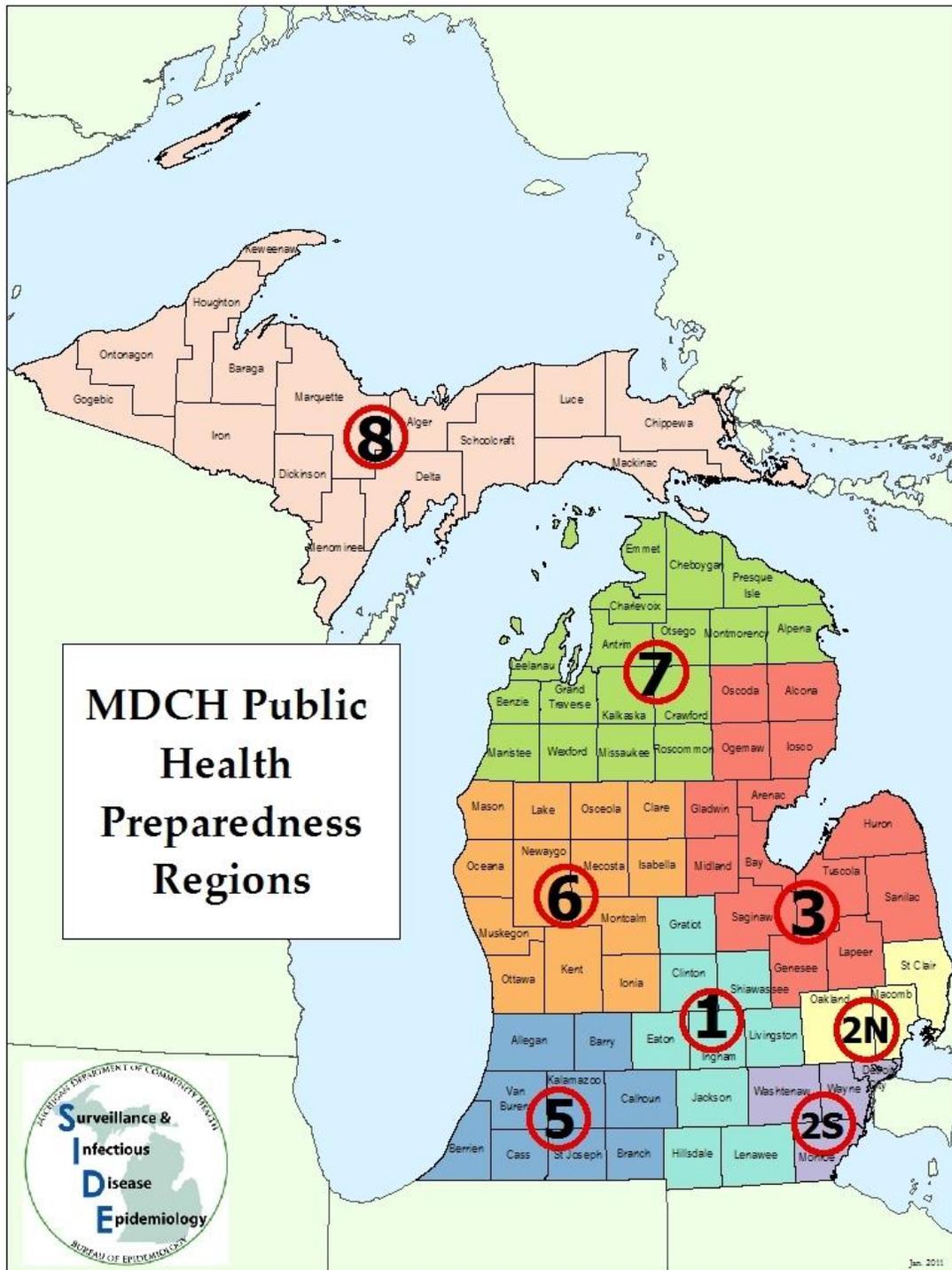


Table 4.

**Number of Facilities by Bed Size Among those Sharing Data with Michigan Department of Community Health**

Number of Beds in Facility	≤100	101 - 200	201 - 500	501+
Number of Facilities in MI	112	21	43	9
Number of Facilities enrolled in NHSN	17	11	15	6

Hospital licensure data, including the number of beds in each hospital, were obtained from the 2010 Michigan Certificate of Need annual survey. The majority (n= 32 or 65%) of participating hospitals have more than 100 licensed beds in their facility. This is in direct contrast to the proportion of all Michigan hospitals with 100 or more licensed beds (73 of 185, or 39%). Of the 73 MI hospitals with 100 or more beds, 32 (44%) of them have enrolled in the SHARP surveillance initiative versus 17 (15%) of the hospitals with fewer than 100 beds. Data indicate that hospitals over 100 beds are more likely to participate with SHARP in this surveillance initiative.

Figure 4 (below) demonstrates the difference between the total number of facilities in Michigan compared to the number of facilities in Michigan who are enrolled in NHSN.

Figure 4.

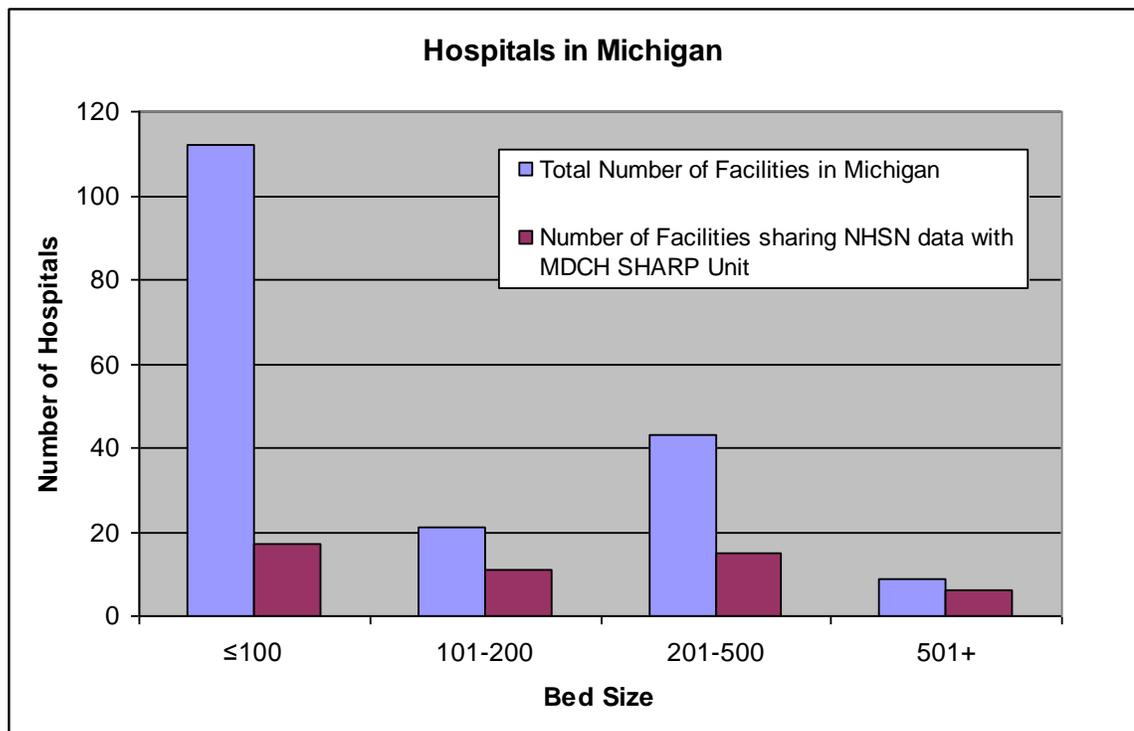


Table 5.

**Types of Units under Surveillance Among Facilities Participating with National Healthcare Safety Network and Sharing Data with the Michigan Department of Community Health**

<b>Unit Type</b>	<b>ICU</b>	<b>SCA</b>	<b>Wards</b>	<b>Outpatient</b>
Number of Facilities Participating	40	2	28	4

These data (Table 5) indicate that the majority of participating hospitals are using intensive care units (ICUs, although the ICU type is not specified in this report) to conduct their NHSN surveillance for MRSA, *Clostridium difficile*, CLABSI, ventilator-associated pneumonia (VAP), and CAUTI. Many hospitals are also conducting surveillance on one or more patient wards. Only two hospitals are conducting surveillance in a Specialty Care Area (SCA). According to the CDC NHSN Patient Safety Manual, an SCA may be an inpatient long-term acute care unit, a transplant unit, an acute dialysis unit, or a hematology/oncology unit. It should be noted that the unit types displayed are not mutually exclusive; some hospitals are monitoring multiple unit types within their facility.

Table 6.

**National Healthcare Safety Network (NHSN) Modules in Use, as Reported by Facility to MDCH SHARP**

<b>NHSN Module</b>	<b>Number of Facilities</b>
Central Line-Associated Bloodstream Infection (CLABSI)	46
<i>Clostridium difficile</i> Infection (CDI) Laboratory-identified (LabID) Event	29
Ventilator-Associated Pneumonia (VAP)	27
Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA) Laboratory-identified (LabID) Event	24
Catheter-Associated Urinary Tract Infection (CAUTI)	18
Surgical Site Infection (SSI)	18
Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA) Infection Surveillance	15
<i>Clostridium difficile</i> Infection (CDI) Surveillance	8

\*Note: The number of facilities participating in each module is as of August 16, 2011 (the date that the data was pulled)

The above table (Table 6) indicates the NHSN module(s) in use, as reported by participating hospitals. From month to month, the type of module(s) being used can change as some modules require varying periods of use. According to MDCH SHARP data, the most commonly used module during this reporting period was the CLABSI module. This is not surprising because of the previous work done by hospitals in conjunction with MHA Keystone to reduce these types of infections. Use of the CLABSI module is also consistent with the 2011 Centers for Medicare & Medicaid Services (CMS) Hospital Inpatient Prospective Payment System (IPPS) reporting rule. Beginning January 1, 2011, hospitals were required to use NHSN to report CLABSIs in adult, pediatric, and neonatal ICUs in order to receive full Medicare reimbursements in 2013. The MDRO/CDI module was the second most common module in use, followed closely by the VAP module.

### Cumulative Annual Aggregate Methicillin-Resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (*C. diff*) Reports

**Table 7.**  
**Cumulative Aggregate MRSA Data from the National Healthcare Safety Network reported to the MDCH SHARP Unit**

	October – December 2010 Quarterly Report	January – March 2011 Quarterly Report	Cumulative Data October 2010 – March 2011
<b>Frequency, Number</b>			
<i>Hospitals with DUA</i> <sup>1</sup>	35	41	<b>41</b>
<i>Hospitals Reporting MRSA Lab ID</i> <sup>2</sup>	19	14	<b>16</b>
<i>Aggregated LabID Events</i>	671	675	<b>897</b>
<b>Onset, Number (%)</b>			
<i>Healthcare Facility-Onset (HO)</i>	104 (16)	106 (16)	<b>234 (26)</b>
<i>Community-Onset (CO)</i>	567 (84)	569 (84)	<b>663 (74)</b>
<b>Specimen Source, Number (%HO)</b>			
<i>Blood Specimens</i>	42 (33)	38 (16)	<b>92 (33)</b>
<i>Sputum Specimens</i>	115 (37)	112 (38)	<b>249 (43)</b>
<i>Wound Specimens</i>	202 (5)	226 (7)	<b>261 (10)</b>
<i>Abcess Specimens</i>	79 (3)	43 (12)	<b>37 (19)</b>
<i>Urine Specimens</i>	59 (8)	72 (7)	<b>69 (13)</b>
<i>Skin Specimens</i>	76 (1)	59 (5)	<b>38 (11)</b>
<i>Other Specimens</i>	98 (29)	125 (23)	<b>151 (34)</b>
<b>Surveillance Location, Number</b>			
<i>Intensive/Critical Care Unit</i>	130 (19)	117 (17)	<b>329 (37)</b>
<i>Specialty Care Area</i>	-	-	<b>-</b>
<i>Wards</i>	184 (27)	217 (32)	<b>432 (48)</b>
<i>Outpatient</i>	349 (52)	325 (48)	<b>136 (15)</b>
<i>Other</i>	8 (1)	16 (2)	<b>-</b>

<sup>1</sup>DUA: Data Use Agreement. This is a document signed between the facility and the Michigan Department of Community Health which outlines how the data will be shared and used.  
<sup>2</sup>MRSA Lab ID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

The above table (Table 7) shows aggregate data by quarter, abstracted from each respective quarterly report, along with cumulative data for the semi-annual time period of October 1, 2010 through March 31, 2011. Because of different abstraction dates and different amounts of data being shared during each respective time period, there may be discrepancies between the Quarterly Report data and the Semi-Annual Report data. In future reports, the methodology for collecting these data will become more uniform and standardized.

The number of MRSA LabID Events reported reflects the number of positive MRSA LabID Events entered by facility per quarter following the NHSN definitions. The NHSN definition for MDRO LabID Event is 'all non-duplicate MDRO isolates [in this case MRSA isolates] from any specimen source and unique blood source MDRO [MRSA] isolates, including specimens collected during an Emergency Department or other clinic visit, if collected the same day as

patient admission'. A unique blood source is defined as "a MDRO isolate from blood in a patient with no prior positive blood culture for the same MDRO and location in  $\leq 2$  weeks, even across calendar months.' A duplicate MDRO isolate is defined as 'any MDRO isolate from the same patient and location after an initial isolation of the specific MDRO during a calendar month, regardless of specimen source except unique blood source. The specimens must be obtained for clinical decision-making purposes to be considered a LabID Event; thus, isolates obtained for 'surveillance purposes only' will not be reflected in this data. Additionally, testing protocol and type of test used (i.e. PCR, assay, culture) vary by facility.

NHSN defines 'healthcare-onset' as a 'LabID Event specimen collected  $>3$  days after admission to the facility (i.e., on or after day 4).' 'Community-onset' is defined by NHSN as a 'LabID Event specimen collected as an outpatient or an inpatient  $\leq 3$  days after admission to the facility (i.e., days 1, 2, or 3 of admission).' Note that the proportion of healthcare facility-onset (HO) and community-onset (CO) reports have remained fairly consistent throughout the four quarters, along with the overall cumulative percentage for the year. Additionally, be aware that the number in parentheses under "Specimen Source" is the percent of healthcare-onset isolates obtained from that source.

Table 8.

**Cumulative Aggregate *Clostridium difficile*<sup>1</sup> Data from the National Healthcare Safety Network reported to the MDCH SHARP Unit**

	October – December 2010 Quarterly Report	January – March 2011 Quarterly Report	Cumulative Data October 2010 – March 2011
<b>Frequency, Number</b>			
<i>Hospitals with DUA</i> <sup>2</sup>	35	41	<b>41</b>
<i>Hospitals Reporting CDI Lab ID</i> <sup>3</sup>	19	18	<b>22</b>
<i>Aggregated LabID Events</i>	215	344	<b>455</b>
<b>Onset, Number (%)</b>			
<i>Healthcare Facility-Onset (HO)</i>	62 (29)	95 (28)	<b>184 (40)</b>
<i>Community-Onset Healthcare Facility-Associated (CO-HCFA)</i>	53 (25)	77 (22)	<b>92 (20)</b>
<i>Community-Onset (CO)</i>	100 (46)	172 (50)	<b>179 (39)</b>
<b>Surveillance Location, Number</b>			
<i>Intensive/Critical Care Unit</i>	41 (19)	58 (17)	<b>116 (25)</b>
<i>Specialty Care Area</i>	1 (0)	6 (2)	<b>9 (2)</b>
<i>Wards</i>	85 (40)	165 (48)	<b>309 (68)</b>
<i>Outpatient</i>	83 (39)	108 (31)	<b>21 (5)</b>
<i>Other</i>	5 (2)	7 (2)	<b>-</b>

<sup>1</sup>The specimen source of all *C.difficile* isolates is stool (100%)

<sup>2</sup>DUA: Data Use Agreement. This is a document signed between the facility and the Michigan Department of Community Health which outlines how the data will be shared and used.

<sup>3</sup>CDI Lab ID: *Clostridium difficile* Infection (CDI) Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

The above table (Table 8) also shows aggregate data by quarter, abstracted from each respective quarterly report, along with cumulative data for the semi-annual time period of October 1, 2010 through March 31, 2011. Again because of different abstraction dates and different amounts of

data being shared during each respective time period, there may be discrepancies between the Quarterly Report data and the Semi-Annual Report data. In future reports, the methodology for collecting these data will become more uniform and standardized.

Also in Table 8, the number of isolates reported reflects the number of positive CDI LabID Events entered by facility per quarter following the NHSN definitions. The NHSN definition for LabID Event is ‘all non-duplicate MDRO isolates [in this case, CDI isolates or positive CDI assays] from any specimen source and unique blood source MDRO isolates, including specimens collected during an Emergency Department or other clinic visit, if collected the same day as patient admission’. A duplicate MDRO [CDI] isolate is defined as ‘any MDRO [CDI] isolate from the same patient and location after an initial isolation of the specific MDRO during a calendar month, regardless of specimen source except unique blood source. A unique [CDI] blood source is defined as “a MDRO [CDI] isolate from blood in a patient with no prior positive blood culture for the same MDRO and location in  $\leq 2$  weeks, even across calendar months. The specimens must be obtained for clinical decision-making purposes to be considered a LabID Event, thus isolates obtained for ‘surveillance purposes only’ will not be reflected in this data. Additionally, testing protocol and type of test used (i.e. PCR, assay, culture) vary by facility.

NHSN defines ‘healthcare-onset’ as a ‘LabID Event specimen collected  $>3$  days after admission to the facility (i.e., on or after day 4).’ ‘Community-onset’ is defined by NHSN as a ‘LabID Event specimen collected as an outpatient or an inpatient  $\leq 3$  days after admission to the facility (i.e., days 1, 2, or 3 of admission).’ Community-onset (CO) healthcare facility-associated onset’ is defined as a ‘CO LabID Event collected from a patient who was discharged from the facility  $\leq 4$  weeks prior to current date of stool specimen collection.’ With the exception of the 1<sup>st</sup> quarter when there were very few participating hospitals, the proportion of healthcare facility-onset (HO), community-onset healthcare facility-associated (CO-HCFA), and community-onset (CO) events has also remained fairly consistent throughout the four quarters and for the year.

## Cumulative Annual Aggregate Rates

Table 9.

### Cumulative Semi-Annual Methicillin-Resistant *Staphylococcus aureus* (MRSA) Rate from the National Healthcare Safety Network reported to the MDCH SHARP Unit

Number of Facilities	Number of Inpatient MRSA Events	Number of Patient Days	Number of Patient Admits	MRSA Rate <sup>1</sup>	MRSA Prevalence Rate <sup>2</sup>
16	488 LabID <sup>3</sup>	99,681	23,641	4.90	2.06
13	16 Infections <sup>4</sup>	54,700	---- <sup>5</sup>	0.279	----

Michigan Rate

<sup>1</sup>MRSA Rate: Methicillin-Resistant *Staphylococcus aureus* (MRSA) rate. This is the number of MRSA LabID Events or surveillance infections per 1,000 patient days.

<sup>2</sup>MRSA Prevalence Rate. This is the number of MRSA infections per 100 patients admitted.

<sup>3</sup>MRSA Lab ID: MRSA Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

<sup>4</sup>Infection: MRSA event under infection surveillance. This is an option in the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module for tracking infections through surveillance.

<sup>5</sup>The infection surveillance module does not currently provide the number of patient admissions; therefore this number is unavailable and a MRSA Prevalence Rate for infection surveillance events cannot be calculated.

In Table 9, the Michigan overall annual MRSA rate according to MRSA LabID Events is 4.90 events per 1,000 patient-days. This number is calculated by dividing the number of inpatient MRSA LabID Events by the number of patient days. There is currently no national rate to compare with the Michigan MRSA LabID rate. Note that LabID Event data do not necessarily indicate infection, but denote a positive lab test result from a specimen collected for clinical purposes (not surveillance purposes only). MRSA is known to colonize skin and mucosal membranes without causing infections. LabID surveillance data provide a proxy measure for MRSA prevalence in Michigan hospitals.

In addition to LabID surveillance, there is also the option to conduct MRSA Infection Surveillance activities at facilities, using infection definitions rather than LabID Events. There were 13 facilities that participated in this option during the time period under study, providing an overall MRSA Rate of 0.279 per 1,000 patient days. A MRSA Prevalence Rate for infection surveillance events was unable to be calculated.

Table 10.

**Cumulative Semi-Annual *Clostridium difficile* (*C. diff*) Rate from the National Healthcare Safety Network reported to the MDCH SHARP Unit**

Number of Facilities	Number of CDI Events	Number of Patient Days	Number of Patient Admits	<i>C.diff</i> Rate <sup>1</sup>	<i>C. diff</i> Prevalence Rate <sup>2</sup>
19	254 LabID <sup>3</sup>	168,873	50,234	1.50	0.51
11	24 Infections <sup>4</sup>	48,826	---- <sup>5</sup>	0.491	----

Michigan Rate

<sup>1</sup>*C.diff* Rate: *Clostridium difficile* rate. This is the number of *C. diff* LabID events or surveillance infections per 1,000 patient days.

<sup>2</sup>*C.diff* Prevalence Rate. This is the number of *C. diff* LabID events per 100 patients admitted.

<sup>3</sup>CDI Lab ID: *Clostridium difficile* Infection (CDI) Laboratory-Identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking laboratory results without conducting additional surveillance for infections.

<sup>4</sup>Infection: *C. diff* event under infection surveillance. This is an option in the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module for tracking infections through surveillance.

<sup>5</sup>The infection surveillance module does not currently provide the number of patient admissions; therefore this number is unavailable and a *C. diff* Prevalence Rate cannot be calculated.

In Table 10, the Michigan overall annual *C. difficile* rate according to CDI LabID Events is 1.50 events for every 1,000 patient days. Again, there is no national rate to make comparisons with Michigan data. *C. difficile* LabID Event data do not necessarily indicate infection but denote a positive lab test result from a specimen collected for clinical purposes (not surveillance purposes only). *C. difficile* is also known to colonize the intestinal tract without causing infection. These surveillance data provide a proxy measure for *C. difficile* prevalence in Michigan hospitals.

There is also the option to conduct *C. difficile* Infection Surveillance activities at facilities, using infection definitions rather than LabID Events. There were 11 facilities that participated in this option during the time period under study, providing an overall *C. diff* rate of 0.491 per 1,000 patient days.

Figure 5.

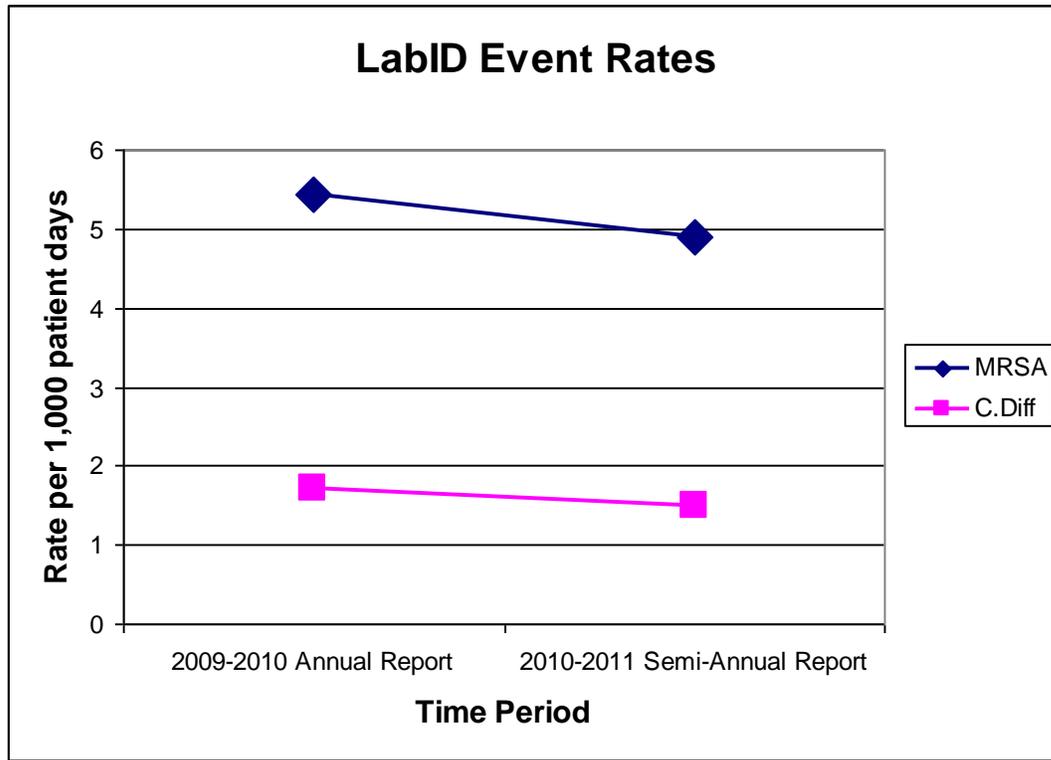


Figure 5 (above) displays the MRSA and *C.diff* LabID Event rates from the 2009-2010 Annual Report through the 2010-2011 Semi-Annual Report.. Because the displayed trend data has only two time points, little can be inferred regarding the trends of these infections. However, it should be noted that the 2010-2011 Semi-Annual Report had many more participating hospitals, so this data should be regarded as more accurate than previous quarterly or annual reports.

**Table 11.**  
**Semi-Annual Catheter-Associated Urinary Tract Infection (CAUTI) Rate Among Facilities using the National Healthcare Safety Network reported to the MDCH SHARP Unit**

Number of Facilities	Number of CAUTIs	Number of Patient Days	Number of Catheter Days	MI CAUTI Rate <sup>1</sup>	US CAUTI Rate <sup>2</sup>	MI DU <sup>3</sup>	US DU <sup>4</sup>
19	49	154,289	49,629	0.99	1.65	0.32	0.25

Michigan Rate
  Comparative National Rate

<sup>1</sup>MI CAUTI Rate is the number of CAUTIs per 1,000 device days among participating facilities.

<sup>2</sup>The US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type. The US CAUTI Rate is the number of CAUTIs per 1,000 device days.

<sup>3</sup>DU = Device Utilization = the proportion of days on a device over the total number of patient days reported for the unit. The device could be a catheter, central line, or ventilator. The MI DU is the proportion of patient days that are spent using a device, in this case a urinary catheter.

<sup>4</sup>The US comparative DU was calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type.

From the 19 hospitals reporting data on CAUTIs to the MDCH SHARP Unit, there were 49 infections. These infections contribute to the MI CAUTI rate of 0.99 per 1,000 device days, which was lower than the US CAUTI rate of 1.65 per 1,000 device days. However, the Device Utilization (DU) ratio for Michigan was 0.32, which was higher than the US DU ratio of 0.25.

*Table 12.*

**Semi-Annual Central Line-Associated Bloodstream Infection (CLABSI) Rate from Facilities using the National Healthcare Safety Network reported to the MDCH SHARP Unit**

Number of Facilities	Number of CLABSIs	Number of Patient Days	Number of Central Line Days	MI CLABSI Rate <sup>1</sup>	US CLABSI Rate <sup>2</sup>	MI DU <sup>3</sup>	US DU <sup>4</sup>
42	63	306,964	92,005	0.68	1.42	0.30	0.28

Michigan Rate
  Comparative National Rate

<sup>1</sup>MI CLABSI Rate is the number of CLABSIs per 1,000 device days among participating facilities.

<sup>2</sup>The US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type. The US CLABSI Rate is the number of CLABSIs per 1,000 device days.

<sup>3</sup>DU = Device Utilization = the proportion of days on a device over the total number of patient days reported for the unit. The device could be a catheter, central line, or ventilator. The MI DU is the proportion of patient days that are spent using a device, in this case a central line.

<sup>4</sup>The US comparative DU was calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type.

Hospitals in Michigan have been working diligently with MHA Keystone to reduce CLABSI infection rates; this is reflected in the data in Table 12 (above). With data collected from 42 hospitals, Michigan's device utilization ratio approximates the U.S. ratio (0.30 and 0.28 respectively). However, the Michigan CLABSI rate per 1,000 patient days (0.68) is substantially lower than the national average of 1.42.

Table 13.

**Semi-Annual Ventilator-Associated Pneumonia (VAP) Rates from Facilities using the National Healthcare Safety Network reported to the MDCH SHARP Unit**

Number of Facilities	Number of VAPs	Number of Patient Days	Number of Ventilator Days	MI VAP Rate <sup>1</sup>	US VAP Rate <sup>2</sup>	MI DU <sup>3</sup>	US DU <sup>4</sup>
27	32	103,365	30,471	1.05	1.80	0.29	0.33

Michigan Rate
  Comparative National Rate

<sup>1</sup>MI VAP Rate is the number of VAPs per 1,000 device days among participating facilities.

<sup>2</sup>The US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type. The US VAP Rate is the number of CLABSIs per 1,000 device days.

<sup>3</sup>DU = Device Utilization = The proportion of days on a device over the total number of patient days reported for the unit.. The device could be a catheter, central line, or ventilator. The MI DU is the proportion of patient days that are spent using a device, in this case a ventilator.

<sup>4</sup>The US comparative DU was calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type.

The above data indicate that the ventilator-associated pneumonia (VAP) rate was 1.05 per 1,000 device days within the 27 hospitals participating in this module with the MDCH SHARP Unit. This rate is less than the national rate of 1.80 per 1,000 device days. The Michigan average ventilator device utilization (DU) rate is also lower than the national average DU rate (0.29 versus 0.33, respectively).

Figure 6 (below) is a graphical representation of the Device-Associated Infection Rates from the 2009-2010 Annual Report through the 2010-2011 Semi-Annual Report. While in this report we can begin to look at trend data, not much can be inferred from these results because there are only two time periods included. As future reports are generated, this data will become more of a true representation of the Michigan and US Device-Associated Infection Rates. As with the LabID data though, it should be noted that the 2010-2011 Semi-Annual Report data are more likely to be accurate due to an increased number of participating facilities.

In the 2009-2010 Annual Report, neither Michigan CAUTI nor US CAUTI rates were available due to the small amount of data at the time. Therefore, these rates are available for the first time in the 2010-2011 Semi-Annual Report. This prevents us from viewing a trend from the previous report to the present.

Figure 6.

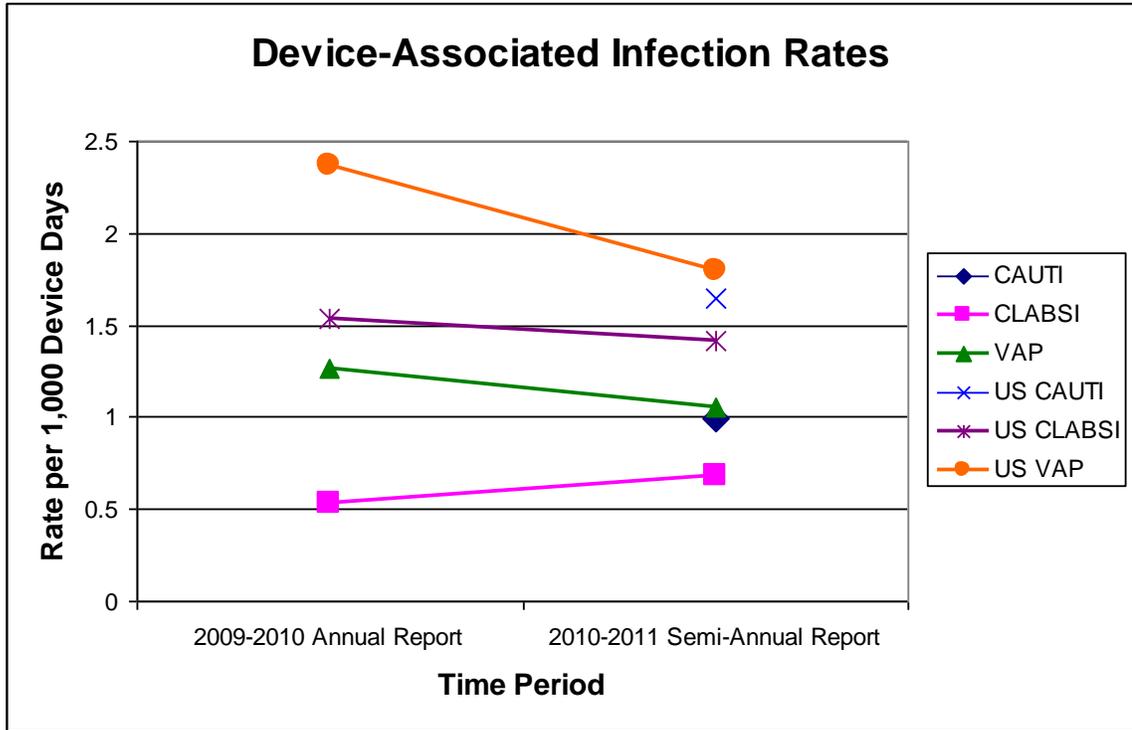


Table 14.

**Procedure-Associated Rates from Facilities using the National Healthcare Safety Network reported to the MDCH SHARP Unit**

Type of Infection	Number of Facilities	Number of SSIs	Number of Procedures	MI SSI Rate <sup>1</sup>	US SSI Rate <sup>2</sup>
SSI <sup>3</sup>	18	176	10,051	1.75	-

Michigan Rate
  Comparative National Rate

<sup>1</sup>MI SSI Rate is the number of SSIs per 100 procedures among participating facilities.

<sup>2</sup>The US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type.

<sup>3</sup>SSI: Surgical Site Infection

Eighteen facilities provided Surgical Site Infection (SSI) data to the MDCH SHARP Unit for the included time period (Table 14 above). In Michigan, the SSI Rate was 1.75 per 100 procedures among the participating facilities. However, there was not enough data within NHSN to calculate a US SSI Rate, so this data cannot be compared. As more data is collected nationally, this will become available for future reports.

Table 15.

**Standardized Infection Ratios (SIR) from Facilities using the National Healthcare Safety Network reported to the MDCH SHARP Unit**

Type of Infection	Number of Facilities	Procedures Done	Observed <sup>1</sup>	Predicted <sup>2</sup>	MI SIR <sup>3</sup>	95% CI <sup>4</sup>
CLABSI <sup>5</sup>	31	N/A	90	212	0.42	(0.34 - 0.52)
SSI <sup>6</sup>	16	4972	71	75	0.95	(0.73 - 1.20)

<sup>1</sup>Observed: Number of infections (CLABSIs or SSIs) reported during the time frame.

<sup>2</sup>Predicted: The number of CLABSIs predicted based on the type of hospital unit(s) under surveillance, or the number of SSIs predicted for the same number and type of procedures performed based upon national SSI rates by procedure type.

<sup>3</sup>SIR: Standardized Infection Ratio: Ratio of observed events compared to the number of predicted events, accounting for unit type or procedure. An SIR of 1 can be interpreted as having the same number of events that were predicted. An SIR that is between 0 and 1 represents **fewer** events than predicted, while an SIR of greater than 1 represents **more** events than expected.

<sup>4</sup>95% CI: 95% confidence interval around the SIR estimate. A 95% CI indicates that 95% of the time, the actual SIR will fall within this interval.

<sup>5</sup>CLABSI: Central Line-Associated Blood Stream Infection

<sup>6</sup>SSI: Surgical Site Infection

Michigan's CLABSI SIR, using data from 31 participating hospitals, is 0.42, reflecting the excellent work that hospitals have done to reduce CLABSIs, in conjunction with MHA Keystone. This SIR can be interpreted as Michigan having 42 percent of the national rate, or 58% fewer CLABSIs than we would expect to have. This is statistically significantly lower than the national average.

Michigan's SSI SIR is 0.95, and was determined from 16 participating hospitals. This indicates that Michigan had 95 percent of the national rate, or 5% less than the predicted number of SSIs; however, this value is not significantly different from the national average.

## Cumulative Rates Aggregated by Specifiers

Table 16.				
Rate <sup>1</sup> by Facility Type				
	Teaching	US Rate <sup>2</sup>	Non-teaching	US Rate
MRSA LabID <sup>3</sup>	5.19 (10 facilities)	unavailable	2.87 (5 facilities)	unavailable
<i>C. diff</i> LabID <sup>4</sup>	1.62 (11 facilities)	unavailable	0.67 (8 facilities)	unavailable
CAUTI <sup>5</sup>	0.84 (9 facilities)	1.70	1.14 (9 facilities)	1.62
CLABSI <sup>6</sup>	0.79 (20 facilities)	1.53	0.17 (19 facilities)	1.31
VAP <sup>7</sup>	1.19 (13 facilities)	1.96	0.80 (11 facilities)	1.46

Michigan Rate    Comparative National Rate

<sup>1</sup>Rates were calculated using the number of infections/events per 1,000 patient days or device days according to the same MI rate shown in Tables 9–14 among facilities that shared data with the Michigan Department of Community Health through the National Healthcare Safety Network.

<sup>2</sup>US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type.

<sup>3</sup>MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking MRSA laboratory results without conducting additional surveillance for infections.

<sup>4</sup>*C. diff* LabID: *Clostridium difficile* (*C. diff*) LabID Event. This is an option within the MDRO/CDI Module of NHSN for tracking *C. diff* laboratory results without conducting additional surveillance for infections.

<sup>5</sup>CAUTI: Catheter-Associated Urinary Tract Infection

<sup>6</sup>CLABSI: Central Line-Associated Blood Stream Infection

<sup>7</sup>VAP : Ventilator-Associated Pneumonia

With the exception of CAUTIs, in Michigan, teaching facilities had higher rates of HAIs than non-teaching facilities. This was especially apparent in MRSA LabID Events, in which teaching facilities had approximately twice the infection rate of non-teaching facilities. When the US rate was made available, however, all Michigan rates were lower than their respective US rate.

Table 17.

	Rate <sup>1</sup> by Region					
	Southeast	US Rate <sup>2</sup>	Mid/Western	US Rate	Northern	US Rate
MRSA LabID <sup>3</sup>	6.62 (7 facs <sup>4</sup> )	unavailable	4.36 (6 facs)	unavailable	---- (3 facs) <sup>5</sup>	unavailable
<i>C. diff</i> LabID <sup>6</sup>	1.76 (8 facs)	unavailable	1.25 (8 facs)	unavailable	---- (3 facs)	unavailable
CAUTI <sup>7</sup>	0.92 (6 facs)	1.75	0.95 (10 facs)	1.64	---- (3 facs)	----
CLABSI <sup>8</sup>	0.79 (16 facs)	1.55	0.64 (22 facs)	1.37	---- (4 facs)	----
VAP <sup>9</sup>	1.06 (11 facs)	2.16	1.15 (13 facs)	1.55	---- (3 facs)	----

Michigan Rate  Comparative National Rate

<sup>1</sup>Rates were calculated using the number of infections/events per 1,000 patient days or device days according to the same MI rate shown in Tables 9–14 among facilities that shared data with the Michigan Department of Community Health through the National Healthcare Safety Network.

<sup>2</sup>US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type.

<sup>3</sup>MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking MRSA laboratory results without conducting additional surveillance for infections.

<sup>4</sup>Facs: facilities

<sup>5</sup>Although MDCH SHARP was able to calculate a rate for each infection/event and facility type combination, there were insufficient data to report all. Data will only be published for groups of five or more hospitals in order to protect hospital identity and data. National rates by facility type are currently unavailable for comparison purposes.

<sup>6</sup>*C. diff* LabID: *Clostridium difficile* (*C. diff*) LabID Event. This is an option within the MDRO/CDI Module of NHSN for tracking *C. diff* laboratory results without conducting additional surveillance for infections.

<sup>7</sup>CAUTI: Catheter-Associated Urinary Tract Infection

<sup>8</sup>CLABSI: Central Line-Associated Blood Stream Infection

<sup>9</sup>VAP : Ventilator-Associated Pneumonia

MRSA LabID Event rates and *C. diff* LabID Event rates were higher in the Southeast region of Michigan compared to the Mid/Western region. However, not enough data were available to display an accurate Northern rate, and the numbers of facilities participating in each region were relatively low. Therefore, these data will be more accurate upon the addition of more facilities using these modules.

For device-associated rates, all three (CAUTI, CLABSI, and VAP) were very similar when comparing the Michigan rates between regions. It should also be noted that the US Rates were higher than each of their respective Michigan counterpart.

Table 18.

Rate<sup>1</sup> by Facility Size

	<100 Beds	US Rate	≥ 100 Beds	US Rate <sup>2</sup>
MRSA LabID <sup>3</sup>	3.57 (5 facilities)	unavailable	5.03 (11 facilities)	unavailable
<i>C. diff</i> LabID <sup>4</sup>	0.81 (7 facilities)	unavailable	1.53 (6 facilities)	unavailable
CAUTI <sup>5</sup>	1.19 (5 facilities)	1.47	0.98 (14 facilities)	1.69
CLABSI <sup>6</sup>	0.00 (11 facilities)	1.32	0.69 (31 facilities)	1.44
VAP <sup>7</sup>	0.00 (5 facilities)	1.36	1.06 (22 facilities)	1.88

Michigan Rate
  Comparative National Rate

<sup>1</sup>Rates were calculated using the number of infections/events per 1,000 patient days or device days according to the same MI rate shown in Tables 9–14 among facilities that shared data with the Michigan Department of Community Health through the National Healthcare Safety Network.

<sup>2</sup>US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type.

<sup>3</sup>MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking MRSA laboratory results without conducting additional surveillance for infections.

<sup>4</sup>*C. diff* LabID: *Clostridium difficile* (*C. diff*) LabID Event. This is an option within the MDRO/CDI Module of NHSN for tracking *C. diff* laboratory results without conducting additional surveillance for infections.

<sup>5</sup>CAUTI: Catheter-Associated Urinary Tract Infection

<sup>6</sup>CLABSI: Central Line-Associated Blood Stream Infection

<sup>7</sup>VAP : Ventilator-Associated Pneumonia

In terms of all HAI rates in Michigan (except for CAUTIs), facilities with 100 or more beds had a higher rate of infection than the group of hospitals with under 100 beds. This difference was particularly noticeable when looking at the MRSA LabID Event rates. In the MRSA LabID module, those facilities with fewer than 100 beds had a MRSA LabID Event rate of 3.57 per 1,000 patient days, compared to those facilities with 100 or more beds, with a rate of 5.03 per 1,000 patient days.

When possible, the comparison of rates between Michigan and the US demonstrated that, for all device-related module rates, Michigan had a lower prevalence of all infections compared to each related US rate.

Table 19.

Rate<sup>1</sup> by Unit Type

	ICU/CCU <sup>2</sup>	US Rate <sup>3</sup>	Wards <sup>4</sup>	US Rate	SCA <sup>5</sup>	US Rate
MRSA LabID <sup>6</sup>	5.97 (13 facs <sup>7</sup> )	unavailable	4.04 (8 facs)	unavailable	---- (0 facs) <sup>8</sup>	unavailable
<i>C. diff</i> LabID <sup>9</sup>	1.92 (14 facs)	unavailable	1.41 (12 facs)	unavailable	---- (2 facs)	unavailable
CAUTI <sup>10</sup>	1.04 (19 facs)	1.61	0.93 (12 facs)	1.68	---- (0 facs)	----
CLABSI <sup>11</sup>	0.81 (41 facs)	1.54	0.35 (16 facs)	1.05	---- (0 facs)	----
VAP <sup>12</sup>	1.04 (27 facs)	1.81	---- (3 facs)	----	---- (0 facs)	----

Michigan Rate  Comparative National Rate

<sup>1</sup>Rates were calculated using the number of infections/events per 1,000 patient days or device days according to the same MI rate shown in Tables 9–14 among facilities that shared data with the Michigan Department of Community Health through the National Healthcare Safety Network.

<sup>2</sup>ICU/CCU: Intensive Care Unit/Critical Care Unit

<sup>3</sup>US comparative rates were calculated using data from the national estimate on the National Healthcare Safety Network (NHSN). This estimate utilized the NHSN 2009 Report data, and is matched to the Michigan data by facility type and unit type.

<sup>4</sup>Wards: Include inpatient units denoted as wards

<sup>5</sup>SCA: Specialty Care Area

<sup>6</sup>MRSA LabID: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Laboratory-identified (LabID) Event. This is an option within the Multidrug-Resistant Organism / *Clostridium difficile* Infection (MDRO/CDI) Module of NHSN for tracking MRSA laboratory results without conducting additional surveillance for infections.

<sup>7</sup>Facs: Facilities

<sup>8</sup>Although MDCH SHARP was able to calculate a rate for each infection/event and unit combination, there were insufficient data to report all. Data will only be published for groups of five or more hospitals in order to protect hospital identity and their data.

<sup>9</sup>*C. diff* LabID: *Clostridium difficile* (*C. diff*) LabID Event. This is an option within the MDRO/CDI Module of NHSN for tracking *C. diff* laboratory results without conducting additional surveillance for infections.

<sup>10</sup>CAUTI: Catheter-Associated Urinary Tract Infection

<sup>11</sup>CLABSI: Central Line-Associated Blood Stream Infection

<sup>12</sup>VAP : Ventilator-Associated Pneumonia

Both MRSA and *C. diff* LabID Event rates were higher in ICU/CCUs than in Wards. There were not enough data to accurately calculate a rate for specialty care areas, as less than 5 facilities provided data under each HAI category. These data will become more reliable as facilities allow the MDCH SHARP Unit to look at more unit types within their hospital in addition to participation by more hospitals.

## Conclusions

HAIs continue to be a problem in Michigan healthcare facilities and throughout the U.S. Although the numbers and rates of CLABSIs have dropped significantly in Michigan since the introduction of the CLABSI checklist by the MHA Keystone Center for Patient Safety & Quality, all HAIs remain a concern. The future holds many challenges related to infection prevention and control – challenges that will continue to affect patient safety and healthcare quality, as well as patient morbidity and mortality.

This semi-annual report looked at Michigan HAIs using NHSN data voluntarily shared with the MDCH SHARP Unit. This report followed the same structure as the previous 2009-2010 Annual Report, and includes data from the 2010 Quarter 4 report and the 2011 Quarter 1 report. Note that this data from participating hospitals has not been validated. Validation studies will be conducted throughout 2012 and beyond, as additional funding becomes available. This report contains data from many more facilities than in previous reports; however, the data will also become more reliable as additional Michigan hospitals participate in this surveillance initiative.

## Appendices

### Acronyms

Below is a list of commonly used acronyms throughout this report to facilitate ease in reading.

APIC	Association for Professionals in Infection Control & Epidemiology, Inc.
ARRA	American Recovery and Reinvestment Act
CAUTI	Catheter-Associated Urinary Tract Infection
CCU	Critical Care Unit
CDC	Centers for Disease Control & Prevention
CDI	<i>Clostridium difficile</i> Infection
CI	Confidence Interval
CLABSI	Central Line-Associated Bloodstream Infection
CO	Community-Onset
CO-HCFA	Community-Onset Healthcare Facility-Associated
DU	Device Utilization
DUA	Data Use Agreement
HAI	Healthcare-Associated Infection
HHS	U.S. Department of Health & Human Services
HO	Healthcare Facility-Onset
ICU	Intensive Care Unit
LabID	Laboratory-Identified Event
MDCH	Michigan Department of Community Health
MDRO	Multidrug-Resistant Organism
MHA	Michigan Health & Hospital Association
MRSA	Methicillin-Resistant <i>Staphylococcus aureus</i>
NHSN	National Healthcare Safety Network
SCA	Specialty Care Area
SHARP	Surveillance of Healthcare-Associated & Resistant Pathogens
SIR	Standardized Infection Ratio
SSI	Surgical Site Infection
VAP	Ventilator-Associated Pneumonia